April 10, 1951 S. C. PEEK, JR 2,548,491

LOW CURRENT FUSE

Filed Jan. 28, 1950

Fig. 1

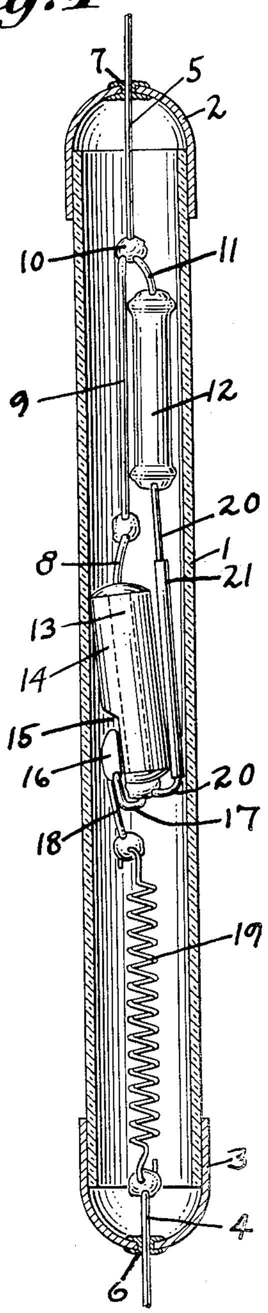
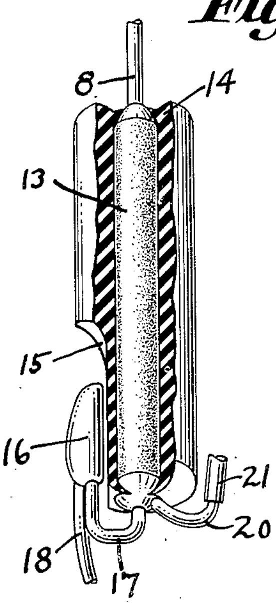


Fig. 2



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LOW-CURRENT FUSE

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6 Claims. (Cl. 175—294)

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This invention relates to fuses for interrupting high voltage; low current circuits on overload, and relates particularly to such fuses for pulsed circuits, such as are used in television or the like.

In many such circuits, although the current is low, the voltage is so high that considerable power may be passed in an overloaded circuit, causing overheating and possibly fire.

The common types of fuse, consisting chiefly of fusible links directly heated by the current passing through it, is unsatisfactory for currents below about ten milliamperes and are incapable of interrupting circuits at greater than 1000 volts.

My invention provides a fuse operable at currents of a milliampere or even lower and capable of breaking such currents even in circuits at voltages of many thousands.

My device is particularly effective in circuits utilizing a series of unidirectional pulses of low average current.

A feature of the invention is a joint of fusible metal in proximity to a resistor, and with a spring to pull the joint open quickly when the fusible metal melts, this rapidly breaking the circuit.

Another feature of the invention is a condenser connected across said resistor to reduce the pulse voltage drop in the resistor without reducing the current available for heating the resistor.

A further feature is a carbon resistor and a fusible joint spaced slightly from said carbon rod but close enough thereto to be heated thereby.

An additional feature is an insulating coating for said resistor, to confine the emitted heat to the portion of the resistor near the fusible link, at least to a considerable extent.

Still another feature is a tube of glass or other refractory insulating material enclosing the operating elements of the device.

Other advantages, features and objects of the invention will be apparent from the following specification, taken in connection with the accompanying drawing, in which:

Figure 1 is a longitudinal sectional view of the device; and

Figure 2 is a perspective cut-away view of a portion of the device of Figure 1.

In the figures, the hollow glass tube 1 has the metal end caps 2, 3 fixed to each of its ends. The lead-in terminal wires 4, 5 are fixed to the end caps 2, 3, by the solder 6, 7, for example. The resistor 13 has a lead-in wire 8 soldered to a connecting wire 9, which in turn is fixed to lead-in wire 5 for example, by the solder 10. The lead-in wire 11 to condenser 12 is also affixed to wire 2 by solder 10.

