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Mamrick et al.

[11] **3,775,724**

[45] **Nov. 27, 1973**

[54] **CIRCUIT PROTECTOR**

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[52] **U.S. Cl.** **337/245**, 337/187, 337/297

[51] **Int. Cl.** **H01h 85/58**

[58] **Field of Search** 337/228, 231, 232, 337/245, 246, 253, 254, 186, 216, 187, 297

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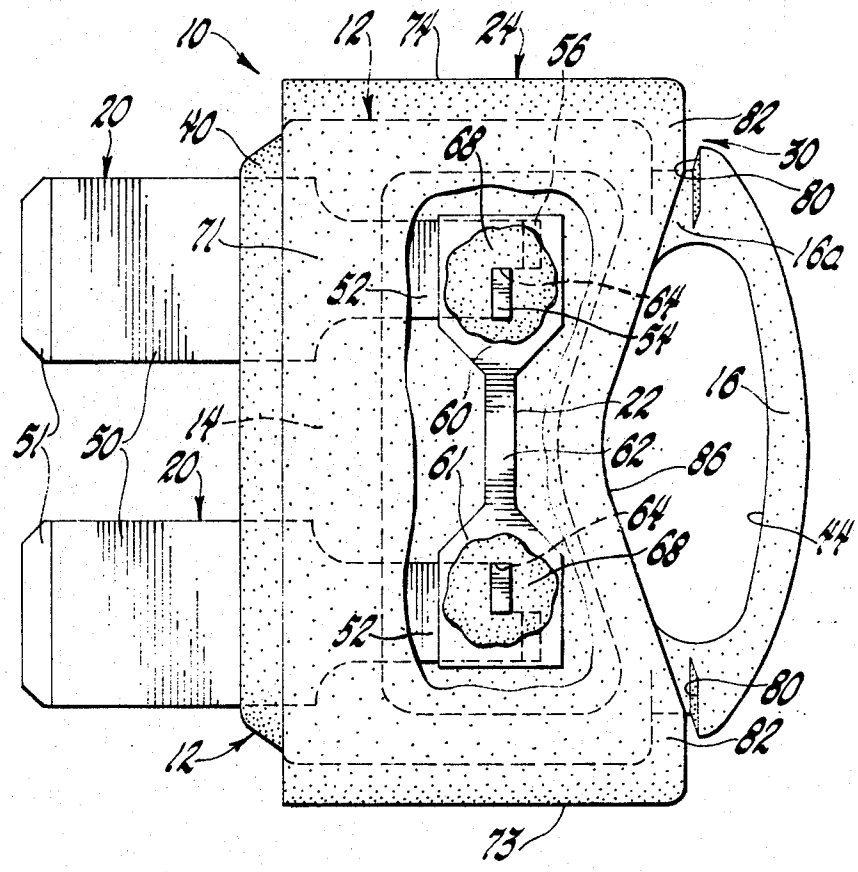
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Attorney—W. S. Pettigrew et al.

[57] **ABSTRACT**

In a preferred form, this disclosure relates to an electric circuit protector comprising a generally planar body member made of an electrically insulating material and having a main body portion with a transverse opening therethrough and an integral handle portion at one side thereof, a pair of spaced terminals carried by the body portion, a metal fuse element having its opposite ends secured to the terminals, a generally rectangularly shaped hollow cover open at its opposite ends and which is slidably received over the body member to provide a covering for the opening and the fuse element, and cooperable detent means on the handle portion and the cover to detent and hold the cover in place on the body member.

