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Electrical blade fuse
Elektrische Messerschmelzsicherung
Fusible électrique à couteaux

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Proprietor: THE WHITAKER CORPORATION
Wilmington, Delaware 19808 (US)

Inventor: Filomia, Domingo R.
1651-San Andres, Buenos Aires (AR)

Representative: Warren, Keith Stanley et al
BARON & WARREN
18 South End
Kensington
London W8 5BU (GB)

References cited:
EP-A- 0 354 676
DE-A- 2 940 607
DE-U- 8 323 440
FR-A- 2 422 250

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Description

This invention relates to an electrical blade fuse and particularly to a type of fuse utilized in automotive applications.

In US-A-4 998 086 an electrical fuse assembly is taught which has a dielectric housing and fuse terminal, stamped and formed from metal stock having appropriate electrical characteristics. The assembly has a plastic housing which supports and holds terminal portions of the fuse in a position for engagement in a fuse block through terminals retained therein and further includes an integral positioning bar allowing the terminal to be properly positioned and held within the housing. The housing of this patent is shown to be open. Dependent upon the attitude of the fuse assembly in position within, melted metal from the fuse, following an overload and fuse action, may fall from the housing and be deposited or become lodged between electrical circuits to cause shorting. In certain other fuse constructions, the bottom of the fuse may be open, allowing melted fuse material to fall or become lodged between the fuse terminals to result in a fuse malfunction and continuing conduction of current between fuse terminals.

Accordingly, it is an object of the present invention to provide an electrical blade fuse which is sealed at both bottom and top so that fuse material, once melted, cannot become dislodged to short out other electrical circuits or to short out the terminals of the fuse itself. It is a further object to provide an electrical blade fuse, housing and terminals allowing for automatic assembly through assembly displacement which is along a common axis. It is still a further object to provide a fuse having a cover enclosing the fuse cavity by utilizing tab portions of the fuse terminals deformed to hold such cover in place and additionally to serve as test electrodes to allow testing of the fuse in place.

The present invention consists in an electrical blade fuse as defined in claim 1.

FR-A-2 422 250 discloses an electrical blade fuse according to the preamble of claim 1.

DE-A-2 940 607 discloses a blade fuse in which a cover of the fuse housing receives bent over tabs on terminals of the blade fuse so that the tabs are within the profile of the housing.

There is disclosed herein an electrical blade fuse having a plastic housing with an interior opening of a volume sufficient to readily accommodate melted fuse material without shorting between the terminals, regardless of the attitude of the fuse at the movement of material melting. The housing includes a cover which fits over such opening and which is held in place by tab portions integral with a terminal mounted in the housing, which tab portions are folded over the cover to retain such to the fuse housing. The terminal of the assembly is a one-piece stamped and formed element having a fuse portion of a resistivity and cross-sectional dimension to be heated up by particular IR heating in the presence of a current I causing the fuse material to melt and separate a pair of terminals which include post blade portions extending from the housing. The blade portions are inserted as terminals within receptacle portions of a circuit being protected by the fuse. An example would be the fuse block arrangement in an automobile wherein the fuses protect the wiring circuit of the vehicle from overloads. Automotive lamp circuits, heater circuits, and electronic devices are typically protected by such fuses.

The terminal is formed of one piece as by stamping to include latch elements which engage the housing of the fuse assembly and latch the terminals in place within such housing against displacement out of such housing. The tab portions formed on the terminals are inserted through the cover and folded to preclude displacement of the cover itself and, in turn, serve as probe points or electrodes for testing of the fuse in place and in use. In this way, the fuse assembly is essentially enclosed so that melted fuse material cannot escape from the interior of the housing.

An embodiment of the present invention will now be described by way of example with reference to the accompanying drawings in which:

Figure 1 is a perspective, substantially enlarged, view of the fuse assembly of the embodiment of the invention;
Figure 2 is a side elevation, partially sectioned, of the assembly shown in Figure 1;
Figure 3 is a view from the bottom of the fuse assembly shown in Figure 2; and
Figure 4 is a side elevational view, partially sectioned, of the fuse as shown in Figures 1-3.

Referring to Figure 1, a fuse assembly 10, in accordance with the present embodiment, is shown to include a housing 12 and a cap 34, both of plastic insulating material and further, a fuse 40 which includes a pair of blades 42 projecting from the housing and a fuse length portion 52 extending between the blades 42 in the manner shown in Figure 4. The housing 12 includes an upper portion 14, as shown in Figure 1, a lower portion 16 apertured as at 18, to receive latches of the terminal holding the terminal in place within the housing. An upper projecting portion 20 is provided which facilitates handling of the fuse during insertion of the fuse or withdrawal of a fuse relative to a fuse block. The fuse block, not shown, would include accommodation for numbers of fuses like 10 and would include further receptacles which receive the blade portions 42 of the projecting terminals and interconnect the fuse, typically in series with a wiring circuit connected to a load. The purpose of the fuse is to regulate the current flowing through such circuit, interrupting such circuit and the current when such current is excessive. In this way, the circuit may be protected from current overloads and the resulting damage including fire avoided thereby.

