July 7, 1959 R. W. CABELL 2,894,099

FUSES FOR ELECTRIC CIRCUITS

Filed Oct. 8, 1956

Fig. 1

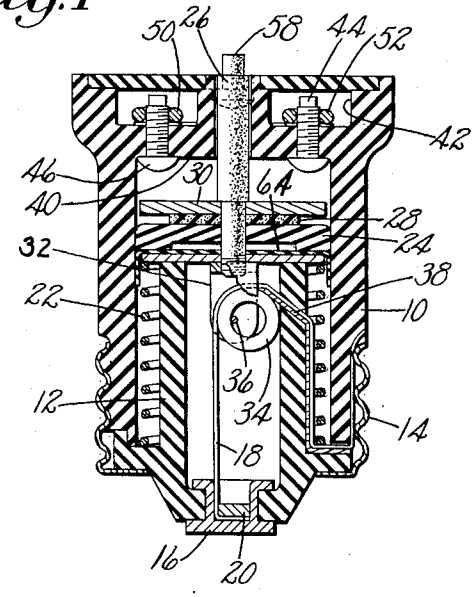



Fig. 2

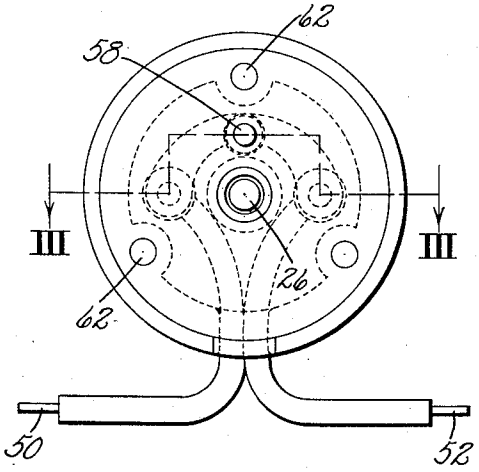
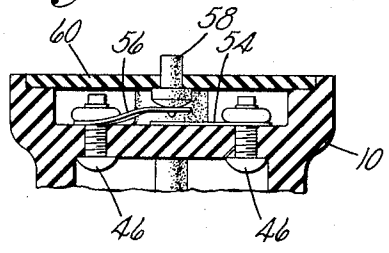



Fig. 3




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# FUSES FOR ELECTRIC CIRCUITS

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6 Claims. (Cl. 200—117)

This invention relates to overload protection devices for electrical circuits, and more particularly to fuses having provision for completing an auxiliary circuit to a signal or other device in response to an overload of a predetermined magnitude in a controlled circuit. The present invention is an improvement over that disclosed in Letters Patent of the United States No. 2,791,663, granted May 7, 1957, on an application filed in my name and may be used with the fire alarm system disclosed therein.

An object of the invention is to provide an improved circuit controller having means for interrupting a controlled circuit in response to an overload therein of a predetermined magnitude and simultaneously to complete an auxiliary circuit.

As illustrated in the aforementioned patent there is provided a fuse having an auxiliary switch member normally held in open position by a fusible element and biased toward closed position by a spring. In order to minimize the force exerted on the fusible element by the spring, and to insure quenching of the arc formed when the fusible element ruptures because of an overload in the circuit being controlled by the fusible element, and in accordance with a feature of the invention, a roll of dielectric material is connected to the auxiliary switch member for movement therewith and the fusible element passes around this roll, the arrangement being such that the force which would otherwise be exerted upon the fusible element is reduced by one half. The roll is loosely mounted and the arrangement is such that the roll readily separates the two parts of the fusible element upon rupture thereof, to minimize the possibility of an arc forming between the two parts of the fusible element.

In accordance with another feature of the invention, the fuse includes means whereby the circuit controlled by the auxiliary switch member may be tested at any time without in any way affecting the normal operation of the fuse.

In accordance with a further feature of the invention, a member movable exteriorly of the fuse is provided for indicating rupture of the fusible element, whereby an attendant can readily determine which of a plurality of such fuses is responsibe for causing closure of the auxiliary circuit.

In accordance with another feature of the invention, the fusible element is contained in a chamber separated from the auxiliary switch member by a diaphragm of asbestos or similar material having a peripheral flanged portion arranged, upon rupture of the fusible element due to an overload in the circuit being controlled, to prevent escape of gases into the chamber containing the auxiliary switch member.

