Nov. 26, 1968 F. J. KOZACKA 3,413,585

ELECTRIC CARTRIDGE FUSE HAVING OFF-CENTER FUSIBLE ELEMENTS

Filed March 10, 1967

FIG. 1

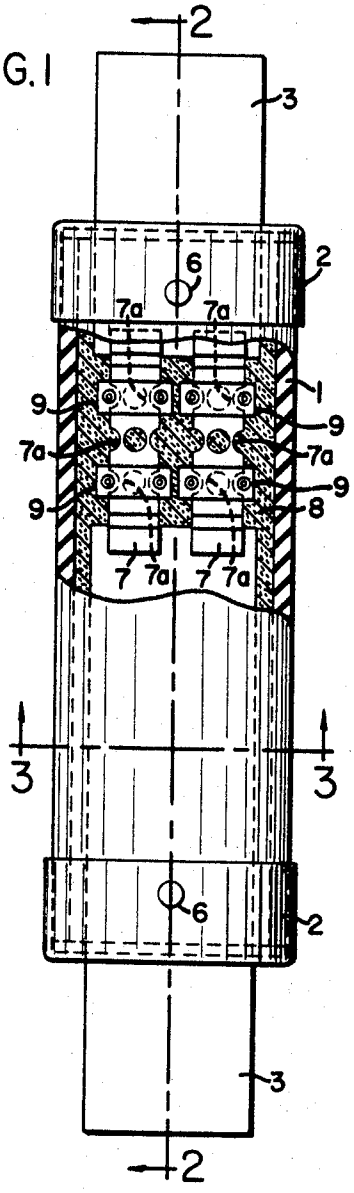


FIG. 2

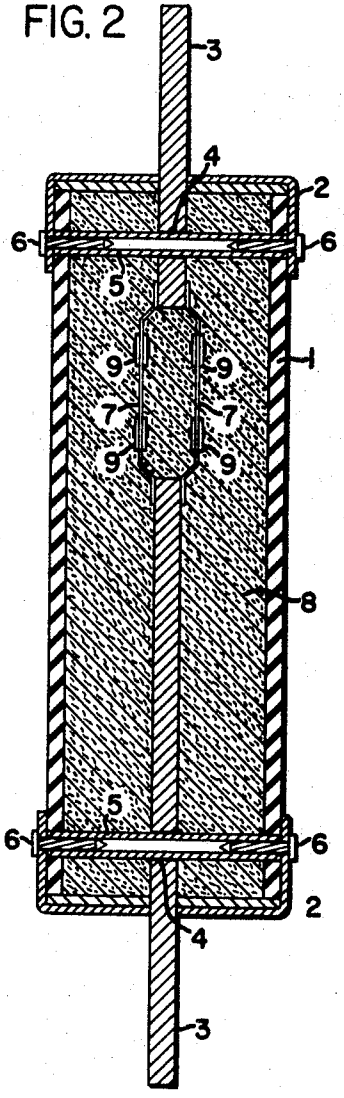
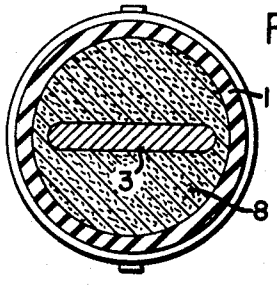


FIG. 3



INVENTOR:
FREDERICK J. KOZACKA
BY Irwin Ralph
ATTORNEY

United States Patent Office

3,413,585
Patented Nov. 26, 1968

3,413,585

ELECTRIC CARTRIDGE FUSE HAVING OFF-CENTER FUSIBLE ELEMENTS

Frederick J. Kozacka, South Hampton, N.H., assignor to The Chase-Shawmut Company, Newburyport, Mass.

Filed Mar. 10, 1967, Ser. No. 622,267
4 Claims. (Cl. 337—159)

ABSTRACT OF THE DISCLOSURE

A fuse intended to promote heat flow in a direction longitudinally of the fuse tube to keep the temperature at the center region of the fuse tube relatively low. This end is achieved by an off-center arrangement of the fusible element, or fuse link.

