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DTIC QUALITY INSPECTED 4

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3 ILLUMINATING ELECTRICAL FUSE

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5 STATEMENT OF GOVERNMENT INTEREST

6 The invention described herein may be manufactured and used
7 by or for the Government of the United States of America for
8 Governmental purposes without the payment of any royalties
9 thereon or therefor.

10
11 BACKGROUND OF THE INVENTION

12 (1) Field of the Invention

13 The invention relates generally to electrical fuses and in
14 particular to fuses having indicator lamps.

15 (2) Description of the Prior Art

16 Present fuse designs are such that when the circuit they
17 service is overloaded, they blow and therefore stop electricity
18 from flowing to the overloaded circuit. This design is a safety
19 feature which prevents both overheating damage to equipment and
20 harm to an individual from either a long-term electrical shock or
21 electrocution.

22 Modern electrical panels often use circuit breakers in lieu
23 of fuses as circuit breakers are easily reset, can be readily
24 identified when tripped, and need not be replaced after a circuit
25 overload. However, many installations have not been converted to

1 circuit breakers due to the costs involved and due to the fact
2 that circuit breakers tend to trip under certain momentary surges
3 when fuses will not blow. This unnecessary tripping can
4 interfere with operations of certain military equipment having
5 inductive or capacitive-induced surges. Although delayed-
6 tripping circuit breakers can be installed, typically such
7 operations result in considerable lost time.

8 A standard fuse has a window inside which the fuse element
9 can be seen. This fuse element is a notched, metal strip
10 connecting the two poles of the fuse. If an overload occurs in
11 the circuit serviced by the fuse, the notched portion of the
12 metal strip will overheat, burn out and separate. The burnout
13 opens the circuit so that current can no longer be supplied.
14 However, it is frequently difficult to identify which fuse in a
15 panel is blown, particularly if the blown fuse does not look
16 black through the window (as some good fuses look blackened while
17 blown fuses may not turn black). Further, the identification
18 difficulty may be compounded by a fuse box being located in a
19 poorly lighted area. What is needed is an indicator which will
20 aid in blown fuse identification.

21 Several types of prior art fuses exist combining an
22 illuminated element or lamp with a fuse to provide a visual
23 indicator of an operating or blown fuse. One type of fuse uses
24 an illuminating indicator set up in parallel. The illuminating
25 indicator has a high resistance, thereby passing little current

1 compared to the fuse element, which has a low resistance. When
2 the fuse element burns out, the remaining electrical path is
3 through the illuminating indicator. The indicator then lights
4 when the fuse element burns out. A problem with this
5 configuration is that current continues to flow through the
6 circuit (via the parallel path provided by the illuminating
7 indicator) after the fuse has blown out. This continued current
8 flow, after the fuse has blown, can create a significant safety
9 hazard leading to equipment damage, fire or even loss of life.
10 An alternate type of illuminated fuse uses an illuminating
11 element in series with fuse element. In this type of fuse, the
12 indicator is illuminated when the fuse is operating and is
13 extinguished when the circuit is broken by the blowing of the
14 fuse. The problem with this configuration is that the entire
15 current load must pass through the illuminating element, thereby
16 leading to voltage drops or current losses. Additionally, if the
17 indicator fails, an open circuit is produced interrupting
18 electrical service.

19 What is needed is an indicating system wherein the current
20 draw of the main electrical load bypasses the indicating circuit.

21 It is also desirable that if the indicating lamp fails without
22 the fuse being blown that the circuit will continue to operate.

1 SUMMARY OF THE INVENTION

2 It is an object of the present invention to provide a fuse
3 having an indicator lamp which is illuminated to show an
4 operating fuse.

5 It is another object of the present invention to provide a
6 fuse in which fuse operation can continue in the event of a
7 failed or burned out indicator lamp.

8 It is yet another object of the present invention to provide
9 a fuse having an indicator lamp which lamp operates in parallel
10 with an electrical load serviced through the fuse.

11 It is a further object of the present invention to provide a
12 fuse having an indicator lamp wherein current to the lamp circuit
13 is extinguished whenever the fuse blows out.

