Oct. 2, 1945. A. H. POWELL 2,386,060

FUSE UNIT

Filed Oct. 29, 1942 2 Sheets-Sheet 1

Fig. 2.

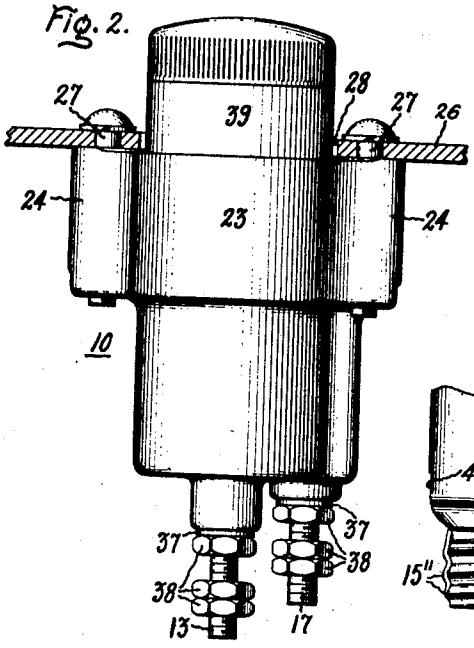


Fig. 4.

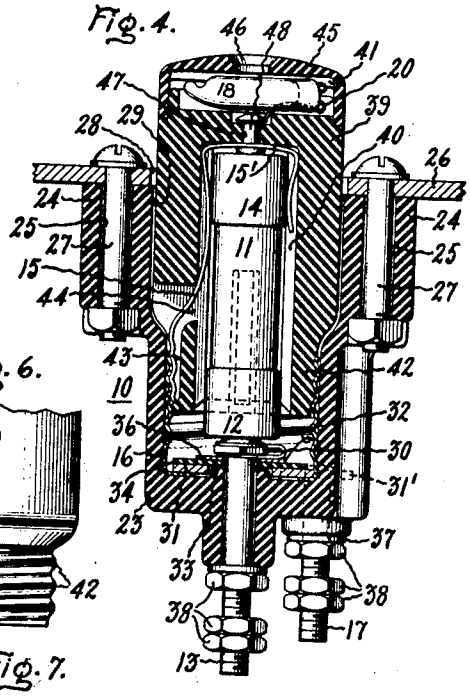


Fig. 6.

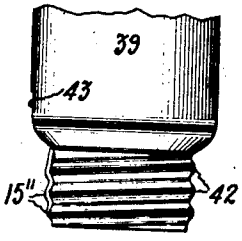


Fig. 7.

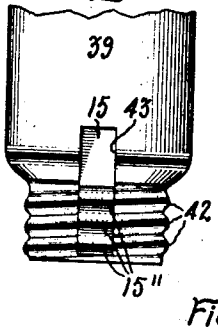


Fig. 3.

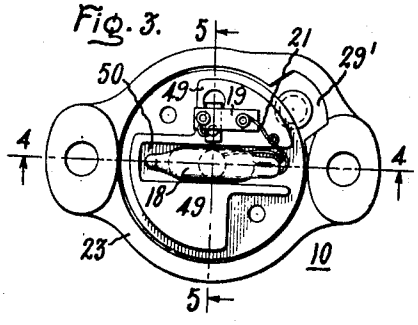


Fig. 8.

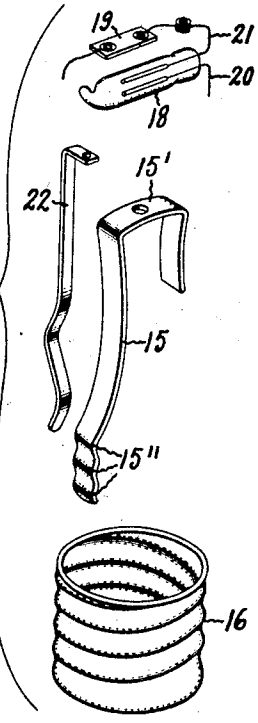


Fig. 5.