The above, and other features of the invention, including various details of construction and novel combinations of parts will now be described by reference to the drawings and pointed out in the claims.

In the drawings,

Fig. 1 is a vertical section through one form of circuit controller embodying the invention;



Fig. 2 is a plan view of the circuit controller shown in Fig. 1, and

Fig. 3 is a section on the line III—III of Fig. 2.

The circuit controller comprises a hollow body formed of concentric members **10**, **12** formed of a suitable electrical insulating material, such as thermoplastic. A metal ferrule **14** secures the members together in assembled relation, the ferrule being provided with a threaded portion whereby it may be screwed into a conventional socket in a fuse box. The lower end of the ferrule is provided with the usual contact button **16** arranged for engagement with a contact usually found in the bottom of the socket in the fuse box. A strip of fusible material **18** has one end soldered at **20** to the contact button and the other end is clamped between the members **10** and **12**, and extends along the outside of the member **10** in contact with the ferrule **14**, thus completing a circuit from the button **16** to the ferrule **14**.

The members **10** and **12** are spaced to provide an annular chamber between them, housing a spring **22** the lower end of which seats against a flange projecting outwardly from the member **12** and held by the ferrule **14** against the member **10**. The upper end of the spring **22** acts against a piston member **24**, preferably of electrical insulating material, which forms with the member **12** an expansible chamber containing the strip of fusible material **18**. Held in assembled relation with the piston member **24** by a pin **26** of suitable electrical insulating material is a washer **28** of rubber or similar material and a metallic circular conductor member **30**, the pin having a shoulder engaging the upper surface of the washer and having a threaded portion below the piston member **24**.

Threaded on the pin **26** is a member **32** having a bifurcated portion extending downwardly below the threaded portion between the legs of which is a roll **34** loosely mounted on a pin **36** extending through the legs. The strip of fusible material passes around the roll **34** and holds the assembled piston member **24**, the washer **28** and the conductor member **30** downwardly in the position shown against the action of the spring **22** until the fusible element ruptures due to an overload in the circuit being controlled. To control the direction of the force exerted by the roll **34** on the strip of fusible material so that it will be taken equally by those portions of the strip on each side of the roll, thereby minimizing the strain on the fusible material, a strip **38** of metal extends from a point between the roll and the fusible material, through a slot in the member **12** beneath the fusible material then down along the outside of the member **12** and is clamped with the fusible material between the members **10** and **12**. With this arrangement, the load on the strip of fusible material is only half as much as in the arrangement disclosed in my aforementioned application. It will be noted that the roll is provided with a circular opening which is of substantially greater diameter than that of the pin **36** so that, when the stress exerted thereon by the fusible element is relieved by rupture of the fusible element, the roll will oscillate and rotate. Thus the roll effectively separates the two portions of the fusible element upon rupture of the element, preventing or quenching any arc which might be formed therebetween. Accordingly, the roll is preferably formed of a suitable dielectric material, such as a ceramic.

The upper end of the member **10** is provided with a top wall **40** spaced from the conductor member **30** and has an annular recess **42** in which are received ends **44** of contact members **46** threaded through the top wall and having heads seated against the inner side of the top wall. Upon rupture of the fusible material, the spring **22** moves the piston **24** upwardly carrying the contact member **30** with it to complete a circuit through the con-

tact members 46. The chamber housing the fusible element expands upon upward movement of the piston member 24, thus reducing the possibility of escape of hot gases caused by burning out of the element 18, igniting nearby combustibles. The rubber washer 24 permits limited rocking movement of the conductor member 30 to insure proper contact between it and the contact members 46.

Wires 50, 52 are secured to the contact members within the annular recess 42 and pass out through an opening in the side wall of the member 10 as illustrated in Fig. 2. These wires may be connected in a circuit to an alarm, as illustrated in my aforementioned application. In order to test the circuit through the contact members 46 from time to time, means are provided for manually connecting the contact members whenever desired. For this purpose, there is connected to one of the contact members a flat contact 54 (Fig. 3), there being a spring contact 56 connected to the other contact member. A plastic button 58 passing through a cover plate 60 is arranged to be manually depressed to force the spring contact 56 into engagement with the other contact 54 to connect the contact members 46 in the same manner as if the circuit controller operated to stop the flow of current through the controlled circuit. Pins 62 are provided for securing the cover plate to the member 10.

