

C. D. HASKINS.
THERMAL CUT-OUT.
APPLICATION FILED SEPT. 19, 1904.

1,060,757.

Patented May 6, 1913.

Fig. 1.

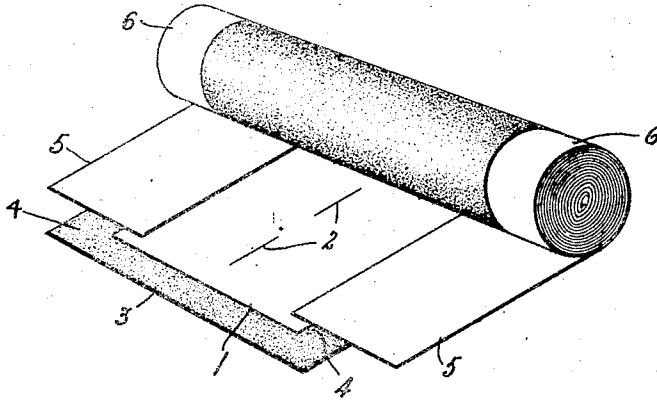


Fig. 2.

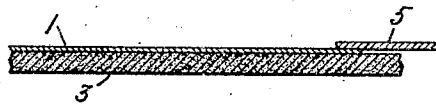


Fig. 3.

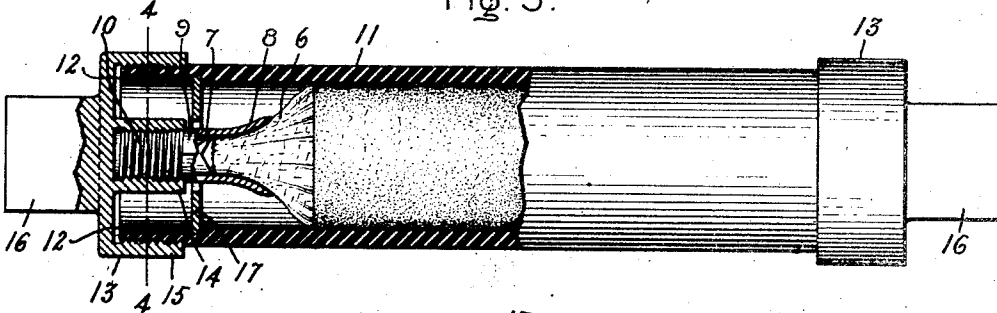
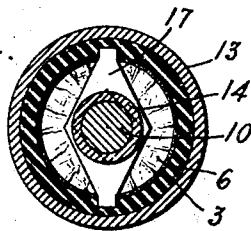


Fig. 4.



Witnesses;

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UNITED STATES PATENT OFFICE.

CARYL D. HASKINS, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

THERMAL CUT-OUT.

1,060,757.

Specification of Letters Patent.

Patented May 6, 1913.

Application filed September 19, 1904. Serial No. 224,998.

To all whom it may concern:

Be it known that I, CARYL D. HASKINS, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Thermal Cut-Outs, of which the following is a specification.

The present invention relates to protective devices for electric circuits and apparatus, and more particularly to that class of such devices commonly known as thermal cut-outs or fuses.

As thermal cut-outs or fuses have been constructed heretofore they have usually consisted of one or more wires or strips of metal which upon the passage therethrough of an abnormal current suddenly become melted and volatilized accompanied by loud detonations, the scattering of masses of molten metal and the formation of dangerous electric arcs. Attempts have been made to overcome these objections to this type of protective device by inclosing the wires or strips in a casing and surrounding them by some substance which tends to absorb or condense the gases of volatilization, but these attempts have been unsuccessful except in the smallest sizes of fuses, but when the fuse is required to carry currents of considerable volume the mass of metal is so large and concentrated that when an overload or short circuit takes place a very great volume of gas is evolved with an explosive effect which is only slightly modified by the absorbent material and casing, the latter being usually blown apart and the contents scattered.

