United States Patent [19]

Brzozowski et al.

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[45] **Jan. 9, 1973**

[54] SAFE DISCONNECT ELECTRIC SOCKET

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[73] Assignee: **International Telephone and Telegraph Corporation,** New York, N.Y.

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[21] Appl. No.: **151,779**

[52] **U.S. Cl.**.....**200/51.1,** 200/51.07

[51] **Int. Cl.**.....**H01r 33/30**

[58] **Field of Search**..200/51.07, 51.08, 51.09, 51.12, 200/51.13, 51.1; 339/181 R, 176 L

[56] **References Cited**

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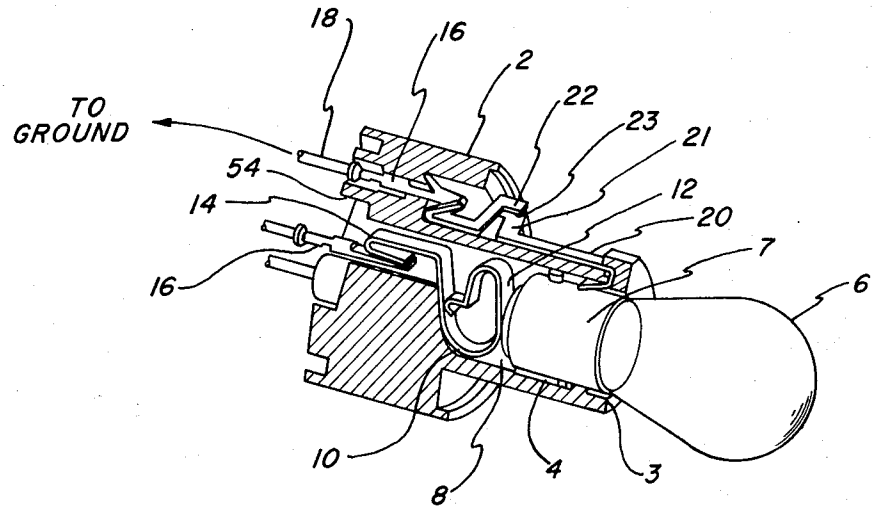
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[57] **ABSTRACT**

A safety feature in the form of a disconnect element for an electric socket structure is disclosed. The socket structure is formed of plastic material which is shaped to lock into openings provided to support and locate electric lights in automotive vehicles or the like. A separate ground element is employed with each socket to enable completion of an electric circuit. The safety feature forms a part of the ground element and automatically disconnects the ground element from the source of power in the event a lamp socket falls from, or is removed from, its respective opening.