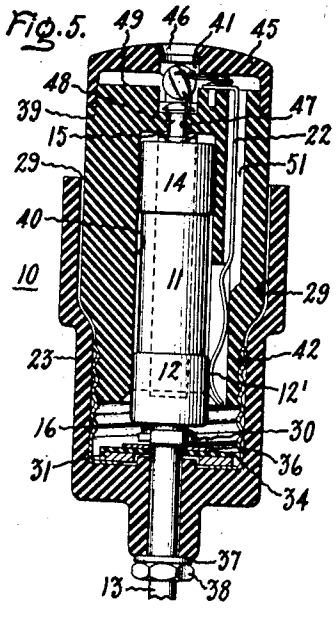
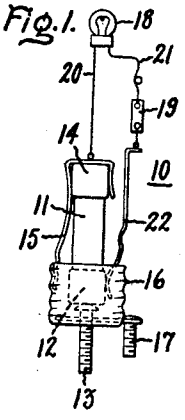


Fig. 1.



Inventor:
Alric H. Powell,
by Harry E. Burham
His Attorney.

Oct. 2, 1945. A. H. POWELL 2,386,060

FUSE UNIT

Filed Oct. 29, 1942 2 Sheets-Sheet 2

Fig. 9.

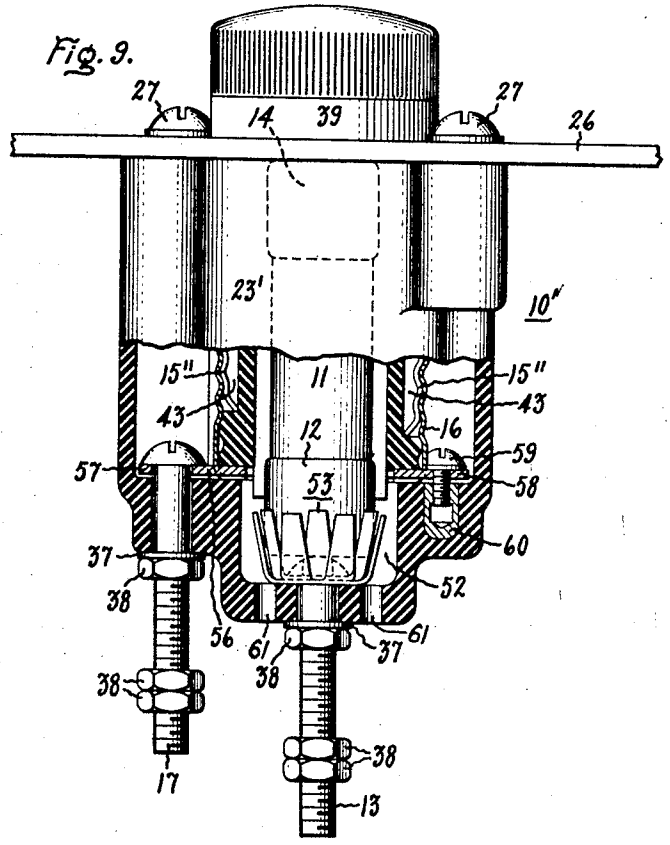
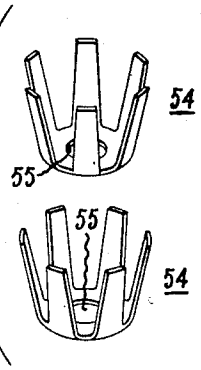


Fig. 10.



Inventor:
Alric H. Powell,
by Harry E. Dunham
His Attorney.

Patented Oct. 2, 1945

2,386,060

UNITED STATES PATENT OFFICE

2,386,060

FUSE UNIT

Alric H. Powell, Yeadon, Pa., assignor to General Electric Company, a corporation of New York

Application October 29, 1942, Serial No. 463,752

17 Claims. (Cl. 200—129)

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.

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.

It is an object of my invention therefore, to provide a new and improved fuse unit which is attractive in appearance, requires less panel space than conventional fuse units used heretofore, which eliminates the requirement of a fuse block, and furthermore provides a dead front construction.

