Oct. 8, 1940. W. S. CATHERWOOD, JR 2,217,510

ELECTRICAL PANEL

Filed June 17, 1939 2 Sheets-Sheet 1

Fig. 1.

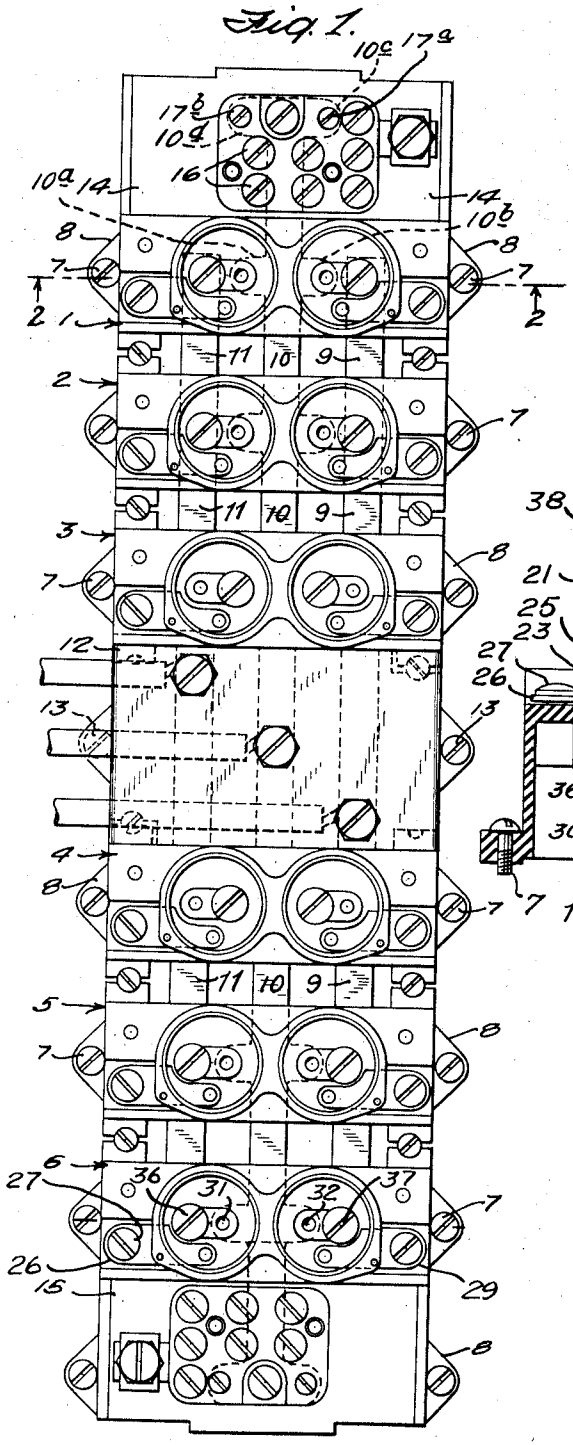
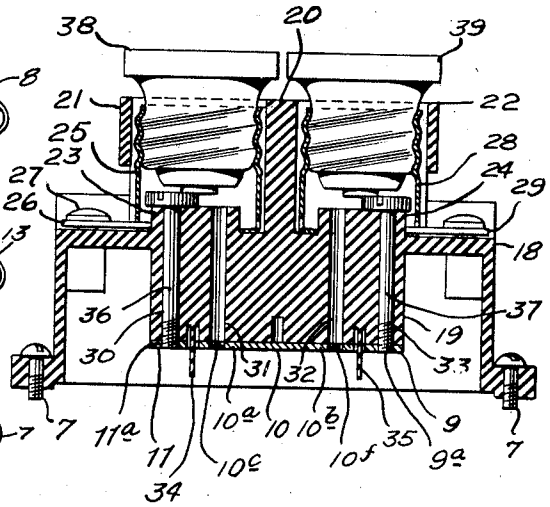


Fig. 2.



