

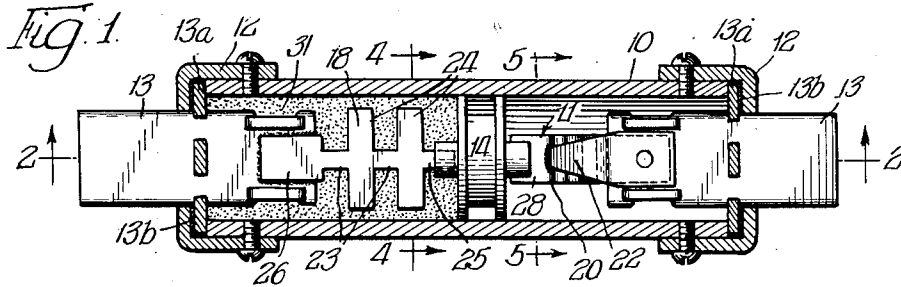
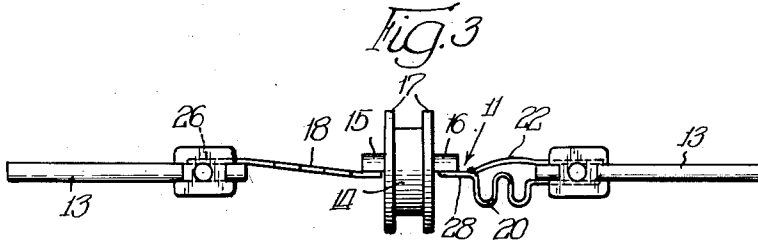
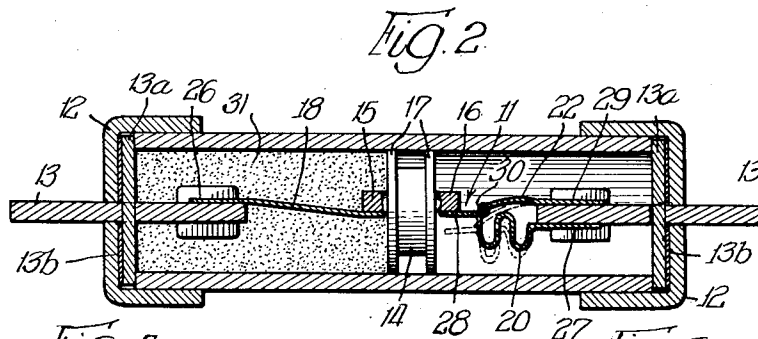
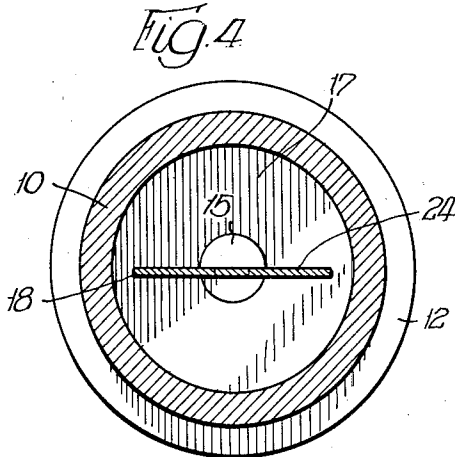
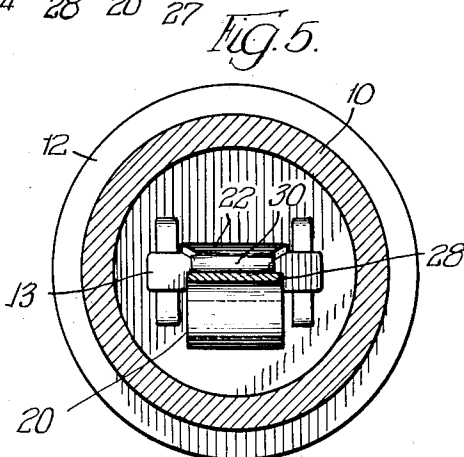
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G. F. LAING

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FUSE CONSTRUCTION

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INVENTOR.
Gordon F. Laing,
BY

Wilkinson, Hargrave, Byrnes & Hume
attys.

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FUSE CONSTRUCTION

Gordon F. Laing, Delavan, Wis., assignor, by
mesne assignments, to Economy Fuse and
Manufacturing Co., Chicago, Ill., a corporation
of Illinois

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The present invention relates to fuse construction.