Figure 2 shows the top portion of the housing 20 to
include a recess 22 which leads to an interior cavity 24
having sloped side walls 26 which lead to apertures 28
extending through the lower portion 18 of the housing
to accommodate the terminal 40 and the blades 42
thereof. As can be seen, the apertures 28 are dimen-
sioned to tightly fit against the outside surfaces of
the fuse blades 42, note also the showing in Figure 4 relative
to the sides of the terminals being tightly engaged by
the plastic material of the housing. Note in Figure 4 that
the ends of the cavities 24 are sloped as at 30 and 32
with the sloped surfaces of 26 facilitating assembly of
the terminals 40 into the housings 12. These sloped sur-
faces further define a volume interiorly of the housing
which further accommodates melted material from fuse
length portion 52 of the terminal.

A cover or cap 34 is provided as shown in Figures
1, 2, and 4 which is made to fit snugly down inside cavity
22 to cover and effectively seal the interior cavity 24. As
can be seen in Figure 4, the ends of the cover 34 rest
up on a ledge shown as 35 which precludes inward dis-
placement of the covers relative to the housing. As
shown in Figures 1, 2, and 4 also, the covers 34 have
recesses at the end shown as 36 and centered in such
recesses, apertures 38 through which can be fitted tab
portions of the terminal. As can be discerned from Fig-
ures 1, 2, and 4, the terminals 40 include, at the lower
ends, blade portions 42 which are beveled as at 44 to
facilitate insertion of the blade portions into receptacle
portions of mating contacts not shown. As also can be
discerned through Figures 2, 3, and 4, the terminals are
formed of an integral metal stamping with the blade por-
tions made sufficiently strong by folding of such material
to effectively double the thickness of the blade portions
42 relative to the thickness of the stock from which the
 terminals are made. Latches 46 are provided extending
out from portions 42 to engage apertures 18. The folded
edge of the terminal portions is to the outside of each
blade. As can be seen in Figures 2 and 4, the upper
portion of each terminal includes a portion 48 which has
extending therefrom a portion 50 forming the tab portion
of the terminal. Both figures, as well as Figure 1, show
the tab portions 50 folded down against the cap portion,
extended through the apertures 38 therein to retain the
caps in a downward position within the housing. As
can be seen from Figures 2 and 4, the tab portions are re-
cessed in the cavities 16 so as to not protrude from the
profile of the overall housing. This prevents the termi-
nals from being shorted out by any conductive material
coming against the housing. The tab portions 50, by ex-
tending through the cap material, allow testing of the
 fuse in place by electrodes of a multimeter or the like,
placed against the tab portions 50 of each terminal por-
tion.

As can be appreciated from Figures 2 and 4, the
terminals can be straightforwardly loaded along a given
axis parallel to the blade portions through the apertures
28 into place within the housings, the latches 46 struck
from the material of the terminals feeding into the aper-
tures 18 and latching therein against the upper surfaces
thereof in the manner shown in Figure 2.

Extending from the upper portions 48 of the termi-
nals transversely between terminal blade portions is a
thermal fuse length portion 52 which is given a resis-
tance by virtue of the characteristics of the material of
which the fuse metal is made in conjunction with a cross-
section of portion 52 to define a precise R. This will yield
a precise heating characteristic in the face of the current
I to generate a melting of portion 52 in the presence of
sufficient I²R energy caused essentially by the size of I.
In accordance with the invention, a further projection be-
neath the length 52 and shown as 54 extends from each
fuse portion 48 to fit within the housing and solidify the
positioning of the terminals therewithin, particularly after
the fuse length 52 which joins the two blades is no longer
present due to having melted. Upon such melting, the
blade portions of the fuse are held relatively rigidly with
respect to the housings 12 by virtue of the latches 46,
the projections 54 and the tab portions 50 held within
the cap 34. The material from 52 typically melts and sep-
arates to form a blob of material attached to each termi-
nal and residing in the volume proximate the upper end
of the terminal, such volume defined by cavity 54 and
the various surfaces 26, 30, and 32. In the event of dis-
placement of material caused by sudden rupturing of
portion 52, no material will escape from the volume of
24 due to the presence of the cap on the upper end of
the housing and due to the presence of the tight fit of
the lower portion of the housing 16 as described. Sep-
erated fuse material, if any such exists, will be retained
inside the housing, regardless of the altitude of the fuse
at the time when the fuse rupture occurs.

