Aug. 31, 1948. A. H. POWELL 2,448,389

FUSE UNIT

Filed June 2, 1945

Fig. 2.

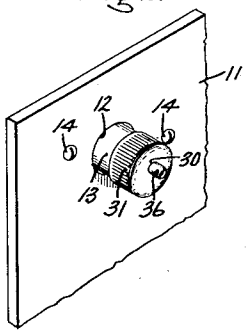


Fig. 1.

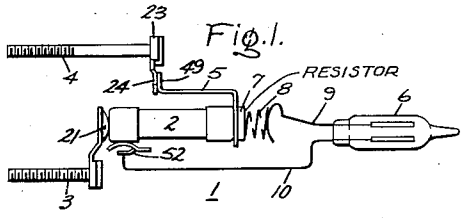


Fig. 3.

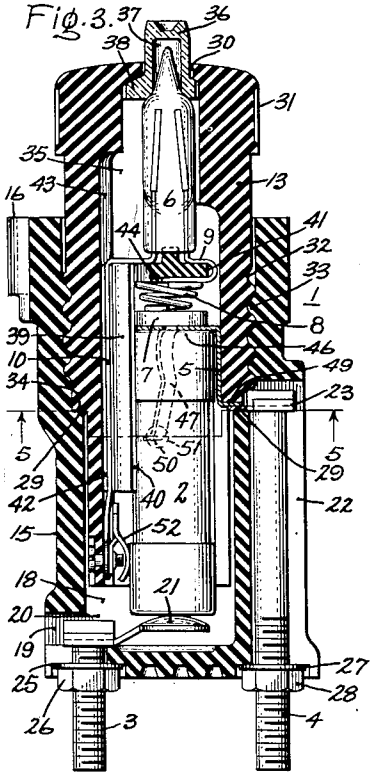


Fig. 4.

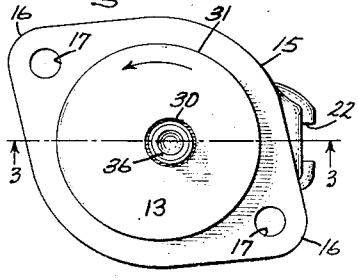


Fig. 6.

