United States Patent [19]

Spangler

[11] **3,878,497**

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[54] **FUSE LINK ASSEMBLY SUITABLE FOR USE IN AUTOMOTIVE ELECTRICAL SYSTEM**

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[52] **U.S. Cl.** **337/295;** 337/186; 337/197; 337/201; 337/228; 337/237; 337/246; 337/290

[51] **Int. Cl.** **H01h 85/08**

[58] **Field of Search** 337/227, 228, 231, 234, 337/236, 237, 186, 187, 197, 198, 201, 246, 290, 291, 295

[56] **References Cited**

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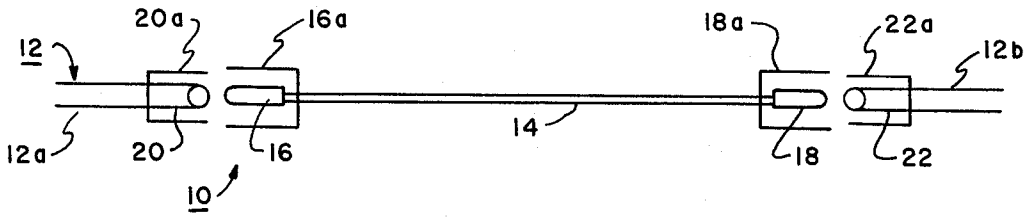
[57] **ABSTRACT**

A fuse link assembly for fusing a conductor comprises a fuse link terminal having a reduced cross section at a central portion thereof, and having first and second female connectors disposed at opposite end portions thereof. The female connectors respectively receive first and second male tab terminals therein. The male terminals include wire barrel portions which accept the end portions of the conductor. A snap-on housing encloses the assembly and provides a thermal barrier between the central portion of the fuse link terminal and the inner chamber of the housing, and therefore, the environment of the fuse assembly.

6 Claims, 9 Drawing Figures



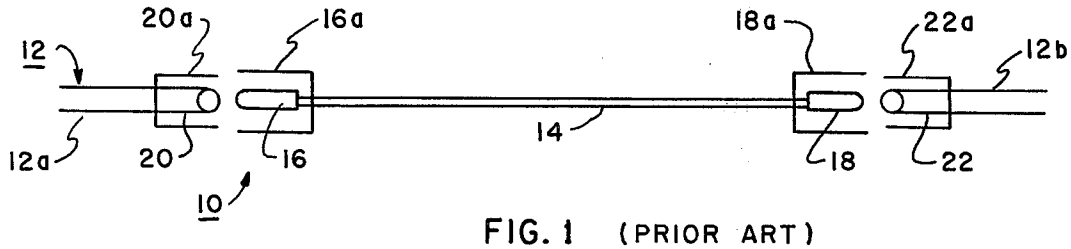


FIG. 1 (PRIOR ART)

