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[54] **FUSE EJECTOR**

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[52] **U.S. Cl.** ..... **337/211**; 339/45 R

[51] **Int. Cl.**[2] **H01H 85/22**; H01H 85/54

[58] **Field of Search** ..... 339/45 R, 45 M, 46; 337/211

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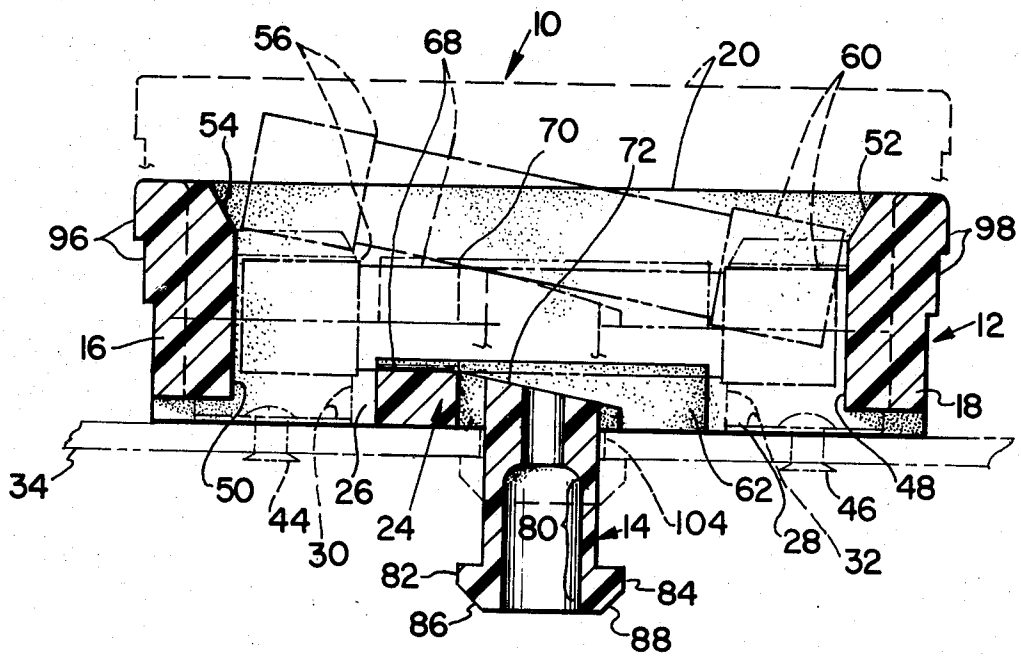
[57] **ABSTRACT**

A combination fuse ejector and protective shroud for cartridge type fuses includes a molded plastic receptacle having protective peripheral walls, an open top and a partially open bottom. The partially open bottom includes an opening adjacent each end through which the usual fuse holding contact clips protrude. A bridge portion across the bottom includes a holding pedestal which provides a loosely coupled captive mounting for the shroud. The bridge portion across the bottom of the shroud also includes a fuse-ejecting abutment adjacent one of the pair of contact clips whereby one end of the fuse may be ejected from that adjacent clip by the lifting of the shroud on its loosely captive pedestal.