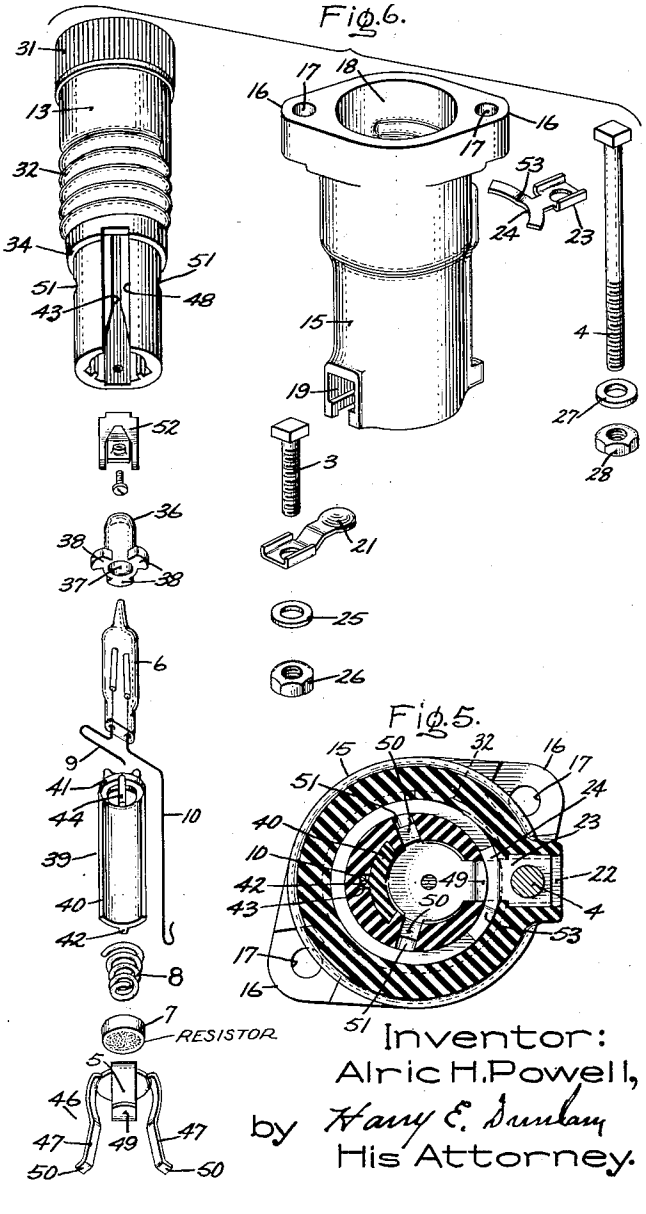


Fig. 5.

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2,448,389

FUSE UNIT

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12 Claims. (Cl. 200—121)

1

My invention relates to fuse units and more particularly to a dead front fuse unit which includes indicating means for indicating whether the fuse has operated. Specifically, my invention is an improvement on the fuse unit disclosed and claimed in United States Letters Patent 2,386,060, issued October 2, 1945, and assigned to the same assignee as the present application.

Cartridge fuses are used to a large extent for protecting electric circuits of all sorts. They are used extensively in connection with control panels for electrical equipment. In such applications it is always desirable to reduce the panel space required therefor to a minimum and to provide a fuse unit which has a dead front so that there is no danger to operators at any time. The so-called "midget" cartridge fuses are extensively used in connection with some electric circuits and it would be desirable to provide a fuse unit for such midget fuses.

It is an object of my invention, therefore, to provide a new and improved fuse unit which is attractive in appearance and which provides a dead front construction.

It is another object of my invention to provide a fuse unit for midget fuses which is relatively inexpensive, which is provided with indicating means, and which furthermore is provided with means which prevent shock or vibration from adversely affecting the unit.

Further objects and advantages of my invention will become apparent as the following description proceeds and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

For a better understanding of my invention reference may be had to the accompanying drawing in which Fig. 1 is a schematic diagram illustrating the electric circuit of the fuse unit of my invention; Fig. 2 is a perspective view of a panel section including the fuse unit of my invention; Fig. 3 is a sectional view through the fuse unit; Fig. 4 is a front view of the fuse unit; Fig. 5 is a sectional view taken on line 5—5 of Fig. 3; and Fig. 6 is an exploded view of the fuse unit.

Referring now to the schematic diagram of Fig. 1 in which the corresponding parts thereof are designated by the same reference numerals as in the other figures of the drawing, I have illustrated the electric circuit of the fuse unit, generally indicated at 1, which includes a midget fuse 2 having one terminal thereof connected to terminal 3 of the fuse unit 1, while the other terminal 4 of the fuse unit is electrically connected

2

by conductor 5 with the other terminal of the midget fuse 2. In order to indicate the operating condition of the fuse 2 an indicating circuit is connected in parallel therewith which comprises a lamp schematically indicated at 6 serially connected with a resistor 7. Suitable conductors comprising a spring 8 and conductors 9 and 10 complete the circuit between the fuse 2 and the parallel indicating circuit. The general arrangement of the electric circuit of Fig. 1 is well known and the resistor 7 provides sufficient impedance in the indicator circuit including lamp 6 so that when the fuse 2 is in the unblown condition the potential across the indicator circuit is insufficient to light lamp 6. However, upon rupture of fuse 2 the potential across the indicating circuit increases sufficiently to cause lamp 6 to be lighted thereby indicating to the operator that replacement of fuse 2 is necessary. My invention is particularly concerned with the new and improved fuse unit to be described hereinafter, which incorporates the general features of the well-known indicating circuit schematically shown in Fig. 1 although certain portions of Fig. 1 have been illustrated in the preferred form embodying my invention.

Usually the fuse unit of my invention is employed in connection with the conventional vertically mounted electrical panel or switchboard generally designated at 11 in Fig. 2. In order to accommodate my fuse unit, panel 11 is provided with an opening 12 through which protrudes a removable insulating member 13 which forms a part of the fuse unit of my invention. This fuse unit is suitably fastened to the panel as by means of bolts 14. It will be obvious from Fig. 2 that the fuse unit 1 of my invention, which is usually mounted on a vertical panel 11, has a very pleasing appearance from the front of the panel, requires a relatively small amount of panel space, and only the removable insulated portion 13 protrudes beyond the panel, which is preferably formed of sheet metal or the like and is usually at ground potential.