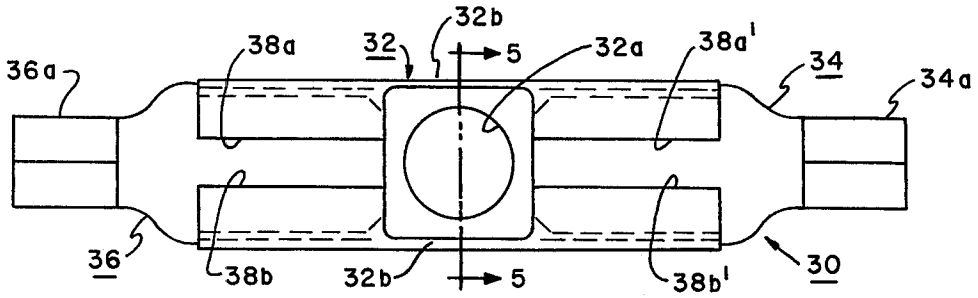


FIG. 2

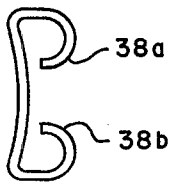


FIG. 4

FIG. 5

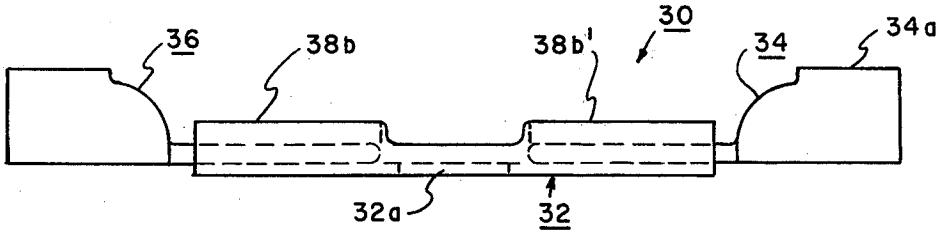


FIG. 3

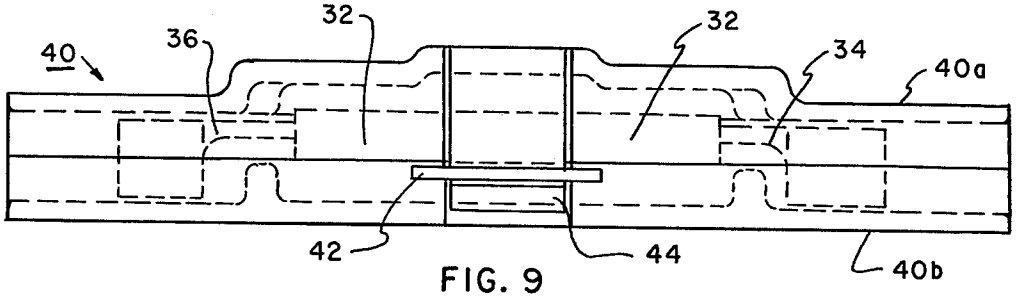


FIG. 9

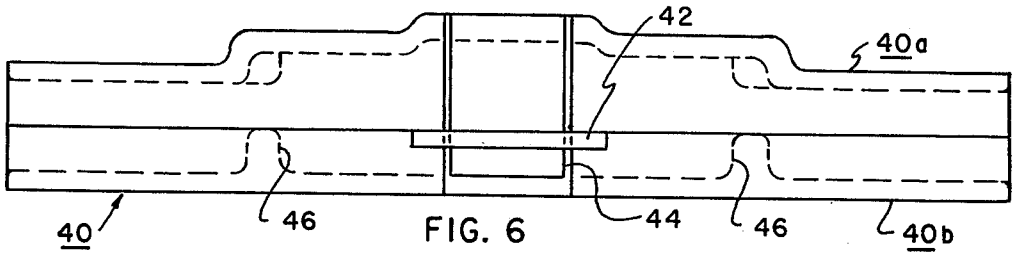


FIG. 6

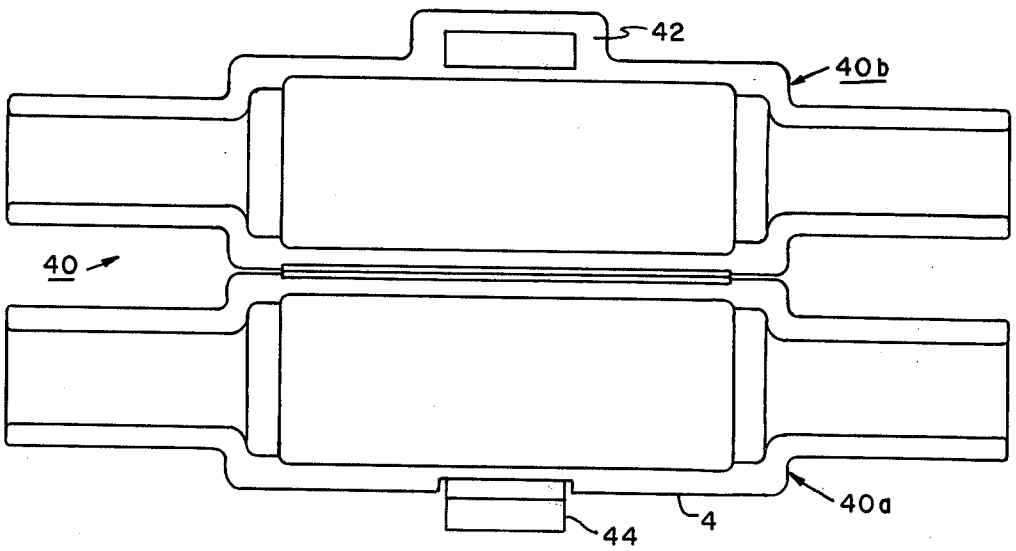


FIG. 7

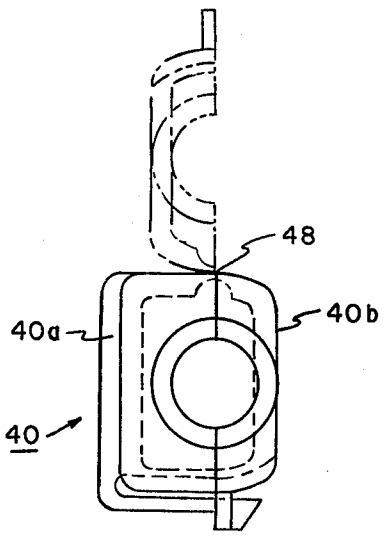


FIG. 8

FUSE LINK ASSEMBLY SUITABLE FOR USE IN AUTOMOTIVE ELECTRICAL SYSTEM

BACKGROUND OF THE INVENTION

This invention relates to a fuse link assembly and, more particularly, to a self-locking fuse link assembly for fusing a conductor such as a conductor in an automotive electrical system.

Fuse link assemblies for fusing a conductor by means of an intermediate, smaller diameter conductor are known. For example, a presently known method for fusing a No. 8 AWG copper wire conductor of a 55 ampere automobile electrical system circuit utilizes a No. 12 AWG copper fuse wire of a given length. Each end of the fuse wire is provided with a contact and, in turn, enclosed within an insulated housing, thereby to provide a connector assembly thereat. The adjacent ends of the No. 8 wire are similarly provided with cooperating contacts and enclosed within suitable housings. The connector assemblies of the fuse wire are respectively coupled to the connector assemblies of the No. 8 wire and a fused conductor is thusly provided. This method, however, has several known disadvantages. For example, four separate housings and contacts are required in addition to the fuse wire. Further, substantial labor is required to crimp a total of four contact joints, and to assemble four separate housings. Still further, these prior art devices necessitate using a high-temperature insulation over the fuse wire as the melting temperature of copper is approximately 1900° F. Moreover, it has been found that even a high-temperature insulation is not always satisfactory; that is, when the high-temperature insulation does melt, or otherwise fail, an exposed, live conductor or live-conductor end results. Accordingly, it has been found that the exposed conductor occassionally welds itself to the frame of the automobile and otherwise defeats the purpose of the fuse link assembly.