5 Claims, 5 Drawing Figures



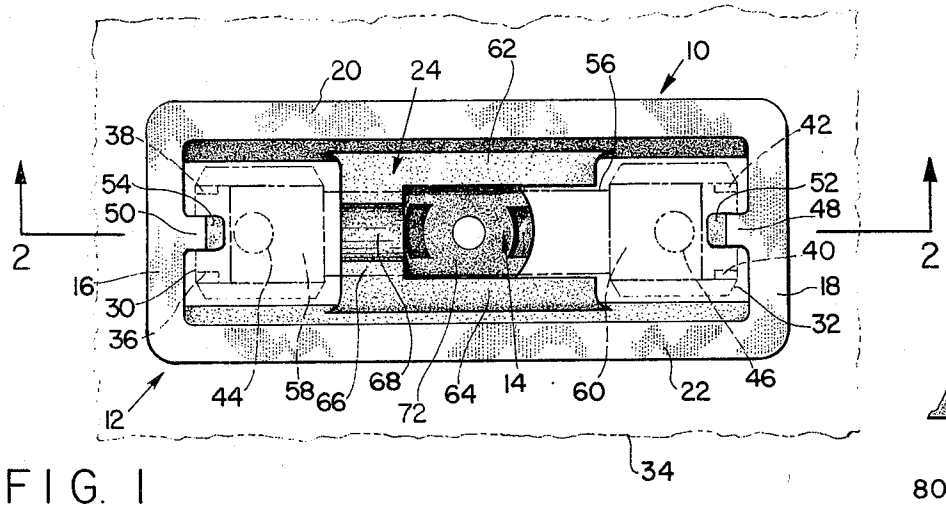


FIG. 1

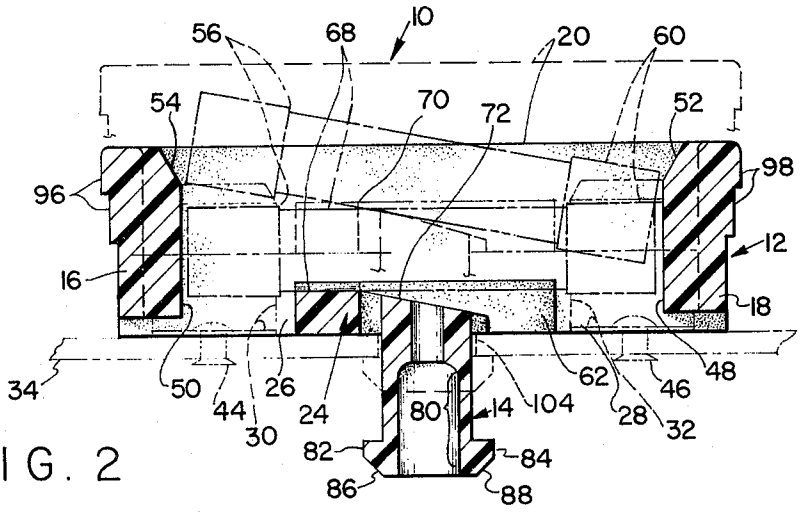


FIG. 2

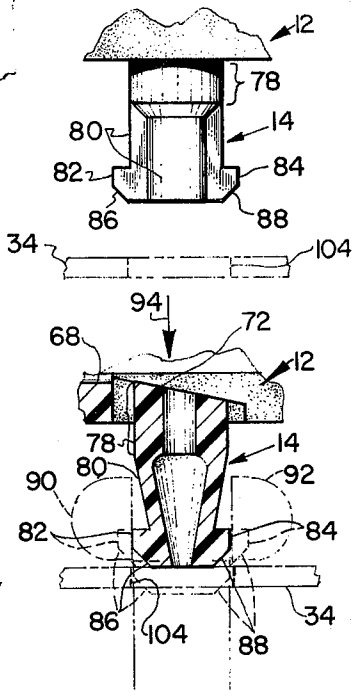


FIG. 4

FIG. 5

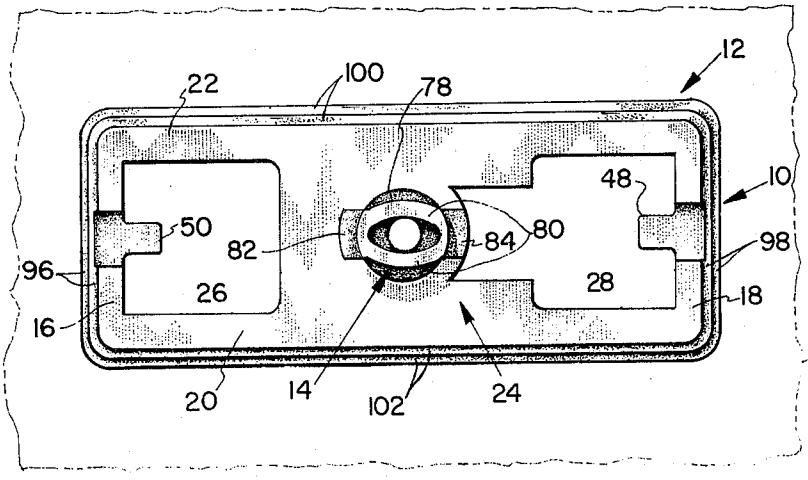


FIG. 3

FUSE EJECTOR

CROSS REFERENCE TO RELATED APPLICATIONS

Subject matter shown and described but not claimed herein is shown, described and claimed in a copending application of Ralph M. Levy Ser. No. 438,369 filed on even date herewith.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to an improved Fuse Ejector of the type generally classified in the United States Patent Office with Tools, Special, Fuse Pullers.

2. Description of the Prior Art

Many different types of devices have been proposed in the prior art for inserting cartridge type fuses into and/or ejecting such fuses from conventional spring clip mounted in fixed spaced apart relationship on a support place, such as a PC board. One such device employes a dedicated plastic tool having finger gripping portions at one end and a C-shaped fuse holder at its other end. Such tool must first be forced over an end of the fuse to a center portion. The fuse may then be mounted in the customary manner between spaced spring clips by gripping the tool and forcing the ends of the fuse into support relationship with the spring clip. In order to remove the fuse from its clips a pulling force may be applied by grasping the tool and pulling. Such a tool is, at best, inconvenient to use. Because of slippage between the tool and the fuse difficulty has been experienced, moreover, in inserting the fuse properly between the spaced clip contacts.

Additionally, there is a possibility with unshrouded or unprotected fuse holders for one servicing equipment to experience a shock when a fuse is inserted or removed because of the exposed electrical contacting surfaces.

For providing a protective shroud, it has been proposed in the prior art to provide a non-conductive U-shaped shell, the base portion of which is mounted rigidly on the associated mounting base. The sides of the shell extend away from the base coextensively with the spring clips. Centrally located slots formed in the sides of the shell enable one servicing the equipment to grasp the central portion of the fuse when it is desired to insert or remove a fuse from the clip contacts.

