March 10, 1970 A. J. TAORMINA ET AL 3,500,462

FUSE CONSTRUCTION

Filed July 26, 1967

FIG.7

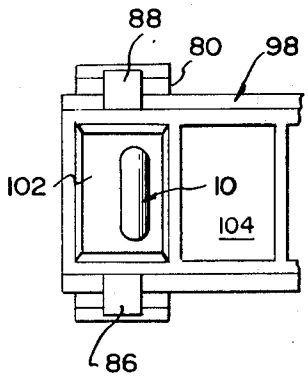


FIG.6

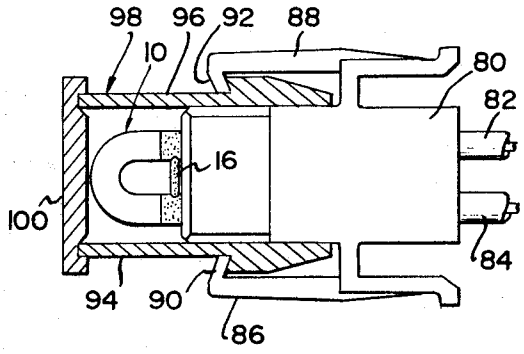


FIG.3

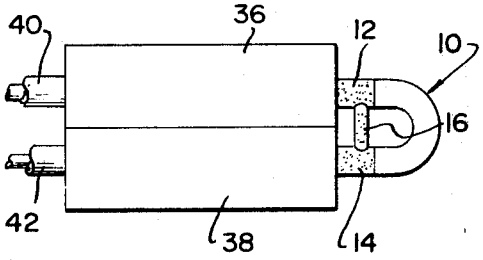


FIG.1

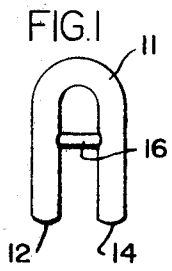


FIG.2

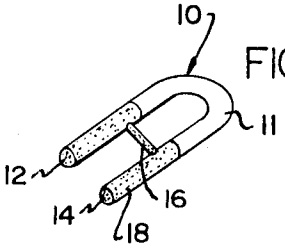


FIG.4

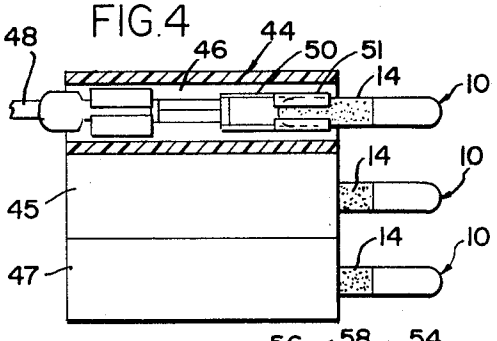
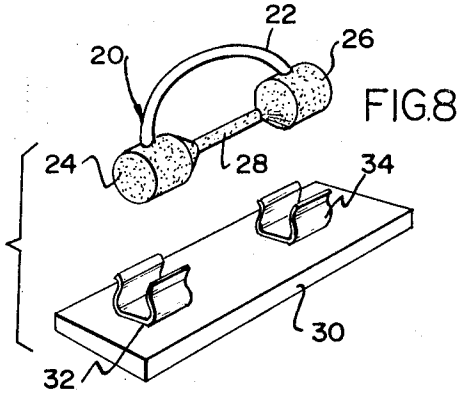


FIG.8



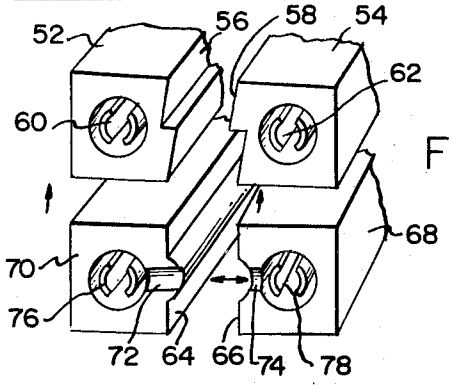


FIG.5

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FUSE CONSTRUCTION

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U.S. Cl. 337—187 9 Claims

ABSTRACT OF THE DISCLOSURE

A fuse which also acts as a terminal connector molded from a non-conducting plastic material. The fuse is U-shaped with a bridge connecting the legs of the U. The legs and bridge of the U are plated with a layer of electrically conductive material. The size of the bridge, as well as the thickness of the plating on the bridge, determines the amperage rating of the fuse. The plating on the bridge section of the fuse melts, breaking the circuit when there is a current overload. The legs of the fuse fit into terminal receptacles and in some instances may support the terminals in position relative to one another.