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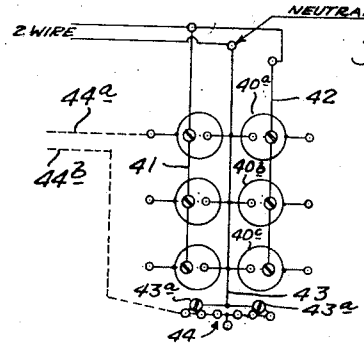


Fig. 3.

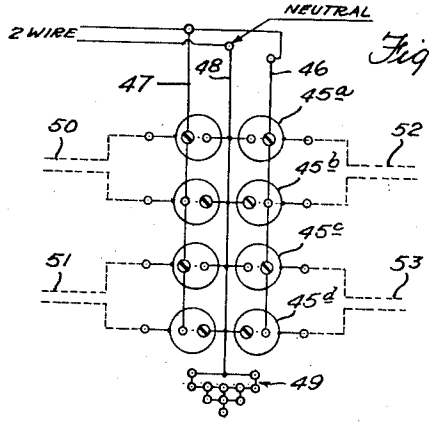


Fig. 4.

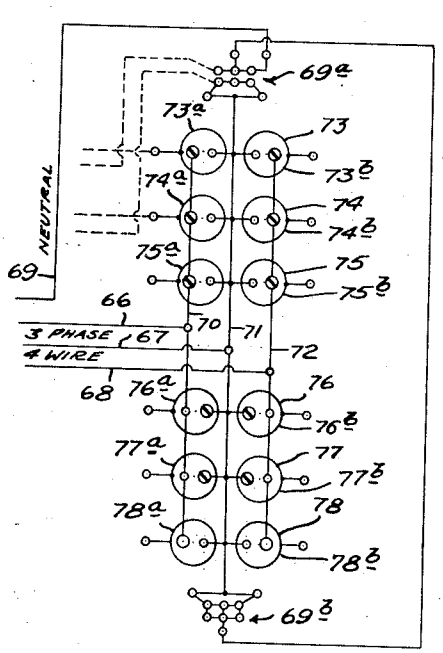


Fig. 7.

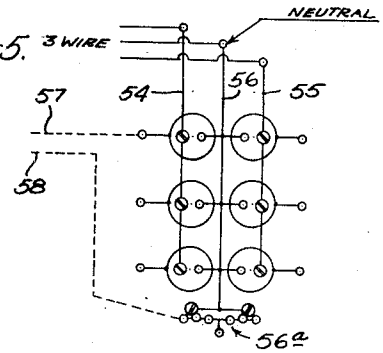


Fig. 5.

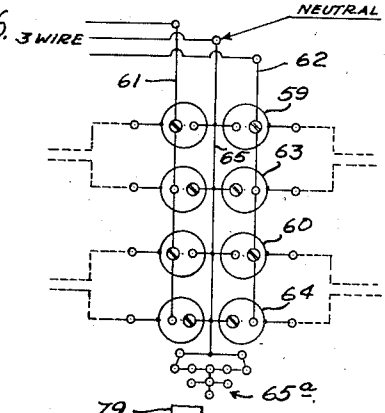


Fig. 6.

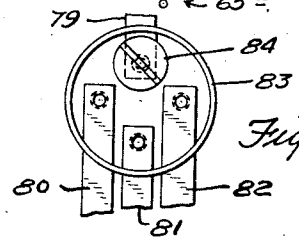


Fig. 8.

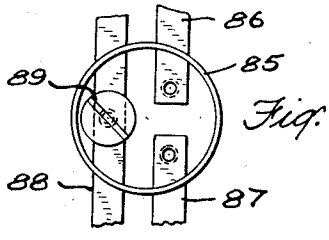


Fig. 9.

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UNITED STATES PATENT OFFICE

2,217,510

ELECTRICAL PANEL

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Application June 17, 1939, Serial No. 279,610

11 Claims. (Cl. 175—369)

The invention herein disclosed relates to an electrical connection panel for effecting electrical connections from buses to branch circuit connectors. More particularly, the invention relates to a panel of this type in which the branch circuits are fused.

