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ELECTROMAGNETIC CIRCUIT MAKER AND BREAKER

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FIG. 1

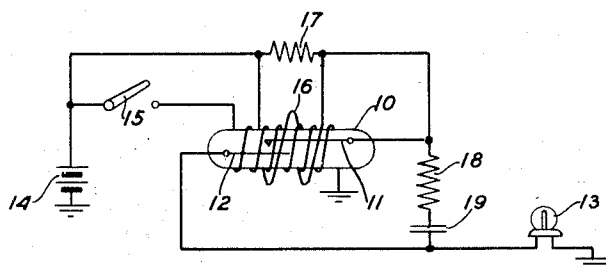
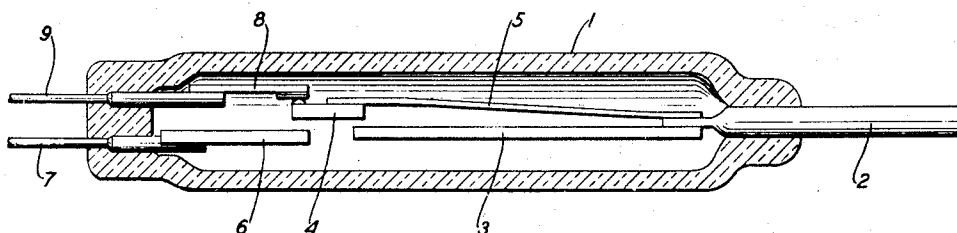


FIG. 2



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ELECTROMAGNETIC CIRCUIT MAKER AND BREAKER

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2 Claims. (Cl. 175-294)

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This invention relates to circuit makers and breakers and particularly to contact protection of glass sealed contact devices.

The object of the invention is to protect the contacts of a switching device from the ill effects of breaking an abnormally high current. It is known that certain types of load give rise to initial transient currents which may reach relatively high values, such for instance, as the ordinary tungsten filament lamp. In such a case the cold resistance of the lamp is very low in comparison to the hot resistance thereof, so that when a lamp circuit is closed the initial current is many times the normal amount. Usually this has no adverse effect on the various circuit elements for the period which is required for the lamp to reach incandescence is very short. There are however situations in which it is desired to use glass sealed contact elements to close such a circuit and in which the contact device is adequate to carry the normal current, but wherein the contacts are subject to serious injury or destruction, if for instance, they are opened during the initial rush of current into the cold lamps. Such an operation might come about through various circumstances, as for instance, the chattering of the contacts which control the magnetic means which are used to operate the said contacts.

In accordance with the present invention means are employed responsive to the high starting current to hold the closed contacts firmly together so that they cannot break the circuit during the period of the starting transient. This takes the form of an extra winding to influence the magnetic circuit of the contacts of such proportions that it will not interfere with the normal operation of the circuits but will respond to an abnormal condition.

A feature of the invention is a locking means for a pair of circuit closing contacts responsive to an abnormal rush of current therethrough. According to this feature an operating winding for the contacts is included in series with the said contacts but is so proportioned and arranged that it will not prevent the opening of the contacts when a normal amount of current is flowing therethrough.

The drawings consist of a single sheet having two figures as follows:

Fig. 1 is a schematic circuit diagram illustrating the invention; and

Fig. 2 is a cross-sectional view of a typical form of glass sealed contact device greatly enlarged.

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In Fig. 2 the contact device consists of a glass envelope 1 into one end of which a tube 2 is sealed and which may be used during the construction for tubulation purposes and later when the device is in operation as an electrode. An element 3 of magnetic material is welded to the electrode 2 and a multiple armature 4 of magnetic material is welded to a spring 5 which is also attached to the electrode 2. At the other end of this device a magnetic element 6 is welded to a lead-in terminal 7 in such a position that gaps are provided between the elements 3, 4 and 6. A back contact element is also provided by the non-magnetic piece 8 welded to another lead-in terminal 9. This glass sealed element may be inserted within a coil and thus subjected to magnetic influence whereupon the element 4 is moved to decrease the gaps and make an electrical connection with the terminal piece 6 so that an electrical circuit may be completed through the device from the electrode 2 to the terminal 7.

Generally, these devices are evacuated and then filled with suitable gas such as hydrogen.

In the schematic circuit diagram such a device is illustrated by the element 10 carrying the two contacts 11 and 12. This is shown in its unoperated position. In this circuit a lamp 13 represents a type of load which requires a high starting current such as an ordinary tungsten filament lamp which has a low cold resistance. The battery 14 may be closed to the load 13 through the use of any type of switch here illustrated by the switch 15. When the switch 15 is closed, a circuit will be extended from ground, battery 14 through the switch 15, the main winding of the coil used for actuating the device 10 to ground. This will cause the contact elements 11 and 12 to complete a circuit through the device so that now a circuit may be traced from ground, battery 14 through the auxiliary winding 16 of the contact device, the contact element 11, the contact element 12, the load 13 to ground. The current flowing through this auxiliary winding will be heavy at first and will then decrease to the ordinary load current of the device 13. This starting current will be sufficient to hold the contacts 11 and 12 closed even though in some manner the circuit for the main winding of the device becomes opened whereby the device is prevented from opening a circuit with an extraordinarily heavy current flowing therethrough. After the operating current through the device 13 has subsided to its normal value, that current flowing through the auxiliary winding 16 will no

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longer be able to hold the contacts 11 and 12 closed so that when the switch 15 is later opened the device will immediately release.

A resistance 17 is shown bridged across the auxiliary winding 16 and this may be changed in value in accordance with the load which the device will be called upon to handle whereby the current through the auxiliary winding 16 may be properly adjusted. The resistance 17 is adjustable in the sense that different values may be provided to fit any particular circuit arrangement but it is not contemplated that this will be a variable type resistance.

A resistance 18 and a capacitor 19 in series therewith are bridged across the contact elements 11 and 12 to prevent arcing of the contacts on normal opening operations.

What is claimed is:

1. The combination of an electromagnetically operated circuit closer comprising a pair of contacts, an operating winding therefor and in series therewith, an external circuit closed for energizing and de-energizing said operating winding to cause opening and closing of said first contacts at will, of an auxiliary winding for holding said contacts closed connected in series with said contacts responsive and effectively responsive only to current of a strength beyond a safe limit to be broken by said contacts.

2. An electromagnetically operated circuit closer having a predetermined mechanical bias providing a predetermined restoring force to hold said circuit closer in normally open position, an electrically operated solenoid in cooperative relationship with said circuit closer and external

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means including a source of current and a switch for energizing and de-energizing said solenoid at will to close and open said circuit closer at will, an auxiliary solenoid in cooperative relationship with said circuit closer, included in series with said source of current, said circuit closer and an external load, said auxiliary solenoid producing a magnetic effect to aid the holding of said circuit closer operated but of insufficient strength to overcome said restoring force until the load current exceeds a predetermined value, whereby said circuit closer may be operated by said external means to break normal loads but will be prevented from responding to said external means to break greater than normal loads.

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