BACKGROUND OF THE INVENTION

This invention relates to an improved fuse construction and more particularly to a fuse construction especially suitable for automotive circuits.

The conventional, low amperage fuse construction used in automotive circuits is relatively fragile and expensive. The fusible element itself usually takes the form of a thin wire filament mounted within a transparent glass tube. The wire filament is connected to terminal caps at either end of the glass tube. Constructing such a fuse has proven to be a relatively delicate and expensive operation. Furthermore, the end product itself is fragile and easily broken.

Such fuses, if not properly constructed, may fail due to the jolting and jarring of a vehicle. An effort to overcome the failure of fuses and provide an improved automobile fuse is disclosed in U.S. Patent No. 2,941,059, June 14, 1960, granted to Sims et al. Sims discloses a fuse comprised of a non-conductive flat, U-shaped sheet of material with conductive material plated on the legs of the U and with a precisely dimensioned strip of conductive material plated across the flat base portion of the U connecting the legs. The conductive material is applied by printed circuit methods to the flat sheet. The rating of the fuse is controlled by accurately controlling the dimensions of the strip of plated conductive material plated on the base of the U. To fuse a circuit, the legs of the fuse are inserted in circuit terminals. When the circuit is overloaded, the flat strip of conductive material melts, breaking the circuit.

The device of Sims is a significant advance in fuse construction. It is rugged and withstands the sudden jolts frequently incurred in auto circuits. Further, the Sims device is easy to handle and replace. However, the device of Sims is difficult and costly to manufacture. That part of the flat sheet from which conductive material is to be excluded, must be precisely masked prior to adhering conductive material onto the sheet. Also, the device of Sims is fragile in the sense that the flat sheet may accidently bend causing a hairline fracture in the strip of fuse material thereby drastically altering the characteristics of the fuse. Moreover, the device of Sims and others is bulky and requires relatively large terminal blocks and fuse clips.

SUMMARY OF THE INVENTION

In a principal aspect, the present invention is a fuse comprising a pair of use terminals structurally interconnected by an insulating material and electrically interconnected by a separate fuse bridge member which is completely plated with an electrically conductive material. The fuse terminals comprise a pair of rigid prongs which are inserted into terminal receptacles associated with separate wires. The fuse not only acts to break an overloaded circuit, but also in some instances it may provide a means for holding the wire terminals in an interconnecting relationship.

As a feature of the invention, a fuse and the wires connected by the fuse may be inserted and held in position in a modular mounting case which has multiple cavities for receiving pairs of used wires. The fuse may also be utilized with conventional fuse clips mounted on a fuse block.

It is thus an object of the present invention to provide an improved fuse construction.

It is a further object of the present invention to provide a more rugged yet less expensive fuse construction.

Another object of the present invention is to provide a fuse which may be utilized to hold a pair of wire terminals in an interconnected relationship.

It is a further object of the present invention to provide a fuse construction which insures connection of the proper pairs of wires with one another while fusing the circuit created by those wires.

Still another object of the present invention is to provide a means for mounting multiple fused pairs of wires adjacent one another for ease of access and replacement of fuses.

One further object of the present invention is to provide a relatively smaller and compact fuse assembly at a lower cost.

These and other objects, advantages and features of the present invention will be set forth in greater detail in the drawings and detailed description which follows.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 illustrates the molded fuse body and the initial steps of fabricating the fuse;

FIGURE 2 shows the fuse body of FIG. 1 after a layer of fuse metal has been plated thereon;

FIGURE 3 shows the fuse of FIG. 1 inserted in a pair of terminal blocks;

FIGURE 4 illustrates a series of fuses inserted in stacked terminal blocks and a cross section of the interconnection of a fuse and a terminal block;

FIGURE 5 shows alternative terminal block constructions;

FIGURE 6 illustrates an alternative fused terminal block construction inserted in a mounting case;

FIGURE 7 is a plan view illustrating the terminal block and fuse mounted in the modular mounting case as shown in FIG. 6; and

FIGURE 8 illustrates an alternative construction of the fuse in combination with a fuse clip board.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 illustrates the initial steps in the process of making the improved fuse construction **10**. A fuse body member **10** is preferably cast or molded from an electrically non-conducting, thermosetting, plastic material, such as phenolic. Thermoplastic materials are also suitable. The main body portion **11** is U-shaped to form substantially parallel prongs **12** and **14**. A strut or bridge **16** connects the prongs **12** and **14**. The strut is preferably of cylindrical cross-section with a constant diameter. Likewise, the main body portion **11** preferably has a constant diameter, cylindrical cross-section.