Prior to this invention, it has been customary and common practice to construct panels of the type referred to in such manner that the branch circuit connectors are permanently, electrically connected to particular buses. Usually, the connection is effected either by a screw or rivet securing a bus and branch connector together on the panel and effecting an electrical connection therebetween. These screws and rivets are assembled in the panel to remain permanently in place and the panel is so constructed and arranged that it is impossible to connect a branch connector to a bus other than the particular bus to which it is originally connected in assembling the panel. Thus, in the common fuse panel for plug fuses of the type that are screwed into a shell, the central fuse connector that engages the contact on the end of the fuse extends through an opening through the base of the fuse receptacle and into an opening in a bus arranged to receive the fuse connector. Only one bus is available to receive the fuse connector which constitutes the connection between the bus and the fused branch circuit.

In consequence of this rigidity of design and construction, many different fuse panels, each suitable to but one particular system, are required. Commonly, fuse panels of this type are made up in sizes from two to forty circuits in steps of two circuits. Heretofore, a set of such fuse panels were required for each of the many electrical systems in use. Among the electrical systems in use at present are (1) the two wire, 120 volt system with unfused or solid neutral; (2) the two wire, 120 volt system with all neutrals fused; (3) the three wire, 120 to 140 volt system with unfused neutral; (4) the three wire, 120 to 240 volt system with all neutrals fused; (5) the three phase, 120 to 208 four wire system with unfused neutral; and (6) other polyphase combinations. For each of these groups a manufacturer, a distributor and a jobber has to stock twenty sizes flush type and twenty sizes surface type or two hundred and forty sizes for the complete line.

By the invention herein disclosed, there is provided a panel having selective connection such that it is feasible, either at the factory or on a job, to arrange the connections of the panel for use on any one of the aforementioned systems. Thus, with a panel embodying the invention it becomes practical for a manufacturer, distributor or jobber to stock but one type of panel in groups of from two to forty circuits and arrange these twenty panels to produce any of the aforementioned two hundred and forty sizes as the demand requires. In accordance with the invention there is provided a panel that comprises a block of insulating material upon which the buses and branch connectors are mounted. The several buses are electrically insulated from each other. The block is constructed and the buses and branch circuit connectors mounted and arranged such that each branch connector is connectable to several of the buses. Provision is made for selectively and exclusively connecting each branch connector to a single bus. In this way the panel may be converted, at the factory or on the job, from a panel for one system to a panel suitable for another system by selectively connecting the branch circuit connectors and the buses.

A fuse panel, embodying the invention, for plug fuses of the type that screw into a shell is disclosed in the accompanying drawings in which:

Fig. 1 is a plan of a fuse panel for a plug type of fuse that is screwed into a shell;

Fig. 2 is a transverse section of the same taken on the line 2—2 of Fig. 1;

Fig. 3 is a wiring diagram of a fuse panel, embodying the invention, and arranged for a two-wire, 120 volt supply with a solid neutral;

Fig. 4 is a wiring diagram of a panel arranged for a two-wire, 120 volt supply with a fused neutral;

Fig. 5 is a wiring diagram of a panel arranged for a three-wire, 120–240 volt supply with a solid neutral;

Fig. 6 is a wiring diagram of a panel arranged for a three-wire, 120–240 volt supply with a fused neutral;

Fig. 7 is a wiring diagram of another fuse panel embodying the invention arranged for a three-phase, four-wire, 120–208 volt supply with a solid neutral;

Fig. 8 is a fragmentary diagrammatic plan illustrating four alternative connections to a fuse receptacle; and

Fig. 9 is a fragmentary diagrammatic plan illustrating three alternative connections to a fuse receptacle.

The fuse panel illustrated in Figs. 1 and 2, is a panel that is made up of a series of unit fuse blocks, designated by the numerals 1, 2, 3, 4, 5, and 6, six in number. The several blocks are identical in construction and are designed to be mounted in a cabinet. The blocks are secured in place in a cabinet and with respect to each other by holddown screws 7. The hold-down screws 7 engage lugs extending from each end of the block at each end thereof. These lugs, on the block 1, are indicated by the numeral 8. Underlying the several unit blocks, there are three buses 9, 10

and 11. The buses 9 and 11 are straight strips of copper of the type commonly employed in fuse panels. The bus 10 which is between the bus 9 and the bus 11 has a pair of extensions or lugs 10a and 10b formed thereon at each unit fuse block. The lugs extend from opposite sides of the bus and underlie the fuse receptacles of the unit block. The connection from the feed cables to the buses is made at the longitudinal center of the fuse panel. For this purpose the unit fuse blocks are divided into two banks of three in each bank and the two banks are separated to provide space for the connections of the feed cables to the buses. Such connections are made to the buses 9, 10 and 11 through clamp connectors (not shown). The buses are covered at this point by a cover 12 held in place by hold-down screws 13.