Since both ends, and parts of each of the sides of the shell are open, there is a possibility that an electrical shock will be received when the fuse is inserted or removed from the spring clips. There is also the possibility that the fuse will be damaged by a mechanical tool such as a screwdriver which is often used by one servicing the equipment, in lieu of a proper tool, to force the fuse into or out of its clip engaging position. Significant force is required to remove cartridge type fuses from the clips retaining them, in consequence of which the fuses sometimes pop out and fly into the face of the person employing an improper tool such as a screwdriver to remove them.

There are other fuse pullers which do not have a "tendency to pop the fuse out." They are in the form of a fiber board pliers with which to grip the fuse and remove or insert it with respect to the clips.

The difficulty with such devices is the usual lethargy of the service person. The tool must be handy when it is desired to change fuses; otherwise, one servicing

equipment will use whatever device is at hand even though not designed for fuse ejection.

SUMMARY OF THE INVENTION

In accordance with the present invention, there is provided a shroud/ejector having openings in a base portion through which fuse retaining spring clips are adapted to extend. The shroud is mounted for limited movement toward and away from the PC board or other support base on which the spring clips are mounted by means of a retaining pedestal that extends away from the base of the shroud and through an opening in the board. For loosely retaining the shroud/ejector on the board, resilient shoulders or other suitable stop means are provided on the remote end of the pedestal. The said stop means are of larger size than the opening in the board receiving the pedestal.

Tongues are formed on inner end wall portions of the shroud/ejector to guide the ends of the fuse into proper position with respect to the spaced spring clips. When so positioned the cartridge fuse is held in proper position to be engaged by a concave surface formed on a bridge portion formed on the bottom of the shroud/ejector. This concave surface is closer to one end of the shroud/ejector than the other.