These and other disadvantages of the prior art are overcome by the present invention wherein there is provided a fuse link assembly having a minimum number of component parts and therefore, requiring substantially less installation labor than prior art devices. In a preferred embodiment the fuse link assembly of the present invention includes a thermal barrier which functions to thermally insulate the heat generated within the fuse link assembly.

SUMMARY OF THE INVENTION

Briefly, a fuse link assembly for fusing a conductor is provided. The assembly includes a fuse link member having a reduced cross-section at a given portion thereof, and having first and second terminal portions respectively at opposite ends thereof. First and second cooperating terminals are provided with means for gripping a bare wire, and each cooperating terminal slidably engages one of the first and second terminal portions of the fuse link number. An insulated housing encloses the assembly, and, in a preferred embodiment, provides a thermal barrier about the given portion of the fuse link member.

BRIEF DESCRIPTION OF THE DRAWING

The advantages of this invention will become more readily appreciated as the same becomes better understood by reference to the following detailed description when taken in conjunction with the accompanying drawing wherein:

FIG. **1** is an assembly view of a fuse link assembly in accordance with the prior art;

FIG. **2** is a top view of the internal structure of a fuse link assembly in accordance with the present invention, and illustrating particularly a fuse link member thereof in engagement with cooperating terminals;

FIG. **3** is a side view of the structure shown in FIG. **2**;

FIG. **4** is an end view of the fuse link member of FIG. **2**;

FIG. **5** is a cross sectional view of the fuse link member taken along the line **5—5** of FIG. **2**;

FIGS. **6** and **7** respectively show side and top views of the fuse link housing in accordance with the present invention;

FIG. **8** is an end view of the fuse link assembly housing of FIGS. **6** and **7**, and further illustrating the hinge member in its alternate positions; and,

FIG. **9** is a side view of the housing of FIGS. **6–8** showing the position of the fuse link member structure of FIG. **2** therein.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