The fuse unit 1 embodying my invention as shown in Figs. 3 to 6, comprises a base of insulating material 15 which is provided with ears 16 containing openings 17 therein by means of which base 15 may be suitably bolted or fastened to panel 11 by bolts 14. Although I have described my invention as employed specifically in connection with vertical panels, it will be obvious that it might also be employed with panels or switchboards which are horizontal or in some other plane. The panel 11, which is preferably metal,

as was mentioned above and grounded in a normal installation, would have insulating base 15 mounted on the back thereof with the opening 12 in the panel cooperating with a recess 18 formed in insulating base 15.

The end of insulating base 15 remote from panel 11 is substantially closed and the terminals 3 and 4 of the fuse unit 1 are associated with this closed end of insulating base 15. The terminal 3 comprises a bolt adapted to be inserted in a recess 19 formed near the closed end of insulating base 15. The recess 19 is connected by an opening 20 with the recess 18 in insulating base 15 so that a spring biased fuse contact 21 may be mounted within recess 18 and electrically connected to bolt or terminal 3. Fuse contact 21 is very similar in structure to the conventional center terminals found in incandescent lamp sockets. Terminal 4, on the other hand, comprises a much longer bolt than terminal 3 which is housed within a recess 22 in insulating base 15. The recesses 19 and 22 are arranged so that the bolts 3 and 4 may be inserted therein merely by lateral movement of the bolts toward the recesses with no complicated assembly problem. The upper end of bolt or terminal 4 engages with a combined terminal and locking device 23, which will be described in greater detail hereinafter, and which includes an arcuate portion 24 extending through an opening in the wall of insulating base 15 so that this arcuate portion 24 is within recess 18.

The assembly of the terminals 3 and 4 and members 21 and 23 with insulating base 15 may readily be accomplished in view of the simple construction described above. A washer 25, a nut 26 and fuse contact 21 are assembled on bolt 3 which is then inserted in recess 19 with the contact 21 extending into recess 18. The bolt 3 is provided with a rectangular head which fits between ridges defined on spring biased contact 21. Similarly, contact 23, washer 27 and nut 28 are assembled on bolt 4 and this assembly is then inserted in recess 22 with the arcuate contact portion 24 extending into recess 18 so as to be positioned on a ledge or shoulder 29 formed in insulating base 15.

In addition to the insulating base and associated terminals described thus far which serve as the fuse block and terminals and the like of the prior art arrangements, my new and improved fuse unit includes the removable insulating member 13 which is a removable cartridge fuse retainer and which is generally tubular in construction. Tubular insulating member 13 has the end thereof protruding through opening 12 in panel 11 substantially closed except for a small opening 30, the purpose of which will become apparent from the ensuing description. This end of tubular insulating member 13 is provided with a knurled effect, indicated at 31 in Figs. 2, 3 and 6, so that it may readily be grasped by the operator. Removable insulating member 13 is also provided with a threaded portion 32 for engaging with a cooperating threaded portion 33 in recess 18 of insulating base 15. Removable insulating member 13 is adapted to be inserted with its substantially open end extending into recess 18. Insulating member 13 is also provided with an annular shelf or abutment 34 which is adapted to engage with shoulder or ledge 29. Removable insulating member 13 contains a chamber 35 which accommodates not only the fuse 2 but also the indicating circuit including the lamp 6. Light from the lamp 6 upon rupture of the fuse 2 should be visible to the operator through opening 30 in insulating member 13. As is disclosed and claimed in my Patent No. 2,426,468, issued Aug. 26, 1947, and assigned to the same assignee as the present application, it may be desirable to provide means for bringing the light from the lamp 6 outside tubular insulating member 13, thereby making it more readily visible from all angles. To this end I have indicated in the drawings a transparent, light-transmitting insert 36 which fits into the opening 30. This transparent insert, preferably formed of plastic or glass, contains a recess 37 therein and includes a plurality of projections 38 which fit into cooperating recesses within insulating member 13 to properly position the same and prevent rotation thereof when so positioned.