It is another object of my invention to provide an indicating type of fuse unit which is relatively inexpensive and which improves the interrupting capacity of the fuses used therewith.

Still another object of my invention is to provide a new and improved dead front indicating fuse unit which 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 drawings in which Fig. 1 is a schematic diagram illustrating the electric circuit of the fuse unit of my invention; Fig. 2 is an exterior view of the fuse unit supported from a panel; Fig. 3 is a top view of the fuse unit of Fig. 2 with the cover over the indicating lamp removed; Fig. 4 is a sectional view of the complete fuse unit taken on line 4—4 of Fig. 3; Fig. 5 is a similar sectional view taken on line 5—5 of Fig. 3; Figs. 6 and 7 are partial views of the fuse unit in order to illustrate the locking features provided thereon, Fig. 8 is an exploded view of the conducting parts of the fuse unit; Fig. 9 is a view partly in section of a modification of the fuse unit of my invention; and Fig. 10 is an exploded view of a portion of the fuse unit of Fig. 9.

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 drawings, I have illustrated the electrical circuit of the fuse unit generally indicated at 10 which includes a conventional cartridge fuse 11 having one terminal 12 thereof electrically connected to terminal 13 of the fuse unit. The upper terminal 14 of the fuse is electrically connected by means of a conducting member 15 to be described in greater detail hereinafter to a conventional threaded shell 16 which in turn is electrically connected to the other terminal 17 of the fuse unit. As best shown in Fig. 8, the conducting shell 16 is very similar to the threaded shells used in connection with the ordinary, well-known lamp sockets. In order to indicate the operating condition of the fuse 11, an indicating circuit is connected in parallel therewith which comprises a lamp schematically indicated at 18, serially connected with a resistor 19. Suitable conductors 20, 21 and 22 complete the circuit between the fuse 11, lamp 18 and resistor 19. The general arrangement of the electrical circuit of Fig. 1 is well known and the resistor 19 provides sufficient impedance in the indicator circuit including lamp 18 so that when fuse 11 is in the unblown condition, the current flowing in the indicator circuit is insufficient to light lamp 18. However, upon rupture of fuse 11 the potential across the indicating circuit increases sufficiently to cause lamp 18 to be lighted and readily indicate to the operator that replacement of fuse 11 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.

The fuse unit embodying my invention as shown in Fig. 2 comprises a block or base of insulating material 23 which is provided with ears 24 containing openings 25 therein by means of which base 23 may be suitably bolted or fastened to a panel, such as is indicated at 26, as by screws 27. Although in Figs. 2, 4, and 5 the fuse unit is indicated as mounted on a horizontal panel 26, it should be understood that as a practical matter this fuse unit would be mounted on a vertical panel for purposes which will become apparent hereinafter. The panel 26 is preferably a metal panel which would be grounded in a normal installation and insulating base 23 would therefore be mounted on the back of the panel which would have an opening 28 therein which cooperates with a recess 29 formed in insulating base 23.

At one end of insulating base 23 remote from panel 26 is provided a pair of terminals 13 and 17 as indicated in Fig. 1, the terminal 13 extending up through the center of insulating base 23 and terminating in a spring biased fuse contact 30 within recess 29. Fuse contact 30 is very similar in structure to the conventional center terminal found in the ordinary incandescent lamp socket. Terminal 17 on the other hand, enters base 23 at one side thereof and as best shown in Fig. 3, ex-