14 Accordingly, the invention is an illuminating electrical
15 fuse having an indicator lamp connected on the electrical load
16 side of the fuse. The indicator lamp is connected to the fuse
17 element and to a voltage-dropping resistor and, in turn, to a
18 ground. The lamp operates in parallel with the electrical load,
19 thereby allowing continued operation of the electrical load in
20 the event of lamp failure. However, whenever the fuse blows out,
21 power is disconnected from both the electrical load and the
22 indicator lamp.

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BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing objects and other advantages of the present invention will be more fully understood from the following detailed description and reference to the appended drawings wherein:

FIG. 1 is a perspective view of the fuse of this invention showing the fuse window;

FIG. 2 is a side view of the fuse;

FIG. 3 is a top, schematic view showing the arrangement of components within the fuse; and

FIG. 4 is a wiring diagram showing the indicator lamp in parallel with an electrical load.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIG. 1, the illuminating electrical fuse with indicator lamp, designated generally by the reference numeral 10, is shown with a sealed, insulated case 18 having a cylindrical shape and a top and bottom. The fuse 10 has a first electrical contact, center electrical contact 14 and a second electrical contact, threaded side electrical contact 12.

Connecting the side contact 12 and the center contact 14 is a fuse element 16 visible through a fuse window (not designated).

FIG. 2 shows a side view of fuse 10 with the lamp's ground points 22 located along the undersurface of the top of the fuse 10.

1 These independent ground points 22 are used for completing the
2 parallel circuit used for the indicator lamp.

3 FIG. 3 is a top view schematic showing the functional
4 arrangement of the fuse 10 and the new features of fuse 10. The
5 fuse element is formed in three sections, the first end being the
6 electrical power source side 32 of the element, the center
7 section forming the notched section 34, intended to create a
8 burnout point, and the second end being the electrical load side
9 36. The arrow 38 indicates the location of an electrical load.
10 All of these preceding features are conventionally known and
11 provided in existing fuses. The new features include an
12 indicator lamp 40 and a voltage-dropping resistor 42 connected to
13 the electrical load side 36 of the fuse element.

14 Referring now to FIG. 4, a schematic-wiring diagram
15 illustrates the operation of the fuse 10 of the invention. A
16 power source 44, such as an alternator, provides power to an
17 electrical load 46 via an electrical load circuit comprising a
18 pair of wires designated wire 48 and wire 50. Within the dashed
19 box 52, the functional components of fuse 10 are represented. The
20 wire 50 is fused by fuse 10 with the fuse element 16 along the
21 line. Attached to the fuse element 16 is the indicator lamp 40
22 in series with voltage-dropping resistor 42, which is then
23 connected to the ground point 22. The indicator lamp 40, in the
24 preferred embodiment, is a low-voltage, light emitting diode
25 (LED) requiring less than five volts to illuminate. The

1 remaining live voltage, from 110 volts for example, occurs across
2 the resistor 42. As a result, only minimal current flow and
3 voltage occurs at the ground point 22. Whether the electrical
4 load 46 is operating or not, the indicator lamp 40 remains
5 illuminated. However, if the fuse 10 blows out, the notched
6 section 34 fails and no power is delivered to either the
7 electrical load 46 or to the indicator lamp 40. The burned out
8 fuse is easily identifiable due to the extinguishing of the
9 indicator lamp 40. Unlike a series installation of an indicator
10 light, there is no need for the current of the entire electrical
11 load to pass through the light. Also, unlike other parallel
12 installations, this invention stops current flow completely when
13 the fuse blows out.

14 The features and advantages of the invention are numerous.
15 The fuse 10 of this invention provides an immediate visual
16 indication of a burned out fuse. With the indicator in parallel
17 with the electrical load, there is no continued current after the
18 fuse blows out. Additionally, if the lamp itself fails, the
19 circuit continues to operate.

20 It will be understood that many additional changes in the
21 details, materials, steps and arrangement of parts, which have
22 been herein described and illustrated in order to explain the
23 nature of the invention, may be made by those skilled in the art
24 within the principle and scope of the invention.

25 For example, different configurations for

1 the ground contacts of the indicator light may include any
2 configuration which provides a circuit parallel to the main
3 electrical load.

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3 ILLUMINATING ELECTRICAL FUSE

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5 ABSTRACT OF THE DISCLOSURE

6 An illuminating electrical fuse having an indicator lamp
7 is provided. The indicator lamp is connected to the fuse
8 element on the load side of the circuit and to an independent
9 ground. During operation of the fuse, the lamp is illuminated.