As distinguished from prior art arrangements, lamp 6 which is preferably a glow lamp of the type containing a mixture of inert gases such as a neon lamp or the like, is inserted in recess 35 with its longitudinal axis parallel with the axis of insulating member 13. Preferably these axes are not coincident as is obvious from Fig. 3 whereby removable unit 13 may be smaller. One end of lamp 6 is adapted to extend into recess 37 in transparent, light-transmitting insert 36 to properly position the same, as is clearly obvious from Fig. 3. Lamp 6 is supported in recess 35 on a movable insulated support 39 which comprises a longitudinally extending arcuate portion 40 and an integral lamp-supporting ledge 41. Arcuate portion 40 includes a ridge 42 which is slidable in a longitudinally extending slot 43 in insulating member 13. Lamp 6 is placed on the shelf 41 of movable insulating support 39 with the terminal lead or conductor 9 thereof looped in the manner indicated in Fig. 6 so as to fit into a recess or groove 44 in shelf 41 on the side opposite lamp 6. The other terminal conductor 10 of lamp 6 extends along ridge 42 and is positioned in the groove or slot 43. Insulated support 39 and lamp 6 with the conductors arranged in the manner described above is inserted in recess 35 with the ridge 42 and conductor 10 positioned in slot or groove 43. Lamps of the type such as 6 are often of variable length and insulating support 39 will be positioned in recess 35 so that the end of lamp 6 fits into recess 37 of transparent, light-transmitting insert 36.

In order to accommodate for the varied lengths of lamps such as 6, the coiled spring 8 is provided having a larger diameter at one end than the other. This coiled spring is adapted to be inserted in recess 35 so that the large diameter end thereof engages the side of shelf 41 containing groove 44 so as to engage electrically conductor 9 connected to lamp 6, as is clearly obvious from Figs. 1 and 3. The side of this shelf opposite lamp 6 is provided with a raised portion engaged by spring 8. Resistor 7, which is in the form of a wafer-like disk, is inserted in recess 35 so as to engage the small diameter end of coiled spring 8. Preferably resistor disk 7 is made of a carbon compound with each face coated with a conducting material to engage adjacent conducting surfaces.

Adjacent resistor 7 I have provided a fuse terminal 46 which is somewhat in the form of a three-legged stool including a conductor portion 5 and supporting prongs 47, the prongs 47 and conductor portion 5 forming the legs of the stool. Fuse terminal 46 is inserted in recess 35 with the prongs extending toward the open end of insulating member 13 whereupon the other end

of fuse contact 46 engages resistor 7. Insulating member 13 includes a longitudinally extending notch 48 for accommodating the extension 49 of conductor 5 which is arranged substantially at right angles to the main portion of conductor 5. The prongs 47 are provided with extensions 50 which are adapted to seat in openings 51 in removable insulating member 13. The prongs 47 are made of spring-like material so that the extensions 50 spring into openings 51 when fuse terminal 46 is properly positioned in recess 35. With this arrangement lamp 6, movable insulating support 39, spring 8, resistor 7 and fuse terminal 46 are securely positioned and locked in the recess 35 in removable insulating member 13. Spring 8 automatically takes care of any variations in the longitudinal dimensions of lamp 6. The extension 49 of conductor 5 provides the electrical contact for connecting one terminal of the indicating circuit and one terminal of fuse 2 with terminal 4 of fuse unit 1.

In order to connect the other terminal of lamp 6 with the end of fuse 2 remote from fuse terminal 46 conductor 10 is connected to a terminal 52 positioned adjacent the open end of removable insulating member 13. When fuse 2 is inserted into the open end of insulating member 13 one end thereof is in electrical contact with fuse terminal 46, while the other end is in engagement with terminal 52 thereby connecting the indicating circuit, including lamp 6, in parallel with fuse 2.