The object of my invention is to provide a thermal cut-out or fuse and a method of constructing the same which upon the occurrence of an overload or short circuit will operate effectively, positively and without noise or explosive effect to interrupt the circuit.

In carrying out my invention I employ as the fusible member a wide and very thin sheet or layer of metal inclosed on both sides by a sheet or sheets of suitable insulation and, preferably for the sake of compactness, roll them up together in the form of a cylinder or tube. The metallic sheet may be made longer than the insulating sheet so that when rolled up there will be projecting ends of the metallic sheet to which circuit connections may be attached, but when

it is desired to have end sections of better conductivity I make the sheet of insulating material longer than the metallic sheet and provide short strips of equal width of sheet metal of increased thickness and arrange them to overlap short sections of the metallic sheet at its end edges and to project beyond the outer edges of the sheet insulation and connect the projecting ends of these terminal sheets in a suitable manner to circuit terminals.

When an overload or short circuit traverses a fuse thus constructed a minimum amount of metal is displaced and volatilized, the arc which forms between the adjacent edges of the undisplaced portions of the fuse is widely distributed and subdivided into a multitude of multiple small arcs, and all of the displaced metal is volatilized so that no masses of molten metal are formed.

In order to protect my fuse from mechanical injury, I inclose it in a casing comprising a barrel of stout insulating fiber and removable metallic end pieces which connect on their inner sides with the ends of the fuse and have provision on their outer sides for engagement with the ordinary line terminal. When a fuse has blown it may be readily replaced by a perfect fuse by removing the end pieces.

For a more complete understanding of my invention reference may be had to the following detailed description and the accompanying drawing forming a part of this specification, in which—

Figure 1 is a view in perspective of a partially rolled fuse embodying one form of my invention; Fig. 2 is a greatly magnified longitudinal section of a part of the fusible member, the insulating sheet and the terminal strip; Fig. 3 is a view in part side elevation and part section of a casing with the complete fuse therein; and Fig. 4 is a cross section on line 4—4 of Fig. 3, showing the means for protecting the ends of the fuse from injury in connecting and disconnecting the end pieces of the casing.

The construction of a fuse according to my invention from silvered or metallic coated paper is disclosed and specifically claimed in a separate application, and accordingly I will confine this description to the construction of my improved fuse in which the fusible member is in the form of an independent sheet of metal.

As shown in Figs. 1 and 2, the fusible element consists of a sheet 1 of metal having a length depending upon the potential of the current to be carried, a width proportional to the volume of the current and a thickness of a thousandth of an inch or thereabout; gold leaf, silver leaf, tin foil and lead foil being well adapted for this purpose, but it is to be understood that any metal or alloy which can be economically beaten or rolled into thin sheets may be used. In order to render the fusible member less conductive at a plurality of points in its width, I cut a series of short slits 2 along its center.

The insulating sheet 3 consists of asbestos or other heat resisting paper of substantially the same width as the fusible strip and somewhat longer, so that when the latter strip is placed centrally thereon a considerable length of the paper will project beyond the end edges of the metal as shown at 4 4. After the fusible strip 1 has been placed upon the paper strip a short length 5 of thicker sheet metal, such as heavy tin foil, is placed to overlap each of the end edges of the fusible strip 1 and project a considerable distance beyond the end edges of the paper strip to form terminals 6 for the fusible member and then the four strips are rolled up transversely as a single sheet and the outer side of the paper pasted down upon the back of its outer convolution.

The projecting terminals 6 are compacted by pressure and connected by soldering or otherwise to solid metallic end pieces 7. In the present instance the end pieces 7 are made with bell-shaped ends 8 for the reception of the foil terminals 6, the shanks 9 are made rectangular and the outer ends 10 screw threaded. The casing consists of a tube 11 of fibrous insulation having a bore large enough to receive the fuse with slight clearance, and provided at each end with external screw threads and internal longitudinal grooves 12 diametrically arranged, and metallic caps 13 each provided with two internally screw-threaded ring flanges 14 and 15 to receive the end of the tube and an end piece 7, and on the side opposite the flanges with contact blades 16 for engagement with the ordinary terminal clips of the circuit.