6 Claims, 6 Drawing Figures



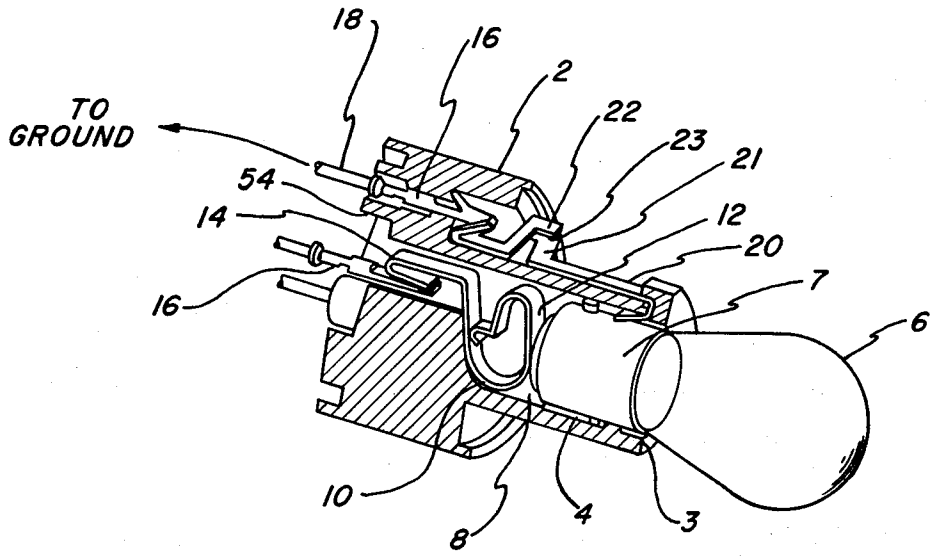


FIG. 1

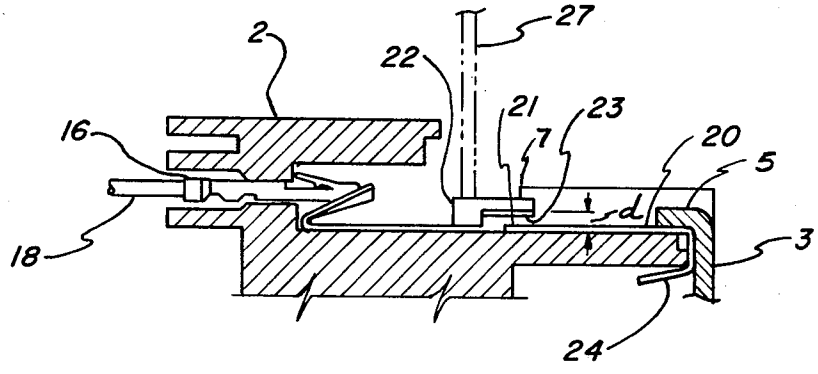


FIG. 2

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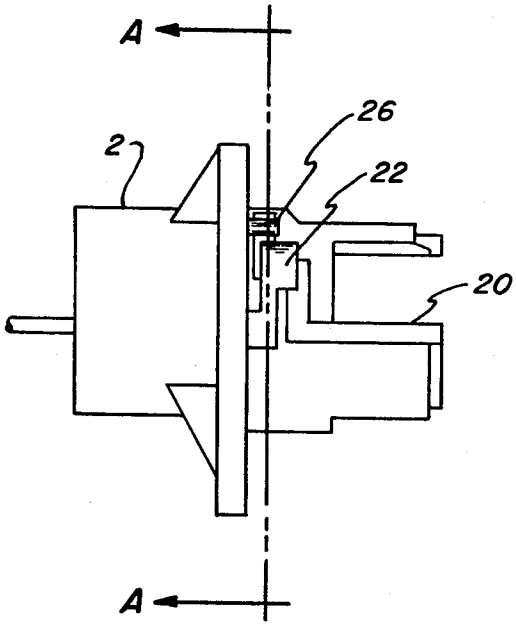


