

[54] **ELECTRICAL PANEL BOARD WITH
GROUND AND NEUTRAL PLUG-IN BUSES**

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Related U.S. Application Data

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abandoned.

[52] U.S. Cl. **317/119, 339/198 M, 317/107**

[51] Int. Cl. **H02b 1/20**

[58] Field of Search **317/104, 105, 107, 108,**
317/111, 112, 118-120; 200/168 R; 339/198
M, 198 N

References Cited

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[57] **ABSTRACT**

A very flexible electric service panel for temporary hookups is constructed to receive plug-in circuit breakers for direct wiring, as well as four prong receptacle type plug-in power outlet fittings for making cord set connections. The power outlet fitting is constructed by utilizing a hook-like member to mechanically hold a subassembly and a receptacle together as a unitary structure. The subassembly consists of two single pole circuit breakers stacked side by side. The receptacle is adjacent to the load end of the subassembly and electrically connected to the load terminals of the breakers. Plug-in type neutral and grounding connectors at the rear of the receptacle engage forwardly extending legs of neutral and ground busses in the service panel, as plug-in line terminals of the breakers engage energized stabs in the service panel.

13 Claims, 13 Drawing Figures

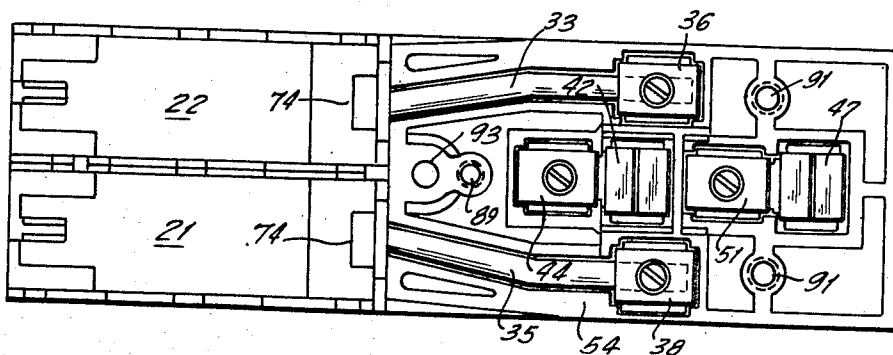


FIG. 2.

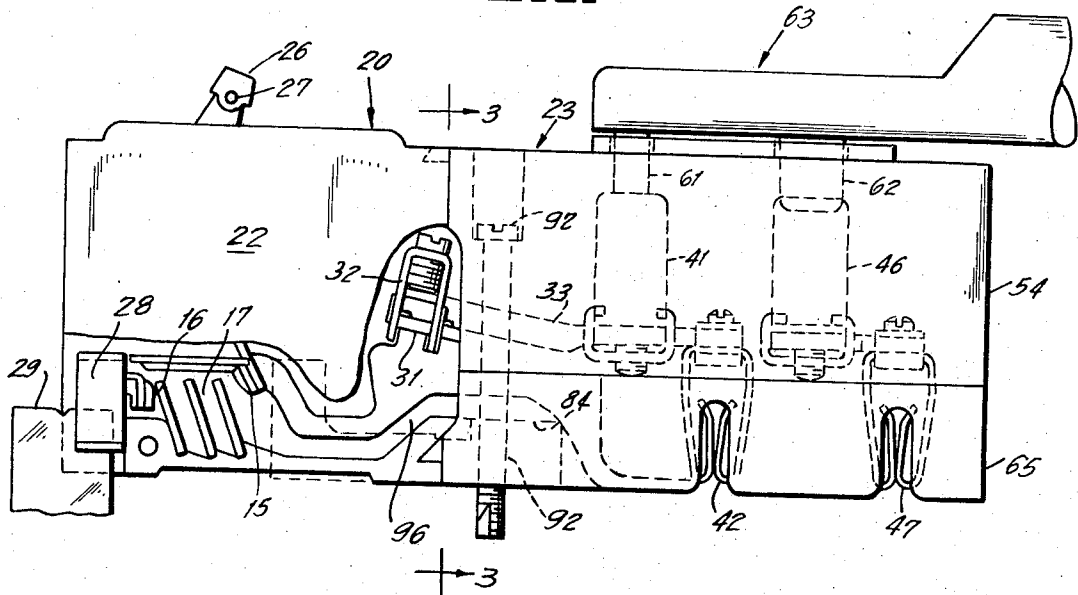


FIG. 1.