In order to prevent the foil terminals 6 from being twisted or otherwise injured by screwing or unscrewing the caps 13, I provide a holder 17 at each end consisting of a sheet iron stamping having a polygonal aperture through which the shank of the end piece 7 passes and contracted ends which enter the grooves 12 in the inner walls of the tube.

If desired the space beneath the caps may be filled with some absorbent powder to condense any slight amount of volatile gas that may be blown out at the ends of the fuse

roll upon the passage of a heavy short circuit.

I do not desire to restrict myself to the particular form or construction of parts herein described and shown, since it is apparent that they may be changed and modified without departing from my invention.

What I claim as new and desire to secure by Letters Patent of the United States, is,—

1. A thermal cut-out comprising a wide sheet of thin leaf like metal which upon blowing produces a wide distribution of the arc, and terminal strips of thicker metal joined to the opposite ends of said metal sheet.

2. A thermal cut-out comprising a wide sheet of thin leaf like sheet metal inclosed by sheet insulation of greater length, and terminal strips of thicker metal joined to the opposite ends of said metal sheet and projecting beyond the ends of said sheet insulation.

3. A thermal cut-out comprising a sheet of thin metal rolled up transversely with its convolutions out of contact with each other, and means at the ends of said roll of metal for connecting it in circuit.

4. A thermal cut-out comprising a sheet of thin metal rolled up transversely with insulation between the several convolutions, and means at the ends of said roll of metal for connecting it in circuit.

5. A thermal cut-out comprising a sheet of thin metal, a sheet of insulation upon which said metal sheet is disposed, and two strips of sheet metal of greater conductivity lapping the opposite ends of said metal sheet and extending beyond the ends of said insulating sheet, the several parts being rolled up transversely with sufficient compression to hold said strips in permanent contact with the ends of said metal sheet.

6. A thermal cut-out comprising a sheet of thin metal, a longer sheet of insulation arranged to project beyond the ends of the metal sheet, and two thicker strips of metal joined to the opposite ends of said metal sheet and projecting beyond the ends of said insulating sheet and the whole rolled up transversely.

7. The combination of a fuse member having metal end pieces of non-circular cross section, a tube surrounding said fuse member and provided with supporting bridge pieces having non-circular apertures for the reception of the ends of the fuse, and removable end caps provided with means for engaging the ends of the tube and the end pieces of the fuse member.

8. The combination of a fuse member having screw-threaded end pieces, an insulating tube surrounding said fuse member and provided at its ends with external screw threads and internal longitudinal grooves, bridge pieces located in said grooves and adapted

to engage said end pieces and prevent rotation thereof relative to the tube, and end caps each provided with screw threads adapted to engage the screw threads of an end piece of the fuse and an end of the tube.

9. A fuse strip composed of a band of metal disposed in a roll having its convolutions separated by insulating material, with means for connecting the opposite ends of the roll to circuit terminals, whereby the current flows in a longitudinal direction through the roll.

10. The combination in electrical fuses, of a fuse strip consisting of a band of metal disposed in a roll having insulating material between its convolutions, and conducting members secured to the opposite ends of the roll for connecting it to circuit terminals, whereby the current flows in a longitudinal direction through the roll.

11. The combination in electrical fuses, of a fuse strip consisting of a band of metal disposed in a roll having insulating material between the convolutions, conducting members secured to the opposite ends of the roll, and a casing inclosing the fuse and connected to the said members for connection with circuit terminals.

12. A fuse strip consisting of a rolled band of metal having a reduced area of cross section at a plane between the ends of the roll and transverse to the longitudinal center of the roll.

13. A fuse strip consisting of a rolled band of metal, terminals secured to the ends of the roll to carry the current longitudinally of the roll, the said roll having an area of cross section which is smaller at a point between the ends of the roll than at the said ends.

14. In a fuse, a fuse strip consisting of a rolled band of metal, terminals connected at opposite ends of the roll to carry the current longitudinally of the roll, the said band being provided with perforations for reducing its area of cross section at a portion approximately midway of the length of the roll.