FIG. 3

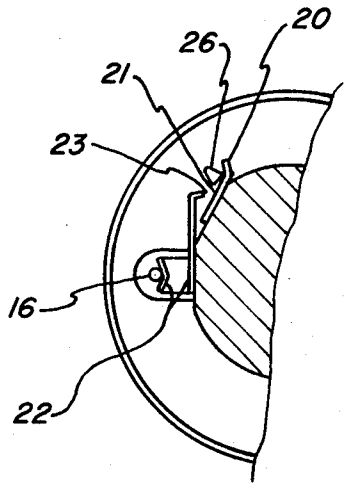


FIG. 4

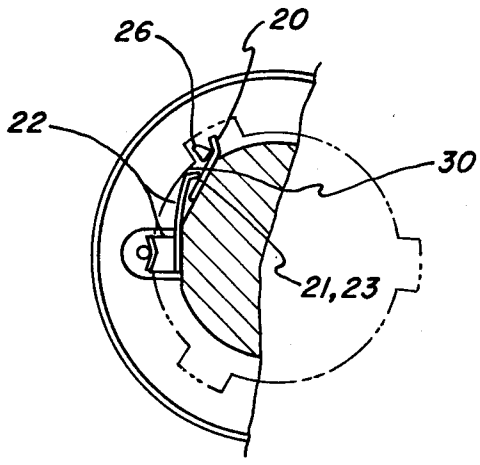


FIG. 5

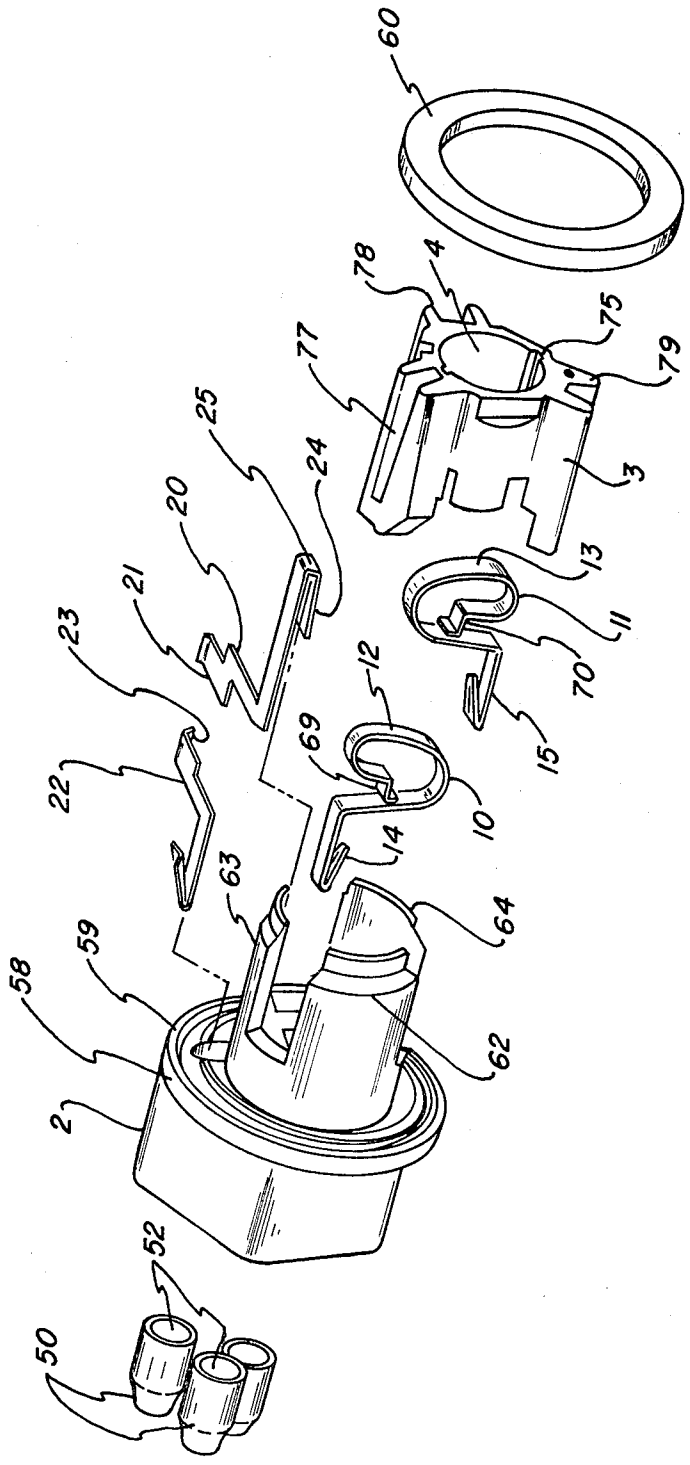

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FIG. 6

SAFE DISCONNECT ELECTRIC SOCKET

RELATED APPLICATIONS

Electric sockets similar to those of interest in the present invention are shown in copending U.S. Pat. applications, Ser. No. 861,113, filed Sept. 24, 1969 in the names of J. P. Burgess and Melvin W. Polkinghorn; and Ser. No. 68,995 filed Sept. 2, 1970, in the names of James P. Burgess, Melvin W. Polkinghorn and Steve J. Brzozowski. Both of these applications have been assigned to the same assignee as the present invention. They are incorporated herein by this reference.

