

Feb. 9, 1937.

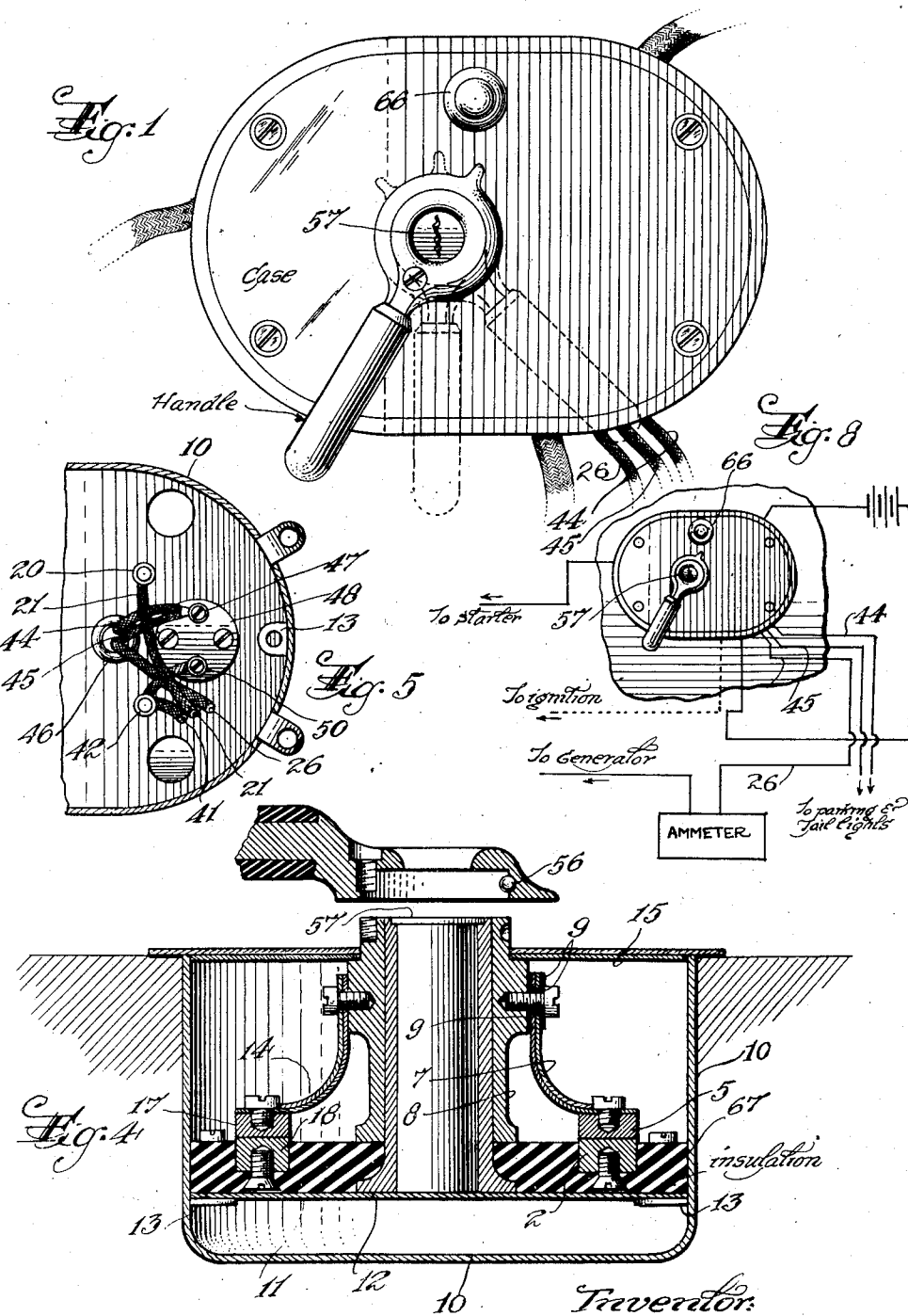
B. A. DURHAM

2,069,946

SWITCH

Filed Jan. 30, 1935

3 Sheets-Sheet 1



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Feb. 9, 1937.