tends into a groove 29' which is an extension of recess 29. Terminal 17 is electrically connected to a washer 31 having an ear or extension 31' which extends into groove 29'. The shell 16 which is threaded in the manner of an ordinary lamp socket has a suitable cut-away portion indicated at 32 in Fig. 4 to permit insertion of washer 31 which has the extension 31' thereof welded or otherwise fastened to terminal 17. The groove or recess extension 29' enables ready assembly of washer 31 and terminal 17 within the insulating base 23 which is constructed as a unitary structure of molded material or the like. Since terminal 13 extends through a central opening 33 in washer 31, a suitable insulating washer 34 of mica or the like is interposed between washer 31 and central spring contact 30. If desired, a suitable conducting washer 36 may be provided on the upper side of insulating washer 34. The assembly of the terminals 13 and 17 and the associated fuse terminals which comprise spring contact 30 and the conducting shell 16 may readily be accomplished in the following manner. Washer 31 having an extension or ear 31' which is welded or otherwise suitably connected to terminal 17 is first inserted through the opening 32 in shell 16, after which this unit is put into position in recess 29 with the groove 29' permitting ready positioning of the conducting members. Thereafter insulating washer 34, conducting washer 36, and terminal 13 to which spring biased center contact 30 is electrically connected are moved into position. Terminals 13 and 17 are suitably threaded so that they may be provided with lock washers 37 and nuts 38, both for holding them in position on insulating base 23 as well as to enable external electrical connections to be made therewith which will be obvious from Figs. 2 and 4.

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 a removable insulating member 39 which includes a first or fuse receiving chamber 40 therein and a second chamber 41 spaced from the first chamber 40 for housing the leak resistor 19 and the lamp 18 described above. Insulating member 39 is generally cylindrical in construction and is adapted to fit into recess 29. The portion of insulating member 39 extending out of recess 29 is in effect a manually operable knob. However, one end of insulating member 39 is somewhat reduced in diameter and is provided with a threaded portion including threads 42 for threadedly engaging the shell 16 to hold the insulating member 39 in the position indicated in Figs. 2, 4, and 5. The threaded portion 42 of insulating member 39 is provided with a narrow slot or recess 43 best shown in Figs. 4 and 7 which slot or recess is connected by an opening 44 (see Fig. 4) with fuse receiving chamber 40. Conducting member 15 which was mentioned in connection with Fig. 1, is provided with a U-shaped end 15' which extends into the upper part of fuse receiving chamber 40 with reference to Fig. 4. This U-shaped portion 15' is adapted to engage the terminal 14 of fuse 11. The other end of conducting member 15 is provided with deformed ridges or corrugations 15'' so that when conducting member 15 is in the position indicated in Figs. 4, 6, and 7 the end of conducting member 15 having the corrugations 15'' fits into narrow slot 43. The corrugations or deformed ridges 15'' are perpendicular to the long dimension of conducting member 15 so that as best shown in Fig. 7 they do not line up perfectly with the threads 42 on the threaded portion of insulating member 39. This misalignment of the deformed ridges or corrugations 15'' of conducting member 15 with respect to the threads 42 of the threaded portion provides a suitable locking means to hold insulating member 39 in threaded engagement with shell 16 so that shock and vibration will not cause its release. In addition as best shown in Figs. 4 and 6 the resiliency of conducting member 15 is such that the corrugated portion 15'' tends to raise out of narrow slot or recess 43. However, when the insulating member 39 has the threaded portion 42 thereof engaged with threaded shell 16, the corrugated end of conducting member 15 is forced into slot 43 and consequently good contact between conducting member 15 and shell 16 is assured, partly due to the resilience of the conducting member 15 and partly due to the misalignment of the threads of the threaded portion 42 with the deformed ridges or corrugations 15''. In addition, the forcing of the corrugated end of conductor 15 into narrow slot or recess 43 by virtue of the shape of conducting member 15 best shown in Fig. 8, causes the U-shaped end 15' to grip upper terminal 14 of fuse 11, thereby providing an improved contact between terminal 14 of fuse 11 and shell 16 and consequently terminal 17 of fuse unit 10. It should be understood that although only one conducting member 15 has been shown, in certain applications where high currents are encountered, a plurality of such conducting members may be provided as is shown in Fig. 9.

The fuse receiving chamber 40 is so designed that when fuse 11 is inserted therein so as to have the terminal 14 thereof gripped by the U-shaped end 15' of conducting member 15 and the insulating member 39 is threadedly engaged with shell 16, the lower terminal 12 of the fuse is forced into intimate current conducting engagement with spring biased contact 30 of insulating base 23.