At the end of each bank of unit blocks there is provided a connector block, the connector block 14 being at one end of the panel and the connector block 15 being at the other end of the panel. The bus 10 extends under each connector block and the wings 10c and 10d thereon are connected to the connector block and in common to the several terminals 16 thereon through removable screws 17a and 17b. Two connector screws are used to avoid over heating. When the connector screws 17a and 17b are in place as illustrated in Fig. 1, the several terminals 16 are connected to the bus 10. When these screws are removed, the terminals 16 are disconnected from the bus 10. It will be seen that the central buses may be made in long lengths and pieces cut off of the right length for any particular panel.

The unit block 1 is shown in cross section in Fig. 2. As will be seen this block consists of a block of insulating material 18 shaped as illustrated and including a central solid portion 19. A partition 20 divides the fuse receptacles 21 and 22 of the unit fuse block. Within the fuse receptacle 21 there is formed, on the solid portion 19 of the block, a boss 23. A similar boss 24 is formed within the fuse receptacle 22. A fuse shell 25 is received within the fuse receptacle 21 and it is electrically connected to a branch circuit connector 26 mounted on the block and having a binding screw 27 by means of which a branch circuit wire may be connected thereto. A similar shell 28 is mounted within the fuse receptacle 22 and connected to a like branch circuit connector 29. Through the boss 23 and extending through the solid portion of the block thereunder, there are two off-center holes 30 and 31. Similar holes 32 and 33 extend through the boss 24 and the solid portion of the block thereunder. The bus 11 extends below the boss 23 adjacent the outside thereof and the bus 9 extends below the boss 24 adjacent the outside thereof, on the right hand side as seen in Fig. 2. The central bus 10 extends below the solid portion 19 of the block centrally thereof and the lug or extension 10a thereof extends under the boss 23 and the opening 30 therethrough. The extension 10b and the bus 10 extends beneath the boss 24 and the opening 32 therethrough. Between the buses 9 and 10 and the buses 10 and 11 there are partitions 34 and 35 that are formed as a part of the block of insulating material.

The bus 9 is provided with a tapped opening 9a alined with the hole 33 through the block. A similar tapped hole 11a is provided in the bus 11 alined with the opening 30 through the block of insulating material. In the extension 10a of the bus 10 there is provided a tapped opening 10c alined with the opening 31 through the block and a similar opening 10f is provided in the extension 10b alined with the hole 32. A machine screw 36 forms the fuse connector between the bus 11 and the fuse receptacle 21. A like machine screw 37 forms the fuse connector between the fuse receptacle 22 and the bus 9. These fuse connector screws are receivable in either of the holes through the bottom of the fuse receptacles. It will be apparent that when the screw 36 is in the position in which it is illustrated, the fuse receptacle 21 is connected to the bus 11. When the screw 33 is in the opening 31 the fuse receptacle 21 is connected to the bus 10. Likewise when the screw 33 is in the position in which it is shown in the drawings, the fuse receptacle 22 is connected to the bus 9, and when it is moved to the opening 32 the fuse receptacle 22 is connected to the bus 10. The head of the screw which abuts against the boss in the receptacle forms the contact that engages the contact on the end of a plug type fuse screwed into the shell in the fuse receptacle. The holes for the screw in each receptacle are off center with respect to the axis of the fuse receptacle but the head of the screw is of sufficient diameter so that it extends over the central part of the boss and so engages the end contact on the plug fuse when screwed into the shell in the fuse receptacle. In Fig. 2, plug fuses 38 and 39 are shown in place in the fuse receptacle of the unit fuse block 1.