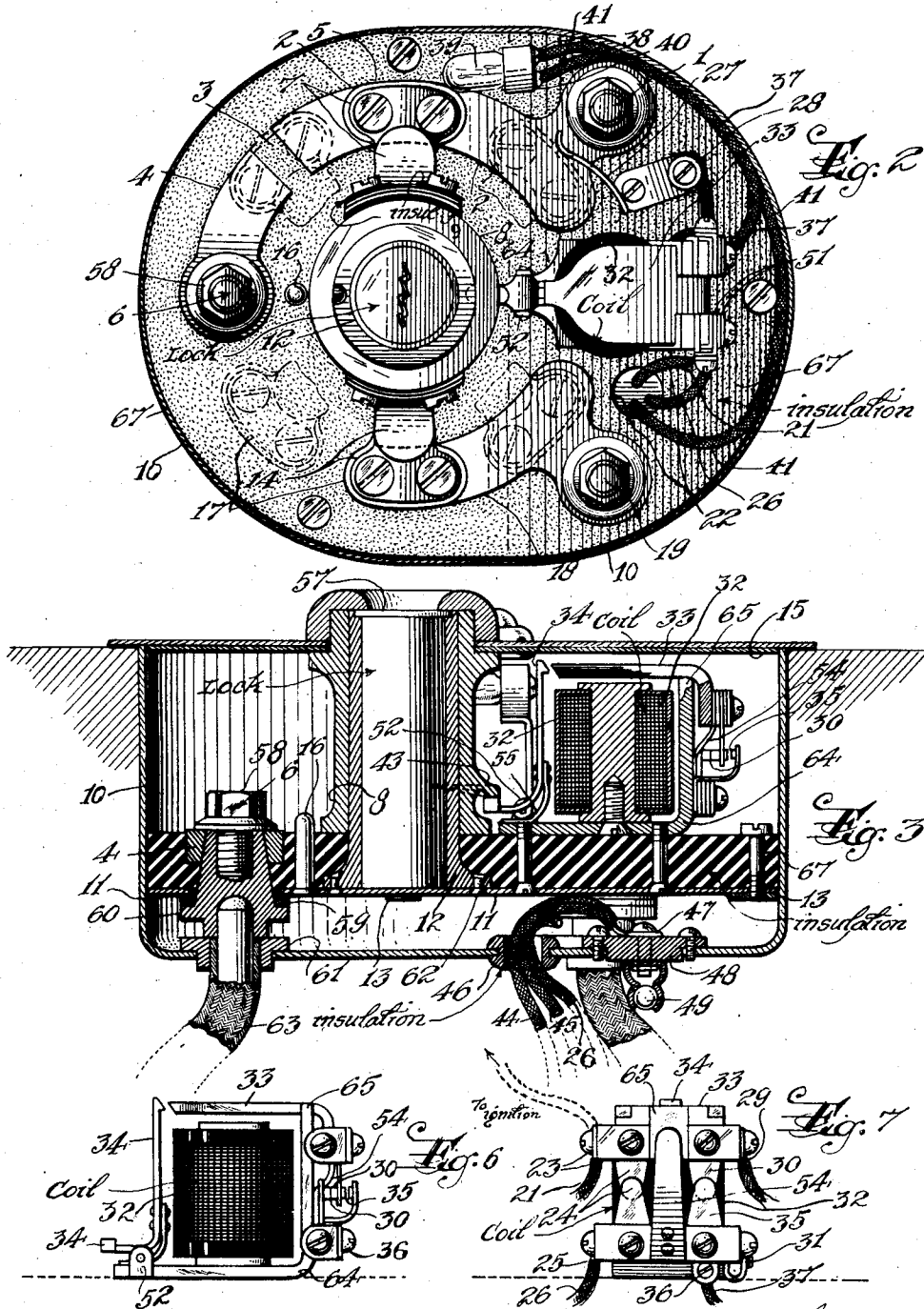
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3 Sheets-Sheet 2