Field of invention

This invention is concerned with a further development of the current-limiting low voltage fuse structure disclosed and claimed in U.S. Patent 2,939,934 to Frederick J. Kozacka, June 7, 1960, for Current-Limiting Low Voltage Fuses, assigned to the same assignee as the present invention. This patent discloses fuses whose casing or fuse tube is of standard size and whose fuse link or fusible element is of such configuration that its length is substantially less than that of the casing or fuse tube, the latter being made of an inorganic insulating material such as, for instance, a synthetic resin, or a synthetic-resin-glass-cloth laminate. Under such conditions it is nesessary or desirable to limit the highest temperature which may occur at any point of the casing or fuse tube while the fuse is performing the current-carrying duty thereof.

Summary of invention

The object of limiting the highest temperature which may occur at any point of the casing or fuse tube while the fuse is performing the current-carrying duty thereof is achieved according to this invention by an arrangement of the fuse link, or fusible element, inside of the casing, or fuse tube, in such a way as to greatly increase the axial heat flow. To be more specific, the increase of axial heat flow is achieved by arranging the fuse link off-center so that the fuse link is located closer to one end of the fuse tube than to the other end thereof. This, in turn, is achieved by providing a pair of knife blade contacts of which one is relatively long and the other relatively short, each projecting transversely through one of the terminal caps mounted on the ends of the fuse tube into the fuse tube. The relatively long blade contact has an axially inner end relatively close to the center region of the fuse tube and said relatively short blade contact has an axially inner end relatively remote from the center region of the fuse tube.

Brief description of drawings

FIG. 1 is in part a front view of a fuse embodying the present invention, some parts being broken away to expose to view the interior of the fuse;

FIG. 2 is a section along **2—2** of FIG. 1; and

FIG. 3 is a section along **3—3** of FIG. 1.

Description of preferred embodiment

The fuse structure shown in the drawings is one of standard size whose casing dimensions are determined by the table below:

Electrical Rating		Length of fuse tube, inches
Volts	Amps.	
250	0- 30	$2\pm\frac{1}{32}$
	31- 60	$3\pm\frac{1}{32}$
	61-100	$3\frac{7}{8}\pm\frac{1}{16}$
	101-200	$4\frac{3}{8}\pm\frac{1}{16}$
	201-400	$4\frac{7}{8}\pm\frac{3}{32}$
	401-600	$5\frac{7}{8}\pm\frac{3}{32}$
600	0- 30	$5\pm\frac{1}{32}$
	31- 60	$5\frac{1}{2}\pm\frac{1}{32}$
	61-100	$5\frac{7}{8}\pm\frac{1}{16}$
	101-200	$6\frac{7}{8}\pm\frac{1}{16}$
	201-400	$7\frac{7}{8}\pm\frac{3}{32}$
	401-600	$8\frac{7}{8}\pm\frac{3}{32}$

The length of the fuse link is substantially less than the standard length of the fuse tube defined by the table above. The length of the fuse link depends, inter alia, upon the intended voltage rating, the number of its serially related points of reduced cross-section and the nature of the pulverulent arc-quenching filler. If quartz sand is used as arc-quenching filler, the number of points of serially related points of reduced cross-section may be so high as to limit the length of the fuse link to a substantially shorter distance than twice the safe minimum distance from mid-point of fuse tube to nearest life part as defined by the U.S. fuse standards. (See Low-Voltage Cartridge Fuses, National Electrical Manufacturers Association Pub. No. FU 1-1963; table 3-5.)

Referring now to the drawings, numeral **1** has been applied to indicate a tubular casing of insulating material, preferably a melamine-glass-cloth laminate. The ends of casing **1** are closed by caps or ferrules **2**, each having an opening for the passage of one of a pair of blade contacts **3**. Each blade contact **3** is provided with a transverse bore **4** receiving a hollow radially expandable pin **5**. Each of the two pins **5** projects transversely through coaxial bores provided in casing **1**. Pins **6** project transversely through caps or ferrules **2** into hollow pins **5**, expanding the latter in radial direction, i.e. increasing the periphery thereof. This establishes a structure of considerable dimensional stability, as more fully explained in U.S. Patent 2,939,935 to F. J. Kozacka, June 7, 1960 for Fuse Structures, assigned to the same assignee as the present invention. The axially inner ends of blade contacts **3** form a gap therebetween, and are conductively interconnected by a pair of ribbon fuse links **7**. The axially outer ends of fuse links **7** sandwich the axially inner ends of blade contacts **3**. A pair of fuse links **7** is arranged to each side of blade contacts **3**. Each fuse link **7** is provided with three transverse lines **7***a* of perforations, and thus each fuse link **7** has three serially related points, or areas, of reduced cross-section. The axially outer lines **7***a* of perforations are sandwiched between plates **9** of melamine-glass-cloth, and thus separated from the quartz sand filler **8** inside of casing **1**. The axially inner lines **7***a* of perforations are not sandwiched in the aforementioned manner between plates of melamine-glass-cloth, and thus exposed to the immediate action of the arc-quenching filler **8** of quartz sand. In this fashion a very desirable control of the

arc voltage incident to blowing of the fuse may be achieved. This is explained in considerable detail in U.S. Patent 2,964,604 to Philip C. Jacobs et al., Dec. 13, 1960 for Current-Limiting Fuses Having Compound Arc-Voltage Generating Means, assigned to the same assignee as the present invention.