3 Claims, 6 Drawing Figures



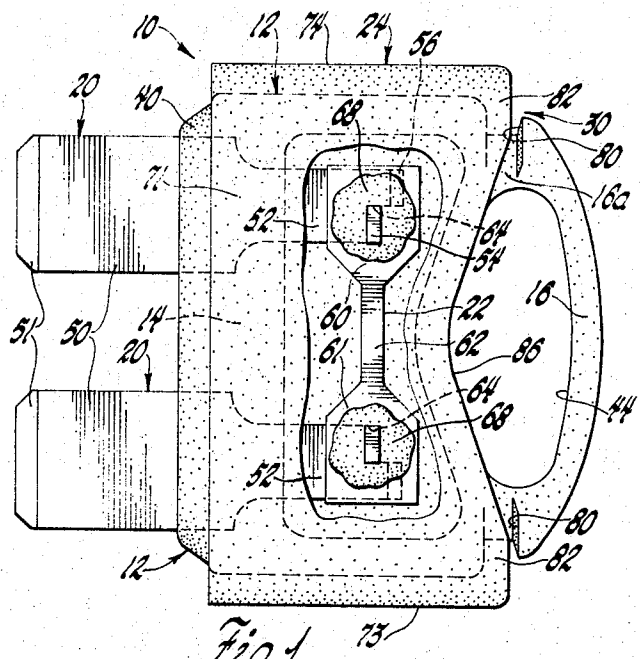


Fig. 1

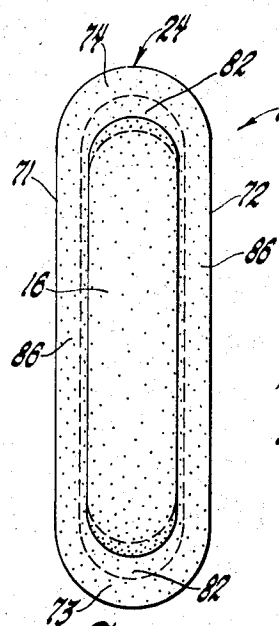


Fig. 3

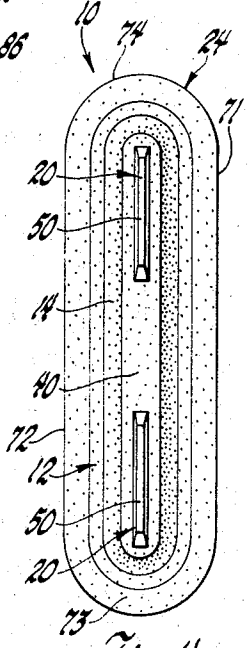


Fig. 4

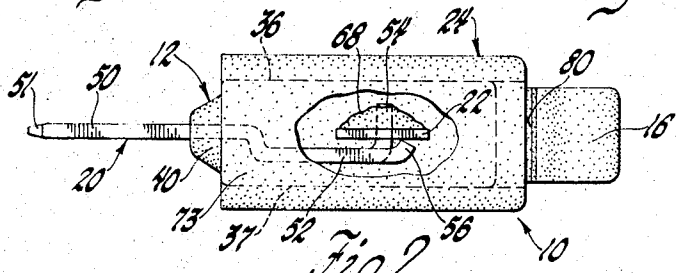


Fig. 2

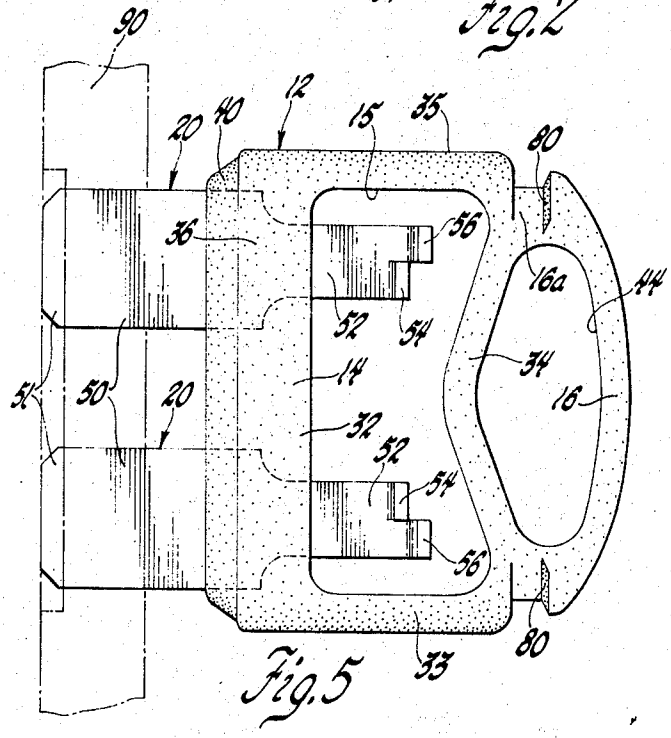


Fig. 5

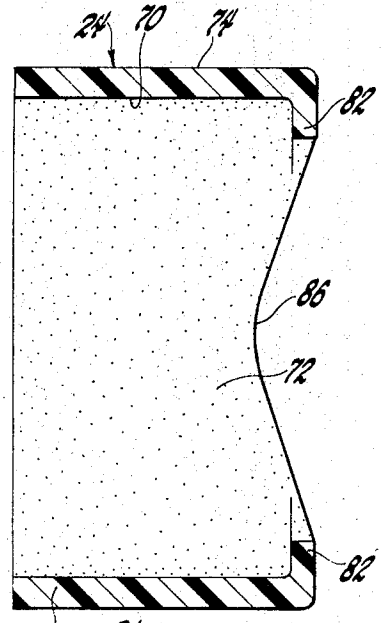


Fig. 6

CIRCUIT PROTECTOR

The present invention relates to a circuit protector, and in particular to a miniature sized circuit protector for use in protecting electrical circuits for electrically operated components of automotive vehicles.

In automotive vehicles, the various electrical circuits for the electrically operated components thereof are protected by circuit protectors, commonly known as fuses. The circuit protectors include a fuse element which melts when an overload current is passed therethrough to interrupt the circuit for the component or components. This prevents any major damage to the electrical circuitry and adjacent electrically operated component or components in the circuitry.

Most of the circuit protectors for the various electric circuits are commonly housed in a circuit protector or fuse block housing located on the inside of a fire wall or adjacent the underside of the dashboard of the vehicle. With the advent of a greater number of electrically operated components in automotive vehicle through the years, it has necessitated the use of a greater number of circuit protectors and a larger housing or block to contain them.

The present invention provides a novel circuit protector which has the advantages of being miniature in size, which can be easily connected to and disconnected from the circuit protector housing, is economical to manufacture, and which can be made and assembled by automated machinery. The miniature size of the circuit protector enables a smaller circuit protector housing to be used or a greater number of circuit protectors for a conventional size housing.

Accordingly, it is a broad object of the present invention to provide a new and improved circuit protector which is miniature in size, which can be easily connected to and disconnected from a circuit protector housing for containing a plurality of circuit protectors, which is ecnonomical to manufacture, and which can be made and assembled by automated machinery.