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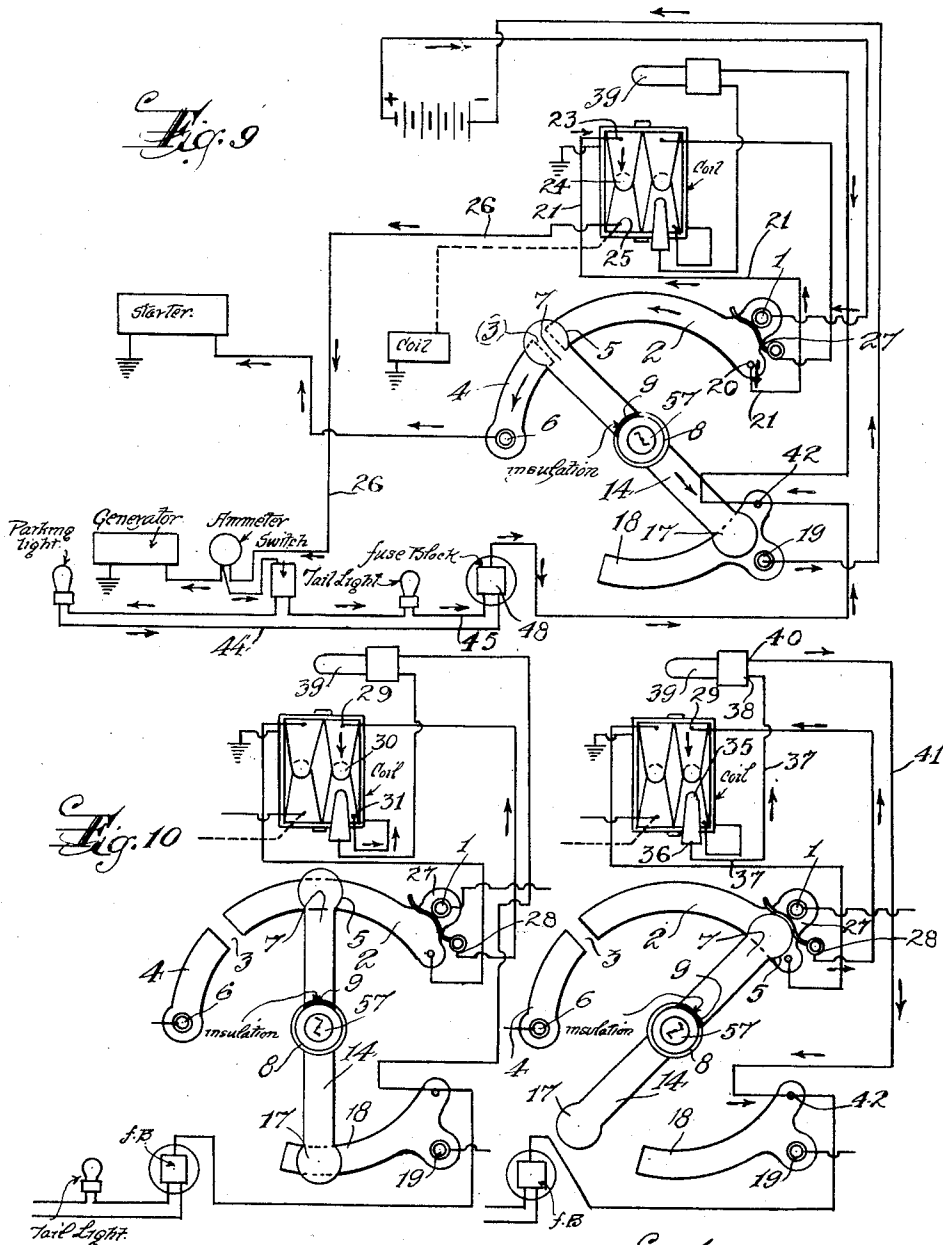


Fig. 11

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UNITED STATES PATENT OFFICE

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SWITCH

Baltis Arthur Durham, Nutley, N. J.

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15 Claims. (Cl. 171-97)

This invention relates to new and useful improvements in switches and has for its primary object to provide a device of this character which is compact, easily installed, practically fool-proof and cheap. Further objects of my invention are to provide a device of this character which places all electrical circuits under one control and the elimination of fire hazards due to short-circuits.