FIG. 2 illustrates the final steps in the construction of

the improved fuse. The main body portion **11** is partially plated by an electrically conductive material **18**. The conductive material **18** is plated only on the legs **12** and **14** and completely around the bridge member **16**, for example, by dipping the body member **10** in a bath of conductive material. A suitable plating material is a compound containing by weight 63% tin and 37% lead.

By increasing the thickness of the plating, the amperage rating of the fuse is increased. For example, a fuse with a 63/37 tin-lead plating thickness of 0.001 inch on an 0.032 inch constant diameter and 0.103 inch long bridge member **16** has a 3 amp rating. An increase in plating thickness to .002 inch produces a 6 amp fuse, an 0.004 inch thickness produces a 7.5 amp fuse, an 0.006 inch thickness produces a 12 amp fuse, and a 0.010 plate thickness produces a 15 amp fuse. These ratings are approximations for a fuse of the above dimensions. Variations result depending upon the fuse metal used and the dimensions of the bridge member **16**.

It is important to note that the configuration of the bridge member **16** may be altered while the plating thickness remains constant in order to vary the amperage rating of the fuse. Thus a bridge member **16** may be cast in various diameter sizes and/or shapes according to the fuse characteristics desired by the fabricator. The length of the bridge **16** is not a critical factor and may be varied without any appreciable effect on the current rating.

FIG. 3 illustrates the combination of a fuse **10** of the type shown in FIG. 2 with a pair of terminal blocks **36** and **38**. The blocks **36** and **38** are formed from an insulating material, preferably an extruded plastic. The prongs **12** and **14** of the fuse **10** are mated with terminal receptacles (not shown in FIG. 4) in the blocks **36** and **38** respectively. The terminal receptacles in the blocks **36** and **38** are in turn electrically connected with the lead wires **40** and **42** respectively. The fuse serves to break the circuit when the current passing through the wires **40** and **42** overheats the metal on the bridge **16**. A strap or support (not shown) may be used to hold the terminal blocks **36** and **38** rigidly in position in respect to one another.

FIG. 4 illustrates the terminal connecting means or terminal connector **50** within the terminal block **44**. The terminal block is generally of a rectangular cross section with a hollowed out cylindrical center portion **46**. The lead wire **48** is inserted into the hollow portion **46** and fastened to the terminal connector **50**. The opposite end of the terminal connector **50** is a receptacle **51** adapted to slidably receive a prong either **12** or **14**. Each terminal block **44**, **45** and **47** is similarly constucted. Thus when pairs of blocks (for example, **40** and **42** in FIG. 4) are properly positioned on a circuit board, for example, electrical connection may be secured by the fuse **10**.

FIG. 4 shows a number of fuses **10** connecting pairs of terminal blocks **44**, **45** and **47**. The pairs of connected blocks **44**, **45** and **47** may be fastened together as a unit and mounted as a unit under the dashboard of an automobile. On the other hand, the blocks **44**, **45** and **47** may be integrally cast and the wires and fuses **10** inserted into the proper openings in the blocks.

FIG. 5 illustrates a construction of the terminal blocks which promotes proper matching and fusing of separate wires in a separate terminal block. Blocks **52** and **54** are molded or extruded with adjacent sides **56** and **58** designed to mate. A fuse (not shown) interconnecting the terminal receptacles **60** and **62** within the terminal blocks **52** and **54** respectively cannot be inserted into the receptacles **60** and **62** unless the blocks **52** and **54** are properly mated. In a similar manner the side **64** of the block **70** is molded to mate with the side **66** of the block **68**.

A further modification is illustrated in the blocks **68** and **70**. Slots **72** in block **70** and **74** in block **68**, are molded to receive the bridge **16** of the fuse **10**. Thus, when the terminals **12** and **14** of the fuse **10** are inserted in the terminal receptacles **76** and **78**, the bridge **16** slides into the slots **72** and **74**. This protects the electrical conducting portion of the fuse. In addition, a person is prevented from accidentally touching the fuse after it is inserted into the protective slots **72** and **74**.

