

Aug. 26, 1947.

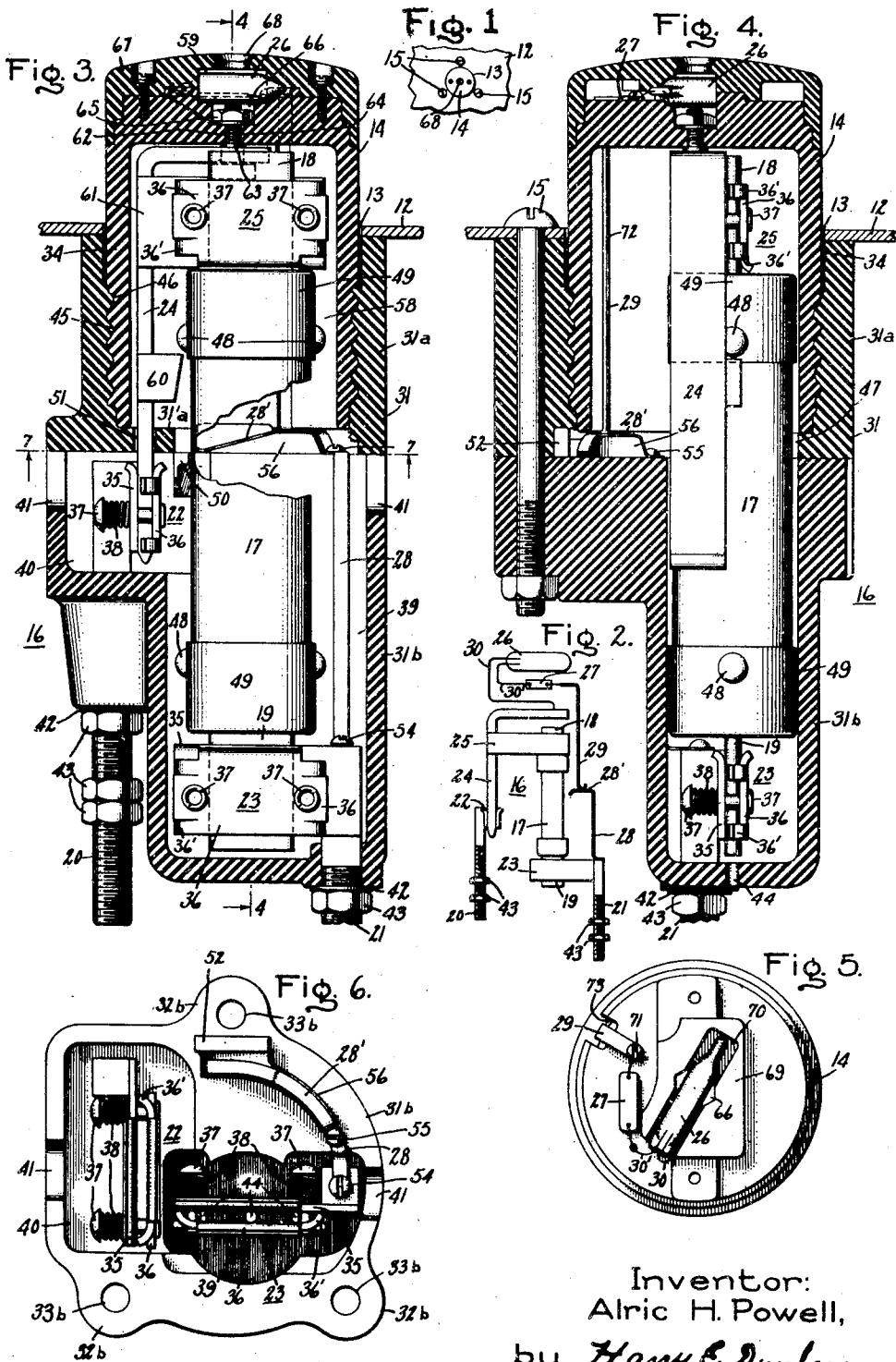
A. H. POWELL

2,426,468

FUSE UNIT

Filed Dec. 8, 1943

2 Sheets-Sheet 1



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

Aug. 26, 1947.

