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E. GRÜNWALD

2,173,200

MAGNESIUM LEAD

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Fig. 1.

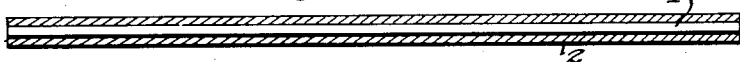


Fig. 1a.



Fig. 4.

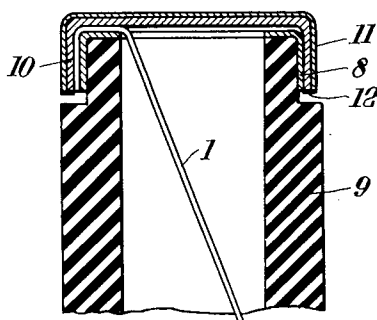


Fig. 1b.

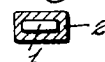


Fig. 2.



Fig. 5.

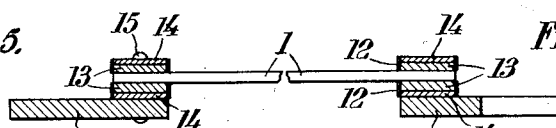


Fig. 6.

Fig. 5a.

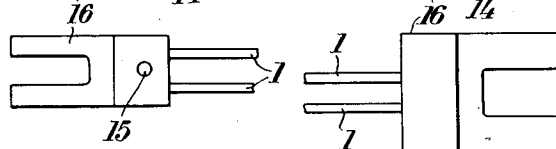


Fig. 6a.

Fig. 5b.

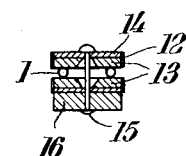


Fig. 6b.

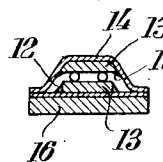


Fig. 3.



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UNITED STATES PATENT OFFICE

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MAGNESIUM LEAD

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7 Claims. (Cl. 200—135)

It is known in fuses, electric coils etc. to make the fusible body or the electric lead of magnesium. Fusible bodies of magnesium, for example for fuses, possess primarily the advantage that, when they blow, non-conductive oxides are produced contrary to fusible bodies of other metals in which, when they blow, conductive metal vapors are formed. It has hitherto not been possible to make and use fuses or electric leads of magnesium. The reason hereof is, that in this magnesium it is not possible to employ the hitherto generally employed methods for connecting the contacts so as to obtain a good connection between the magnesium and the contact elements which may be of copper. If there is a poor or a loose connection between the magnesium and contacting elements of other metals such as copper, brass, silver and the like, electrolytic corrosions occur between the magnesium lead and the contacting element due for example to the moisture in the atmosphere which lead to corrosion of the contact points.

These objections are overcome by the invention which moreover enables the employment in general of electric leads of magnesium, for example for magnet windings. This in many instances constitutes an important and determining factor because magnesium is considerably lighter than the lead material hitherto employed in the electrical industry. The employment of magnesium leads in fuses of the cartridge type presents the special advantage that short-proof cartridges especially those for relatively high nominal current intensity can be manufactured in a simple and cheap manner. Another advantage is that these cartridge fuses can be made in a certain size without any packing or filling medium of the fuse passage. Thus not only the manufacture is facilitated but the security afforded by the fuse is increased, as defects which occur in the known cartridges owing to too little sand, insufficient or bad packing with crevices and the like, can no longer occur as these materials in many cases are no longer employed according to the present invention.

According to the invention a lead of magnesium is combined with a shell of a good electric conductor, such as copper, brass, silver or the like, so that electrolytic or other corrosions do not occur between the magnesium lead and the contacting element or elements. The contacting element, or elements may be a shell or coating applied directly to the magnesium lead, or an intermediate element which may be of magnesium, like the lead or of copper or other suitable metal, may be interposed between the lead and the contacting element, or elements. The intimate connection between the magnesium lead and the contacting element, or elements, and between the intermediate element, or elements, or between

the magnesium lead and the intermediate element on the one hand, and the intermediate element and its contacting element on the other hand is effected by rolling, welding or by a Leonese process, that is, a process first performed in the Spanish town of Leon and consisting in coating wires of a less valuable metal with a shell of a precious metal, for instance coating copper wires with gold. It is possible according to the invention to provide for example a fusible body or fusible wire of magnesium for electric fuses of closed or open type with a coating or shell of good conductive material along its entire length. However, the coating can likewise be applied only at the contact points and in places, for example especially in the middle of the fusible wire. If a coating for example of silver is applied only in the middle of such a fusible body a cut-out retardation is also attained by this section thickened with silver and having an increased conductivity and a higher melting point. The silver coating may also be so arranged that the changes in resistance occur on larger sections of the coating and then, together with the magnesium body which is at first less heavily loaded, effect delayed interruption of the circuit or, after the destruction of the conductive silver coating, automatically again interrupt the magnesium lead with delay. The ratio of inertia for such fuse leads may also be influenced by varying the thickness of the shells of silver, copper or the like, or by connecting them in known manner with an easily fusible metal capable of forming an alloy, such as solder. A part-coating or shell, for example of silver, on the magnesium lead can be obtained by first completely coating the fuse body and then removing this coating for example by a corrosive fluid at the points where there is to be no coating.