The unit fuse blocks 2, 3, 4, 5 and 6 are similar in all respects to the fuse block 1. In the unit blocks 1, 2, 5 and 6, the fuse connector screws are arranged so that one fuse receptacle of each unit block is connected to the bus 9 and the other fuse receptacle is connected to the bus 11. In each of the unit blocks 3 and 4, the fuse connector screw is arranged so that each receptacle of each block is connected to the bus 10.

In Fig. 3 there is illustrated diagrammatically a wiring diagram for a fuse panel having three unit blocks 40a, 40b, and 40c. It will be seen that the fuse connector screws in all of the fuse receptacles are arranged so that one fuse receptacle in each unit block is connected to the outside bus 41 and the other fuse receptacle in each unit block is connected to an outside bus 42. This panel is thus arranged for a two-wire, 120 volt supply system with a solid or unfused neutral. The panel so connected with the feed buses 41 and 42 connected as indicated and the central bus 43 connected to the terminal block 44 through the screws 43a is suitable for six branch circuits one of which has been indicated by the broken lines 44a and 44b. In such a panel, one side of a branch circuit, the line 44a is connected to the branch circuit, such as indicated by the line 44b is connected directly to the neutral through a terminal on the connector block 44.

Another panel is illustrated diagrammatically in Fig. 4, arranged for a two-wire, 120 volt supply with all neutrals fused. In this panel which contains four unit blocks 45a, 45b, 45c, and 45d one fuse receptacle of each of the unit fuse blocks 45a and 45c is connected to an outside bus 46 and the other fuse receptacle is connected to the other outside bus 47. The fuse receptacles of the unit blocks 45b and 45d are connected to the neutral 48. The central or neutral bus is connected from the terminal connector block 49 by the removal of the connector screws. So connected, each side of each branch circuits is fused, the panel being suitable for four branch circuits 50, 51, 52 and 53.

Another fuse panel similar to that of Fig. 3 is illustrated diagrammatically in Fig. 5 with the fuse connectors arranged so that the panel is suitable for a three-wire, 120–240 volt supply with a solid or unfused neutral. The connections for this panel are the same as the connections for the panel as illustrated in Fig. 3. That is to say one fuse receptacle of each of the unit blocks is connected to an outside bus **54** and the other fuse receptacle of each fuse block is connected to the other outside bus **55**. The neutral bus **56** is not connected through any fuse receptacle but it is connected to the terminal connector block **56***a*. The panel as thus connected is suitable for six circuits each circuit including a wire such as the wire **57** connected to one of the branch connectors of one of the unit fuse blocks and a wire such as the wire **58** connected directly to the solid neutral.

For a three-wire, 120–240 volt system with a fused neutral, the panel is connected through the fuse connectors as illustrated in Fig. 6. The panel contains four unit fuse blocks and the connections of the fuse panel in this instance is similar to the connection as illustrated in Fig. 4. A fuse receptacle of each of the two unit blocks **59** and **60** is connected to an outside bus **61** and the other fuse receptacle of these blocks are connected to the outside bus **62**. The fuse receptacles of each of the unit blocks **63** and **64** are connected to the neutral bus **65** and the neutral bus **65** is disconnected from the terminal connector block **65***a*. The branch circuits in this case have both sides fused, each branch circuit consisting of one side connected to a fuse receptacle branch connector that is connected to one of the mains **61** or **62** and the other wire of the branch circuit being connected to a connector of a fuse receptacle that is connected to the neutral bus **65**.