The second or lamp receiving chamber 41 is accessible through removal of a cover 45 which is secured to the end of insulating member 39 opposite the threaded portion thereof. The cover 45 includes an opening 46 therein through which lamp 18 is readily discernible. A suitable opening 47 is provided between fuse receiving chamber 40 and the chamber 41 through which electrical connection between conducting member 15 and the indicating circuit is made. As illustrated in the drawings a suitable rivet 48 is fastened to the U-shaped end 15' of conducting member 15 and extends through opening 47 into the second chamber 41 wherein rivet 48 is electrically connected to conductor 20 which in turn is connected to one terminal of lamp 18.

In order to properly position lamp 18 in chamber 41 insulating member 39 is provided with raised portions 49 extending into chamber 41 which define a suitable recess 50 therebetween of such size as to accommodate indicating lamp 18. Indicating lamp 18 is preferably a glow lamp of the type containing a mixture of inert gases such as a neon lamp or the like. Resistor 19 is mounted on one of the raised portions 49 and has one end thereof electrically connected with the other terminal of lamp 18 as by conductor 21, while the other terminal of resistor 19 is connected to conducting member 22 which extends down through insulating housing 39 through an elongated opening 51 therein and into

fuse receiving chamber 40 so as to electrically engage terminal 12 of fuse 11 as indicated at 12' in Fig. 5.

Whenever the fuse 11 is in good current conducting condition a very low potential will be impressed across the parallel indicating circuit including lamp 18 and resistor 19 so that lamp 18 will not be lighted. On the other hand, as soon as the fusible element of fuse 11 is ruptured, the potential across the indicating circuit is increased so that lamp 18 indicates to the operator through opening 46 that a new fuse is required.

With the arrangement described a dead front construction is provided so that there is no danger to an operator that contact with a live circuit can be made. Furthermore, the condition of the fuse is clearly indicated to the operator at all times. Also by virtue of the fact that the fuse 11 is completely housed within base 23 of insulating member 29 the interrupting capacity thereof is considerably increased due to the smothering action of the housing. A fuse, according to some standards is considered to satisfactorily interrupt a circuit if it is not blown apart in this process, and will not cause inflammable material closely adjacent thereto to ignite. It is obvious that with applicant's improved arrangement therefore the interrupting capacity of the fuse units according to these standards is greatly increased with less danger to an operator due to flying fuse parts. The fuse may also be replaced without any danger to the operator merely by unscrewing insulating member 39 which then entirely disconnects the fuse from the associated electric circuit. In addition to the advantages enumerated above my new and improved fuse unit presents a pleasing appearance on a control panel as contrasted with the conventional fuse block used heretofore, and not only requires considerably less panel space as was mentioned above, but actually saves material. Furthermore, the locking feature described above makes this fuse unit especially desirable where it might be subjected to shock and vibration.

When larger currents are to be carried by the fuse, it may be necessary to use cartridge fuses having greater external dimensions and accordingly the base and insulating member of the fuse unit must be increased in size and also the current conducting parts may require somewhat different construction. In Fig. 9 I have illustrated a fuse unit for accommodating a fuse for carrying and interrupting considerably large currents than the fuse of Fig. 4. The corresponding parts of Fig. 9 are designated by the same reference numerals as in Figs. 1 to 8. The base indicated at 23' is provided with an enlargement forming a contact chamber 52 below shell 16. In order to satisfactorily carry the larger currents the lower fuse contact illustrated generally at 53 comprises two multi-legged conducting members 54 each having an opening 55 therein to accommodate the screw which forms the center terminal 13 of the fuse unit 10'. These multi-legged members 54 are nested together with the legs of one member out of alignment with the legs of the other so that effectively a single multi-legged member having twice as many legs as each of the members 54 is produced. The legs of the contact engage lower fuse terminal 12 to produce a good electrical connection therebetween. With this construction a much more resilient contact is provided with more legs or contact fingers which can be constructed of thinner material.