In the modification of FIG. 5, the terminal blocks, for example **52** and **54**, are held in an interconnecting relationship by inserting a fuse **10** into the appropriate receptacles, for example **60** and **62**. Thus the fuse **10** performs two functions: (1) electrical conduction and (2) structural interconnection.

FIG. 6 illustrates an alternative terminal block construction. The terminal block **80** is molded to receive a pair of lead wires **82** and **84** which are appropriately connected to terminal connectors (not shown) within the block **80**. The prongs **12** and **14** of the fuse **10** fit into receptacles in the block **80** and electrically connect the wires **82** and **84**. The terminal block **80** is constructed of a plastic insulating material such as polypropylene or nylon, though nylon is preferred.

Block **80** has a pair of flexible arms **86** and **88** with catches **90** and **92** which mate with the sides **94** and **96** of modular mounting case **98**. Modular mounting case **98** is likewise constructed of an insulating material such as plastic. A snap-on cover plate **100** is attached to the modular mounting case **98** to protect the fuse **10** and prevent harmful contact with the fuse. The cover **100** is constructed of a clear material such as plastic to provide for visual inspection of the fuse **10**.

FIG. 7 illustrates the modular mounting case **98** of FIG. 6 mated with the terminal block **80** by means of the arms **86** and **88**. The fuse **10** is, of course, inserted in the modular well **102** of the modular case **98**. The fuse **10** connects the wires **82** and **84** as shown in FIG. 7. Additional terminal blocks which are fused may be inserted in additional wells such as the well **104** in FIG. 7.

FIG. 8 illustrates an alternative construction of the fuse of the invention. The fuse **20** is comprised of an integrally molded or cast U shaped support member **22** connecting first and second terminals **24** and **26** and a bridge or fuse member **28** also connecting the first and second terminals **24** and **26**. The terminals **24** and **26** and the bridge **28** are simultaneously, completely plated at a desired uniform thickness with a low melting fuse metal such as the tin-lead alloy previously disclosed. The body support member or handle **22** gives the fuse construction structural strength as well as providing a means for removing the fuse from a live circuit without contacting the current carrying terminals **24** and **26** or the bridge **28**.

The fuse of FIG. 8 may be inserted into a standard fuse clip board **30**. Fuse clips **32** and **34** are adapted to receive the terminals **24** and **26** respectively.

While in the foregoing there has been disclosed a preferred embodiment of the present invention, it is to be understood that embodiments obvious to those skilled in the art as well as embodiments which are equivalent are to be included within the scope of the claimed subject matter.

What is claimed is:

1. An electrical fuse comprising, in combination, a fuse body member formed from an electrically non-conductive material and having two electrically conductive terminal prong portions, a rigid, non-conducting, strut member portion interconnecting said prongs and a separate, bridge fuse portion also interconnecting said prong portions, said bridge fuse portion having a cross sectional area no greater than the cross sectional area of either of said prong portions, said prong portions and said bridge fuse portion having a substantially uniform coating of an electrically conductive material; said coating on said bridge fuse portion completely plating said bridge portion; said coating on said bridge fuse portion

being a thickness which melts to break a fused circuit when current overload causes excess heating.

2. The combination of claim 1 wherein said fuse body member is a U-shaped rod having a first and second prong, said prongs having equal, constant diameters, said bridge fuse portion connecting said first and second prongs and being cylindrically shaped.

3. The combination of claim 1 including electrical connector means adapted to engage said prongs in an electrical circuit.

4. The combination of claim 3 wherein said electrical connector means comprise a terminal block with an electrically conductive receptacle therein, one of said receptacles being coupled with each of said prongs, said terminal blocks being held in substantially immovable and interlocking relationship by said fuse body member.

5. The combination of claim 3 wherein said electrical connector means comprise terminal blocks mounted by mounting means in predetermined spaced relation, said terminal blocks including electrically conductive receptacles therein, said receptacles being interconnected in pairs by said fuse.

6. The combination of claim 1 including a single block having first and second receptacles for receiving said first and said second prongs of said fuse to complete an electrical circuit.

7. The combination as set forth in claim 4 including

mounting case means, said case means having a plurality of multiple cavities each adapted to receive one of said combination of claim 4.

8. The combination as set forth in claim 6 including cover means positioned over said fuse for protecting said fuse.

9. The combination of claim 1 wherein said coating on said bridge fuse portion is variable in thickness to alter the rating of said fuse.

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U.S. Cl. X.R.

337—295, 297; 339—147