Referring now to FIG. **1** there is shown generally at **10** a fuse link assembly in accordance with the prior art. Fuse link assembly **10** functions to fuse a conductor **12** between its adjacent ends **12***a* and **12***b*. Assembly **10** includes a fuse wire **14** which typically exhibits a size which is four AWG wire sizes smaller than that of conductor **12.** The ends of fuse wire **14** are provided with male contacts **16** and **18** which are crimped, soldered or suitably fastened onto fuse wire **14.** Contacts **16** and **18** are respectively enclosed within housings **16***a* and **18***a*. The adjacent ends of conductor **12** are provided with suitable female contacts **20** and **22.** Similarly, contacts **20** and **22** are respectively enclosed within housings **20***a* and **22***a*. Contacts **20** and **22** are also crimped, soldered or suitably fastened to the adjacent ends of conductor **12.**

It can be seen that fuse link assembly **10** necessitates four housings, four contacts and a fuse wire. Moreover, it will be appreciated by those skilled in the art that utilization of assembly **10** of FIG. **1** necessitates substantial labor in that four crimped joints must be provided and that four housings must be assembled. As will be discussed more fully hereinafter, the fuse link assembly in accordance with the present invention substantially reduces the component count and, accordingly, simplifies the labor requirements as compared to the numerous elements and associated labor requirements of assembly **10** of FIG. **1.**

Referring now to FIGS. **2** and **3** there is shown generally at **30** a metallic fuse link member **32** in engagement with cooperating male connector terminals **34** and **36.** As best illustrated in FIG. **4,** fuse link member **32** is provided with curls **38***a* and **38***b* (and **38***a'* and **38***b'*), thereby to provide integral, female-connector-terminal end portions. Accordingly, the end portions of fuse link member **32** cooperate with and function to accept the

spade portions of connector terminals **34** and **36.** Terminals **34** and **36** are respectively provided with wire barrel portions **34***a* and **36***a*. As is well known in the art, these wire barrel portions are adapted to accept a bare wire for crimping therein.

The central portion of fuse link member **32** is provided with a suitable aperture **32***a* such that the current carrying cross section of the central portion (as best illustrated in FIG. **5**) is of an area which is substantially less than the current carrying cross-sectional area of the associated conductor. For example, in one embodiment, the cross section of the central portion of fuse link member **32** is approximately four AWG wire sizes smaller than the cross-sectional area of the bare wire conductor which has its ends crimped into male terminals **34** and **36.** It can also be seen that fuse link member **32** is provided with side rails **32***b*, which are readily formed by turning a portion of the edge of member **32** through a right angle. As will be discussed more fully hereinafter, rails **32***b* afford sufficient structural strength to member **32,** thereby to prevent bending or kinking of member **32** particularly at the central portion thereof.

Hence, it should now be appreciated that fuse link member **32,** in a preferred embodiment of the present invention, comprises a substantially rigid and generally rectangular unitary metallic member, having a reduced cross section at an integral portion thereof, and having first and second integral terminal portions respectively at opposite ends thereof.

Referring now to FIG. **6,** there is shown a side view of an insulated housing **40.** The composition of housing **40** preferably comprises nylon, vinyl or any other suitable insulating material. Housing **40** includes a top portion **40***a* which is hinged about lower portion **40***b*. Upper portion **40***a* includes a ring **42** which engages a clasp **44** of lower portion **40***b*. Ring **42** and clasp **44** function to snap-lock housing **40** in its closed position. Lower portion **40***b* also includes raised portions or pads **46.**

Turning now to FIG. **7** there is shown a top view of housing **40** wherein top portion **40***a* is shown in its open position. The end portions of housing **40,** as illustrated in FIGS. **6** and **7,** is preferably reduced to a circular cross section having a diameter which approximates that of the outside diameter of the insulation portion of the associated conductor to be fused.

In FIG. **8** there is shown an end view of housing **40** and further illustrating upper portion **40***a* in both the closed and open positions. FIG. **8** also illustrates an integral hinge **48** which results when housing **40** is suitably molded in a mold housing as is well known in the art.