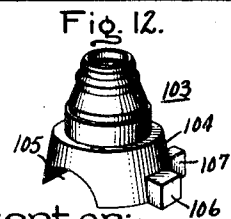
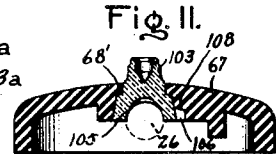
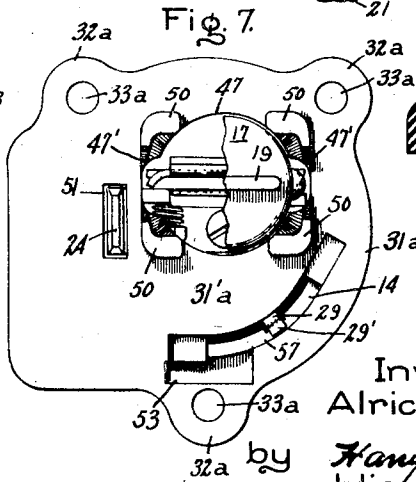
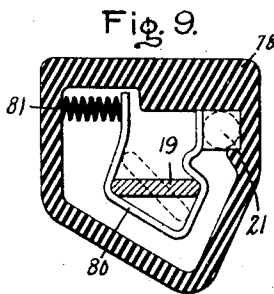
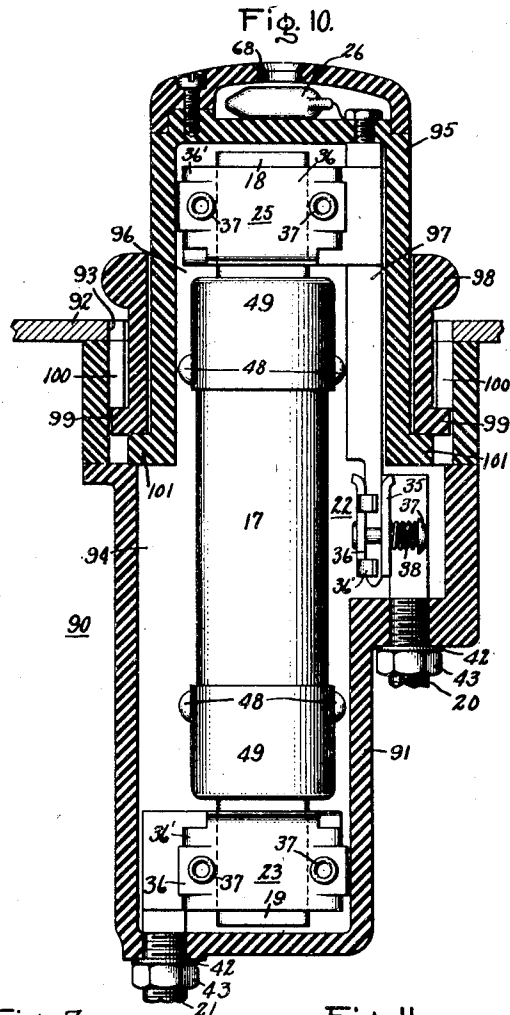
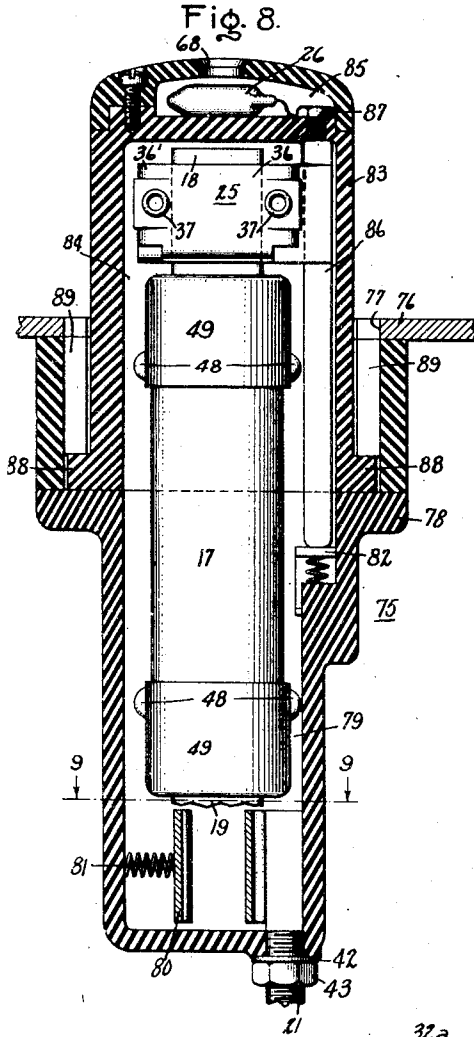
A. H. POWELL

2,426,468

FUSE UNIT

Filed Dec. 8, 1943

2 Sheets-Sheet 2



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

UNITED STATES PATENT OFFICE

2,426,468

FUSE UNIT

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

Application December 8, 1943, Serial No. 513,391

18 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.

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. In my copending application Serial No. 463,752, filed October 29, 1942, on which Letters Patent 2,386,060 was granted October 2, 1945, there is disclosed and claimed a new and improved fuse unit which has numerous advantages over the conventional fuse units used heretofore. This fuse unit accommodates cartridge fuses of the type in which the cylindrical ferrules provide the contacts for the cartridge fuse. As a general rule cartridge fuses having current ratings of more than 60 amperes are provided with blade-type contacts.

It is an object of my invention to provide for cartridge fuses having blade-type contacts, a fuse unit which is attractive in appearance, requires less panel space than conventional fuse units used heretofore, and 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 fuse unit for cartridge fuses of the blade contact type 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 fuse unit for cartridge fuses having blade type contacts in which the fuse is moved longitudinally into position merely by rotating a portion of the fuse 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 front view of a portion of a vertically mounted electric panel or switchboard upon which the fuse unit of my invention is mounted; Fig. 2 is a schematic diagram illustrating the electric circuit of the fuse unit of my invention; Fig. 3 is a sectional view of the com-

2

plete fuse unit with the fuse in place, although with a certain portion thereof broken away; Fig. 4 is a sectional view through the casing of the fuse unit of my invention taken on line 4-4 of Fig. 3; Fig. 5 is a view of a portion of the fuse unit of Fig. 3 with the cover over the indicating lamp removed; Fig. 6 is a view looking into a portion of the base of the fuse unit of my invention with the cartridge fuse removed therefrom; Fig. 7 is a view taken on line 7-7 of Fig. 3 with the cartridge fuse and contacts therefor shown in full; Fig. 8 is a sectional view similar to Fig. 3 of a modification of the fuse unit of my invention; Fig. 9 is a sectional view taken on line 9-9 of Fig. 8; Fig. 10 is a view partly in section similar to Fig. 3 of still another modification of the fuse unit of my invention; Fig. 11 is a sectional view illustrating a further modification of my invention, and Fig. 12 is a perspective view of a portion of the fuse device shown in Fig. 11.