Another object of the present invention is to provide a new and improved electric circuit protector comprising a generally planar body member made of an electrically insulating material and with the body member having a main body portion provided with a transverse through opening and an integral handle portion at one side of the body portion, a pair of spaced terminals carried by the body portion, a metal fuse element having its opposite ends secured to the adjacent ends of the terminals, and disposed within the transverse through opening, a generally rectangularly shaped hollow cover open at its opposite ends and slidably received over the body member to provide a covering for the opening and fuse element, and cooperable detent means on the handle portion and the cover to detent and hold the cover in place on the body member.

The present invention further resides in various novel constructions and arrangement of parts, and further objects, novel characteristics and advantages of the present invention will be apparent to those skilled in the art to which it relates and from the following detailed description of the illustrated embodiment thereof made with reference to the accompanying drawings forming a part of this specification and in which similar reference numerals or characters are employed to designate corresponding parts throughout the several views, and in which:

FIG. 1 is a top plan view of a preferred embodiment of the novel circuit protector of the present invention;

FIG. 2 is a side elevational view of the circuit protector shown in FIG. 1;

FIG. 3 is a right side elevational view of the circuit protector shown in FIG. 1;

FIG. 4 is a left side elevational view of a circuit protector shown in FIG. 1;

FIG. 5 is a plan view of part of the circuit protector shown in FIG. 1 and showing the same in its partially assembled state; and

FIG. 6 is a cross-sectional view of part of the circuit protector shown in FIG. 1.

As representing a preferred embodiment of the present invention, FIGS. 1–4 of the drawings show a novel circuit protector **10**. The circuit protector **10** broadly comprises a generally planar body member **12** made of an electrically insulating material, such as a suitable phenolic plastic material, and with the body member having a main body portion **14** having a transverse through opening **15** and an integral handle portion **16** at one side of the body portion **14**, a pair of terminals **20** carried by the body portion **14**, a metal fuse element **22** secured to the terminals **20**, a generally rectangularly shaped hollow cover **24** open at its opposite ends and slidably received over the body member **12** to provide a covering for the opening **15** and the fuse element **22** and cooperable detent means **30** on the handle portion **16** and the cover **24** to detent and hold cover **24** in place on the body member **12**.

