C. N. SACHS.

ELECTRIC SAFETY FUSE.

APPLICATION FILED JAN. 16, 1905.

1,016,524. Patented Feb. 6, 1912.

Fig. 1.

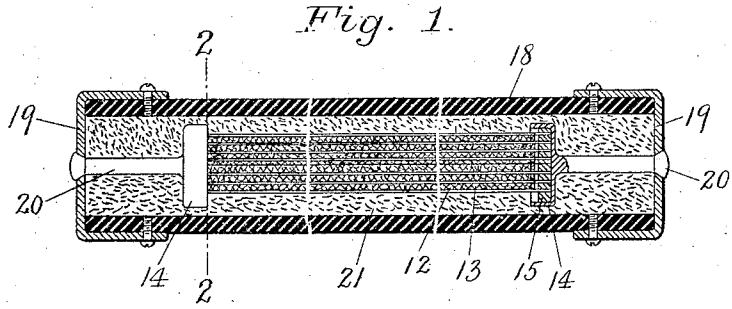


Fig. 2.

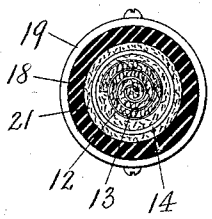


Fig. 3.

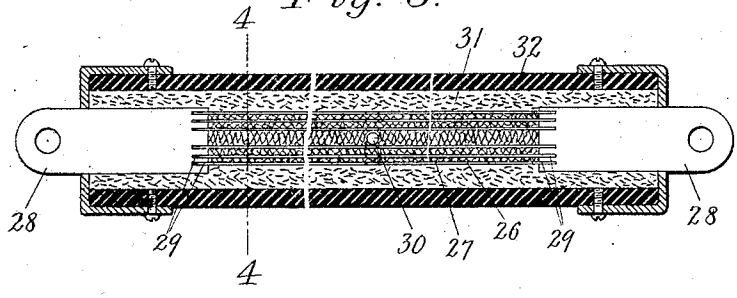


Fig. 4.

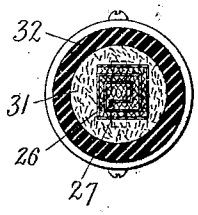


Fig. 5.

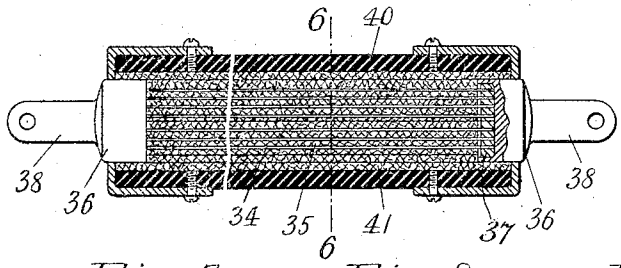


Fig. 6.

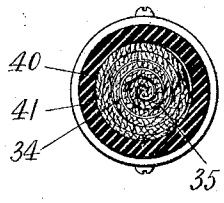


Fig. 7.

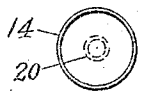


Fig. 8.

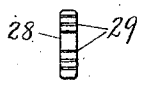
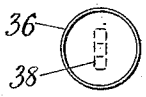


Fig. 9.



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UNITED STATES PATENT OFFICE.

CAROLINE N. SACHS, OF HARTFORD, CONNECTICUT, ASSIGNOR TO THE SACHS COMPANY, OF HARTFORD, CONNECTICUT, A CORPORATION OF CONNECTICUT.

ELECTRIC SAFETY-FUSE.

1,016,524. Specification of Letters Patent. Patented Feb. 6, 1912.

Application filed January 16, 1905. Serial No. 241,169.

To all whom it may concern:

Be it known that I, CAROLINE N. SACHS, a citizen of the United States, and resident of Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Electric Safety-Fuses, of which the following is a full, clear, and exact specification.

This invention relates to an improved safety fuse used to protect electric circuits and the devices connected thereto from excess currents. The purpose of such safety fuses is to open the circuit by melting when an excessive current passes through it, the wire or strip composing the customary safety fuse being usually made of a metal which melts at a comparatively low temperature. It is the common practice to inclose this fuse strip in a casing or tube which is filled with a loose powdered or granulated material of an insulating character surrounding the fuse and held about it by the casing. Upon the rupture of the fuse by an excessive current, the loose material surrounding the fuse absorbs the metallic vapor resulting from the rupture, thus breaking up the arc and dissipating the heat energy by reducing the temperature of the expanding gases. The rapidity with which this absorption takes place depends largely upon the area of the surface of contact between the fuse and the surrounding material. For this reason the fuse conductor is commonly made in the form of a flat strip. The width of the strip cannot, however, be very largely increased without unduly increasing the diameter of the casing and in other ways creating troublesome conditions.

