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METHOD OF MANUFACTURING FUSE ELEMENTS FROM STRIP MATERIAL FOR CARTRIDGE FUSE LINKS

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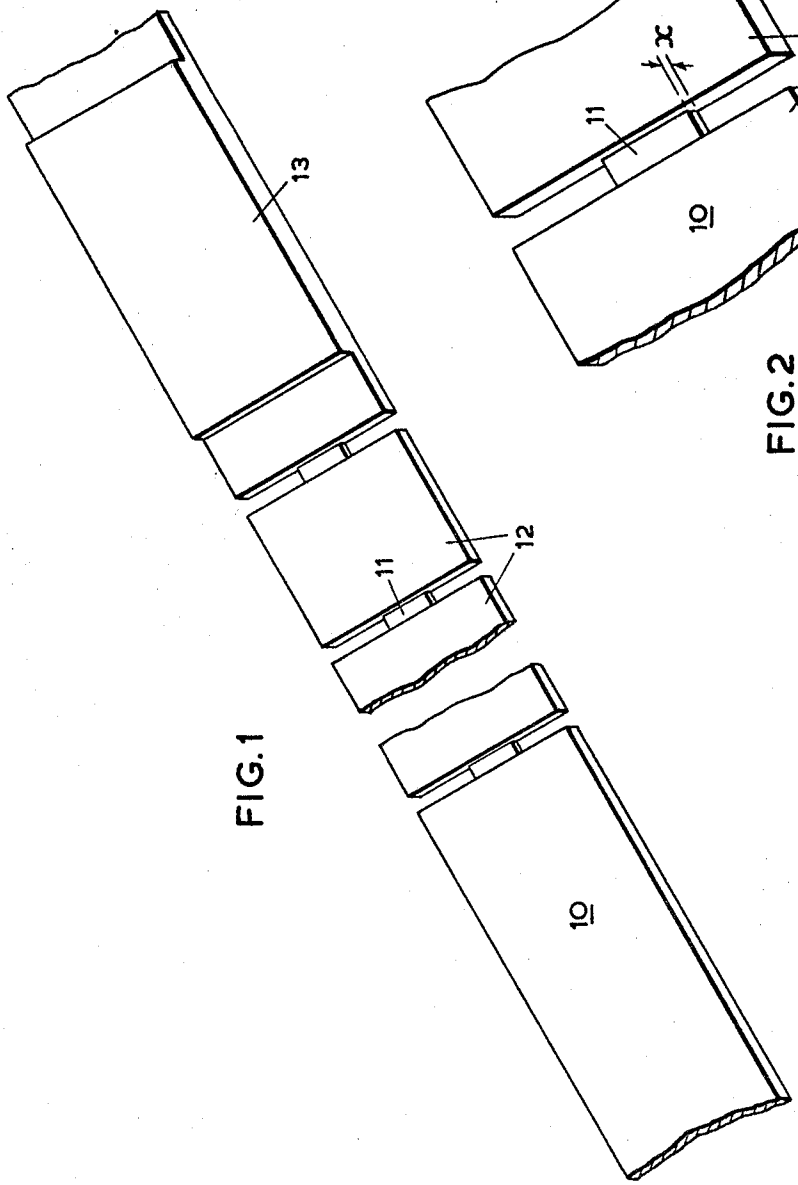


FIG. 1

FIG. 2

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METHOD OF MANUFACTURING FUSE ELEMENTS FROM STRIP MATERIAL FOR CARTRIDGE FUSE LINKS

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U.S. Cl. 29—623 2 Claims
Int. Cl. H01h 69/02

ABSTRACT OF THE DISCLOSURE

This invention relates to a method of forming a fuse element from strip material by initially rolling in the strip a plurality of grooves spaced apart along its length and subsequently forming notches on opposite sides of the strip along the length of each groove, whereby the thickness and width of each neck portion thus produced are less than the thickness and width of the remaining portions of the strip adjacent thereto.

This application is a division of our co-pending application Ser. No. 341,267 filed on Jan. 30, 1964, now Patent No. 3,288,968.

The invention relates to electrical fuse-elements and is particularly applicable to fuse-elements for use in cartridge fuse links of the type in which a fuse-element is supported within a tubular insulating container by two conductive members secured to the container one at each end thereof.