In carrying out my invention it is my purpose to provide a master switch of the type hereinafter described which will automatically become locked when the operating circuits have been switched off and the motor has been brought to a stop, necessitating the employment of a key provided for the purpose, before the motor can again be started or the vehicle again set in motion under its own power. It is also my purpose to prevent electrical circuits or currents being by-passed around the master switch without first having passed through the primary controlling element of the operating circuit of the master switch, thereby forestalling the employment of jumpers or other devices or methods, or of any manipulation whatsoever of any circuits outside the master switch in an unlawful effort to start a motor vehicle which has been locked automatically with the stopping of the motor.

In my device the primary controlling element of the operating circuit is of the cut-out or circuit breaker type and is constructed to operate only when the electrical system has become grounded or short-circuited because of a defect in the system or because of any other natural or unnatural condition which may exist outside the master switch. When the master switch is set in the "off" position and therefore automatically locked it will, when activated by a ground or short-circuit or other natural or unnatural condition, open the operating primary circuit thereby causing all circuits in the operating circuit to become inoperative or dead.

When the primary controlling element has thus been brought into action and the primary circuit has been caused to open, such opening closes the tell-tale lamp circuit and lights the tell-tale lamp which is located inside the master switch. This lamp, of any attention-arresting color, is visible on the face of the master switch and, when lighted, indicates trouble or an unnatural condition existing in the electrical system.

In my device there can be but one cause for the operation of the controlling element in the primary operating circuit, viz: a ground circuit must be provided between the negative post of the battery and the chassis (the common ground) which

circuit is open when the mechanism of the master switch is set in the "off" position and therefore locked. To clear the controlling element and the tell-tale lamp the master switch must be unlocked and the master control lever must be advanced to the running position, thus releasing the locking device of the primary controlling element and permitting the same to return to its normal position. If, however, upon returning the master control lever to the "off" position where it again becomes locked, the primary controlling element again operates and the tell-tale lamp lights, trouble is indicated as being still present. This trouble must be located and removed before the motor vehicle can again be started or operated.

With these and other objectives in view, the invention consists of the construction, combination and arrangement of the parts and circuits hereinafter described and detailed in the accompanying drawings, in which:

Figure 1 is a plan view thereof.

Figure 2 is a transverse horizontal section therethrough.

Figure 3 is a vertical section of Figure 2.

Figure 4 is a similar section of Figure 2 taken at right angles to Figure 3.

Figure 5 is a fragmentary section showing the fuse plug attachment.

Figure 6 and Figure 7 are detail views of the coil members.

Figure 8 is a view of my device mounted on a panel board.

Figures 9, 10 and 11 are wiring diagrams showing the method of hooking up my device.

Beginning at the battery a cable is connected between the plus positive post of the battery and the terminal 1 of the master switch. From this point the circuit is continued through the contact 2 and is connected to the contact plate 4 by means of the contact shoe 5 which bridges the neutral space 3. The contact shoe 5 and the contact shoe arm 7 are insulated from the main rotor body 8 with an accepted insulating material 9 as shown in the cross sectioned view. A cable from the terminal 6 of the contact plate 4 is connected to the starting motor thus completing the positive side of the starting circuit.

The negative side of the battery circuit, known as the common ground, is returned through the chassis and other metal conductors to the master switch body or shell 10. The mounting plate 11, upon which is mounted the lock barrel 12 is carried upon the lugs 13 in the shell 10. The contact arms 7 and 14 are of spring metal and when

mounted, exert an upward thrust on the rotor 8 and against the top plate 15. The contact arm 14 and the contact shoe 17 are not insulated, but are directly connected to the rotor 8. When this rotor is placed in either the running or starting positions the contact shoe 17 rests upon the contact plate 18 which is connected to the battery terminal 19 in the master switch, thence to the negative post of the battery by means of a cable, thus completing the circuit.

The operating circuit is the source of electrical supply to all lights, ignition, horn and all other electrical devices other than the starting motor, and is of the one-wire or ground-return system. The negative circuit employed in the operating circuit is the same as that employed in the starting circuit.

Beginning at the terminal 20 the wire circuit 21 is carried through the insulating panel and support plate at 22 to the terminal 23 of the circuit-breaker; through the breaker contact points 24 to the terminal 25, then back through wire 26, the opening 22 in the insulating panel to the opening in the shell 10, and thence to the ammeter and generator of any assembly which the various motor vehicle manufacturers now employ, or in the future may design.