BACKGROUND OF THE INVENTION

The present invention relates to improvements in electric sockets which may be readily affixed to the end of a cable harness and which then may be inserted by rotary motion into a prepared opening in a motor vehicle or other structure. In particular, the invention relates to lamp or other electric sockets made of non-conductive material which employ separate ground circuits and to means for automatically disconnecting the ground circuit of such a socket in case the socket becomes disengaged from the prepared opening.

Sockets of interest in this application are used in automotive lamp housing assemblies to hold miniature electric lamp bulbs. Such bulbs are used, for example, as light sources in front and side indicator and rear tail and stop units. Lamp housings have been made for this use out of steel stampings, die cast molds, or as presently, in ever increasing numbers, plastic molded units.

In the case of metal shell sockets found in the prior art, the ground is completed to a light bulb by a connection to the metal socket shell itself. In case such a socket falls from its seat, the bulb may not be extinguished if the socket falls on a grounded metal surface or across other conductors. No economical way of incorporating a safety interlock to open ground circuits in such metal shell sockets is known.

At the present time plastic housing installations are used for many different lamp sockets. An individual grounding circuit is required in all such installations because of the electrical isolation provided for conductive elements by the plastic housing relative to grounded metal body parts. This is accomplished in the wiring harness by bringing a grounded wire up to the socket.

In the present state of the art there is no provision in the sockets held in plastic housing installations for deenergizing the lamp bulb if the socket should accidentally become disengaged from the plastic lamp housing, since a separate grounding wire remains fastened to each socket.

It can be seen with sockets using ground connections of the foregoing type that there is a fire hazard. This hazard arises from the possibility that a lighted bulb may fall loose from its housing into a trunk area, or other space, where it may contact paper, cloth or other flammable material.

It is an object of the present invention to overcome this possibility of fire from a lighted bulb by arranging to extinguish the bulb in the event it is accidentally dislodged from its housing.

It is a further object of the invention to enable an indication to the vehicle operator that a lamp outage has occurred when a lamp socket falls out of its housing. Such an indication may be provided when the bulb is extinguished, thereby causing changes in the rate of a flasher system or in some other indicator system.

SUMMARY OF THE INVENTION

The foregoing objects and others ancillary thereto are attained in the present invention by use of a two-part interlock switch in the circuit connecting a plastic socket and ground. This two-part interlock switch is arranged so that it is closed by elements in the housing when the socket is properly seated in its housing. If the socket falls out of, or is removed from, the housing the interlock switch opens and the connection to ground is interrupted.

More particularly, ground connections between a bulb and a ground wire are completed through an interlock switch which is closed only when the socket is properly seated in its housing. When the socket is rotated (30° – 60°) clockwise into a lamp housing, a switch blade is compressed between the edge of the application hole and a second blade to complete the ground circuit from the ground wire to the bulb base. When the socket is removed from the application hole, the switch blade moves away from the second blade to open the ground circuit.

BRIEF DESCRIPTION OF THE DRAWINGS

The above mentioned and other features and objects of this invention and the manner of obtaining them will become more apparent, and the invention itself will be best understood by reference to the following description of an embodiment of the invention taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a sectional view of a typical lamp socket showing the use of a safety-lock ground connection in accordance with the present invention,

FIG. 2 is a sectional view of a portion of a lamp socket showing further details of the safety-lock ground connection,

FIG. 3 is an elevation showing relationships between a typical lamp socket and a safety-lock ground connection,

FIG. 4 is a partial section along A—A in FIG. 3, showing relationships between the socket and the ground connection as it appears when ground contact is broken,

FIG. 5 is a partial section along A—A in FIG. 3, showing relationships between the socket and the ground connection when the ground connection is completed by camming action, and

FIG. 6 is an exploded view showing elements of a socket and their relationships to the ground connection.