Shell 16 is larger in size than the corresponding member of Fig. 4 and as indicated in Fig. 9 is held in position by a washer 56 having bars or extensions 57 and 58. The extension 57 is electrically connected to the screw forming terminal 17 which also holds washer 56 in position. To further hold washer 56 in postion a screw 59 passes through extension 58 and is threadedly engaged with a nut 60 embedded in a recess in base 23'. Also in order to permit the escape of gases from the fuse chamber, I provide suitable openings 61 in the base 23'. These openings 61 vent the gases produced during circuit interruption and also provide ventilation during normal operation. They may also be provided in the fuse unit 10 of Fig. 2 if desired.

As was mentioned above in connection with Figs. 1 to 8, two conducting members 15 are provided in Fig. 9 only the ends having corrugations 15'' being visible in the drawings. By using two such members larger currents can of course be carried and the locking feature is improved since two locking members are correspondingly provided.

While I have shown and described certain particular embodiments of my invention, I do not desire my invention to be limited to the construction shown and described for it will of course be obvious that changes may be made without departing from my invention. 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 fuse unit comprising a base of insulating material including a recess therein, a pair of terminals in said recess, one of said terminals comprising a threaded shell, an insulating member having a threaded portion for threadedly engaging said shell, said insulating member having a fuse receiving chamber adapted to house a fuse therein, said insulating member being so constructed and arranged that when said fuse is in said chamber and said insulating member is threadedly engaged with said shell in said base that one end of said fuse is electrically connected with said other terminal, and means for electrically connecting the other end of said fuse with said shell, said last mentioned means serving to lock said insulating member and said fuse in position so that shock or vibration will not cause its release.

2. A fuse unit comprising a base of insulating material including a recess therein, a pair of terminals in said recess, one of said terminals comprising a threaded shell, an insulating member having a threaded portion of insulating material for threadedly engaging said shell, said insulating member having a fuse receiving chamber, a fuse housed in said chamber, said insulating member being so constructed and arranged that when said fuse is in said chamber and said insulating member is threadedly engaged with said shell in said base that one end of said fuse is electrically connected with said other terminal, means for electrically connecting the other end of said fuse with said shell, a second chamber in said insulating member, means mounted in said second chamber for indicating the blown condition of said fuse, and means for connecting said fuse across said terminals by rotating said insulating member.

3. In combination, a base of insulating material including a terminal comprising a threaded shell associated therewith, an insulating member having a threaded portion for threadedly engaging said shell, said threaded portion including a short discontinuous section, and a conducting member for electrically connecting said shell with another member and having ridges at one end thereof, said conducting member being adapted to have said ridges complete the discontinuous section of said threaded portion with said ridges somewhat out of alignment with the threads on said threaded portion so as to lock said insulating member in position against shock or vibration.

4. A fuse unit comprising a base of insulating material, a recess in said base, a pair of terminals mounted in said recess, one of said terminals comprising a threaded shell, an insulating member having a threaded portion for threadedly engaging said shell, said threaded portion including a short discontinuous section, a fuse-receiving chamber in said insulating member, a fuse housed in said chamber, said insulating member being so constructed and arranged that when said fuse is in said chamber and said insulating member is threadedly engaged with said shell in said base that one end of said fuse is electrically connected with said other terminal, a conducting member for electrically connecting the other end of said fuse with said shell and having deformed ridges at one end thereof, the ridges on said conducting member being adapted to complete the discontinuous section of said threaded portion with said ridges somewhat out of alignment with the threads on said threaded shell so as to effectively lock said insulating member and fuse in position against shock or vibration.

5. A fuse unit comprising a base of insulating material, a recess in said base, a pair of terminals mounted in said recess, one of said terminals comprising a threaded shell, an insulating member having a threaded portion for threadedly engaging said shell, a narrow slot in said insulating member transverse to the threads so as to form a discontinuous section of said threaded portion, said insulating member having a fuse-receiving chamber, a fuse housed in said chamber, said insulating member being so constructed and arranged that when said fuse is in said chamber and said insulating member is threadedly engaged with said shell in said base that one end of said fuse is electrically connected with said other terminal, and a conducting member for electrically connecting the other end of said fuse with said shell arranged to fit into said slot, one end of said conducting member having corrugations so that when said conducting member is in said slot said corrugations substantially complete the discontinuous section of said threaded portion but are out of alignment with the threads on said threaded shell so as to lock said insulating member and fuse in position against shock or vibration.