With the fuse 2 inserted in removable fuse holder 13 the electric circuit to associated apparatus may be completed by inserting fuse holder 13 in recess 18 of base 15 until one terminal of fuse 2 engages the spring contact 21 and contact 49 engages with the arcuate portion 24 of conducting member 23. In order that jarring or vibration will not cause removable unit 13 to break contact with the conducting portions arranged in insulating base 15, arcuate portion 24 of conducting member 23 is provided with a stepped portion 53. As contact 49 drops below stepped portion 53 it effectively locks removable insulating member 13 to insulating base 15 whereby jarring or vibration will have no deleterious effect.

Although I have described my invention in connection with a socalled midget fuse, it will be understood that it is applicable for use with all kinds of cartridge fuses, the term "cartridge fuse" being intended to include any form of fuse link enclosed in a tubular shell whether current limiting or not.

While I have shown and described a particular embodiment of my invention, it will be obvious to those skilled in the art that various changes and modifications may be made without departing from my invention in its broader aspects and I, therefore, aim in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A dead front cartridge fuse holder and indicator for a cartridge fuse comprising in combination a base of insulating material having a recess therein, a pair of contact terminals in said recess in said base, a removable insulating member for removably retaining a cartridge fuse within the recess of said base and in series with said contact terminals, an indicating circuit including a lamp contained in said member and visible outside thereof, a support for said lamp

mounted within said member for movement relatively thereto and adapted to assume various positions in dependence on variations in the size of said lamp, and means for holding said lamp and said support in position in said member including a conducting member detachably mounted within said insulating member for electrically interconnecting one of said contact terminals with one terminal of the lamp and with one terminal of the cartridge fuse.

2. A dead front cartridge fuse holder and indicator for a cartridge fuse comprising in combination a base of insulating material having a recess therein, a pair of contact terminals in said recess in said base, a removable insulating member for removably retaining a cartridge fuse within the recess of said base and in series with said contact terminals, an indicating circuit including a lamp contained in said member and visible outside thereof, a support for said lamp mounted within said member for movement relatively thereto and adapted to assume various positions in dependence on variations in the size of said lamp, and means comprising a conducting member detachably mounted within said insulating member to form a contact for engaging a cartridge fuse and for holding said lamp and said support in position in said member.

3. A dead front cartridge fuse holder and indicator for a cartridge fuse comprising in combination a base of insulating material having a recess therein, a pair of contact terminals in said recess in said base, a removable insulating member for removably retaining a cartridge fuse within the recess of said base and in series with said contact terminals, an indicating circuit including a lamp contained in said member and visible outside thereof, said lamp being arranged so that its longitudinal axis is parallel with the longitudinal axis of said member, a support for said lamp mounted within said member for movement relatively thereto, and means for holding said lamp and said support in position in said member including a conducting member detachably mounted within said insulating member for electrically interconnecting one of said contact terminals with one terminal of the lamp and with one terminal of the cartridge fuse.

4. A dead front cartridge fuse holder and indicator for a cartridge fuse comprising in combination a base of insulating material having a recess therein, a pair of contact terminals in said recess in said base, a removable insulating member for removably retaining a cartridge fuse within the recess of said base and in series with said contact terminals, an indicating circuit including a lamp contained in said member and visible outside thereof, a support for said lamp mounted within said member for movement relatively thereto and adapted to assume various positions in dependence on variations in the size of said lamp, and means comprising a conducting member provided with a prong engageable with an opening in said member for holding said lamp and said support in position in the member and with another prong for electrically connecting one of said contact terminals with one terminal of the lamp and with one terminal of the cartridge fuse.

5. A dead front cartridge fuse holder and indicator for a cartridge fuse comprising in combination a base of insulating material having a recess therein, a pair of contact terminals in said recess in said base, a removable insulating

member for removably retaining a cartridge fuse within the recess of said base and in series with said contact terminals, an indicating circuit including a lamp contained in said removable member and visible outside thereof, a support for said lamp mounted within said member for movement relatively thereto and adapted to assume various positions in dependence on variations in the size of said lamp, spring means engaging said support for taking care of variations in asid lamp size, and means for holding said lamp, said spring means and said support in position in said member including a conducting member detachably mounted within said insulating member for electrically interconnecting one of said contact terminals with one terminal of the lamp and with one terminal of the cartridge fuse.