It is the object of the present invention to provide a safety fuse strip in which the metal is so distributed as to be in contact with a comparatively large amount of filling material, while at the same time being of such a form as to enable it to be inclosed within a moderate sized casing and making the proper terminal connections.

In carrying out this invention, it is preferable to employ a thin sheet of zinc or other suitable metal, the thickness depending upon the capacity of the fuse. This thin sheet of metal is cut in a band the width of which is the same as the desired length of the finished fuse strip. It is then either rolled, folded or otherwise longitudinally bent in such a manner that the folds or convolutions of the strip are separated from each other sufficiently to allow the space between the portions to be filled with insulating material. The ends of the bent or rolled strip are then connected by solder or other continuous or integral metallic connection to suitable terminals by which the fuse may be connected to the exterior or circuit wires.

The embodiments of the invention are herein shown in connection with a type of fuse adapted to be placed in a suitable clip or holder, the circuit wires being attached either to the holder or directly to the terminals of the fuse.

Figure 1 of the drawings is a side view in section through the longitudinal center, of one form of fuse where the circuit wires are intended to be attached to the holder. Fig. 2 is an end view of the fuse in section through the line 2—2 of Fig. 1. Figs. 3 and 4 are sectional side and end views corresponding to Figs. 1 and 2 showing a modified form of the fuse. Figs. 5 and 6 are sectional side and end views respectively of still another modified construction of the fuse. Figs. 7, 8 and 9 are views of the inner ends of the terminals shown in Figs. 1, 3 and 5, respectively.

In Fig. 1 the metal band 12 has been rolled into a spiral form with asbestos fabric 13 between the convolutions. The metal at the ends of the fuse strip thus formed extends beyond the asbestos cloth and is soldered into the terminal cups 14. To thus connect the strip to the terminals it is preferable to first flow molten solder into the cup and then to immerse the strip ends in this solder which after hardening makes a permanent connection between the terminal and the metal of the fuse strip proper. The cups 14 are connected to the terminals 20, which extend through the ferrules 19 on the ends of the casing 18. The space within the casing between the fuse strip and the inner surface of the casing is filled with powdered or granular insulating material 21. Upon the rupture of the metal strip 13 by an excessive current, the gases resulting therefrom are absorbed and dissipated through the asbestos strip 13 and the surrounding granular material 21.

In Figs. 3 and 4 the metal and the asbestos cloth are rolled into a form which might be called a flat sided spiral, the metal convolutions 26 being separated by the asbestos cloth

27. Holes 30 are drilled through the metal in order to permit the fuse to rupture more easily at that portion of the fuse than elsewhere. The terminals 28 are provided with saw cuts 29 into which are soldered the projecting ends of the metal strip, the flat sides of the spiral permitting the edges of the metal to properly fit the saw-cuts. The fuse is surrounded with filling 31 contained within a casing 32.

Figs. 5 and 6 show another modified form of the fuse strip. In this case the band of asbestos cloth 35 is made somewhat longer than the band of metal, so that its convolutions continue beyond the end of the metal band 34, thus enabling it to form a covering for both the metal and the asbestos adjacent thereto. The metal may then be secured by solder 37 to the terminal cups 36 from which extend terminals 38 to which the current carrying wires may be connected. This form may be employed without any exterior casing if the end of the asbestos band is secured so that it cannot unroll. It is preferable, however, to employ a casing 40 similar to that shown in the other figures.

The carrying capacity of the fuse may be varied by correspondingly varying the width of the metal. The extended area of surface afforded by this form of fuse strip is of special utility in connection with large fuses, since it gives a large area of contact with the filling material and hence disperses more widely the heat and gases resulting from the rupture of the fuse, thereby also quenching more promptly the arc attendant upon the rupture. In cases where asbestos or similar fabric is employed for enveloping the strip the comparatively loose weave of the fabric affords numerous interstices for the dispersion of the heat and gases.

