Sept. 8, 1931. S. T. SCHOFIELD 1,822,112

OIL CIRCUIT BREAKER

Filed Aug. 9, 1927

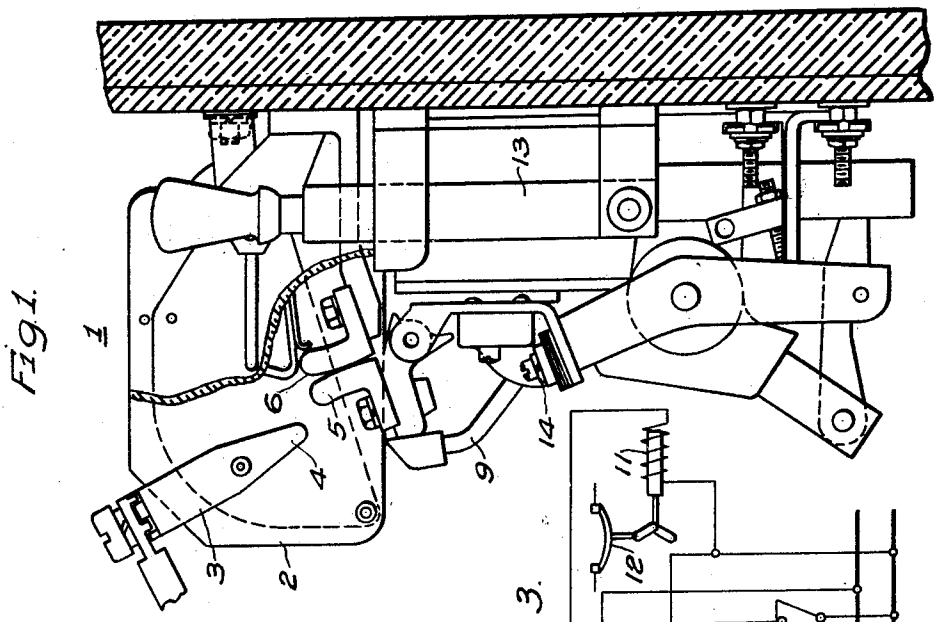


Fig. 1.

Fig. 3.

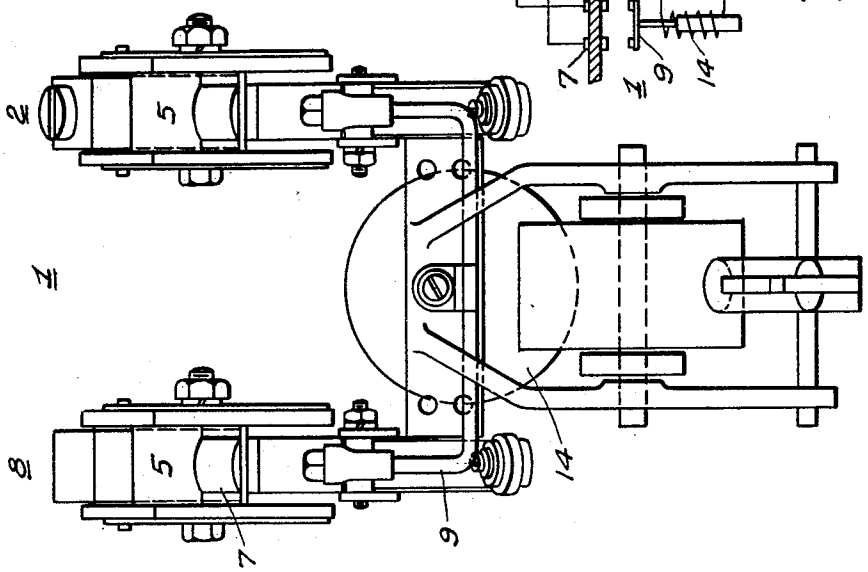


Fig. 2.

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UNITED STATES PATENT OFFICE

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OIL CIRCUIT BREAKER

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My invention relates to circuit-interrupting devices and more particularly to devices that may be employed to dissipate the stored energy of solenoids.

One object of my invention is to provide a circuit interrupter with means for dissipating the stored energy of the inductive circuit when the latter is open-circuited and to thereby prevent the inductive surge from traversing the supply circuit.

Another object of my invention is to provide a circuit-interrupting device with means for producing an arc to complete a circuit for dissipating the inductive energy in a circuit.

A still further object of my invention is to provide a circuit-interrupting device with a double-break contact, one pair of separable contacts of which is employed for establishing an arc to short-circuit the inductance, while the other pair interrupts the current supply to a solenoid.

Trouble has been experienced in the past, when employing heavy-current solenoids for the operation of circuit interrupters and other devices, by reason of the fact that surges were produced in the supply circuit when the solenoid was disconnected therefrom. The surge produced thereby on traversing the said supply circuit would burn out ground detectors and cause breakdowns in the insulation of other apparatus. Resistors employed to shunt across the solenoid to eliminate this transient voltage proved unsatisfactory, as the energy in the solenoid was not dissipated soon enough and the solenoid functioned to delay the opening of the circuit interrupter.