6. A dead front cartridge fuse holder comprising in combination a base of insulating material having a recess therein, a pair of contact terminals in said recess in said base, a removable insulating member for removably retaining a cartridge fuse within the recess of said base and in series with said contact terminals, a lamp within said member, a support for said lamp mounted within said member and slidably positioned in a groove formed therein, and means for holding said support in position in said member including a conducting member detachably mounted within said insulating member for electrically interconnecting one of said contact terminals with one terminal of the lamp and with one terminal of the cartridge fuse.

7. A dead front cartridge fuse holder and indicator for a cartridge fuse comprising in combination a base of insulating material having a recess therein, a pair of contact terminals in said recess in said base, a removable insulating member for removably retaining a cartridge fuse within the recess of said base and in series with said contact terminals, an indicating circuit including a lamp contained in said member and visible outside thereof, said lamp being arranged so that its longitudinal axis is parallel with the longitudinal axis of said member, a support for said lamp mounted within said member for movement relatively thereto, means for holding said lamp and said support in position in said member including a conducting member detachably mounted within said insulating member for connecting or disconnecting said indicating circuit and said terminals by mere rotation of said member.

8. A dead front cartridge fuse holder comprising in combination a base of insulating material having a recess therein, a pair of contact terminals in said recess in said base, a removable insulating member for removably retaining a cartridge fuse within the recess of said base and in series with said contact terminals, a lamp within said member, a support for said lamp mounted within said member for movement relatively thereto, means for holding said support in position in said member including a conducting member detachably mounted within said insulating member for electrically interconnecting one of said contact terminals with one terminal of the lamp and with one terminal of the cartridge fuse, and means for effectively locking said insulating member to said base to prevent jarring or vibration from causing release of the member.

9. A dead front cartridge fuse holder comprising in combination a base of insulating material having a recess therein, a pair of contact terminals in said recess in said base, a removable

insulating member for removably retaining a cartridge fuse within the recess of said base and in series with said contact terminals, a lamp within said member, a support for said lamp mounted within said member for movement relatively thereto, means for holding said support in position in said member, and means including a portion of said holding means for effectively locking said member to said base to prevent jarring or vibration from causing release of the member.

10. A dead front cartridge fuse holder and indicator for a cartridge fuse comprising in combination a base of insulating material having a recess therein, a pair of contact terminals in said recess in said base, a removable insulating member for removably retaining a cartridge fuse within the recess of said base and in series with said contact terminals, an indicating circuit including a lamp contained in said member and visible outside thereof, a support for said lamp mounted within said member for movement relatively thereto and adapted to assume various positions in dependence on variations in the size of said lamp, spring means engaging said support for taking care of variations in said lamp size, conducting means for holding said lamp and said support in position in said member, a first contact integrally formed with said conducting means, a second contact supported in said base and connected to one of said contact terminals, means for causing engagement of said first and second contacts, and means associated with one of said contacts for locking said removable member to said base to prevent jarring or vibration from causing disengagement of said first and second contacts.

11. A dead front cartridge fuse holder and indicator for a cartridge fuse comprising in combination a base of insulating material having a threaded recess therein, a pair of contact terminals in said recess in said base, a removable insulating member including a threaded portion for removably retaining a cartridge fuse within the recess of said base and in series with said contact terminals, an indicating circuit including a lamp in said member, a support for said lamp mounted within said member for movement relatively thereto, and means for connecting and disconnecting said indicating circuit and said terminals merely by rotating said member including cooperating conducting means respectively mounted in said member and said base, the means mounted in said member being constructed and arranged to maintain the position of said support.

12. A dead front cartridge fuse holder and indicator for a cartridge fuse comprising in combination a base of insulating material having a recess therein, a pair of contact terminals in said recess in said base, a removable insulating member for removably retaining a fuse within the recess of said base and in series with said contact terminals, an indicating circuit including a lamp contained in said member, means including a light transmitting member for causing the light from said lamp to be visible outside said member, a support for said lamp mounted within said member for movement relatively thereto, conducting means for holding said lamp and said support in position in said member, a first contact integrally formed with said conducting means, a second contact supported in said base and connected to one of said contact terminals,

and means for causing engagement of said first and second contacts.

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