Referring now to Fig. 1 of the drawings, there is illustrated a portion of a vertically mounted electric panel or switchboard 12 having an opening 13 therein through which protrudes a removable insulating member 14 which forms a part of the dead front fuse unit of my invention. This fuse unit is suitably bolted to the panel as by means of bolts 15, also shown in Fig. 4. It will be obvious from Fig. 1 that the fuse unit of my invention which is usually mounted on a vertical panel, has a very pleasing appearance from the front of the panel and as will become apparent from the following description, requires a relatively small amount of panel space.

In the schematic diagram of Fig. 2 of the drawings there is illustrated the electrical circuit of the fuse unit of my invention. The corresponding parts of Fig. 2 are designated by the same reference numerals as in Figs. 1-7 of the drawings. The electrical fuse unit generally indicated as 16 includes a cartridge fuse 17, having blade contacts 18 and 19, respectively. The blade contact 18 is electrically connected to terminal 20 of the fuse unit, while blade contact 19 of fuse 17 is electrically connected to the terminal 21 of the fuse unit. The terminals 20 and 21 have associated therewith suitable female type contacts 22 and 23, respectively, which will be described in greater detail hereinafter. A conductor 24 interconnects the terminal 20 of the fuse unit 16 and the blade contact 18 of the fuse 17 which terminates in a female type contact 25, identical with contacts 22 and 23, for engaging the blade contact 18. In order to indicate the operating condition of the fuse 17 an indicating

3

circuit is connected in parallel therewith which comprises a lamp schematically indicated at 26 serially connected with a resistor 27. Suitable conductors 28, 29, 30 and 30' complete the indicating circuit and also provide the means for connecting it across the contacts of the fuse 17.

The general arrangement of the indicating circuit of Fig. 2 is well known. The resistor 27 provides sufficient impedance to limit the current flowing through the indicating circuit when the voltage across this circuit rises upon rupture or blowing of the fuse 17. The lamp 26 is lighted whenever the fuse 17 is ruptured or blown to indicate to the operator that the replacement of cartridge fuse 17 is necessary. My invention is particularly concerned with the fuse unit to be described hereinafter which incorporates the general features of the indicating circuit schematically shown in Fig. 2, although certain portions of Fig. 2 have been illustrated in the preferred form embodying my invention.

The fuse unit 16 embodying my invention as shown in Figs. 3 to 7, comprises a base 31 of insulating material which comprises two separate parts 31a and 31b in order to facilitate assembly of the contacts and connections contained therein. Each of the parts 31a and 31b of the insulating base 31 is provided with three ears 32, best shown in Figs. 6 and 7, containing openings 33. These ears and openings are designated by the appropriate letter a or b to indicate whether they are a part of portion 31a or 31b. By means of bolts 15 indicated in Figs. 1 and 4 passing through the openings 33, specifically designated with the letter a or b to indicate whether the openings are in the portions 31a or 31b, in base 31 the base may be suitably bolted or fastened to a panel such as 12, having opening 13 therein. The base 31 would generally be mounted at the back of a vertical panel, such as 12, preferably formed of metal. The opening 13 in the panel would then cooperate with a recess 34 formed in the insulating base 31, this recess being specifically contained in the portion 31a of the base 31.

At the end of insulating base 31, remote from recess 34 there are provided a pair of terminals 20 and 21, as indicated in Fig. 2, the terminal 20 entering the base at one side thereof, while the terminal 21 enters the base at the other side thereof as viewed in Fig. 3. These terminals 20 and 21, respectively, terminate in spring-biased female type contacts 22 and 23. Each of these spring-biased contacts is identical and comprises a pair of punched parts 35 and 36 which are held together by rivets 37 and springs 38. The part 36 includes bent portions 36' to provide a predetermined separation between contacting parts 35 and 36. The parts 35 are suitably fastened, as by welding, to terminals 20 and 21, respectively. The spring-biased contact 23 is preferably mounted at the bottom of a deep recess 39 in the portion 31b of base 31 which accommodates a large part of the body of fuse 17, while the contact 22 is mounted considerably above the contact 23 in a recess 40 closely adjacent the portion 31a of base 31. The portion 31b of base 31 is provided with openings 41 adjacent contact 22, the purpose of which will become apparent as the following description proceeds. Terminals 20 and 21 are suitably threaded so that they may be provided with lock washers 42 and nuts 43, both for holding them in position in insulating base 31 as well as to enable external electrical connections to be made therewith which will be obvious from Figs. 2 and 3. Openings such as 44 in the lowermost

4

part of the portion 31b of base 31, as viewed in Fig. 4, are provided to permit ventilation of the recess 39.