More particularly, the present invention relates to fuse construction designed to open an electric circuit with a minimum formation of gas and/or flame under conditions approximating short circuit and which will have a predetermined time lag in the event of reasonable overload of prolonged duration.

An object of the present invention is to provide a fuse construction of the kind referred to embodying a heat capacity member having relatively high specific heat and high electrical conductivity for providing the desired time lag.

A further object is to provide an electric fuse construction having means for blowing under short circuit conditions with a minimum of gas and/or flame and having novel heat reservoir means for providing the desired time lag under overload conditions.

A further object is to provide an improved fuse construction having means for open circuiting said fuse construction with a minimum of gas and/or flame under short circuit conditions and also having improved means for controlling the open circuiting of said fuse construction under prolonged overload conditions.

A further object is to provide an improved fuse construction having means adapted to blow with a minimum of gas and/or flame under short circuit conditions, which means may be enclosed within an inert powder, said fuse construction having improved means for open circuiting with a predeterminable time lag under overload conditions, said fuse construction being provided with means for protecting said open circuiting means from interference by said powder.

A further object is to provide a fuse construction having certainty of action, sturdiness, cheapness of manufacture, and which is well adapted to meet the needs of ordinary service.

Further objects will appear as the description proceeds.

Referring to the drawings—

Figure 1 is a longitudinal sectional view of a fuse embodying the principles of the present invention;

Figure 2 is a sectional view taken along the plane indicated by the arrows 2—2 of Figure 1;

Figure 3 is a view in side elevation of the fuse element illustrated in Figures 1 and 2;

Figure 4 is a sectional view taken along the plane indicated by the arrows 4—4 of Figure 1; and

Figure 5 is a sectional view taken along the plane indicated by the arrows 5—5 of Figure 1.

The numeral 10 indicates a cylindrical casing within which is housed a fuse element indicated as a whole by the numeral 11. Disposed at the two ends of the casing 10 are cap members 12—12 of cup-shaped conformation adapted to be slipped

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over the ends of the casing 10 and to be secured to said casing. The bottoms of said cap members 12—12 are apertured for the reception of terminal blades or contact members 13, 13.

5 United to each of the terminal blades 13, 13 is a metal plate 13a adapted to contact the adjacent end of the casing 10. Bottomed in said cap members 12, 12 are washers 13b, 13b adapted to be held by said cap members against the corresponding plates 13a, 13a. The washers 13b, 13b are provided with slots closely fitting the blades 13, 13.

The fuse element 11 is made up fundamentally of the following elements: a slug 14 of copper or other material having a relatively high specific heat and high electrical conductivity, providing a metallic heat reservoir member which slug will preferably be of cylindrical conformation and preferably will have projections or ends 15 and 16 projecting from the two sides thereof; a pair of diaphragms 17, 17 preferably of a slightly greater diameter than the diameter of the slug 14 which diaphragms are adapted to fit rather closely within the cylindrical casing 10; a fusible link 18 designed to fuse under conditions approximating a short circuit, which link should open circuit the fuse construction under such conditions with a minimum of gas and/or flame, one end of said fusible link being thermally and electrically connected to the projection 15 of the slug 14, the other end of said link 18 being electrically connected to one terminal blade 13; the flexible strip 20 having one end soldered to the projection 16 of the slug 14 and having its other end soldered or otherwise connected to the other terminal blade 13; and a spring member 22 carried by that terminal blade 13 which is connected to the flexible member 20, insulated from the flexible member 20 but positioned to exert pressure upon said flexible member 20 to urge it out of electrical contact with the projection 16 if and when the solder between said flexible member 20 and the projection 16 should melt.

The fusible link 18 is illustrated as having a plurality of restricted portions 23, 23 alternating with relatively wide portions 24, 24. The end portion 25 of the fuse link 18 is adapted to be soldered to the projection 15 of the slug 14 and for this purpose said projection 15 may be provided with a flat surface whereby to facilitate the soldering operation. The opposite end portion 26 of the link 18 is physically and electrically united to a terminal blade 13.

The flexible strip 20, which may be composed of copper or other electrically conductive metal, has its extremity 27 physically and electrically united to the right hand terminal blade 13. The other extremity 28 of the flexible strip 20 is soldered to the projection 16 of the slug 14. The solder which unites the extremity 28 of the flexible strip 20 with the projection 16 should have a

lower melting point than the solder which is used to unite the fusible link 18 with its projection 15 and its terminal blade 13 and should have a lower melting point than the solder which unites the extremity 27 of the fusible link 20 with its terminal blade 13.