Ejection of the fuse from its position between the spring clips is accomplished by pulling the loosely mounted shroud/ejector away from the support base. Such pulling causes the concave surface on the bridge to lift one end of the fuse out of its retaining clip. The lifted end of the fuse may then be safely grasped and be readily removed.

The aforementioned fuse ejection shroud therefore provides a better means for protecting a fuse from mechanical damage when it is mounted therein than prior art fuse pullers. The ejector/shroud also provides a means by which the fuse can be moved to an ejected position without the need of an ancillary fuse ejecting tool. Such tools, dedicated or not, have disadvantages, as has been noted.

BRIEF DESCRIPTION OF THE DRAWINGS

A better understanding of the present invention may be had when the following detailed description is read in connection with the accompanying drawings in which:

FIG. **1** is a plan view of the fuse ejector/shroud embodying the present invention;

FIG. **2** is a sectional elevation view taken along the line **2—2** of FIG. **1**;

FIG. **3** is a bottom view of the fuse ejector/shroud;

FIG. **4** shows an external view of a self-anchoring tube and a portion of the shroud to which it is attached before these unitary parts are mounted on the support plate and;

FIG. **5** shows the anchoring tube being compressed for insertion into an opening in a support base.

DESCRIPTION OF THE PREFERRED EMBODIMENT

DETAILED DESCRIPTION

Referring to FIGS. **1, 2,** and **3** in more detail, there is shown a unitary fuse ejector/shroud **10** which is comprised of two major parts, namely, a shroud **12** and a self-anchoring tube **14.** The unitary fuse ejector **10** is molded of a suitable electrical insulating plastic mate-

rial having semi-resilient characteristics, as for example a suitable polypropylene material or nylon.

The shroud **12** is of a rectangular box shaped configuration and has a pair of walls **16, 18** forming the end portions of the box, a pair of elongated walls **20, 22** forming the sides of the box and a bridge portion **24** which form a base of the box shaped shroud **12.**

The bridge portion **24** of the shroud **12** has a pair of spaced apart openings **26, 28** therein. Each of the openings **26, 28** are shown positioned about a different one of a pair of U-shaped spring clip contacts **30, 32** which are, in turn, shown in phantom mounted in a fixed position on a support board **34.**

The spring clip contacts **30, 32** which are surrounded by the shroud **12** are of a well known type. These clip contacts **30, 32** are shown having a pair of end stops **36,** 38; **40, 42** at each of their outer end portions. The base of each of the clip contacts **30, 32** is attached by a rivet **44, 46** to the support board **34.**

The shroud **12** has a pair of fuse guide surfaces or tongues **48, 50** extending in an inward direction from its end wall **16, 18.** The upper ends of each of these tongues **48, 50** have a beveled surface **52, 54.** A cartridge type fuse **56** is shown in phantom in FIG. **1,** having its respective conductive ends **58, 60** held between the associated spring clip contacts **30, 32.** The fuse **56** is shown extending between and in spaced relation with the top of the tongues **48, 50.** These tongues are positioned to extend between the end stops **36, 38; 40, 42** formed on the associated spring clip contacts **30, 32.**

The bridge portion **24** of the shroud **12** has rib portions **62** and **64,** extending, respectively, inwardly from the elongated sides thereof, and a transverse abutment portion **66** interconnecting one end of the rib portions **62, 64.**

A concave or arcuate shaped surface **68** is formed in the transverse bridge portion **66** the radius of curvature of which is larger than that of the transparent part of the fuse **56.** In FIGS. **1** and **2,** there is shown a lower left transparent end portion of the fuse **56** substantially in engagement with longitudinal portion of the concave surface **68** when the fuse **56** is mounted in the clips **30,** 32.