The portion 31a of insulating base 31, also formed of insulating material, is a more or less cup-shaped element including a floor 31'a which forms the bottom of the circular recess 34 into which removable insulating member 14 may be inserted. The surfaces of the cylindrical walls of the recess are threaded as indicated at 45 to engage cooperating threads 46 on removable insulating member 14. The floor 31'a of insulating portion 31a is provided with an opening 47 best shown in Fig. 7, which is of a size to permit the fuse 17 to move freely therethrough. Since cartridge fuses of the type such as 17 are usually provided with screws or rivet heads 48 to hold the ferrule such as 49 to the fuse body, the opening 47 is provided with ear-like extensions 47' which will permit the fuse with the rivet or screw heads 48 to pass through opening 47 in a predetermined position. As a matter of fact, the ear-like extensions 47' serve as a guiding means to guide the fuse 17 in its longitudinal movement while being inserted in insulating base 31. In order to further guide the fuse while being inserted or removed a plurality of projections 50, best shown in Figs. 3 and 7, are provided which extend into the recess 39 and preferably are integrally formed with the floor 31'a of the portion 31a of base 31. These projections or extensions 50 will guide the fuse 17 in its longitudinal movement and prevent rotation thereof by engaging the rivet or screw heads 48 in the same manner that the ear-like extensions 47' of opening 47 guide the fuse. The floor 31'a is also provided with a rectangular opening 51 through which the conductor 24 extends when it engages the contact 22. As soon as the conductor 24 enters opening 51 then the fuse will be properly guided in its longitudinal movement. However, during the time that the fuse is moved from its removed position until the conductor 24 is inserted into opening 51 the ear-like extensions 47' of opening 47 and the projections 50 in cooperation with the rivet or screw heads 48 of the fuse 17 maintain the fuse in a predetermined non-rotating position during its longitudinal movement into recess 39.

In order to position portion 31a and portion 31b of base 31 during the assembly process of the fuse unit of my invention, the adjacent surfaces of these insulating portions are provided with cooperating interlocking members. As shown, the portion 31b is provided with a rectangular shaped ridge or extension 52 (Fig. 6) which is adapted to fit into a rectangular recess 53 (Fig. 7) in insulating portion 31a of base 31.

In order that the indicating circuit for the fuse unit may be connected to terminal 21 in recess 39, a ribbon-like conductor 28 is provided which is connected to terminal 21 as indicated at 54. This ribbon-like conductor 28 extends to the edge of recess 39 and is suitably fastened as by screw 55 to the surface of insulating portion 31b which is adapted to be mounted adjacent the floor 31'a of portion 31a of base 31. Also extending from this surface of portion 31b which is mounted adjacent the floor 31'a of insulating portion 31a, is a projection 56 formed integrally with the portion 31b. This projection 56 is in the form of an inclined plane, as best shown in Fig. 3, and is of somewhat circular configuration as indicated in Fig. 6. A resilient conducting member 28' is mounted along the top edge of projection 56 so that contact with conductor 29 may be made when

5

removable insulating member 14 is fully inserted in recess 34. When the insulating member 14 is removed from recess 34 the resilient conducting member 28', which is held in place by screw 55 and electrically connected to conductor 28, raises up from projection 56 thereby providing a contact wipe with conductor 29 as insulating member 14 is inserted fully in recess 34. The floor 31'a of insulating portion 31a of base 31 is provided with a narrow curved opening 57, best shown in Fig. 7, into which projection 56 extends. Projection 56 is sufficiently long so that resilient conducting member 28' extends into recess 34 so as to be electrically engaged by conductor 29, to be described hereinafter. Conductor 28' provides a contacting surface equal to about one-eighth of the circumference of insulating member 14 to insure contact with conductor 29.

In addition to the insulating base and associated terminals described thus far which serve the same function as the fuse block and terminals and the like of the prior art arrangements, my new and improved fuse unit 16 includes the removable insulating member 14 which is generally cylindrical in construction and provided with the threads 46 for threadedly engaging the threads 45 in recess 34. Removable insulating member 14 includes a first fuse-receiving chamber 58 therein and a second chamber 59 spaced from the first chamber 58 for housing the resistor 27 and the lamp 26, described above. Mounted within the fuse-receiving chamber 58 is conductor 24, described above, which is preferably an L-shaped punching having an integral interlock extension 60. The spring-biased contact 25, which may be identical with contacts 22 and 23, is preferably fastened to the L-shaped conductor 24 remote from the portion of conductor 24 which engages contact 22. Preferably the conductor 24 is provided with an integral extension 61 similar to the integral interlocking extension 60, which forms one part of the contact 25 similar to the portions 35 of contacts 22 and 23. The portion 36 of contact 25 is identical with the portion of contacts 22 and 23 marked with the same reference numerals. L-shaped conductor 24 is rotatably mounted within fuse-receiving chamber 58 by a suitable bolt 62, having a shoulder 63 thereon. This bolt passes through an opening 64 in the wall of removable insulating member 14 between the fuse-receiving chamber 58 and the second chamber 59. A hexagonal nut 65 mounted in a hexagonal recess 66 in chamber 59 completes the means for holding L-shaped conductor in fuse-receiving chamber 58. L-shaped conductor 24 is rotatable about the enlarged portion of bolt 62 formed by virtue of shoulder 63.

The second, or lamp-receiving chamber 59, is accessible through the removal of a cover 67 which is secured to the end of insulating member 14 opposite the threaded portion thereof. The cover 67 includes an opening 68 therein through which lamp 26 is readily discernible. One terminal of the lamp 26 is connected through conductor 30 to bolt 62 whereby it is electrically connected to L-shaped conductor 24 and consequently to contact 25 which engages the blade contact 18 of fuse 17.