The spring member 22 may be made of beryllium copper or other resilient material capable of retaining its spring properties under the temperatures expected to be encountered in the operation of the fuse. The extremity 29 of the spring 22 is physically united to the corresponding terminal blade 13. The other extremity of the spring 22 is provided with a coating 30 of ceramic cement or other insulating material to prevent the passage of electric current by way of the spring 22 to the flexible member 20. Said spring 22 is adapted to exert force through the non-conducting coating 30 against the extremity 28 of the flexible member 20 to break contact between the flexible member 20 and the projection 16 when the solder between the extremity 28 and the projection 16 has melted.

The solder used to unite the extremity 28 of the flexible member 20 with the projection 16 should be of eutectic composition, that is, a composition having a low and definite melting point. For this purpose it is at present preferred to utilize an alloy consisting of:

	Per cent
Tin, approximately.....	50
Lead, approximately.....	32
Cadmium, approximately.....	18

Such a composition has a sharp melting point and will retain its holding properties substantially until completely melted.

It is preferred to have the fusible link 18 and the flexible strip 20 so designed that upon the passage of electric current through the fuse assembly substantially the same amount of heat will be developed in the flexible strip 20 as in the fusible link 18. In other words, said link 18 and said flexible member 20 are so correlated that passage of electric current therethrough will develop the same amount of heat in each of them. This precaution will prevent variations which might otherwise occur if the fuse is reversed end for end when mounted in a vertical position.

The space between the left-hand diaphragm 17 and the left-hand plate 13a may be filled with an inert powder indicated by the numeral 31. This powder is disposed in enveloping relationship with the fusible link 18 and will assist in quenching the arc formed when the fuse is subjected to short circuit conditions. The diaphragms 17-17 serve to prevent the powder 31 from interfering with the mechanical functioning of the spring 22 and the flexible strip 20 when opening on overload.

Though a preferred embodiment of the present invention has been described in detail, many modifications will occur to those skilled in the art and it is intended to cover all such modifications that fall within the scope of the appended claims.

What is claimed is:

1. In a fuse element, in combination, a heat reservoir member having two ends and comprising a mass of metal of relatively high specific heat, a fusible link having one of its extremities in electrical connection with one end of said reservoir member, a terminal contact member united to the other extremity of said link, a movable metal member having one of its extremities in connection, by means of solder, with said reservoir member at the other end of said reservoir

member, another terminal contact member in electrical connection with the other extremity of said movable metal member, and a spring member biasing said movable metal member out of contact with said reservoir member, insulating means for preventing passage of electric current through said spring member, the solder connecting said movable metal member to said reservoir member being adapted to fuse before any other of said connections of said fuse element upon the passage of electric current therethrough, said link and said movable metal member being so correlated that passage of electric current in series therethrough will develop the same amount of heat in each of them.

2. In a fuse element, in combination, a heat reservoir member having two ends and comprising a mass of metal, a fusible link in electrical connection with one end of said reservoir member, a diaphragm located at one end of said reservoir member, said diaphragm being of cylindrical contour adapted to fit within an enclosing casing, a movable member of electrically conductive material, one end of said movable member being in electrical connection with the other end of said reservoir member by means of a fusible solder, and a spring biasing said movable member out of engagement with said other end of said reservoir member, insulating means for preventing passage of electric current through said spring, said solder being adapted to fuse before any other of said connections of said element upon the passage of electric current therethrough, said link and said movable member being so correlated that passage of electric current in series therethrough will develop the same amount of heat in each of them.

3. In a fuse element, in combination, a heat reservoir member having two ends and comprising a mass of metal of relatively high specific heat, a fusible link having one of its extremities connected by means of solder to one end of said reservoir member, a terminal contact member united to the other extremity of said link, a movable metal member having one of its extremities connected by means of solder to said reservoir member at the other end of said reservoir member, another terminal contact member electrically connected to the other extremity of said movable metal member, and a spring member biasing said movable metal member out of contact with said reservoir member, insulating means for preventing passage of electric current through said spring member, the solder connecting said movable metal member to said reservoir member having a lower melting point than the solder connecting said fusible link to said reservoir member, said link and said movable metal member being so correlated that passage of electric current in series therethrough will develop the same amount of heat in each of them.

GORDON F. LAING.

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