DESCRIPTION OF A PREFERRED EMBODIMENT

Turning to specific details, a partial section of one embodiment of an assembled lamp socket structure in accordance with the invention is shown in FIG. 1 of the drawings. The lamp socket structure, for simplicity, is shown as an integral unit at 2. It will be recognized, however, that the socket body may be composed of a number of discrete elements as shown in the copending applications referenced in the first part of this application.

The main body housing shown in FIG. 1 is provided with a bulb receiving cavity 4 which is adapted to receive a twist lock bulb 6 therein. A contact receiving and retaining cavity 8 is provided within the central part of the body housing 2. The contact receiving cavity 8 is in open communication with the bulb receiving cavity 4. Contact elements such as 10 are inserted through the bulb receiving cavity 4 into their operative use positions in the contact cavity 8. Each of the contact elements 10 is provided with a resilient curved bulb contacting portion 12 at one end thereof. Further, each of the contacts 10 is provided with a leaf spring extension 14 which is adapted to slidingly, wipingly and springingly make contact with terminal plugs 16 inserted into the lamp socket structure.

A ground connection between the base 7 of a bulb 6 and a ground wire at 18 may be completed through a terminal plug 16 and the two ground elements 20 and 22. The connection is completed whenever the adjacent contact faces 21 and 23 of 20 and 22 are pressed together. The connection is broken whenever the contacts are separated.

In the sectional view shown in FIG. 2,relationships between the ground elements 20 and 22 are presented in greater detail. In this view, the respective contact areas 21 and 23 are separated by a distance d in such a way that no ground potential is available at point 24 and consequently a lamp present in the socket (as shown in FIG. 1) would be disconnected electrically. Lines are phantomed in at 27 to indicate where a cam bearing plate would be located to close the contact areas 21 and 23. Element 20 is retained in part by an extension 5 from the upper part of the socket 3. Similarly, element 22 is retained in part by an extension 7 from the upper part of the socket 3.

A further disclosure is made in FIG. 3 of the elements 20 and 22 as they relate to a portion of the socket 2. In this view, a part of the socket represented by 3 in FIGS. 1 and 2, has been removed. A portion of element 20 is seen to extend over the top of the socket (connecting to the ground point 24 of FIG. 2) while an end of the element is held in position under the pin 26. The pin 26, typically, is an integral part of the socket 2.

FIG. 4 presents a partial section taken along lines A—A of FIG. 3. It can be seen that the contacts 21 and 23 are open between 20 and 22 giving rise to an open circuit condition. The position of 20 relative to the pin 26 is illustrated. In addition, it will now be clearer how the terminal plug 16 extends through a cavity into contact with one end of the element 22.

FIG. 5 is a partial section along A—A of FIG. 3 demonstrating how a cam surface 30 rides on the top of ground element 22, forcing it down to close contacts 21 and 23 between elements 20 and 22. In this view, the cam surface 30 is a part of the opening (shown by phantom lines) into which the socket is fitted by pushing and twisting action. The process of twisting seats the socket and at the same time causes the elements 20 and 22 to complete the electrical connection to ground. If the socket comes out of the opening, the element 22 will be released by the cam surface 30, returning due to spring action to the position shown in FIG. 4 and breaking the ground connection.

Additional aspects of an embodiment of the invention are shown in the exploded perspective view of FIG. 6. FIG. 6 shows in detail some components of an embodiment of the lamp socket which have not been disclosed previously. Weather-proof boot seal units are shown at 50 with terminal plug openings 52 therethrough. Each of the individual boot seal units 50 is cylindrically configured to matingly engage the external walls of an individual terminal plug cavity socket extension tower such as 54, in FIG. 1, and thus to seal the opening between the terminal plug 16 and the tower. The connector 2 is shown with various elements in exploded positions to illustrate additional aspects of the invention. The body housing 2 is provided with three guide retaining arms 62, 63 and 64, respectively, which are adapted to matingly engage the upper body housing 3. The lower body housing 2 is provided with an annular compression ring retaining flange 58 and circumferential lip extension 59 upon which the compression ring member 60 may be seated.