In FIG. **2,** there is shown in solid line form, the position that the shroud **12** and anchoring tube **14** is in when it is mounted on the support board **34.** In this latter mentioned figure there is also shown the fuse **56** having its end portions **58, 60** retained in the U-shaped clips **30, 32** and a transparent part of the fuse **56** substantially in engagement with the base portion **24** of the shroud **12** and tending to hold the shroud in loose engagement against the support board **34.**

There is further shown, in FIG. **2,** in dash line form the position that the shroud **12** and anchoring tube **14** is in when the shroud **12** has been lifted away from the support board **34** to a position where the left end **58** of the fuse **56** has been ejected from its associated clip **30.**

In FIG. **2,** it is also shown that a point **70** on the right lower most portion of the concave surface **68** is the only part of the base plate **24** that is engaged with the fuse **56** when the shroud **12** is in its fully lifted fuse ejected position such as is shown in dash line form in FIG. **2.**

The shroud **12** is shown in FIG. **2** as having a slanted surface **72** extending between the rib portions **62, 64** and sloping in a left to right downward direction from the right end of the concave surface **68.** This sloping surface **72** is shown in spaced relation to the fuse **56** when the fuse **56** is in either its horizontal or in its tilted position as is shown in FIG. **2.**

As is best shown in FIGS. **1** and **2,** the slanted surface **72** forms the upper end of the previously mentioned self anchoring tube **14.** As shown in FIGS. **4** and **5,** the upper portion **78** of the tube **14** is of substantially cylindrical configuration. In FIG. **3,** the lower portion **80** of the tube **14** is shown as being of a substantially elliptical shaped configuration. A pair of lugs **82, 84** having associated beveled edges **86, 88** are shown integral with the lower end of the tube **14** and extending away from one another along the major axis of the elliptical shaped portion **80.**

The lower or elliptical portion **80** of the tube **14,** including the lugs **82, 84,** may be compressed, as illustrated in FIG. **5,** for example, by the jaws **90, 92** of a pair of pliers. Such compression of the lower end **80** of the tube **14** permits that end to be inserted through an opening **104** in the support board **34.** Release of the compression after the end of the tube **14** has been inserted through the opening **104** allows that end of the tube to resume its initial configuration. The lugs **82, 84** then extend beyond the edge of the opening **104** whereby the tube **14** with its lugs **82, 84** constitute a loosely coupled captive mounting for the extractor **10.**

MODE OF OPERATION

The fuse ejector **10** is mounted on a support board **34** by first employing the free elliptical shaped end **80** of the self-anchoring tube **14** to cover the aperture **104** formed on the board **34** while the end of this tube **14** is in its non-compressed state as is shown in FIG. **4.** As is best shown in FIG. **5** a pair of pliers or the like is then employed to compress the lugs **82, 84** and the end of the elliptical portion **80** of the tube **14,** toward one another. While the lugs **82, 84** are thus compressed a sufficient amount to allow them to be inserted through the opening in the support board **34,** a force is applied in the direction of the arrow **94** to the top surfaces of the walls **16, 18** of the shroud **12.**

After the lugs **82, 84** have been inserted through the opening **104** in the support plate **34,** the natural resilient nature of the material of which the lugs **82, 84** and the tube **14** are made will allow these parts to resume the position they were in before they were compressed and therefore into the shroud retaining position as is shown in FIG. **2.**

While the tube **14** is being moved through the support board **34** as just described, the openings formed by walls **26, 28** in the base **24** of the shroud **12** will allow the shroud **12** to be inserted over the U-shaped spring clips **30, 32** and to be brought into loose captive mounting relationship with respect to the support board **34,** as is shown in FIG. **2.**

As the fuse **56** is inserted into the space formed by the walls **16, 22** of the shroud **12** the chamfered ends **52, 54** of the shroud **12** will guide end surfaces **58, 60** of fuse **56** into correct alignment with the ridges **48, 50** of the shroud **12.**

The ridges **48, 50** thus provide guide surfaces for the end portions **58, 60** of a fuse **56** while the fuse **56** is being inserted through the open top portion of the shroud **12** whereby these end portions can be easily inserted in a desired position between the clips **30, 32.** A glass central portion of the fuse will be substantially in

line contact with the concave surface **68** formed on the inner base part **26** of the shroud **12.**