In order to properly position lamp 26 in chamber 59 insulating member 14 is provided with a raised portion 69 (see Fig. 5) extending into chamber 59 which defines a suitable recess 70 of such a size as to accommodate indicating lamp 26. Indicating lamp 26 is preferably a glow lamp of the type containing a mixture of inert gases,

6

such as a neon lamp or the like. Resistor 27 is preferably mounted adjacent the raised portion 69 and has one end thereof electrically connected with the other terminal of the lamp, as by conductor 31, while the other terminal of resistor 27 is connected to a screw 71 suitably threaded in the wall between chambers 58 and 59, best shown in Fig. 5. Connected to screw 71 is a flat conducting ribbon 29 which is accommodated in an undercut recess 72 extending along the wall of chamber 58. This conductor passes through an opening 73 in the wall between chambers 58 and 59 and extends for the full length of the fuse receiving chamber 58 through recess 72. The end of conductor 29 remote from screw 71 is bent at right angles as indicated at 29' in Fig. 7 so as to extend over the edge of cylindrical insulating member 14 adjacent the threaded end. With this arrangement, when removable insulating member 14 is threadedly engaged with the recess 34 in base 31 the end 29' of conductor 29 electrically engages with the spring-like conductor 28' thereby connecting the indicating circuit to the blade contact 19 of fuse 17.

When removable insulating member 14 is removed from recess 34 a cartridge fuse 17 having blade contacts 18 and 19 may be inserted in fuse-receiving chamber 58 so that blade contact 18 is engaged by cooperating spring-biased contact 25. When the blade contact 18 is fully engaged with the cooperating contact 25, as indicated in Fig. 3, the interlocking projection 60 of conductor 24 engages with the rivet or screw head 48 of fuse 17 so as to prevent the fuse 17 from being readily removed from fuse-receiving chamber 58 when in engagement with contact 25. With this construction removal of the insulating member 14 will insure that cartridge fuse 17 is also removed and remains within fuse-receiving chamber 58. The removable insulating member 14 with the cartridge fuse held therein by virtue of projection 60 is inserted in the recess 34 of base 31 so that the fuse 17 extends into the recess 39. During this longitudinal movement of the fuse into recess 39 the ear-shaped extensions 47' of opening 47 and the projections 50 guide the longitudinal movement until the conductor 24 enters recess 51. The fuse may then be inserted into its conducting position so that blade contact 19 is inserted in contact 23 and conductor 24 is inserted in contact 22 by merely rotating member 14 so that threads 46 engage cooperating threads 45. This rotation of member 14 causes longitudinal movement of fuse 17 and conductor 24 without corresponding rotation of fuse 17. When the removable member 14 is fully inserted in recess 34 not only is fuse 17 connected across terminals 20 and 21, but the indicating circuit in parallel with fuse 17 is also completed between conductor 28' and conductor 29. As long as the fuse 17 is in good current conducting condition substantially no potential will be impressed across the parallel indicating circuit including lamp 26 and resistor 27 so that lamp 26 will not be lighted. As soon as the fusible element of fuse 17 is ruptured the potential across the indicating circuit is increased and lamp 26 is lighted. The lamp is visible through opening 68 so that the operator is apprised of the fact that a new fuse is required. Whenever it is desired to open the circuit, insulating member 14 is rotated and by virtue of the threaded arrangement fuse 17 is moved longitudinally to break the circuit between contact 22 and conductor 24 and between contact 23 and blade contact 19. As indicated in the drawings, the circuit is preferably broken at contact 22 and

7

the openings 41 in base 31 are provided to permit the escape of arc gases and the like. In addition to venting the arc gases during circuit interruption, the openings 41 in cooperation with the openings 44 provide ventilation for the fuse unit during normal operation.

With the arrangement described above, it is obvious that a dead front construction is provided similar to the arrangement in my copending application so that there is no danger to an operator that contact with a live circuit can be made. The fuse unit of my invention accommodates cartridge fuses having blade contacts which may be moved longitudinally into and out of position merely by rotating a portion of the fuse unit. The construction of the fuse unit furthermore permits the operator to be aware at all times of the condition of the fuse. By virtue of the fact that the fuse 17 is completely housed in my fuse unit 16, 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 furthermore does not cause inflammable material closely adjacent thereto, to ignite. It is obvious that with my improved arrangement therefor 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 14 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 or switchboard as contrasted with the conventional fuse unit used heretofore and not only requires considerably less panel space, as was mentioned above, but actually saves material.

In Fig. 8 there is illustrated a modification of my invention in which the fuse unit generally indicated at 75 also accommodates a fuse 17 having blade type contacts 18 and 19. The corresponding parts of Fig. 8 are designated by the same reference numerals as in Figs. 1 and 7. This fuse unit 75 is also adapted to be mounted on a vertical panel 76 having an opening 77 therein. An insulating base 78, which may be formed of one part if desired, is preferably illustrated as being formed of two parts to facilitate assembly of the contacts and terminals associated therewith. The terminal 21 mounted near the bottom of the recess 79 in base 78 is electrically connected to a resilient contact 80 best shown in Fig. 9. This resilient contact comprises a resilient U-shaped member having one end of the U suitably connected to terminal 21, as by welding or the like. The other end of the U is engaged by a spring 81 which tends to bias the U towards the closed position. Good electrical contact with the blade type contact 19 and contact 80 may be made by inserting the blade type contact 19 so as to assume the dotted position indicated in Fig. 9 and then rotating it in a counterclockwise direction to the position shown in full in Fig. 9 to spread the U-shaped contact 80 apart against the bias of spring 81. Near the upper end of recess 79 in base 78 there is provided a resilient contact 82 which is adapted to be connected to the other terminal 20 of the fuse unit (not shown).