Referring now to FIG. **9** there is shown a side view of housing **40** in its closed position with fuse link member **32** and male connector terminals **34** and **36** disposed therein in engaged relation. It can be seen that the length of fuse link member **32** is selected such that the gussets or transitional portions of terminals **34** and **36** respectively rest upon pads **46.** Further, it can be seen that the relative dimensions of housing **40** and the thickness of fuse link member **32** are selected such that an air barrier results between the surface of fuse link member **32** and the inner chamber of housing **40.** Accordingly, an air-insulated barrier is provided therein. It will be appreciated by those skilled in the art that the conductor to be fused with the fuse link assembly of the present invention is suitably crimped or fastened at its adjacent ends to the fuse link assembly within the wire barrel portions of terminals **34** and **36.**

The operation of the fuse link assembly in accordance with the present invention is described as follows. It is assumed that the fuse link assembly is suitably connected between the adjacent ends of the conductor to be fused by way of the wire gripping means provided at the ends of terminals **34** and **36.** In response to an overload or high-current fault, fuse link member **32** melts at the central portion thereof. Since the central portion of fuse link member **32** has a reduced cross section, the heat generated is localized thereat. Since there is no direct contact between fuse link member **32** and housing **40,** the generated heat is isolated within the housing by virtue of the thermally-isolating air barrier established therein.

It should now be appreciated that once the fuse does melt or blow, it can be readily replaced with a new fuse link member **32.** It should be noted that terminals **34** and **36** are preferably provided as male members in that they are thereby virtually impervious to the generated heat. That is, there is essentially no chance of damaging the male tabs, as the resulting temperatures thereat are insufficient to anneal the material of the tab. Further, any damage that does result to the female connector portions of fuse link member **32** is of no consequence, as this part is replaced after the fuse melts or blows.

It should be appreciated, however, that in a given application, terminals **34** and **36** can advantageously be provided in the form of female connector terminals. It should also be noted that aperature **32***a* can be provided in any given geometric pattern other than the preferred circular aperture shown in the relevant figures of the present specification. As previously discussed, fuse link member **32** is preferably provided with means for increasing its bending strength such as, for example, side rails **32***b*. This feature provides for a more rugged member which therefore will not deform during the installation operation when the cooperating male tab terminals are inserted therein. Hence, the dimensional requirements for an air-insulated barrier within housing **40,** in accordance with the present invention, are maintained.

It will be appreciated by those skilled in the art that the preferred fuse link assembly in accordance with the present invention merely requires two crimp joints for installation. Whereas, however, the prior art devices require four crimp joints and, in many cases, additional soldering.

What has been taught, then, is a fuse link assembly facilitating, notably, a fuse link for fusing a conductor such as a conductor in an automotive electrical system. The form of the invention illustrated and described herein is a preferred embodiment of these teachings. It is shown as an illustration of the inventive concept, however, rather than by way of limitation, and it is pointed out that various modifications and alterations may be indulged in within the scope of the appended claims.

What is claimed is:

1. A fuse link assembly for fusing a conductor, said assembly comprising, in combination:

a substantially rigid unitary metallic fuse link member having a reduced cross section at a given generally central integral portion thereof which melts in

response to a given current level in said conductor, said fuse link member having structural means at said given portion formed from the meltable material of said fuse link member for increasing the structural strength of said fuse link member, wherein said structural means comprises at least one turned portion extending through said reduced cross section and projecting away from at least one plane of said fuse link member thereby to resist bending or kinking of said fuse link member at said given portion, and said fuse link member having first and second integral terminal portions respectively at opposite ends thereof;

first and second cooperating terminals each cooperating terminal having means for gripping a bare wire and each cooperating terminal slidably engaging one of said first and second terminal portions of said fuse link member; and,

an insulating housing enclosing said assembly.

2. The assembly according to claim **1**, wherein said housing comprises a removable enclosure of insulating material having first and second projections for respectively engaging said first and second cooperating terminals and having a central portion spaced apart from said given portion of said fuse link member, whereby a thermal barrier is provided between said given portion and said insulating enclosure.

3. The assembly according to claim **2**, wherein said housing includes upper and lower portions, and further including means for removably locking said upper portion to said lower portion.

4. The assembly according to claim **1**, wherein said first and second terminal portions of said fuse link member each comprise a female connector and wherein said first and second cooperating terminals each comprise a male connector.

5. The assembly according to claim **1**, wherein said reduced cross section is formed by providing at least one aperture in said fuse link member at said given portion thereof.

6. The assembly according to claim **1**, wherein said structural means comprises at least one side rail wherein at least one edge portion of said fuse link is turned through a right angle to form said side rail.

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