While the use of the intervening layer of asbestos cloth between the convolutions or folds of the fuse strip is a simple way of obtaining the desired result, the space between the convolutions, bends or folds may be filled in any ordinary or convenient manner. For instance, a felt insulating wrapping may be used, made of asbestos fibers loosely associated to form a felted cloth; and this cloth may be used in the same manner as the woven cloth. Or the space may be filled with any suitable powdered, granulated or otherwise finely divided material, such for instance as the loose material used to surround the exterior of the strip in the forms of Figs. 1 and 3. In this case, the strip may be rolled up spirally, using any convenient flexible material as a core, for separating the convolutions, and this core may be afterward withdrawn and replaced by the loose material. In doing this, however, it is advisable to first solder one end of the spiral to its terminal, and then place around it a retaining tube of one or two wrappings of asbestos paper. After this the core may be removed and the granular material substituted for it.

The terminals are connected to the ends of the roll, or of the folds as the case may be so that the current has a direct flow lengthwise of the roll, and substantially at right angles to the direction in which the strip is folded or rolled. Thus the fuse strip forms a comparative short but thin, wide, and continuous conductor through which the current flows widely dispersed, but undivided. In order to dispose this wide sheet-like conductor compactly as to its transverse or lateral dimensions it is rolled or folded together in sinuous convolutions, as herein described.

Although the band of sheet metal of which the fuse strip is formed is preferably rolled into a spiral form, it may be bent into other forms without departing from the spirit of this invention. The band may be bent back and forth upon itself or it may be bent in various other sinuous forms which will give a suitably compact cross-section. Where a loose insulating material is to be used to separate the different portions of the strip, one bent form is about as easily adapted to the requirements as another. The spirally-bent form is, however, preferred as it is more easily manufactured, and permits the use of a continuous piece of insulating fabric for separating the adjacent portions of the strip.

It is generally advisable in fuses of this class to provide for having the rupture take place at approximately the middle of the length of the fuse strip, in order to give room lengthwise in both directions for the absorption of the gases by the insulating material. For this purpose the strips herein shown may be formed in various ways to provide a reduced area of cross-section at the portion where it is desired to have the rupture take place. This reduction of the cross-section may be accomplished in various ways; as for example, by rolling the sheet metal a little thinner at this portion of its length, or holes like that shown at 30 in Fig. 3 may be made in the metal either before or after the band is bent into its final form. These perforations 30 afford a simple and inexpensive way of reducing the cross sectional area of the fuse strip so as to predetermine the location of the rupture. Also when using finely divided insulating material between the folds or convolutions, these perforations enable the powdered insulation to pass through the band at these central portions and thus aid in the distribution of the insulating material.

The term "bent" is herein employed to designate broadly any rolled or sinuous form in which the sheet may be doubled, or folded, or plicated, or rolled, or otherwise

bent, so as to dispose the sheet-like form in close lateral compass with a space between the folds, or plications, for insulating materials. The terminals are attached to the ends of the rolled or folded fuse, considering it in its completed form, and the current flows longitudinally of the roll or fold, in the sense that it flows in a longitudinal direction through the folded structure, parallel with the lines upon which the sheet is folded or rolled, or otherwise bent, instead of flowing in a transverse direction to and following the sinuosity or bends of the structure.

I claim as my invention:—

1. 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 connecting members fused to and between the convolutions of the opposite ends of the roll for connecting it to circuit terminals.

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

3. 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 joined by fusion to and between the convolutions of the opposite ends of the roll, and a casing inclosing the fuse and connected to the said members for connection with circuit terminals.

4. A fuse strip consisting of a rolled band of metal, terminals soldered to the ends and between the convolutions 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.

5. A fuse comprising a sheet of metal and a sheet of insulating material forming a roll with the insulating material separating the plies of the metal sheet, terminals extending from the ends of the metal roll and joined to and between the plies thereof by fusion, and finely divided insulating material surrounding the roll.

6. 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 and between the plies of the projecting ends of said fusible member.

7. 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.

8. 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.

9. In an electric fuse, the combination of superposed layers of sheet insulation, a sheet of metal with a central section of reduced cross section interposed between said layers and projecting beyond the ends thereof, and metallic connections soldered to and between the projecting ends of said metal sheet.

10. 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 disks soldered to the projecting ends of said metal sheet.

11. A thermal cut out comprising a sheet of thin metal rolled up transversely with insulation between the several convolutions, and soldered connection extending between the plies at the ends of said roll of metal for connecting it in circuit.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CAROLINE N. SACHS.

Witnesses:
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WM. H. HONISS.