Referring now more particularly to FIGS. 1 and 2, it is apparent that upper blade contact **3** is considerably shorter than lower blade contact **3**. The portions of blade contacts **3** projecting beyond the end surfaces of caps or ferrules **2** are equal in length, but the portion of upper blade contact **3** inside of casing **1** is considerably shorter than the portion of lower blade contact **3** inside of casing **1**. As a result, fuse links **7** whose length is by far exceeded by that of fuse tube **1** are arranged off center. In other words, the axially inner end of the upper, relatively short blade contact **3**, to which the upper ends of links **7** are conductively connected, is arranged relatively remote from the center region of fuse tube **1**, and the axially inner end of the lower, relatively long blade contact **3**, is arranged relatively close to the center of the fuse tube.

Pins **5** have the same spacing from the ends of fuse tube **1** and a different spacing from the axially inner ends of blade contacts **3**. To be more specific, the spacing of upper pin **5** from the axially inner end of upper blade contact **3** is considerably less than the spacing of lower pin **5** from the axially inner end of lower blade contact **3**.

It will be understood that though but one embodiment of the invention has been illustrated and described in detail, the invention is not limited thereto. It will also be understood that the structure illustrated may be modified without departing from the spirit and scope of the invention as set forth in the accompanying claims.

I claim as my invention:

1. In an electric low voltage fuse the combination of a body of quartz sand, a ribbon fuse link having a plurality of serially related points of reduced cross-section submersed in said body of quartz sand, a fuse tube accommodating said body of quartz sand and said fuse link, the length of said fuse tube considerably exceeding the length of said fuse link, a pair of knife blade contacts conductively interconnected by said fuse link, one of said pair of blade contacts being relatively long and the other of said pair of blade contacts being relatively short and each projecting transversely through one of said pair of caps into the inside of said casing and into said body of quartz sand, the axially inner end of said relatively long blade contact being arranged relatively close to the center region of said fuse tube and said relatively short blade contact having an axially inner end arranged relatively remote from said center region of said fuse tube.

2. An electric fuse as specified in claim **1** wherein said plurality of points of reduced cross-section is sufficiently high to limit the length of said link to a substantially shorter distance than twice the safe minimum distance from midpoint of the fuse tube to nearest life part.

3. An electric fuse as specified in claim **1** wherein the length of said fuse tube is substantially the length defined by the table below;

Electrical Rating		Length of fuse tube, inches
Volts	Amps.	
250	0- 30	$2\pm\frac{1}{32}$
	31- 60	$3\pm\frac{1}{32}$
	61-100	$3\frac{7}{8}\pm\frac{1}{16}$
	101-200	$4\frac{3}{8}\pm\frac{1}{16}$
	201-400	$4\frac{7}{8}\pm\frac{3}{32}$
	401-600	$5\frac{7}{8}\pm\frac{3}{32}$
600	0- 30	$5\pm\frac{1}{32}$
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	61-100	$5\frac{7}{8}\pm\frac{1}{16}$
	101-200	$6\frac{7}{8}\pm\frac{1}{16}$
	201-400	$7\frac{7}{8}\pm\frac{3}{32}$
	401-600	$8\frac{7}{8}\pm\frac{3}{32}$

and wherein the length of said fuse link is substantially less than the standard length of said fuse tube as defined by the table above.

4. An electric fuse as specified in claim **1** wherein each of said pair of blade contacts is supported by a pair of pins each projecting transversely, through one of said pair of caps and through said fuse tube, each of said pair of pins having a spacing of equal magnitude from the axially outer ends of said fuse tube and each of said pair of pins having a spacing of different magnitude from the axially inner ends of said pair of blade contacts.

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BERNARD A. GILHEANY, *Primary Examiner.*

HIRAM B. GILSON, *Assistant Examiner.*