Therefore, when the rotor 8 is set in the "off" position and is locked as shown, the contact shoe 17 is removed from the contact plate 18, thereby opening the ground circuit between the rotor 8 and the contact plate 18 thus rendering inoperative or dead all circuits except the parking and tail-light circuits.

When the rotor 8 is in the "off" position, the primary circuit-breaker is activated by the contact arm 7 on the contact shoe 5 which is in contact at all times with the contact plate 2. From the contact arm 7, the activating circuit of the primary circuit-breaker continues through the terminal 28 of the contact arm 7 to the terminal 29 and through contact points 30 to the terminal 31, thence to the breaker coil winding 32. The other end of the coil winding is grounded.

When the control rotor 8 is in the "off" position and the ground circuit to the battery is open, the only method of actuating the circuit breaker is to establish a ground connection between the battery terminal at the battery and the chassis or frame. When such a ground is established outside the master switch, the operating circuit-breaker is brought into action. The activity is as follows:

The coil of the circuit-breaker having been actuated because of the ground circuit having been closed by an electrical connection made outside the master switch the coil armature 33 is drawn downward thus opening the contact points in both the operating and breaker circuits. The armature is locked in this position by the armature lock 34 thus rendering the entire operating system dead, parking and tail-lights included.

When the coil armature has been drawn downward and locked as above described the contact points 35 are closed causing a circuit to flow through the terminal 36 and wire 37 to the lamp terminal 38. The current passes through the lamp 39 to the lamp terminal 40, thence by wire 41 through the opening 22 in the insulating panel, to the terminal 42 of the negative battery contact plate 18, causing the tell-tale lamp to light, same being visible on the front of the master switch and indicating a ground in the system.

To clear the circuit-breaker in the master switch, the master switch-key must be employed.

After the switch is unlocked the master control is set in the running position, thus causing the boss 43 (which is part of the rotor 8) to pass over and release the armature lock 34, thereby allowing the armature 33 to return to its normal position. If, however, upon returning the master control lever to the "off" position, the circuit-breaker should again operate, a ground outside the master switch is indicated and such ground must be removed before the motor vehicle can again be operated under its own power.

The parking and tail-light circuits (which are of the two-wire system) are operated in the usual way, that is, from the lighting switch. The lamps are of the double-contact type and the negative circuit is returned to the master switch through wires 44 and 45 instead of through the chassis or common ground; through the insulator 46, to the terminal 47 on the fuse block 48, thence through the fuse 49 as shown in Fig. 3, to the terminal 50, thence to the terminal 42 of the negative contact plate 18.

There is no possibility of a ground in the parking or tail-light circuits as the negative or common ground circuit to the battery is open when the master control is set in the "off" position. There is, however, a possibility of a direct short-circuit between the positive and negative circuits of the parking and tail-lamps at the lamp connections, or by the two circuits becoming bared or otherwise united, a condition which is present in any two-wire system. To eliminate possibility of fire at this source, a fuse block and fuse is placed in the ground circuit. This fuse is readily accessible, being fixed on the back of the master switch as shown in Fig. 3.

Should any short-circuit occur, the high amperage flowing to the ground would instantly melt the fuse and open the negative circuits of the parking and tail-lights, thus rendering these circuits inoperative and absolutely free of all electrical energy, there being no other ground through which to complete the circuit.

I have described my invention as applied to automobiles, but it is well adapted to aeroplane, lighter-than-air craft, and submarines, or any other device wherein a switch of this character may be employed, and the claims should be interpreted accordingly.

What I claim is:

1. In an electrical system for automotive mechanism including starter, ignition, generator and lighting circuits, a control device for said circuits comprising a first contact having a wire connection to a starting motor, a second contact having a wire connection to a load and to a first battery terminal, a third contact, a fourth contact having a wire connection to a second battery terminal, a circuit-breaker coil having a wire connection to the third contact, a switch for the load circuit adapted to be operated by the coil, a switch for the coil circuit adapted to be operated by the coil, means for holding said switches in open position, an insulated movable switch member for connecting the starting motor and circuit-breaker coil to the first battery terminal contact, and a grounded movable switch member for connecting the second battery terminal contact to ground, said switch members being movable successively to close the motor starter circuit, to close the load circuit, and to close the circuit-breaker coil circuit while opening the battery switch.