As best shown in FIG. **5**, the main body portion **14** of the body member **12** is generally rectangular in shape and with the opening **15** being defined by sidewalls **32, 33, 34,** and **35**. The sidewalls **32** and **34** are rectangular, as viewed in cross-section, and the walls **33** and **35** are arcuate, as viewed in cross-section. The main body portion **14** has planar top and bottom surfaces **36** and **37**. The side wall **32** includes an outwardly extending tapered boss portion **40**. The side wall **34** is arcuate or bowed inwardly toward the side wall **32** and integral with the opposite ends of an arcuately and outwardly extending handle portion **16**. The side wall **34** and handle portion **16** define a generally oval through opening **44**. The handle portion **16** enables the circuit protector **10** to be manually grasped to enable it to be assembled to and disassembled from a fuse block or circuit protector (not shown).

The main body portion **14** of the body member **12** carries a pair of spaced terminals **20**. The terminals **20** are embedded within the boss portion **40** and side wall **32** midway between the upper and lower surfaces **36** and **37**. The terminals **20** are planar and include a forwardly or outwardly extending blade portion **50** having tapered forward ends **51** and rearward portions **52** which are disposed within the opening **15** in the main body portion **14**. The rearward portions **52** are planar, but lanced and bent to define upwardly extending rectangularly shaped fingers **54** and a slightly upwardly bent rectangularly shaped fingers **56** adjacent their rearwardmost ends. The fingers **54** are perpendicular to the blade portions **50**.

The upwardly extending fingers **54** on the terminals **20** are adapted to receive the opposite ends **60** and **61** of a planar fuse element **22**. The fuse element **22** has a narrow neck or fusible portion **62** of a lesser width than the ends **60** and **61** and the ends **60** and **61** have a rectangularly shaped opening **64** shaped complementary to the upwardly extending fingers **54**. The fuse ele-

ment 22 is made from a suitable or conventional metallic material such that the neck portion 62 will melt to break electrical continuity between the terminals 20 when a current in excess of a predetermined magnitude is passed therethrough. The fuse element 22 is adapted to be positioned onto the terminals 20 by having fingers 54 received within the openings 64. The other fingers 56 provide a support to hold the fusable element 22 in a plane which is parallel to the plane of the body portion 14. The fusable element 22 is adapted to be secured in place on the fingers 54 by soldering it thereto, as indicated by reference numeral 68.

The fusable element 22 is adapted to be covered to prevent dirt and other deleterious matter from coming into contact therewith by the cover 24. The cover 24 is hollow and open at both ends to define an axial through opening 70 which is shaped complementary to main body portion 14 of the body member 12. That is, the cover has planar top and bottom sides 71 and 72, as viewed in FIG. 6, and rounded ends 73 and 74 shaped complementary with the external arcuate sides of the side walls 33 and 35.

The cover 24 is adapted to be slidably receiver over the main body portion 14 of the body member 12 and held in place when positioned thereover by the detent means 30. The detent means 30 comprises a pair of inwardly extending recesses 80 adjacent the opposite ends of the handle portion 16 and inwardly extending, arcuate flanges 82 formed integral with the rounded ends 73 and 74 at the right end of the cover 24, as viewed in FIG. 1. The cover 24, like the body portion 14, is made from a suitable electrically insulating material, such as plastic. When the cover is being positioned over the main body portion 14, the flanges 82 will engage the handle portion 16 adjacent the recesses 80. The cover 24, though substantially rigid, is nevertheless thin enough to be sufficiently flexible to enable the flanges 82 to be cammed outwardly over the outermost handle sections 16a until the flanges 82 are positioned adjacent the recesses 80 whereupon the self-biasing forces of the plastic cover will return toward its original free state position and be snapped or detented in place within the recess 80, as shown in FIG. 1. The flanges 82 and the cover 24 are thus detented between the side wall 34 and the handle section 16a adjacent the recesses 80. The top and bottom walls 71 and 72 of the cover 24 are also recessed, as indicated by reference numeral 86, adjacent its right end so as to expose the oval opening 44 so that the handle portion 16 can be manually grasped. It should be noted that even though the cover 24 prevents or substantially prevents deleterious matter from coming into contact with the fuse element 22, the sliding fit between the cover 24 and body member 12 is such that air can pass therebetween. This helps to dissipate the heat generated by the fuse element.

The advantages of the novel circuit protector 10 are that it is miniature in size, i.e., less than an inch square, and it can be readily assembled to and disassembled from mating female connectors carried by a circuit protector housing or fuse block, can be made economically, and can be made and assembled by automated machinery, as noted below.