A panel similar to that shown in Fig. 1 with the connections arranged for a three-phase, four-wire 120–208 volt system is illustrated in Fig. 7. Such a system includes three wires **66**, **67** and **68** and a neutral **69**. The wires **66**, **67** and **68** are respectively connected to buses **70**, **71** and **72** of the fuse panel. The neutral **69** is connected to the terminal block **69***a* at one end of the panel and to a terminal block **69***b* at the other end of the panel through a jumper **69***c*. In the unit fuse blocks **73**, **74**, **75** and **78** the fuse receptacles **73***a*, **74***a*, **75***a* and **78***a* are connected to the bus **70**. The fuse receptacles **74***b*, **75***b* and **78***b* of the same unit fuse blocks are connected to the bus **72**. The fuse receptacles of the unit fuse blocks **76** and **77** are connected to the bus **71**. The bus **71** is disconnected from the terminal blocks **69***a* and **69***b*. Each branch circuit includes one wire that is connected to a branch connector of a fuse receptacle on the panel and a wire that is connected directly to the neutral **69** through either the terminal block **69***a* or the terminal block **69***b*. It will be obvious that as the fuse receptacles are connected as indicated in Fig. 7, the twelve circuits for which the panel is suitable are arranged so that four are taken from each of the buses **70**, **71** and **72**. Thus, the circuits that include the fuse receptacles **73***a*, **74***a*, **75***a* and **78***a* are taken from the bus **70** and in consequence, the main **66**. The circuits that include the fuse receptacles **73***b*, **74***b*, **75***b* and **78***b* are taken from the bus **72** and in consequence the main **68**. By virtue of the connections of both fuse receptacles of the unit fuse blocks **76** and **77** to the central bus **71**, the four branch circuits that would include these fuse receptacles are taken from the bus **71** and consequently the main **67**.

From the foregoing, it will be seen that the fuse panel described above is suitable for any one of the several systems now in use. Fuse panels constructed as described above may be changed from an arrangement suitable for one system to another arrangement suitable for another system merely by changing the fuse connector screw that connects the fuse receptacle and the bus. This operation may be performed by the manufacturer or the distributor of the panels upon order for a panel for a particular system. This flexibility of arrangement and connection simplifies the construction of these fuse panels and materially reduces the number of sizes that need to be held in stock. The number of unit fuse blocks in a panel and their connection to the buses will of course depend on the particular system with which the panel is used and the number of branch circuits. Also various combinations of fused and unfused neutrals may be made up by proper arrangement of the connector screws to meet particular conditions.

For certain purposes, particular connections may be required. To meet these conditions, there is provided a fuse panel of which a fragmentary portion is shown diagrammatically in Fig. 8. In this fuse panel, there are four fuses, **79**, **80**, **81** and **82** underlying a fuse receptacle **83**. The base of the fuse receptacle has four holes therethrough each alined with a threaded opening in each of the bases. The screw connector **84** may be received in any one of these openings and threaded into any one of the four buses thus effecting a fuse connection between the fuse receptacle and any one of the four buses underlying the fuse receptacle.

Another special form useful for certain conditions is illustrated in Fig. 9. In this form, there is a fuse receptacle **85** which overlies three buses **86**, **87** and **88**. The buses **86** and **87** terminate at the fuse receptacle and the bus **88** is a through bus. Each of these buses are electrically insulated from each other and underlie the fuse receptacle. Holes are provided in the fuse receptacles and alined with threaded openings provided in each of the buses. By inserting the fuse connector screw **89** into a particular opening, a selective connection as the case may require is made.

From the foregoing description of the embodiments of the invention illustrated in the drawings, it will be apparent that the number of buses may vary as well as the arrangement of connections. The invention is equally applicable with four or more buses and the only limitation is the available space and practical considerations. The same arrangements and construction may be used when it is desired to include switches, either fixed or removable, in the panel.

In old dwellings that have been wired with fused neutrals, new circuits may be readily installed with the panel of this invention and the panel readily arranged to conform with the requirements for unfused neutrals. Some of the circuits are connected to the solid neutral and others fused.

It will be obivous that various changes may be made by those skilled in the art in the details of the embodiments of the invention illustrated in the drawings and described above within the prin-

ciple and scope of the invention as expressed in the appended claims.

I claim:

1. A fuse panel of the type described comprising in combination a block of electrical insulating material, two buses on one side of the block of insulating material and electrically insulated from each other, a fuse receptacle on the other side of the block of insulating material and extending over said buses, the base of the fuse receptacle and the two buses having alined openings to receive a fuse connector.