Claims

1. An electrical blade fuse (10) including an insulating
housing (12) having an inner cavity (24) leading to
a pair of lower apertures (28) and a common upper
opening (22), a terminal element (40) fitted in said
cavity including a pair of terminal members (42) with
each member (42) extending through one of the
lower cavities, said members (42) being connected
together by a fuse length portion (52) of a cross-
section to provide a precise resistance R to melt at
a precise temperature associated with a given cur-
rent I through I²R heating, wherein the said element
(40) includes a pair of tabs (50) extending opposite-
ly to said terminal members (42) integral with said
terminal members (42) and fuse portion (52), an in-
sulating cover (34) having apertures (38) receiving
said tabs (50) with the said tabs (50) extended
through the said cover apertures and folded to lock
the said cover (34) to the housing (12) into the upper
opening to confine melted fuse material internally
of said housing and provide test points via the said
tabs to test said fuse, characterised in that the cover
(34) which is fitted into said upper opening (22) engages a ledge (35) formed in a cavity of said upper opening (22), said ledge (35) and said cover (34), thereby defining an interface providing a seal within said cavity of the upper opening (22), for securing the cover (34) and sealing the inner cavity (24).

2. The electrical blade fuse of claim 1 characterised in that the said cover (34) includes a recess (36) to receive the folded tabs (50) such that the tabs reside within the profile of said housing.

3. The electrical blade fuse of claim 1 characterised in that the said housing material is formed tightly around the terminal members (42) to preclude a melted fuse material from shorting the said terminal members.

4. The electrical blade fuse of claim 1 characterised in that the said inner cavity (24) is of a volume to readily accommodate melted fuse material without shorting the said terminal members.

5. The electrical blade fuse of claim 1 characterised in that the interior cavity includes beveled surfaces (26, 30, 32) to facilitate direct insertion of the terminal element into said housing along a single axis.

6. The electrical blade fuse of claim 1 characterised in that the said terminal members include latches (46) engaging housing apertures (18) and operable to lock the said terminal elements in one sense against displacement in said housing through the engagement with said housing and said tabs (50) operate to lock the said terminal through engagement with said cap (34) in an opposite sense relative to said displacement and said housing.

Patentansprüche

1. Elektrische Messerschmelzschutzsicherung (10) mit einem isolierenden Gehäuse (12), das einen inneren Hohlraum (24), der zu einem Paar von unteren Öffnungen (28) führt, und eine obere gemeinsame Öffnung (22) hat, wobei ein Anschlußelement (40) in den Hohlraum eingepaßt ist, das ein Paar von Anschlußgliedern (42) aufweist, wobei jedes Glied (42) sich durch einen der unteren Hohlräume erstreckt, wobei die Glieder (42) miteinander durch einen Längenschnitt (52) der Sicherung mit einem Querschnitt verbunden sind, um einen genauen Widerstand zu bilden und bei einer genauen Temperatur zu schmelzen, die zu einem gegebenen Strom I gehört, und zwar durch Prüfung, wobei das Element (40) ein Paar von Laschen (50) aufweist, die sich entgegengesetzt zu den Anschlußgliedern (42) erstrecken und die einstücksig mit den Anschlußgliedern (42) und dem Sicherungsabschnitt (52) sind, wobei eine isolierende Abdeckung (34) Öffnungen (38) hat, die die Laschen (50) aufnehmen, wobei die Laschen (50) sich durch die Öffnungen der Abdeckung erstrecken und in die obere Öffnung hinein umgefaßt sind, um die Abdeckung (34) mit dem Gehäuse (12) zu verriegeln, um geschmolzenes Sicherungsmaterial innerhalb des Gehäuses zu halten und über die Laschen Testpunkte zum Testen der Sicherung zu schaffen, dadurch gekennzeichnet, daß die Abdeckung (34), die in die obere Öffnung (22) eingepaßt ist, an einer Leiste (35) angreift, die in einem Hohlraum der oberen Öffnung (22) gebildet ist, wobei die Leiste (35) und die Abdeckung (34) dadurch eine Begrenzung definieren, die eine Dichtung innerhalb des Hohlraums der oberen Öffnung (22) bildet, um die Abdeckung (34) zu befestigen und den inneren Hohlraum (24) abzudichten.

2. Elektrische Messerschmelzschutzsicherung nach Anspruch 1, dadurch gekennzeichnet, daß die Abdeckung (34) eine Ausnehmung (38) aufweist, um die umgefaßten Laschen (50) daran aufzunehmen, daß die Laschen innerhalb des Profils des Gehäuses liegen.