2. In an electrical system for automotive mechanism including starter, ignition, generator and

lighting circuits, a control device for said circuits comprising a first contact having a wire connection to a starting motor, a second contact having a wire connection to a load and to a first battery terminal, a third contact, a fourth contact having a wire connection to a second battery terminal, a circuit-breaker coil having a wire connection to the third contact, a switch for the load circuit adapted to be operated by the coil, a switch for the coil circuit adapted to be operated by the coil, means for holding said switches in open position, an insulated movable switch member for connecting the starting motor and circuit-breaker coil to the first battery terminal contact, a grounded movable switch member for connecting the second battery terminal contact to ground, said switch members being movable successively to close the motor starter circuit, to close the load circuit, and to close the circuit-breaker coil circuit while opening the battery switch, and means for releasing the holding means of said switches.

3. In an electrical system for automotive mechanism including starter, ignition, generator and lighting circuits, a control device for said circuits comprising a first contact having a wire connection to a starting motor, a second contact having a wire connection to a load and to a first battery terminal, a third contact, a fourth contact having a wire connection to a second battery terminal, a circuit-breaker coil having a wire connection to the third contact, a switch for the load circuit adapted to be operated by the coil, a switch for the coil circuit adapted to be operated by the coil, means for holding said switches in open position, an insulated movable switch member for connecting the starting motor and circuit-breaker coil to the first battery terminal contact, a grounded movable switch member for connecting the second battery terminal contact to ground, said switch members being movable successively to close the motor starter circuit, to close the load circuit, and to close the circuit-breaker coil circuit while opening the battery switch, means for releasing the holding means of said switches, and means for indicating the formation of a by-pass circuit for the second battery terminal contact.

4. In an electrical system for automotive mechanism including a load and battery, a control device comprising a first contact having a wire connection to a load and to a first battery terminal, a second contact, a third contact having a wire connection to a second battery terminal, a circuit-breaker coil having a wire connection to the second contact, a switch for the load circuit adapted to be operated by the coil, a switch for the coil circuit adapted to be operated by the coil, means for holding said switches in open position, an insulated movable switch member for connecting the circuit-breaker coil to the first battery terminal contact, a grounded movable switch member for connecting the second terminal battery contact to ground, said switch members being movable successively to close the load circuit and to close the circuit-breaker coil circuit while opening the battery circuit.

5. In an electrical system for automotive mechanism including a load and battery, a control device comprising a first contact having a wire connection to a load and to a first battery terminal, a second contact, a third contact having a wire connection to a second battery terminal, a circuit-breaker coil having a wire connection to the second contact, a switch for the load circuit adapted to be operated by the coil, a switch for the coil circuit adapted to be operated by the coil, means for holding said switches in open position, an insulated movable switch member for connecting the circuit-breaker coil to the first battery terminal contact, a grounded movable switch member for connecting the second terminal battery contact to ground, said switch members being movable successively to close the load circuit and to close the circuit-breaker coil circuit while opening the battery circuit.

circuit adapted to be operated by the coil, a switch for the coil circuit adapted to be operated by the coil, means for holding said switches in open position, an insulated movable switch member for connecting the circuit-breaker coil to the first battery terminal contact, a grounded movable switch member for connecting the second terminal battery contact to ground, said switch members being movable successively to close the load circuit and to close the circuit-breaker coil circuit while opening the battery circuit, and means for releasing the holding means of said switches.

6. In an electrical system for automotive mechanism including a load and battery, a control device comprising a first contact having a wire connection to a load and to a first battery terminal, a second contact, a third contact having a wire connection to a second battery terminal, a circuit-breaker coil having a wire connection to the second contact, a switch for the load circuit adapted to be operated by the coil, a switch for the coil circuit adapted to be operated by the coil, means for holding said switches in open position, an insulated movable switch member for connecting the circuit-breaker coil to the first battery terminal contact, a grounded movable switch member for connecting the second terminal battery contact to ground, said switch members being movable successively to close the load circuit and to close the circuit-breaker coil circuit while opening the battery circuit, means for releasing the holding means of said switches, and means for indicating the formation of a by-pass circuit for the second battery terminal contact.