6. In combination, a base of insulating material, including a terminal comprising a threaded shell associated therewith, an insulating member having a threaded portion for threadedly engaging said shell, a narrow slot in said insulating member transverse to the threads so as to form a discontinuous section of said threaded portion, and a conducting member for electrically connecting said shell with another member and arranged to fit in said slot, one end of said conducting member having deformed ridges so that when said conducting member is in said slot said ridges complete the discontinuous section of said threaded portion with said ridges somewhat out of alignment with the threads on said threaded portion so as to lock said insulating member in position against shock or vibration.

7. A fuse unit comprising a base of insulating material, a recess in said base, a pair of terminals mounted in said recess, one of said terminals comprising a threaded shell, an insulating member having a threaded portion for threadedly engaging said shell, a narrow slot in said insulating member transverse to said threads so as to form a discontinuous section of said threaded portion, said insulating member having a fuse-receiving chamber, a fuse housed in said chamber, said insulating member being so constructed and arranged that when said fuse is in said chamber and said insulating member is threadedly engaged with said shell in said base that one end of said fuse is electrically connected with said other terminal, and a conducting member having a U-shaped end for electrically engaging the other end of said fuse, the other end of said conducting member being adapted to fit into said slot, said conducting member having sufficient resilience to cause said other end thereof to raise out of said slot and electrically contact said shell when said insulating member is threadedly engaged with said shell and to be pressed into said slot so that said U-shaped end tightly grips said other end of said fuse.

8. A fuse unit comprising a base of insulating material including a recess therein, a pair of terminals in said recess, one of said terminals comprising a threaded shell, said other terminal comprising a resilient contact including a plurality of multi-legged conducting members nested together, an insulating member having a threaded portion for threadedly engaging said shell, said insulating member having a chamber adapted to house a fuse member so that when said insulating member is threadedly engaged with said shell in said base said fuse member has one end thereof in electrical engagement with said other terminal, and means for electrically connecting said other end of said fuse member with said shell, said last mentioned means being so constructed and arranged with respect to said insulating member and said shell to lock said insulating member in position so that shock and vibration will not cause its release.

9. A fuse unit comprising a base of insulating material, a recess in said base, a pair of terminals mounted in said recess, one of said terminals comprising a resilient contact including a plurality of multi-legged conducting members nested together, an insulating member, means for mounting said insulating member in said recess, said insulating member having a fuse-receiving chamber adapted to receive a fuse, said insulating member being so constructed and arranged that when a fuse is housed in said chamber and said insulating member is mounted in said recess in said base that one end of said fuse is electrically connected with said one terminal, and a conducting member for electrically connecting the other end of said fuse with said other terminal.

10. A fuse unit comprising a base of insulating material, a recess in said base, a pair of terminals mounted in said recess, one of said terminals comprising a resilient contact including a pair of multi-legged conducting members nested together with the legs of one member axially displaced from the legs of the other member, an insulating member, means for mounting said insulating

member in said recess, said insulating member having a fuse-receiving chamber adapted to receive a fuse, said insulating member being so constructed and arranged that when a fuse is housed in said chamber and said insulating member is mounted in said recess in said base that one end of said fuse is electrically connected with said one terminal, and a conducting member for electrically connecting the other end of said fuse with said other terminal.

11. A fuse unit comprising a base of insulating material, a recess in said base, a pair of terminals mounted in said recess, an insulating member, threaded means for mounting said insulating member in said recess, said insulating member having a fuse-receiving chamber adapted to receive a fuse, said insulating member being so constructed and arranged that when a fuse is housed in said chamber and said insulating member is mounted in said recess in said base that one end of said fuse is electrically connected with one of said terminals, a conducting member for electrically connecting the other end of said fuse with said other terminal, means for indicating the blown condition of said fuse, comprising an indicating circuit including a lamp and serially arranged resistor, a second chamber in said insulating member for housing said lamp and resistor, and means including said first mentioned means for locking said insulating member in position in said base so that shock and vibration will not cause its release.