Fuse unit 75 also includes a removable insulat-

8

ing member 83 including a fuse-receiving chamber 84 and a second chamber 85 similar to the chamber 59 of Fig. 3 for accommodating the indicating lamp 26, etc. A conducting member 86 is rigidly supported within fuse-receiving chamber 84 as by means of a bolt 87. This conducting member has integrally or otherwise suitably fastened thereto a contact 25 which may be identical with the contact designated by the same reference numeral in Fig. 3. This contact is adapted to receive the blade contact 18 of fuse 17. The removable insulating member 83 is generally cylindrical in construction with the chamber 84 extending to one end thereof. In order to hold the insulating member 83 in position relative to base 78 it is provided with lugs 88 which are adapted to be inserted in grooves 89 longitudinally formed in base 78. When the insulating member is longitudinally inserted into the recess formed in base 78 its longitudinal movement is guided by lugs 88 moving in grooves 89. When the insulating member 83 is fully inserted in base 78 as indicated in Fig. 8, the lugs 88 move clear of grooves 89 so that insulating member 83 may be rotated not only to lock insulating member 83 into position with respect to base 78, but also to move blade contact 19 from the dotted position of Fig. 9 to the full position of Fig. 9 to insure good contact between contacts 19 and 80. At the same time conductor 86 is forced into good electrical contact with contacting member 82. Although the indicating circuit is not fully disclosed in Fig. 8, it will be understood that it may be very similar to the arrangements disclosed in Figs. 1 to 7. With the arrangement disclosed in Figs. 8 and 9, the removable unit 83 with the fuse 17 inserted in the fuse-receiving chamber 84 is moved longitudinally in position into recess 79 of base 78. By rotating the member 83 slightly in the counterclockwise direction after complete insertion the electrical circuit is completed and a dead front construction similar to that described above is provided.

In Fig. 10 there is disclosed still another modification of my invention in which the fuse unit 90 comprises an insulating base 91 suitably fastened to the back of the vertical panel 92 which is provided with an opening 93 therein cooperating with a recess 94 in base 91. The terminals of the fuse unit which are very similar to the terminals of Fig. 3 have been designated by the same reference numerals, as are also the spring biased contacts associated therewith. The fuse unit 90 also includes a removable member 95 which is very similar to the member 83 of Fig. 8 including a fuse-receiving chamber 96 within which is mounted a conductor 97 extending longitudinally of the chamber 96. This conductor is electrically connected to a contact 25 for engaging the blade contact 18 of fuse 17. With the construction shown in Fig. 10, the removable unit 95 having the fuse 17 mounted therein is inserted in the recess in base 91 so that the fuse 17 is longitudinally moved into position. No rotation of the removable member 95 whatever is required at any time. To hold removable member 95 in position relative to base 91 there is provided a locking member 98 which is annular in shape so as to fit around removable unit 95. This annular member is provided with lugs 99 adapted to cooperate with grooves 100 very similar to the grooves 89 of Fig. 8. The annular locking member 98 is rotated when in the position indicated in Fig. 10 so that the lugs 99 engage shoulders in base 91 to hold removable unit 95 in position. Removable

unit 95 is provided with a circumferential extension 101 so that it may be engaged by locking member 98 in order that the latter may properly perform its locking function. The indicating circuit for lamp 26 is not shown but it should be understood that it may be very similar to the arrangement disclosed in Figs. 1 to 7.

It may be desirable to provide means for bringing the light from the lamp 26 outside the cap of the fuse unit to make it more readily visible from all angles. To this end I have indicated in Fig. 11 the cap 67 of the fuse unit shown in Figs. 1 to 7, which is provided with a transparent light transmitting insert 103 which will fit into the opening 68' in the cap. It will be understood that this transparent insert 103 preferably formed of plastic or glass, best shown in Fig. 12 may be employed just as well with the fuse unit 75 of Figs. 8 and 9 or with the fuse unit 90 of Fig. 10 as with the fuse unit 16 of Figs. 1 to 7.

This insert 103 has an enlargement 104 for engaging a shoulder associated with opening 68' in cap 67. Insert 103 also has a concave groove 105 in the bottom thereof into which lamp 26, which is shown in dotted lines in Fig. 11, may fit to hold insert 103 in place. Insert 103 is also provided with lugs 106 and 107. To prevent rotation of insert 103 lug 106 fits into a notch 108 formed in cap 67. Lug 107 also fits into a cooperating notch, not shown.

It should be understood that the expression "cartridge fuse" as used in this specification and the claims annexed thereto includes any form of fuse enclosed in a tubular shell.