Lead-wire 8 extends into electrical and mechanical connection with the carbon rod resistor 13, which is enclosed in the insulating cylinder 14, except where the cylinder 14 is cut away at 15, to expose the carbon rod 13 to the fusible metal 16 for heating the same. The fusible metal 16 joins the lead-in wire 17, firmly fixed electrically and mechanically to an end of carbon rod 13 opposite to the end to which lead-in wire 8 is fixed, to the connecting wire 18, which is in turn soldered to an end of the stretched helical spring 19. Lead-in wire 20 from condenser 12 may be soldered to wire 17 to connect the condenser 12 across the resistor 13. An insulating tube 21 may be used around wire 20.

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The spring 19 is connected at one end to the lead-in wire 4, for example, by solder 3.

The wire 17, is turned back on the resistor to place the fusible metal 16 in position to be heated by the current in carbon rod 13, which is surrounded by the electrically and thermally insulating tube 14 at other points. The fusible metal is close to, but spaced from, the rod 13 to be in heat-receiving relationship therewith without short-circuiting to the rod 13.

For use with a current of about 1.1 milliamperes, I have used a resistor 13 of about a megohm. This is a rather large resistance and would, by itself, tend to reduce considerably the maximum value of pulses passing therethrough. I have found that the shunting of a condenser 12 across the resistor 13 enables the use of such a large resistor without undue effect on the pulse magnitude. The condenser appears to shunt the alternating components of the pulse across the resistor 12, the resistor 12 then passing the direct current component. I have found that this does not reduce the effectiveness of the resistor as a heating element.

A condenser of about 0.005 microfarad has been found satisfactory with a resistor of 1 megohm in a circuit feeding a cathode ray tube with a 15 kilocycle pulse on a 10% duty cycle, as is common in television apparatus. The 10% duty cycle means that the pulse is on for 10% of each cycle and off for the other 90%. Without the condenser, the resistor 13 would have to be of too small a value to give proper heating.

What I claim is:

1. A high-voltage low-current fuse comprising a resistor of high resistance, a fusible metal mass in heat-receiving relationship thereto and joining two metallic connecting pieces, a stretched spring attached to one of said metallic connecting pieces, the other of said pieces being connected to said resistor and a condenser in shunt to said resistor.

2. The combination of claim 1, in which the resistor is a carbon rod, and an insulating tube enclosing the major portion of said resistor but exposing the resistor in the proximity of said fusible metal mass.

3. The combination of claim 1, and a hollow insulating envelope enclosing said device.

4. A high-voltage low-current pulse fuse comprising a graphite resistor rod, an insulating tube enclosing said rod except at one portion thereof, a fusible metal mass spaced from, but in close proximity to, said resistor rod at said portion thereof, two metal connecting pieces held together by said fusible mass, a coiled spring connected to and tending to pull one of said connecting pieces away from said fusible metal mass, the other of said connecting pieces extending to an end of said resistor, a condenser connected in shunt to said resistor, an enclosing insulating envelope, and a terminal connection at each end of said envelope, one of said terminals being connected to one end of said resistor, the other being connected to one end of said spring.

5. The combination of claim 4, in which the resistor is of the order of a megohm in resistance and the condenser of the order of 0.005 microfarad.

6. A high voltage low-current pulse fuse comprising a resistor of high resistance, a fusible metal mass spaced from, but in close proximity to said resistor, two metal connecting pieces held

together by said fusible mass, a coiled spring connected to and tending to pull one of said connecting pieces away from said fusible metal mass, the other of said connecting pieces extending to an end of said resistor, a condenser connected in shunt to said resistor, an enclosing insulating envelope, and terminal connections extending through said envelope, one of said terminals being connected to one end of said resistor, the other being connected to one end of said spring.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,401,881	Conrad	Dec. 27, 1921
1,807,228	Starr	May 26, 1931
2,117,123	Werner	May 10, 1938
2,287,998	Johnson	June 30, 1942
2,398,993	Ayers	Apr. 23, 1946
2,495,791	Van Daele et al.	Jan. 31, 1950