The method of making the novel circuit protector 10 comprises the following steps: a reel of sheet metal is passed through a suitable punch and die apparatus to punch out a carrier strip 90 and partial terminals 20, as shown in FIG. 5. Thereafter, the terminals and carrier strip 90, as shown in FIG. 5, are moved to a mold station wherein the plastic body member 12 is molded onto the terminals 20. The partial assembly is then passed through another punch and die apparatus where the carrier strip portions between the blade portions 50 of the terminals 20 is punched out and removed to separate and provide the finished terminals 20. It should be understood that the carrier strip could be removed at a later operation, if desired.

Thereafter, the body member 12 and terminals 20 are conveyed and fed via a hopper onto a work station where blanked out fuse elements 22 are fed and positioned onto the fingers 54. This assembly is then fed to another work station where a pair of rings of solder are placed over the fingers 54 and then heated to melt the solder to form the soldered connections between the ends 60 and 61 of the fuse elements and the terminals 20. Thereafter, the circuit protector thus made is fed by hopper feed into a machine where a previously molded cover 24 is assembled thereover by relatively moving the circuit protector and cover towards each other until the flanges 82 snap within the recesses 80. The particular construction and arrangement of the novel circuit protector 10 is such that it lends itself very readily to automated assembly and thus, reduces the cost of manufacture.

Although the illustrated embodiment hereof has been described in great detail, it should be apparent that certain modifications, changes, and adaptations may be made in the illustrated embodiment, and that it is intended to cover all such modifications, changes and adaptations which come within the spirit of the present invention.

What is claimed is:

1. An electric circuit protector comprising:
- a generally planar body member made of an electrically insulating material, said body member having a main body portion having a transverse through opening and an integral outwardly extending handle portion at one side of the body portion and lying in the plane of the body portion,
- a pair of spaced terminals carried by said body portion, one end of each of said terminals projecting outwardly of said body portion and the other end of said terminals being disposed within said transverse through opening,
- a metal fuse element having its opposite ends secured to said other ends of said terminals,
- a hollow cover open at its opposite ends and shaped complementary with the main body portion of the body member, said cover being slidably receivable over said body member to provide a covering for said opening and fuse element,
- and cooperable snap-fitting detent means on one of said handle and body portions and said cover to detent and hold said cover in place on said body member when positioned thereover.

2. An electric circuit protector comprising:
- a generally planar body member made of an electrically insulating material, said body member having a main body portion having a transverse through opening and an integral outwardly extending handle portion at one side of the body portion and lying in the plane of the body portion,
- a pair of spaced terminals carried by said body portion, one end of each of said terminals projecting

outwardly of said body portion and the other end of said terminals being disposed within said transverse through opening,

a metal fuse element having its opposite ends secured to said other ends of said terminals,

a hollow cover open at its opposite ends and shaped complementary with the main body portion of the body member, said cover being slidably receivable over said body member to provide a covering for said opening and fuse element,

and cooperable snap-fitting detent means on said handle portion and said cover to detent and hold said cover in place on said body member when positioned thereover.

3. An electric circuit protector comprising:

a generally rectangularly shaped, planar body member made of an electrically insulating material, said body member having a main body portion with a transverse opening therethrough and an integral, outwardly extending handle portion at one side of the body portion and lying in the plane of the body portion, said one side being arcuate and defining with said handle portion a generally oval-shaped opening,

a pair of terminals embedded within said main body portion at its side remote from the handle portion and generally extending parallel to the plane of the body member,

said terminals including a planar forward portion projecting outwardly of said remote side and a planar rearward portion having upturned ends disposed within said transverse opening,

a fuse element having first and second end portions and an intermediate portion of a narrower width than the end portions, said end portions having a through opening shaped complementary to the ends of the rearward portion of said terminals, said end portions being slidably received on said ends of said rearward portion of said terminals and being soldered thereto,

a hollow cover open at its opposite ends and shaped complementary with the main body portion of said body member, said cover being slidably received over said body portion to provide a cover for said transverse opening and fuse element,

and cooperable detent means comprising a pair of oppositely facing recesses in said handle portion adjacent its junctures with said one side of said body portion and a pair of inwardly extending flanges on said cover which are snap-fittingly receivable within said recesses to detent said cover in place on said body member.

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