While I have shown and described certain particular embodiments of my invention, I do not desire my invention to be limited to the constructions 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 dead front cartridge fuse holder and indicator for the cartridge fuse held therein comprising in combination a panel board, a base having a recess therein secured to one face of said panel board, a pair of contact terminals leading into said recess in said base, a cartridge fuse retainer for removably retaining the cartridge fuse thereof within the recess of said base and in series with said contact terminals, an indicating circuit including a lamp for indicating rupture of said cartridge fuse, means defining an opening in said retainer so that said lamp at times is visible from the opposite side of said panel board from that to which said base is secured, a light transmitting insert in said opening so that said lamp is visible at all angles from said opposite side of said panel board, and means for connecting said indicating circuit in parallel with said cartridge fuse at least when retained in contact with said contact terminals.

2. A dead front cartridge fuse holder and indicator for the cartridge fuse held therein comprising in combination a panel board, a base having a recess therein secured to one face of said panel board, a pair of contact terminals leading into said recess in said base, a cartridge fuse retainer for removably retaining the cartridge fuse thereof within the recess of said base and in series with said contact terminals, and indicating circuit including a lamp for indicating

rupture of said cartridge fuse, means defining an opening in said retainer so that said lamp at times is visible from the opposite side of said panel board from that to which said base is secured, a light transmitting insert in said opening so that said lamp is visible at all angles from said opposite side of said panel board, a groove in said insert adapted to fit around said lamp, and means for connecting said indicating circuit in parallel with said cartridge fuse at least when retained in contact with said contact terminals.

3. A dead front cartridge fuse holder and indicator for the cartridge fuse held therein comprising in combination a panel board, a base having a recess therein secured to one face of said panel board, a pair of contact terminals leading into said recess in said base, a cartridge fuse retainer for removably retaining the cartridge fuse thereof within the recess of said base and in series with said contact terminals, an indicating circuit including a lamp for indicating rupture of said cartridge fuse, means defining an opening in said retainer so that said lamp at times is visible from the opposite side of said panel board from that to which said block is secured, a light transmitting insert in said opening so that said lamp is visible at all angles from said opposite side of said panel board, a groove in said insert adapted to fit around said lamp, cooperating means on said insert and said cartridge fuse retainer to prevent rotation of said insert, and means for connecting said indicating circuit in parallel with said cartridge fuse at least when retained in contact with said contact terminals.

4. A dead front fuse holder and indicator for a cartridge fuse having at least one blade type contact comprising in combination a base having a recess therein, a pair of contact terminals leading into said recess in said base, an insulating member comprising a cartridge fuse retainer for removably retaining the cartridge fuse thereof within the recess of said base and in series with said contact terminals, and means for longitudinally moving said one blade type contact into or out of electrical connection with one of said contact terminals by merely rotating said insulating member.

5. A dead front fuse holder and indicator for a cartridge fuse having at least one blade type contact comprising in combination a base having a recess therein, a pair of contact terminals leading into said recess in said base, an insulating member comprising a cartridge fuse retainer for removably retaining the cartridge fuse thereof within the recess of said base and in series with said contact terminals, means for longitudinally moving said one blade type contact into electrical connection with one of said contact terminals by merely rotating said insulating member, an indicating circuit including a lamp in said fuse holder for indicating the condition of said cartridge fuse, and means for also connecting said indicating circuit in parallel with said cartridge fuse by rotation of said insulating member.

6. A dead front fuse holder and indicator for a cartridge fuse having at least one blade type contact comprising in combination a base having a recess therein, a pair of contact terminals leading into said recess in said base, an insulating member comprising a cartridge fuse retainer for removably retaining the cartridge fuse thereof within the recess of said base and in series with said contact terminals, means for longitudinally moving said one blade type contact out of electrical connection with one of said contact terminals by merely rotating said insulating mem-

ber, an indicating circuit including a lamp in said fuse holder adapted to be connected in parallel with said cartridge fuse for indicating the condition of said cartridge fuse, and means for also opening said indicating circuit by rotation of said insulating member to move said blade type contact out of electrical connection with one of said contact terminals.

7. A dead front fuse holder and indicator for a cartridge fuse having blade type contacts comprising in combination a base having a recess therein, a pair of contact terminals leading into said recess in said base, an insulating member including a fuse receiving chamber adapted to be removably retained within the recess of said base, an L-shaped conductor mounted within said chamber and having a portion thereof extending longitudinally from said chamber, a contact connected to said conductor within said chamber for electrically engaging one of said blade type contacts of said cartridge fuse, means on said conductor for removably holding said cartridge fuse in said chamber in said insulating member while inserting and withdrawing said insulating member with respect to said recess, and means for longitudinally moving said other blade type contact of said cartridge fuse and the portion of said L-shaped conductor extending from said chamber into and out of electrical connection with said contact terminals by merely rotating said insulating member.

8. A dead front fuse holder and indicator for a cartridge fuse having blade type contacts comprising in combination a base having a recess therein, a pair of contact terminals leading into said recess in said base, an insulating member including a fuse receiving chamber adapted to be removably retained within the recess of said base, an L-shaped conductor mounted within said chamber and having a portion thereof extending longitudinally from said chamber, a contact connected to said conductor within said chamber for electrically engaging one of said blade type contacts of said cartridge fuse, means on said conductor for removably holding said cartridge fuse in said chamber in said insulating member while inserting and withdrawing said insulating member with respect to said recess, means in said recess for guiding said fuse while inserting or withdrawing said insulating member with respect to said recess, and means for longitudinally moving said other blade type contact of said cartridge fuse and the portion of said L-shaped conductor extending from said chamber into and out of electrical connection with said contact terminals by merely rotating said insulating member.