15. In a safety fuse, the combination of a rolled band of metal, terminals secured to the ends of the roll, insulating means for keeping the convolutions of the roll from contact with each other, the said band being perforated approximately midway of the length of the roll to reduce the area of cross section of the roll to predetermine the location of the rupture.

16. A fuse strip composed of a band of metal rolled upon itself so as to leave spaces between the convolutions, and means for passing a current in a longitudinal direction through the roll.

17. A fuse strip comprising a band of metal rolled upon itself and having its convolutions separated by insulating material,

and means for passing a current in a longitudinal direction through the roll.

18. The combination in electrical fuses, of a fuse strip consisting of a spirally rolled band of metal having insulating material between the convolutions, and means for connecting the opposite ends of the roll to circuit terminals, whereby the current flows in a longitudinal direction through the roll.

19. A fuse comprising a bent band of metal, terminals connected to the opposite bent edges of the band to carry the current longitudinally of the bends, a casing for the band and its terminals, and insulating material surrounding the band and separating the plies thereof.

20. The combination in electrical fuses, of a fuse strip consisting of a bent band of metal having insulating material between the bends, a casing surrounding the fuse strip and having end closures of conducting material, and conducting means for connecting the end closures with the opposite edges of the strip.

21. A fuse comprising a bent band of metal, terminals connected to the outside bent edges of the band to carry the current longitudinally of the bend, and insulating material surrounding the band and separating the bent plies thereof.

22. A fuse comprising a bent band of metal, terminals connected to the opposite bent edges of the band, a casing for the band and its terminals, insulating material surrounding the band and separating the plies thereof, and finely divided insulating material filling the space within the casing not occupied by the other parts contained therein.

23. A cut-out for electric circuits, comprising a sheet of thin metal disposed in superposed layers separated by insulating material, and means at the ends of said layers for connecting the sheet in circuit.

24. A fuse strip consisting of a sheet of thin metal disposed in superposed layers separated by insulating material and having a reduced area of cross-section between the bent opposite edges of the layers.

25. In an electric fuse, the combination of superposed layers of sheet insulation, a sheet metal fusible member interposed between said layers and projecting beyond the ends thereof, and metallic connections soldered to the projecting ends of said fusible member.

26. In an electric fuse, the combination of a roll of sheet insulation, a sheet of fusible metal extending therethrough and projecting beyond the ends of said roll, and metallic connections soldered to the projecting ends of the metal sheet.

27. In an electric fuse, the combination of a roll of sheet insulation, a sheet of fusible metal interposed between the convolutions

of said insulation and projecting beyond the ends thereof, and metal connections soldered to the projecting ends of said metal sheet.

28. In an electric fuse, the combination of
5 a roll of sheet insulation, a sheet of fusible metal interposed between the convolutions of said insulation and projecting beyond the ends thereof, and metal end pieces soldered to the projecting ends of said metal sheet.

10 29. The combination in electric fuses, of a fuse strip consisting of a bent band of metal, sheet insulating material interposed between the surfaces of the band, a casing surrounding the fuse strip and having end
15 closures of conducting material, and terminal connections between the end closures and the said band soldered to the opposite ends of the strip.

20 30. In a fuse, a fuse strip consisting of a rolled band of metal, terminals fused to opposite ends of the roll to carry the current

longitudinally of the roll, the said band being provided with perforations for reducing its area of cross section at a portion approximately midway of the length of the
25 roll.

31. In a fuse, a fuse strip consisting of a rolled band of metal, terminals fused to opposite ends of the roll to carry the current longitudinally of the roll, the said band
30 being provided with perforations for reducing its area of cross section at a portion approximately midway of the length of the roll, and insulating means for keeping the convolutions of the roll from contact with
35 each other.

In witness whereof I have hereunto set my hand this 15th day of September, 1904.

CARYL D. HASKINS.

Witnesses:

BENJAMIN B. HULL,
HELEN ORFORD.