10 When the fuse blows out, the lamp is extinguished. The
11 configuration of the circuit places the lamp in parallel with
12 the circuit load in contrast to similar fuses having the lamp,
13 fuse element and load in series. With the lamp in parallel,
14 lamp failure does not shut down the circuit. Further, the
15 current draw of the electrical load bypasses the lamp circuit
16 through which only a small current passes. The lamp in the
17 preferred embodiment is a light emitting diode.

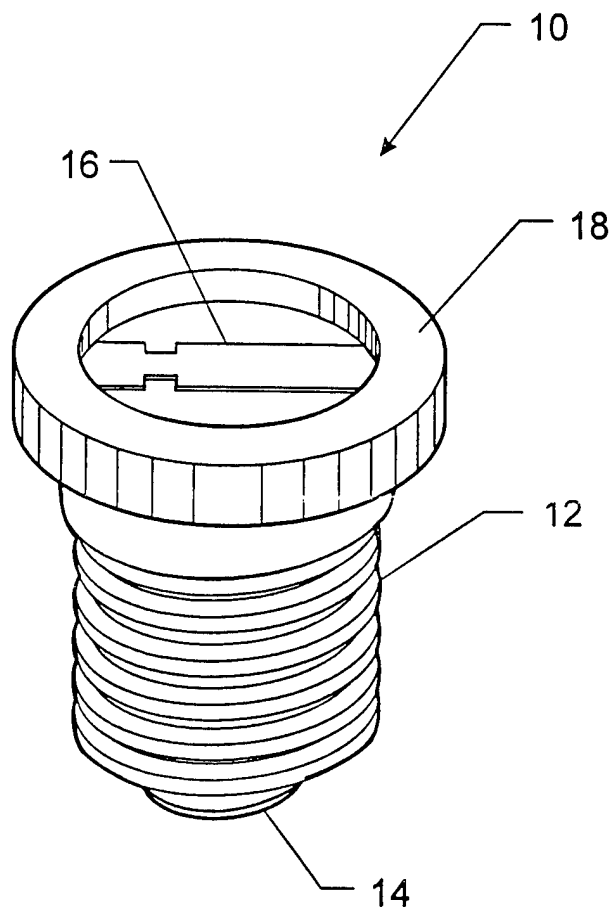


FIG. 1

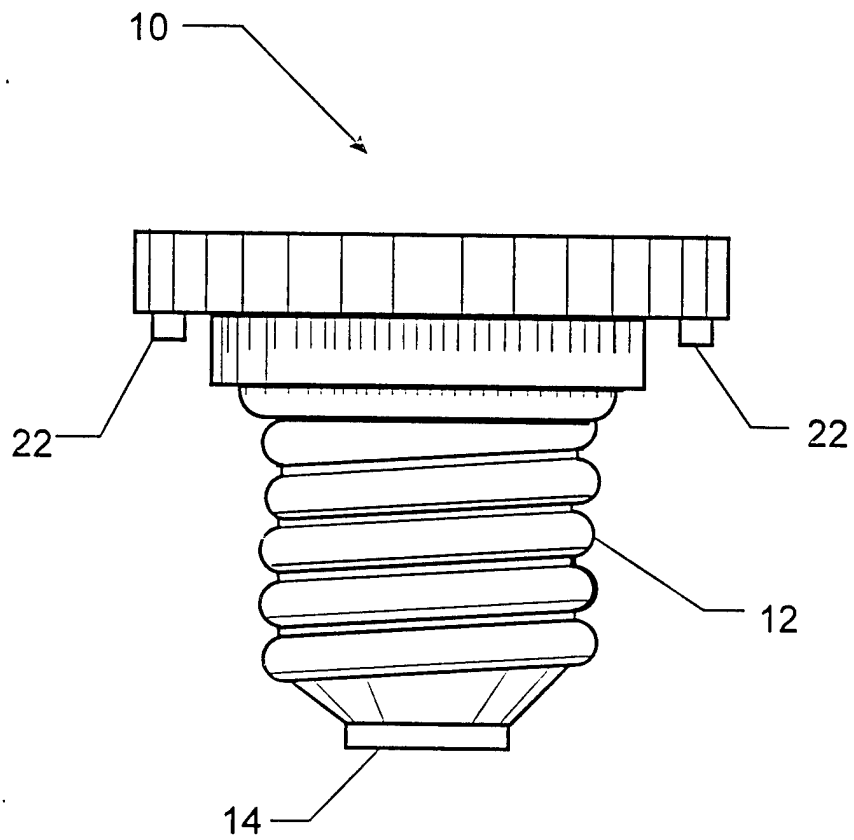


FIG. 2

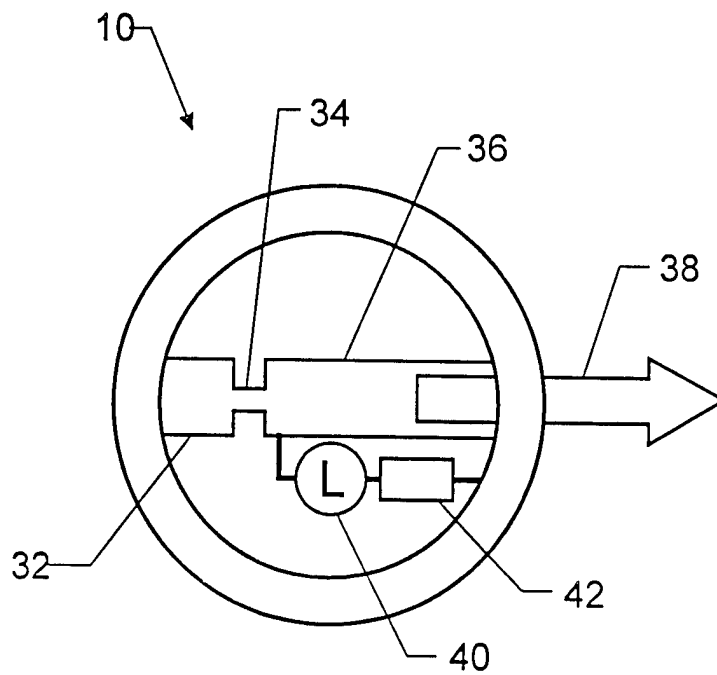


FIG. 3

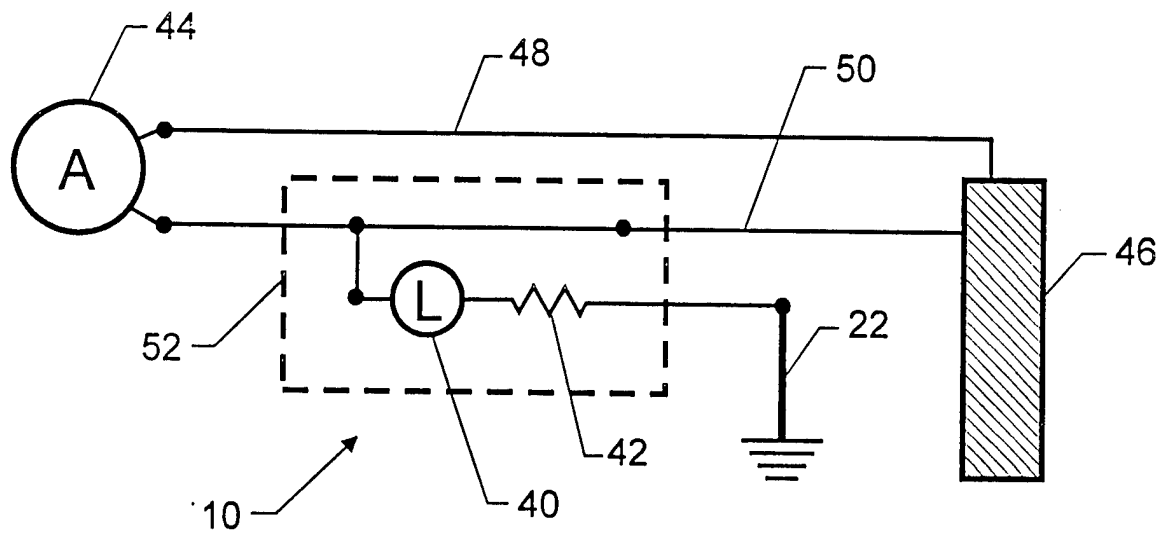


FIG. 4