According to the invention, there is provided a method of producing a fuse element from a strip of fusible metal, comprising the steps of initially forming a groove across the width of the strip and subsequently forming notches on opposite sides of the strip along the length of the groove, whereby the thickness and width of the neck portion so formed are less than the thickness and width of the remaining portion of the strip.

A preferred form of fuse-element made by a method according to this invention will now be described with reference to the accompanying drawings in which:

FIG. 1 is a perspective view of the fuse-element; and

FIG. 2 is a fragmentary view, to an enlarged scale, of part of the fuse-element.

The fuse-element comprises a strip **10** of silver which is provided with a series of neck portions **11** joining full-section portions such as those indicated at **12**. The neck portions **11** are disposed centrally relative to the width of the strip **10** and have a thickness x (FIG. 2) which is less than the thickness v of the full-section portions **12**. The cross-sectional area of each neck portion **11** in the plane perpendicular to the length of the strip **10** is approximately $\frac{1}{10}$ the cross-sectional area of each full-section portion **12**.

The fuse-element includes a thickened portion **13** for reducing the overall resistance of the fuse. Such a portion may be positioned at either or both ends of the element and/or in the middle of the element.

In producing this fuse element, the appropriate strip of material is fed between two closely spaced contra-rotating rollers, one having a plane surface and the other having a male contour conforming to the grooves to be formed in the strip, the clear spacing between the rollers thus defining the thickness of the neck portion slots are then formed, extending inwardly from the ends of the groove so as to define the lateral width of the neck portion. Alternatively, the grooves can be formed by milling with a cutter.

It has been found that a ratio between the cross-sectional areas of the full-section portions and the neck portion of the order of 10:1 (that is, ranging from about 8:1 to about 12:1), as in this case, is an important factor in producing a fuse with a high current rating within limited dimensions and with a fast fusing action. It has also been found that the proportions of the neck portion affect the distribution of current in the full-section portions and hence the overall effective resistance of the fuse element which should be as low as possible. The best current distribution in the full-section portions (and hence the lowest overall effective resistance) is obtained by reducing the thickness, rather than the width, of the neck portion: ideally, the neck portion would consist of a groove extending across the whole width of the strip. However, the desired ratio of cross-sectional areas between the full-section portions and the neck portion cannot in many cases be obtained in this way without so reducing the thickness of the strip at the groove as to make the strip unmanageable mechanically. Therefore, by providing, in a fuse-element according to the invention, a neck-portion having both a reduced width and a reduced thickness, a compromise can be made between the conflicting requirements of mechanical strength and good current distribution and at the same time the desired ratio of cross-sectional areas can be achieved. In a test illustrating this, a first fuse-element, three inches long was provided, with a series of six neck portions by simply forming slots in the sides of the strip so that the lateral width of the strip was reduced to $\frac{1}{10}$ of the full width. The measured resistance was 750 microhms. A second fuse-element of the same length had the thickness of the neck portions reduced from .010 inch i.e. about 1:3, to 0.003 inches enabling the width of the neck portions to be $3\frac{1}{3}$ times wider than in the first fuse-element for the same cross-sectional area. The measured resistance of the second element was 600 microhms.

Desirably, the required cross-sectional area of the neck portion should be spread over as much of the width of the strip as possible commensurate with good mechanical strength: this also provides the most effective heat dissipation because, for a given cross-section, the largest possible surface area is available for heat transfer purposes.

What we claim as our invention and desire to secure by Letters Patent is:

1. A method of producing a fuse element from a strip of fusible metal substantially rectangular in cross-section, comprising the steps of

initially forming across the width of the strip a plurality of grooves spaced apart along the length of the strip so that the thickness of the strip in the grooves is reduced to about one-third, and

subsequently forming notches of equal length on opposite sides of the strip along the length of each groove, whereby both the thickness and the width of each neck portion thus produced are less than the thickness and width of the remaining portions of the strip.

2. A method of producing a fuse element from a strip of fusible metal substantially rectangular in cross-section, comprising the steps of

initially forming a plurality of grooves extending across the width of the strip by a rolling operation, the grooves being spaced apart along the length of the strip so that the thickness of the strip in the grooves is reduced to about one-third, and

subsequently forming notches of equal length on opposite sides of the strip along the length of each

groove, whereby both the thickness and the width of each neck portion thus produced are less than the thickness and width of the remaining portions of the strip.

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