3. Elektrische Messerschmelzschutzsicherung nach Anspruch 1, dadurch gekennzeichnet, daβ das Gehäusematerial dicht um die Anschlußglieder (42) herum geformt ist, um ein geschmolzenes Dichtungsmaterial daran zu hindern, die Anschlußglieder kurzschließen.

4. Elektrische Messerschmelzschutzsicherung nach Anspruch 1, dadurch gekennzeichnet, daβ der innere Hohlraum (24) ein Volumen hat, das leicht das geschmolzene Sicherungsmaterial aufnimmt, ohne die Anschlußglieder kurzschließen.

5. Elektrische Messerschmelzschutzsicherung nach Anspruch 1, dadurch gekennzeichnet, daβ der innere Hohlraum abgeschraubte Oberflächen (26, 30, 32) aufweist, um ein direktes Einsetzen des Anschlußelements in das Gehäuse längs einer einzigen Achse zu erleichtern.

6. Elektrische Messerschmelzschutzsicherung nach Anspruch 1, dadurch gekennzeichnet, daβ die Anschlußglieder Riegel (46) aufweisen, die in Gehäuseöffnungen (18) eingreifen und die zum Verriegeln der Anschlußelemente in einem Sinn gegen Verlagerung in dem Gehäuse durch Eingriff mit dem Gehäuse wirksam sind, und daβ die Laschen (50) zum Verriegeln des Anschlusses durch Eingriff mit der Abdeckung (34) in einem entgegengesetzten Sinn relativ zu der Verlagerung und zu dem Gehäuse wirksam sind.
Reündigungen

1. Fusible électrique (10) à couteaux comprenant un boîtier isolant (12) ayant une cavité intérieure (24) menant à deux ouvertures inférieures (28) et à une ouverture supérieure commune (22), un élément à bornes (40) logé dans ladite cavité comprenant deux pièces de bornes (42), chaque pièce (42) s'étendant à travers l'une des cavités inférieures, lesdites pièces (42) étant reliées l'une à l'autre par une partie de longueur fusible (52) d'une section transversale établissant une résistance précise R pour fondre à une température précise associée à un courant donné I, par chauffage, ledit élément (40) comprenant deux pattes (50) s'étendant du côté opposé à celui desdites pièces de bornes (42) avec lesquelles et ladite partie fusible (52) elles sont réalisées d'une seule pièce, un capot isolant (34) présentant des ouvertures (38) recevant lesdites pattes (50), lesdites pattes (50) s'étendant à travers lesdites ouvertures du capot et étant pliées pour bloquer ledit capot (34) sur le boîtier (12) dans l'ouverture supérieure afin de retenir la matière fusible fondue à l'intérieur dudit boîtier et d'établir des points de contrôle par l'intermédiaire desdites pattes pour contrôler ledit fusible, caractérisé en ce que le capot (34), qui est ajusté dans ladite ouverture supérieure (22), porte contre un rebord (35) formé dans une cavité de ladite ouverture supérieure (22), ledit rebord (35) et ledit capot (34) définissant ainsi une interface formant un joint dans ladite cavité de l'ouverture supérieure (22), pour fixer le capot (34) et sceller la cavité intérieure (24).

2. Fusible électrique à couteaux selon la revendication 1, caractérisé en ce que ledit capot (34) présente un évidement (36) destiné à recevoir les pattes pliées (50) afin que les pattes se logent à l'intérieur du profil dudit boîtier.

3. Fusible électrique à couteaux selon la revendication 1, caractérisé en ce que la matière dudit boîtier est formée de façon à entourer étroitement les pièces de bornes (42) afin d'empêcher une matière fusible fondue de court-circuiter lesdites pièces de bornes.

4. Fusible électrique à couteaux selon la revendication 1, caractérisé en ce que ladite cavité intérieure (24) est d'un volume pouvant loger aisément une matière fusible fondue sans court-circuiter lesdites pièces de bornes.

5. Fusible électrique à couteaux selon la revendication 1, caractérisé en ce que la cavité intérieure présente des surfaces biseautées (26, 30, 32) pour faciliter l'introduction directe de l'élément à bornes dans ledit boîtier le long d'un seul axe.

6. Fusible électrique à couteaux selon la revendication 1, caractérisé en ce que lesdites pièces à bornes comprennent des verrous (46) s'engageant dans des ouvertures (18) du boîtier et pouvant agir de façon à bloquer lesdites pièces de bornes dans un sens, à l'encontre d'un déplacement dans ledit boîtier, par l'engagement avec ledit boîtier, et lesdites pattes (50) agissent de façon à bloquer ladite borne par engagement avec ledit capot (34) dans un sens opposé par rapport audit déplacement et audit boîtier.