2. A fuse panel of the type described comprising in combination a block of electrical insulating material, three buses on one side of the block of insulating material arranged side by side and electrically insulated from each other, the buses having fuse connector openings therein, a plurality of fuse receptacles on the other side of the block of insulating material, all of the fuse receptacles having two fuse connector openings, one alined with a fuse connector opening in one of the three buses, and one-half of the fuse receptacles having fuse connector openings alined with fuse connector openings in one of the other buses and the remaining half of the fuse receptacles having fuse connector openings alined with fuse connector openings in the remaining bus.

3. A fuse panel of the type described comprising in combination a block of electrical insulating material, three buses on one side of the block of insulating material arranged side by side and electrically insulated from each other, the buses having fuse connector openings therein, a plurality of fuse receptacles having two fuse connector openings on the other side of the block of insulating material, all of the fuse receptacles having a fuse connector opening alined with a fuse connector opening in one of the three buses, one-half of the fuse receptacles having fuse connector openings alined with fuse connector openings in one of the other buses and the remaining half of the fuse receptacles having fuse connector openings alined with fuse connector openings in the remaining bus, and a fuse connector for each fuse receptacle for selectively and exclusively connecting the fuse receptacle to a single bus.

4. A fuse block of the type described comprising in combination a support of electrical insulating material, a screw plug fuse receptacle on the support including a side contact and a terminal connected thereto, two conductors mounted adjacent to and insulated from the fuse receptacle, and an end contact within the fuse receptacle and manipulable therein for selectively and individually completing the circuit with either of said conductors.

5. A fuse block of the type described comprising in combination a support of electrical insulating material, a screw plug fuse receptacle on the support including a side contact and a terminal connected thereto, a plurality of conductors electrically insulated from each other and from the fuse receptacle, and an end contact within the fuse receptacle and manipulable therein for selectively and individually completing a circuit with any one of said several conductors.

6. A distribution panel selectively connectable for several different electrical systems comprising in combination a plurality of branch circuit units, each including a screw plug fuse receptacle, a branch circuit connector, and selective connector means within the fuse receptacle, the several branch circuit units being arranged and interrelated to form a panel, and several supply buses associated with the branch circuit units, the several buses being arranged such that the selective connector means of each unit is selectively connectable for completing a circuit with a plurality of the buses.

7. A distribution panel selectively connectable for several different electrical systems comprising in combination a plurality of branch circuit units, each including a screw plug fuse receptacle, a branch circuit connector, and selective connector means within the fuse receptacle, the several branch circuit units being arranged and interrelated to form a panel, and three supply buses associated with the branch circuit units, the buses being arranged such that the selective connector means of each unit is selectively connectable for completing a circuit with two of the three buses.

8. A distribution panel selectively connectable for several different electrical systems comprising in combination, a plurality of branch circuit units each including a branch circuit connector, several supply buses for said branch circuit units, and connector means for each branch circuit unit for selectively effecting an electrical connection between the unit and the buses including connector screw openings and a connector screw, the distance between centers of the openings and the diameter of the connector screw head being such that the head of the screw extends over half the distance between the screw openings.

9. A distribution panel selectively connectable for several different electrical systems comprising in combination a plurality of branch circuit units each including a branch circuit connector, several supply buses for said branch circuit units having threaded connector screw openings therethrough, and connector means for each branch circuit unit for selectively effecting an electrical connection between the unit and the buses including connector screw openings overlying a plurality of the buses and aligned with connector screw openings in the buses, the distance between the centers of the openings and the diameter and thickness of the connector screw heads being such that the connector strip is connectable to but one bus at a time.

10. A branch circuit unit for a distribution panel having several supply buses, the branch circuit unit comprising in combination a block of insulating material, a branch circuit connector mounted thereon, and connector means for selectively effecting an electrical connection between the unit and several supply buses including connector screw openings and a connector screw, the distance between centers of the openings and the diameter of the connector screw head being such that the head of the screw extends over half the distance between the screw openings.

11. A branch circuit unit for a distribution panel having several supply buses, the branch circuit unit comprising in combination a block of insulating material having a receptacle therein, a branch circuit connector mounted thereon, and connector means within the receptacle for selectively effecting an electrical connection between the unit and several supply buses including connector screw openings and a connector screw, the distance between the centers of the openings and the diameter of the connector screw head being such that the head of the screw extends over half the distance between the screw openings.

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