My invention consists in completing a circuit across the terminals of the solenoid by means of an arc which dissipates the energy in a very short time and eliminates transient voltages in the supply circuit.

My invention will best be understood by referring to the drawings, in which

Figure 1 is a view, partly in elevation and partly in section, of a particular embodiment of my invention.

Fig. 2 is a plane view thereof.

Fig. 3 is a diagram showing the connections of the various circuits of the particular embodiment of my invention shown in Figs. 1 and 2.

My invention comprises, in general, a contactor 1 that may be of any standard type having a bridging member for opening the circuit of the solenoid at two points, one contact co-operating with an auxiliary terminal to short-circuit the solenoid in a manner more fully described hereinafter, while the other contact insures the opening of the supply circuit.

Fig. 1 shows an arc chute 2 with the conventional arc-splitter, of the prior art, removed and an arc horn 3 of conducting material provided in its stead. An end 4 of the arcing horn is adjacent to the path of the arc which forms upon the movement of a contact member 5 to its open position. When the contactor 1 is operated, an arc is first produced between contacts 5 and 6 and is then caused to transfer to a path between the end 4 of the arcing horn 3 and the stationary contact member 6. A pair of contact members 7 in an adjacent arc chute 8 may be provided and connected in series with the contacts 5 and 6 by means of a conducting shunt 9.

Referring to the circuit connections as shown in Fig. 3, a solenoid 11 is the operating means for a circuit interrupter 12. One terminal of solenoid 11 is in circuit with the stationary contact member 6, the other terminal being connected to one side of a supply line and also to the arcing horn 3. The contacts 7 are connected in series with the other side of the supply line. By the closing of a control switch 13 in said supply line, the solenoid 14 is energized and closes the contactor 1. Thereupon the shunt 9 completes the circuit to the coil 11 from the supply line through contacts 5, 6 and 7 and the circuit interrupter 12 closes.

When the control switch 13 is opened, the contactor-closing coil 14 is deenergized, and the contactor 1 opens, thus separating the contacts 7 in the arc chute 8 and the contacts 5 and 6 in the arc chute 2. Upon the opening of the separable contacts 5 and 6, the arc drawn thereby will be transferred from the contact 5 to the end 4 of the arcing horn 3,

establishing an arc between the end 4 and stationary contact 6 to complete the circuit across the solenoid 11. This permits the magnetic energy stored in the solenoid to be quickly dissipated in the arc thus established. By reason of contacts 7 being open, the further flow of current from source 13 to solenoid 11 is prevented, regardless of the existence of arcs in arc chute 2.

It will thus be seen that I have provided a method of dissipating the energy in a highly-inductive circuit very quickly, at the same time preventing transient voltage from traversing the supply circuit thereby protecting lamps and instruments connected thereto from being burned out or having their insulation destroyed.

It is to be understood that such changes in the form, arrangement and connection of the component parts of my invention may be made as shall fall within the scope of the appended claims.

I claim as my invention:

1. In combination with an inductance, a device for disconnecting said inductance from its source of supply, arcing means positioned adjacent to a contact of said device and means for shunting the inductance including the arcing means.

2. In combination with an inductance, a source of voltage for energizing said inductance, means for connecting and disconnecting said inductance from said source and means for establishing an arc in shunt with the inductance when said disconnecting means is operated.

3. The method of dissipating the electromagnetic energy of an inductance which comprises disconnecting said inductance from the source supplying current thereto and establishing an arc in shunt to said inductance.

4. The combination with an inductance, of a pair of separable contacts for disconnecting one end of said inductance from the current source supplying it, and means for transferring one terminal of the arc incident to separating said contacts to the other end of said inductance.

5. In combination with a solenoid, a circuit-opening device therefor comprising a pair of separable contacts, a source of voltage for energizing the solenoid controlled by the said device and an arcing horn in proximity to the said contacts and in circuit with the solenoid.

6. In combination with a solenoid, a circuit-opening device therefor comprising a pair of stationary contacts and a bridging member, a source of voltage for energizing the solenoid through the said contacts and bridging member, and an arcing horn in proximity to one of the said stationary contact members and in circuit with the said solenoid.

7. In combination with a solenoid in circuit with a source of energy controlled by a circuit-interrupting device, a second circuit adapted to include the solenoid, and arcing means for shunting the solenoid to complete the said second circuit when said circuit-interrupting device is opened.

8. The combination with a motor for operating a mechanism, of a circuit for supplying energy thereto, a switch for said circuit having a pair of contact members that are bridged by a conducting member for drawing two arcs in series relation when interrupting the circuit to the motor, a contact member positioned adjacent to the arc path of one of said arcs, a circuit from said motor to the last said contact member that is completed when an arc impinges on said contact member, the other arc, upon extinguishment, disconnecting the source of energy from said motor.

In testimony whereof, I have hereunto subscribed my name this 3rd day of August, 1927.

STANLEY T. SCHOFIELD.