7. In an electrical system for automotive mechanism including a load and battery, a control device comprising a first contact having a wire connection to a load and to a first battery terminal, a second contact, a third contact having a wire connection to a second battery terminal, an insulated movable switch member for connecting a circuit-breaker coil to the first battery terminal contact, a grounded movable switch member for connecting the second battery terminal to ground, and means including said circuit-breaker coil for breaking said load connection when the insulated switch member engages with the second contact when the grounded switch opens the ground circuit and when a by-pass is formed about said third contact.

8. In an electrical system for automotive mechanism including a load and battery, a control device comprising a first contact having a wire connection to a load and to a first battery terminal, a second contact, a third contact having a wire connection to a second battery terminal, an insulated movable switch member for connecting the circuit-breaker coil to the first battery terminal contact, a grounded movable switch member for connecting the second battery terminal to ground, means for breaking said load connection when the insulated switch member engages with the second contact when the grounded switch opens the ground circuit and when a by-pass is formed about said third contact, and means for indicating a by-pass of said third contact.

9. A contact having a permanent wire connection to a first battery terminal and a wire connection to ground, an insulated contact having a permanent wire connection to a second battery terminal, a grounded switch member movable to ground said insulated contact, and means for

opening said ground wire connection when the insulated contact is electrically shunted.

10. A contact having a permanent wire connection to a first battery terminal and a wire connection to ground, an insulated contact having a permanent wire connection to a second battery terminal, a grounded switch member movable to ground said insulated contact, means for opening said ground wire connection when the insulated contact is electrically shunted, and means for holding said ground wire connections open.

11. A contact having a permanent wire connection to a first battery terminal and a wire connection to ground, an insulated contact having a permanent wire connection to a second battery terminal, a grounded switch member movable to ground said insulated contact, means for opening said ground wire connection when the insulated contact is electrically shunted, means for holding said ground wire connections open, and additional means for disabling said ground wire connection opening means.

12. A contact having a permanent wire connection to a first battery terminal and a wire connection to ground, an insulated contact having a permanent wire connection to a second battery terminal, a grounded switch member movable to ground said insulated contact, means for opening said ground wire connection when the insulated contact is electrically shunted, and signalling means for indicating formation of said shunt.

13. In combination, a battery, an electric generator, a load, a switch unit comprising a contact having a permanent wire connection to a first battery terminal and a wire connection to ground, an insulated contact having a permanent wire connection to a second battery terminal, and a grounded switch member movable to ground said insulated contact, means for opening said ground wire connection when the insulated contact is electrically shunted, means for holding said ground wire connections open, addi-

tional means for disabling said ground wire connection opening means, and signalling means for indicating formation of said shunt.

14. An electrical system for internal combustion engines comprising a starting motor, battery and load, a master switch including first, second, third and fourth contacts, an insulated movable switch member for connecting said first and second contacts, and a grounded switch member for grounding the third contact, a circuit connecting the first contact and the motor, a circuit connecting the load and second contact, a circuit connecting a first battery terminal to the second contact, a circuit connecting a second battery terminal to the third contact, a second switch in said load circuit, electromagnetic means for operating the second switch, a circuit between the electromagnetic means and the fourth contact, said insulated switch member being adapted to close the second and fourth contacts when said grounded member is disconnected from the third contact.

15. An electrical system for internal combustion engines comprising a starting motor, battery, load, a master switch, said switch including first, second, third and fourth contacts, an insulated movable switch member for connecting the first and second contacts and a grounded switch member for grounding the third contact, a circuit connecting the first contact and motor, a circuit connecting the load and second contact, a circuit connecting a first battery terminal to the second contact, a circuit connecting a second battery terminal to the third contact, a second switch in said load circuit, electromagnetic means for operating said second switch, and a circuit between the electromagnetic switch and said fourth contact, said insulated switch member being adapted to close the second and fourth contacts when said grounded member is disconnected from the third contact, said electromagnetic means being energized only when said second battery terminal is grounded.

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