The pin 26 extends upwardly through a hole in the top wall 40 of the member 10, and moves upwardly with the piston member 24 when the fusible element ruptures because of an overload in the circuit being controlled, to indicate by projecting outwardly of the top which fuse has blown and which circuit has been overloaded.

Further to prevent escape of hot gases caused by rupture of the fusible element 18 due to an overload in the circuit controlled thereby, into the chamber housing the contact members 46 and the conductor member 30, a sheet 64 of noncombustible flexible material is clamped below the piston member 24 to provide a gas-tight seal. The sheet 64 has a downwardly extending flange portion which, upon expansion of the gas in the chamber housing the fusible element, is forced into tight contact with the interior wall of the member 10. Thus, there is no possibility of any products of combustion in the lower chamber being deposited on the contact members 46 or the conductor member 30, or escaping into the atmosphere.

Having thus described the invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. A fuse adapted for insertion in an electric circuit comprising a hollow body member, a piston dividing said body member into a pair of chambers, a fusible circuit controlling element in one of said chambers, a pair of contact members in the other of said chambers, a switch member carried by said piston and arranged for engagement with said contact members to complete a circuit therethrough, means urging said piston in a direction to engage the switch member with the contact members, means connecting said fusible element to said piston whereby the piston is held in a position in which the switch member is spaced from the contact members, and a sheet of noncombustible flexible material associated with said piston providing a gas-tight seal between said chambers.

2. A fuse adapted for insertion in an electric circuit comprising a hollow body member, a piston dividing said body member into a pair of chambers, a fusible circuit controlling element in one of said chambers, a pair of contact members in the other of said chambers, a switch member carried by said piston and arranged for engagement with said contact members to complete a circuit therethrough, means urging said piston in a direction to engage the switch member with the contact members, means connecting said fusible element to said piston whereby the piston is held in a position in which the switch member is spaced from the contact members, said means comprising means arranged to separate the portions of the fusible element at the point of rupture due to an overload in the circuit being controlled to quench the arc which may be formed at the time of rupture, and a sheet of noncombustible flexible material associated with said piston providing a gas-tight seal between said chambers.

3. A fuse of the type having a screw threaded metal ferrule and a contact button in the base, a fusible element comprising a strip of fusible material connecting said metal ferrule and said contact button, a pair of contact members remote from said base and arranged to be connected into an auxiliary circuit, a switch member for bridging said contact members, a spring urging said switch member toward said contact members, means for holding said switch member out of engagement with said contact members comprising a roll of dielectric material connected to said switch member for movement therewith and around which said fusible element passes, a second switch member for bridging said contact members, and means accessible exteriorly of said fuse for actuating said second switch member.

4. A fuse comprising a fuse body having at one end a screw threaded metal ferrule and a contact button, and having at its other end a pair of spaced contact members, a non-metallic pin slidable through said other end of the fuse body and carrying within the fuse body a switch member arranged to be moved into bridging engagement with said spaced contact members, means urging said switch member into bridging engagement with said spaced contact members, said pin projecting through said switch member and carrying at its inner end a loosely mounted roll of dielectric material, a strip of fusible material connecting said metal ferrule and said contact button and passing around said roll normally to hold said switch member out of engagement with said spaced contact members, an auxiliary switch member carried by the other end of the fuse body and arranged to be moved into bridging relationship with the spaced contact members, and an actuating member for said auxiliary switch member passing through said other end of the fuse body.

5. A circuit controller comprising a hollow body member, a fusible element therein arranged for series connection in a circuit being controlled and arranged to rupture upon a predetermined overload in the circuit to interrupt the current therethrough, a pair of contact members within the body member arranged for connection to an auxiliary circuit, means operative upon rupture of said fusible element for connecting said contact members to close the auxiliary circuit, and manually controlled means for completing a circuit through said contact members.

6. A circuit controller comprising a hollow body member, a fusible element therein arranged for series connection in a circuit being controlled and arranged to rupture upon a predetermined overload in the circuit to interrupt the current therethrough, a pair of contact members within the body member arranged for connection to an auxiliary circuit, means operative upon rupture of said fusible element for connecting said contact members to close the auxiliary circuit, and means movable exteriorly of said body member for indicating rupture of said fusible element.

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