To eject the fuse **56** from its position between the spring clips **30, 32,** it is merely necessary to grasp the ends or side portions **96, 98; 100, 102** and to then pull the shroud **12** in a direction away from the support board **34.**

The concave lifting surface **68** of the bridge portion **66** of the shroud **12** is positioned closer to the left end (as illustrated) of the fuse **56** than to its right end. The concave portion **68** of the shroud **12** will as the shroud is lifted exert a force against the left end of the fuse **56** causing the left end of the fuse **56** to be forced from its position in which it is clamped by the spring clip **30,** to a tilted position in which it is in point contact with a right end portion **70** of the concave surface **68** and completely disengaged from the spring clip **30.**

Ejecting only one end of the fuse **56** in the aforementioned manner thus allows the concave surface **68** of the shroud **12** and then the right end point **70** of the surface **68** in sequence, to apply a small diminishing force to the lower surface of the fuse as the fuse **56** is ejected, obviating the tendency of the fuse to pop out of the fuse holder, out of control.

Employing a shroud of the aforementioned type to eject the fuse in the aforementioned manner therefore eliminates the need for the use of any ancillary tool, such as a screwdriver such as has heretofore been improperly used with prior art fuse ejecting devices to pop these fuses out of their associated clips. Since no fuse popping action occurs in the use of the fuse ejecting shroud **12,** the danger of an operator being hit in the face with a fuse that has been shattered or popped out of its clips by means of a screwdriver is eliminated.

When the left portion of the fuse **56** has been moved to a tilted position in which it is free of its clip **30,** the other end of the fuse **56** can then be readily removed from its position in the clip **32** by returning the shroud **12** to its position in contact with the support board **34,** then grasping the portion of the fuse that is near its free upper left end, and applying a slight pulling force thereto.

Thus it may be seen that there has been provided an improved combination fuse ejector and protective shroud wherein no ancillary tool is required for removing a fuse from its spring clip mounting, and wherein injury to an attendant is avoided and protection for the mounted fuse is provided.

The embodiments of the invention in which an exclusive property or privelege is claimed are defined as follows:

1. A fuse ejector/shroud member for use in association with a pair of spaced spring clip contacts for a cartridge type fuse, said clip contacts being mounted on a suitable support base, said member comprising:

a non-conductive shroud body member of a single piece construction and of a substantially rectangular configuration having side and end walls of sufficient height to be at least coextensive with the spring clip contacts;

said shroud body member having a partially open bottom with an integral bridging portion extending transversely between said side walls, said bridging portion and said side and end walls defining a pair of openings through which said clip contacts are adapted to extend;

said bridging portion including a fuse engaging surface, a mounting pedestal integral with said bridging portion and extending in a direction opposite from the direction of the extension of said side walls and adapted to be inserted through a suitable opening in the support base, and

mounting means for loosely securing said pedestal in said opening, said pedestal being of a suitable length to provide a loosely captive mounting of said ejector/shroud member with respect to said support base, whereby to permit a cartridge fuse to be inserted between said clip contacts when said ejector/shroud member is fully seated on said support base and whereby said fuse engaging portion of said bridging portion is operative to eject said mounted fuse from between said clip contacts when said shroud is lifted slightly from said support base.

2. A fuse ejector/shroud member as set forth in claim **1** wherein said shroud member is formed of a molded semi-resilient plastic material.

3. A fuse ejector/shroud member as set forth in claim **2** wherein said fuse engaging surface of said bridging portion includes a fuse ejecting abutment adjacent one of said openings through which said clip contacts extend whereby one end of said fuse is ejected from the associated clip contact by the lifting of said shroud/ejector from said support base on its loosely captive pedestal.

4. A fuse ejector/shroud member as set forth in claim **3** wherein said abutment includes a concave surface for engagement with said fuse.

5. A fuse ejector/shroud member as set forth in claim **2** and characterized by the inclusion of guide tongues formed on the inner surface of each of said end walls to guide the ends of said fuse into longitudinal position relative to said clip contacts.

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