9. A dead front fuse holder and indicator for a cartridge fuse having blade type contacts comprising in combination a base having a recess therein, a pair of contact terminals leading into said recess in said base, an insulating member including a fuse receiving chamber adapted to be removably retained within the recess of said base, an L-shaped conductor mounted within said chamber for relative rotation therewith and having a portion thereof extending longitudinally from said chamber, a contact connected to said conductor within said chamber for electrically engaging one of said blade type contacts of said cartridge fuse, means on said conductor for removably holding said cartridge fuse in said chamber in said insulating member while inserting and withdrawing said insulating member with respect to said recess, and means for longitudinally

moving said other blade type contact of said cartridge fuse and the portion of said L-shaped conductor extending from said chamber into and out of electrical connection with said contact terminals by merely rotating said insulating member around said fuse and L-shaped conductor.

10. A dead front fuse holder and indicator for a cartridge fuse having blade type contacts comprising in combination a base having a recess therein, a pair of contact terminals leading into said recess in said base, an insulating member including a fuse receiving chamber adapted to be removably retained within the recess of said base, a conductor mounted within said chamber and having a portion thereof extending longitudinally from said chamber, a contact connected to said conductor within said chamber for electrically engaging one of said blade type contacts of said cartridge fuse, means on said conductor for removably holding said cartridge fuse in said chamber in said insulating member while inserting and withdrawing said insulating member with respect to said recess, and means for longitudinally moving said other blade type contact of said cartridge fuse and the portion of said conductor extending from said chamber into and out of electrical connection with said contact terminals by merely rotating said insulating member.

11. A dead front fuse holder and indicator for a cartridge fuse having blade type contacts comprising in combination a base having a recess therein, a pair of contact terminals leading into said recess in said base, an insulating member including a fuse receiving chamber adapted to be threadedly engaged with cooperating threads in said recess of said base, a conductor mounted within said chamber and having a portion thereof extending longitudinally from said chamber, a contact connected to said conductor within said chamber for electrically engaging one of said blade type contacts of said cartridge fuse, means on said conductor for removably holding said cartridge fuse in said chamber in said insulating member while inserting and withdrawing said insulating member with respect to said recess, and means for longitudinally moving said other blade type contact of said cartridge fuse and the portion of said conductor extending from said chamber into and out of electrical connection with said contact terminals by merely rotating said insulating member.

12. A dead front fuse holder for a fuse comprising a base having a fuse receiving recess therein, a contact terminal in said recess, an insulating cover for said base arranged for threaded engagement with said base, a fuse having blade-like terminals adapted to be inserted in said recess with one of said blade-like terminals engaging said terminal in said recess, and swivel means relating said fuse to said cover so that merely screwing said cover to said base causes said one of said blade-like terminals to electrically engage said contact terminal.

13. A dead front fuse holder for a fuse having at least one blade-type contact comprising in combination a base having a recess therein, a contact terminal leading into said recess in said base, an insulating member comprising a fuse retainer for removably retaining a fuse within the recess of said base and in series with said contact terminal, said retainer being rotatably mounted in said insulating member, and means for moving said one blade-type contact recti-

13

linearly into or out of electrical connection with said contact terminal by rotating said insulating member including means for preventing rotation of said retainer during rotation of the insulating member.

14. A dead front fuse holder for a cartridge fuse having at least one blade-type contact comprising in combination a base having a recess therein, a contact terminal leading into said recess in said base, an insulating member comprising a cartridge fuse retainer for removably retaining a cartridge fuse within the recess of said base and in series with said contact terminal, said retainer being rotatably mounted in said insulating member, and means for longitudinally moving said one blade-type contact into or out of electrical connection with said contact terminal by rotating said insulating member including means for preventing rotation of said retainer during rotation of the insulating member.

15. A dead front fuse holder for a cartridge fuse having at least one blade-type contact comprising in combination a base having a recess therein, a contact terminal leading into said recess in said base comprising a U-shaped spring biased contact, an insulating member comprising a cartridge fuse retainer for removably retaining the cartridge fuse thereof within the recess of said base and in series with said contact terminal, and means for moving said one blade-type contact into or out of electrical connection with said contact terminals by merely rotating said insulating member.

16. A fuse holder for a fuse comprising a base having a pair of terminals mounted therein, an insulating cover for said base including a recess having a third terminal mounted therein, a fuse having blade-like contacts inserted in said recess

14

with one of said contacts in electrical engagement with said third terminal, and means for relating said cover to said base so that said fuse is connected across said pair of terminals in said recess.

17. A fuse holder for a fuse comprising a base having a pair of terminals mounted therein, an insulating cover for said base including a recess having a third terminal mounted therein, a fuse having blade-like contacts inserted in said recess with one of said contacts in electrical engagement with said third terminal, and threaded means for relating said cover to said base so that said fuse is connected across said pair of terminals in said recess.

18. A fuse holder for a fuse comprising a base having a pair of terminals mounted therein, an insulating cover for said base including a recess having a third terminal mounted therein, a fuse having blade-like contacts inserted in said recess with one of said contacts in electrical engagement with said third terminal, and an independent insulating member for relating said cover to said base so that said fuse is connected across said pair of terminals in said recess.

ALRIC H. POWELL.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,858,157	Lagandro	May 10, 1932
2,207,837	Sundt	July 16, 1940
1,765,546	Sloane	June 24, 1930
690,928	Clausen	Jan. 14, 1902