12. A dead front cartridge fuse holder and indicator for the cartridge fuse held therein comprising in combination a panel board, a block having a recess therein secured to one face of said panel board, a pair of contact terminals leading into said recess in said block, a cartridge fuse retainer for removably retaining the cartridge fuse thereof within the recess of said block and in series with said contact terminals, a lamp for indicating rupture of the cartridge fuse, said lamp at times being visible from the opposite side of said panel board from that to which said block is secured, a leak resistor in series with the terminals of said lamp, and means for connecting said lamp and leak resistor in series with said contact terminals, but in parallel with the cartridge fuse when retained in contact with said contact terminals.

13. A dead front fuse holder and indicator for the fuse held therein comprising in combination a panel board having an opening therein, a block having a recess therein secured to one side of said panel board, a pair of contact terminals connected to said block, a fuse retainer insertable through the opening within said panel board and removably seated within the recess of said block, one end of said fuse retainer projecting from the opposite side of said panel board from that to which said block is secured when seated within the recess of said block, means for connecting the fuse in series with said contact terminals when the fuse retainer is inserted within the recess of said block, a lamp for indicating rupture of the fuse and visible at times from the projected end of said fuse retainer, a leak resistor connected in series with the terminals of said lamp, said lamp and leak resistor being arranged in parallel with the fuse and in series with said contact terminals.

14. A dead front fuse holder and indicator for the fuse held therein comprising in combination a panel board having an opening therein, a block having a recess therein, a pair of contact terminals leading within the recess of said block, means for attaching said block to one face of said panel board, a fuse retainer insertable through the opening within said panel board for retaining the fuse thereof within the recess of said block and in series with said contact terminals, one end of said fuse retainer projecting from the opposite face of said panel board to which said block is attached when the fuse thereof is retained in series with said contact terminals, a lamp and leak resistor connected in series and arranged within the projected end of said fuse retainer whereby the lamp may at times be visible from said projected end of said fuse retainer and means for detachably connecting said lamp and resistor in series with said contact terminals but in parallel with the fuse when the latter is retained in series with said contact terminals.

15. A dead front fuse holder and indicator for the fuse held therein comprising in combination a block having a recess therein, a pair of contact terminals extending within the recess of said block, a fuse retainer, a knob whereby said fuse retainer may be manually inserted within the recess of said block for retaining the fuse thereof in series with said contact terminals, a lamp for indicating the rupture of the fuse mounted within said knob and visible at times therefrom, a leak resistor connected in series with the terminals of said lamp, conductors carried by said fuse retainer and connected in series with said lamp and leak resistor and a detachable connection between said conductors and said contact terminals whereby said lamp and leak resistor may be connected in series with said contact terminals and in parallel to the fuse when the fuse retainer is inserted within the recess of said block.

16. A fuse unit comprising a base of insulating material for retaining a cartridge fuse, a pair of contact terminals supported by said base, a manually operable knob, a lamp for indicating rupture of the cartridge fuse mounted within said knob and visible at times from said knob, a leak resistor in series with the terminals of said lamp, contact members controllable by said knob and means whereby when said knob is in one position said contact members will cause the cartridge fuse lamp and leak resistor to be electrically connected in series with said contact terminals, but the lamp and leak resistor in parallel with the cartridge fuse.

17. A dead front cartridge fuse holder and indicator for the cartridge fuse held thereby comprising in combination a panel board, a block secured to one face of said panel board, a pair of contact terminals carried by said block, a cartridge fuse removably retained within said block and in series with said contact terminals, a knob extending from the opposite face of said panel board, a lamp for indicating rupture of the cartridge fuse mounted within said knob, said lamp being at times visible from the opposite side of said panel board from that to which said block is secured, a leak resistor in series with the terminals of said lamp, and means for connecting said lamp and leak resistor in series with said contact terminals, but in parallel with the cartridge fuse when retained in contact with said contact terminals.

ALRIC H. POWELL.