In the case of a closed fuse, for example a cartridge or a plug, the magnesium fuse lead contacts only with the intermediate elements made of magnesium whereas the socket contacts, connection wires and the like of the fuse only contact with the contacting elements made of copper. In this manner only parts of the same material i. e. magnesium are exposed to the moisture of the air whereas the points at which different metals, for example magnesium and copper, come together are, according to the invention, so tightly enclosed by the contacting elements that they are inaccessible for the moisture of the air. The magnesium lead or leads may, be detachably connected, for example by clamping or by screw connection, with the intermediate elements made of magnesium or it may also be rigidly connected to the intermediate elements for example by rolling. In this instance the fuse lead may be fixed between two contact pieces in such a manner that the parts of one contact part facing the fuse lead

are made of magnesium, whereas those of the second contact piece are made of magnesium intimately connected with a shell or coating for example of copper excluding the air from the magnesium part. The other connections for example the copper external leads, are then made with the contacting elements of copper or the like which surround the intermediate elements of magnesium.

10 An open fuse strip can, for example be clamped in a resilient part bent in U-shape and consisting on its inner side of magnesium and on its outer side of copper and being fixed on another contact member of copper.

15 Several forms of contact-connections between magnesium or magnesium alloys and a good conductive material according to the invention are illustrated by way of example in the accompanying drawing in which:

20 Fig. 1 shows a fuse body for sluggish acting fuses in longitudinal section,

Fig. 1a is a cross-section of Fig. 1,

Fig. 1b shows the cross-section of a rectangular body,

25 Fig. 2 is a longitudinal section of a fuse body with separate contact points.

Fig. 3 shows an intermediate element for contact-connections in fuses.

Fig. 4 shows a fuse plug in longitudinal section.

30 Figs. 5, 5a and 5b show in longitudinal section, top plan view and cross section respectively a mode for connecting a magnesium fuse wire to a copper terminal.

Figs. 6, 6a and 6b are similar views to Figs. 5, 5a and 5b of a modified form of construction.

In Figs. 1, 1a and 1b lead 1 is of magnesium and is completely covered with a shell of a good electricity conducting material 2. A good contact is established between the magnesium and the shell by rolling the shell on to the magnesium lead. The lead in Fig. 1a consists of a round wire whereas in Fig. 1b it is of rectangular cross-section.

In Fig. 2 the magnesium lead 1 has copper coatings 2 one at each end and a third copper coating 3 in the middle of its length. On the coating 3 in the middle of the fuse body 1, a bead 4a of solder is applied.

Fig. 3 shows another type of intermediate element in longitudinal section. It consists of two intermediate members, each in the shape of a cylindrical body 6 of magnesium which is provided on its outer side with a coating 7 of copper. The magnesium lead 1 is connected with each magnesium body 6 in such a manner that it does not come into contact with the copper coating 7. The connection between the lead 1 and bodies 6 may for example be detachable by means of a screw connection (not shown) or it may be rigid. As an electrolytic corrosion would occur if the magnesium lead 1 or a body 6 were in loose contact with another metal such as copper or silver, but when the magnesium is loosely connected with magnesium, electrolytic corrosion cannot occur in this form of construction.

Fig. 4 shows a contact connection for a cartridge fuse. An intermediate element 8 made of magnesium is fixed on the cartridge body 9. 10 designates a second intermediate element which also consists of magnesium and is intimately and air tightly connected on its outer surface with a cap 11 for example of copper or an alloy of this metal. One end of the magnesium lead 1 is

clamped between the elements 8 and 10. The copper cap 11 may be applied on the magnesium element 10 by rolling, welding, or Leonese process or by some other means; provided an intimate air tight connection is reliably obtained. The joint between the main element 10 and the cap 11 is provided with a moisture-proof paint or varnish coat 12 to prevent electrolytic actions at this point. A metal spraying process may be employed instead of applying a paint or varnish coat.

Figs. 5, 5a, 5b and 6, 6a and 6b show in longitudinal section, plan view and cross sections contact connections according to the invention with exposed fuse strips. The lead 1 of magnesium is held by magnesium intermediate elements 13 provided with a copper coating 14. The coating 14, intermediate elements 13 and the ends of the lead 1 are, according to Fig. 5 fixed by rivets or screws 15 to the contacts 16 to which the leads from the supply mains are connected. As shown in Fig. 5b the bores in the intermediate element 13 through which the screws 15 extend are of such diameter that these screws 15 do not come into contact with the intermediate element 13. The joints between the intermediate element 13 and copper coating 14 are protected by a coat of moistureproof paint or varnish or the like.

Figs. 6, 6a and 6b show the same exposed fuse strip or magnesium lead 1 in which the contact connection between the several metals is rigid.

I claim:

1. An electric fusible lead for fuses, comprising in combination a body of magnesium, and a shell of good electricity-conducting and contact-making metal intimately and airtightly surrounding said body.

2. An electric fusible lead for fuses, comprising in combination a body of magnesium, and a shell of good electricity-conducting and contact-making metal intimately and airtightly surrounding said body along the entire length thereof.

3. An electric fusible lead for fuses, comprising in combination a body of magnesium, and a shell of good electricity-conducting and contact-making metal intimately and airtightly surrounding said body along a portion of the length thereof.

4. An electric fusible lead for fuses, comprising in combination a body of magnesium, and a shell of good electricity-conducting and contact-making metal intimately and airtightly surrounding said body at the ends and the central portion thereof.

5. An electric lead comprising a body of magnesium, a shell of a good electric conductor on the body, and a material of low melting point on the shell.

6. An electric fusible lead for fuses, comprising in combination a body of magnesium, a shell of good electricity-conducting and contact-making metal intimately and airtightly surrounding said body, and an intermediate member of magnesium between said body and said shell.

7. An electric fusible lead for fuses, comprising in combination a body of magnesium, a sleeve of magnesium surrounding said body and a sleeve of a good electricity-conducting and contact-making metal intimately and airtightly surrounding said magnesium sleeve.

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