Contact elements 10 and 11 are provided having curved bulb contact portions 12 and 13 at one end thereof, respectively, and leaf spring terminal plug contact portions 14 and 15 at the opposite end thereof. It should be noted that the contact elements are configured so that the tip ends 69 and 70 of the contact elements bear against the mid-portion of the contact elements. This tends to impart a more positive contact pressure against the base of the bulb inserted thereagainst.

The ground strap element 20 is provided with a curved end portion 25 which is adapted to engage the upper body housing 3. The ground strap 20 is also provided with a leaf spring extension 24 which is adapted to engage a lamp ground terminal when a lamp is inserted into the housing 3. The relationships between contacts 21 and 23 of ground elements 20 and 22 are shown from a different viewpoint than heretofore.

The upper body housing 3 is provided with a bulb engaging cavity 4 therethrough. Suitable grooves 75 are provided within the bulb engaging cavity 4 which are adapted to lockably engage the ears on the base of a standard twist lock bulb.

Orienting alignment shoulders 77, 78 and 79 are provided on the upper body housing 3. The alignment shoulders 77, 78 and 79 have different thicknesses and are configured to matingly engage corresponding recesses provided in the opening in a lamp socket reflector housing into which the lamp socket structure is mounted. This alignment or orienting feature insures that the lamp socket structure can only be inserted into the reflector housing in its proper use position. As a result, a fool-proof installation is provided for the lamp socket structure in the lamp socket reflector housing.

While the principles of the invention have been described above in connection with specific apparatus and applications, it is to be understood that this description is made only by way of example and not as a limitation on the scope of the invention.

We claim:

1. An electric socket incorporating an automatic ground disconnect element to enable automatic release of a ground connection through a ground wire in the event an insulated electric lamp socket falls out of an insulated support, said socket comprising

an insulating socket body,

a recess in one end of said socket body for receiving a mating electric socket,

an interlock switch formed of two separate parts supported in an open space along a wall of said socket body,

a first part of said interlock switch including a ground element terminating in a first ground terminal and a first switch contact,

a second part of said interlock switch including a ground element terminating in a second ground terminal and a second switch contact, and

means aligning said first and second switch contacts in said open space to enable them to respond to pressure applied radially inward from outside the socket body to complete a circuit between said first and second ground terminals,

said first and second switch contacts responding to release of pressure from outside said socket body to break an existing connection between said first and second ground terminals.

2. A socket as claimed in claim 1, in which

the socket body includes retaining elements, and

the first part of said interlock switch is retained in a given position by retaining elements of the socket.

3. A socket as claimed in claim 1, in which

the socket includes retaining elements,

the first part of said interlock switch is retained by retaining elements in a fixed position,

the second part of said interlock switch is retained in a given position by retaining elements of the socket, and

said retaining elements permit movement of said second switch contact means to make and break connections between said ground terminal and said source of ground potential.

4. A socket as claimed in claim 3, in which

the retaining elements of the socket which retain the first switch contact include a pin rigidly holding said first pin contact against a seat in the socket.

5. A socket body as claimed in claim 1, in which

the socket body includes retaining elements, and

the second part of said interlock switch is held by said retaining elements where the retaining elements include a cavity to receive and hold the connection to the second ground terminal and a recess to receive and hold an edge of the second switch contact.

6. A socket incorporating an automatic ground disconnect element, as claimed in claim 1, including

means for applying pressure to said second switch contact means to complete a circuit between the first and second ground terminals, and

a spring element incorporated into said second contact switch element responsive to release of said pressure to cause said first and second contact elements to spring apart and disconnect the ground circuit.

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