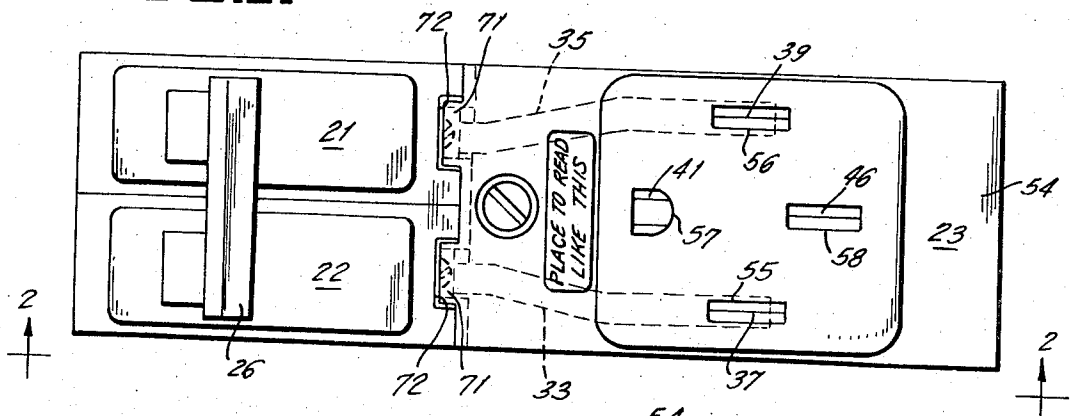
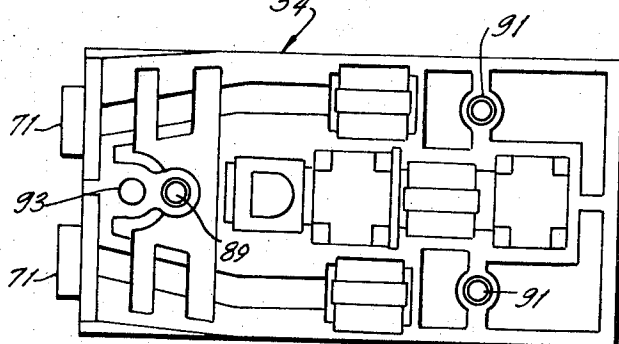


FIG. 6.



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FIG. 5.

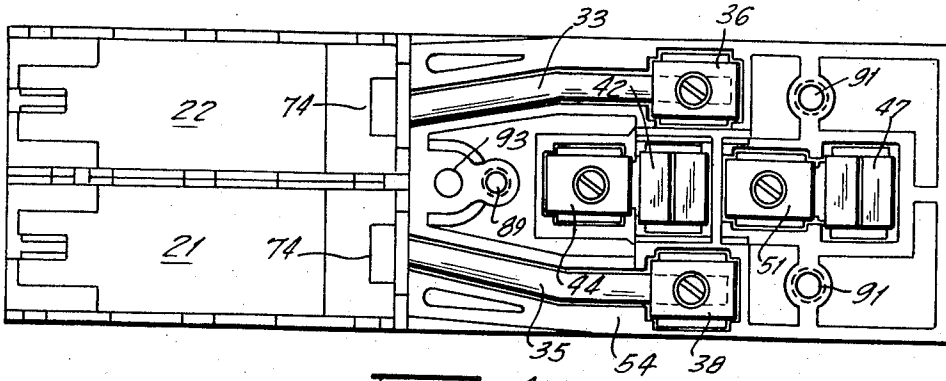


FIG. 4.

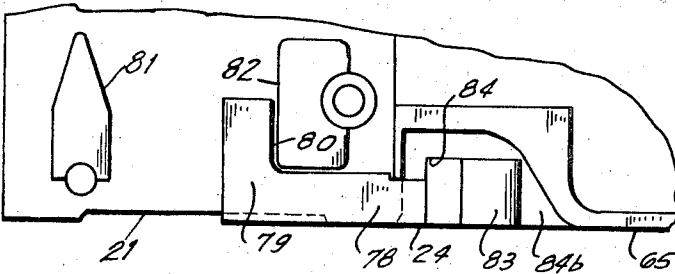
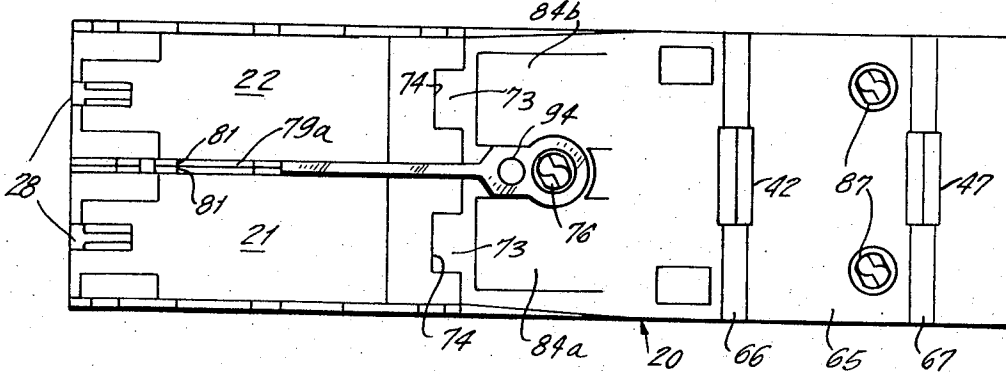
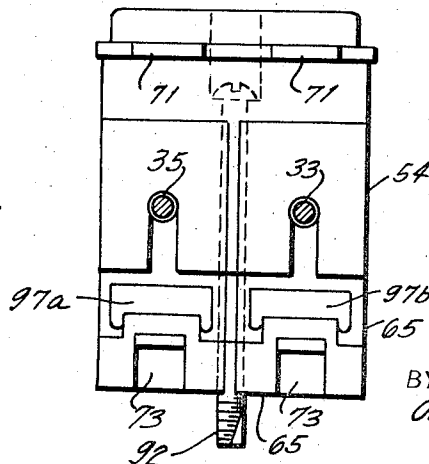


FIG. 7.

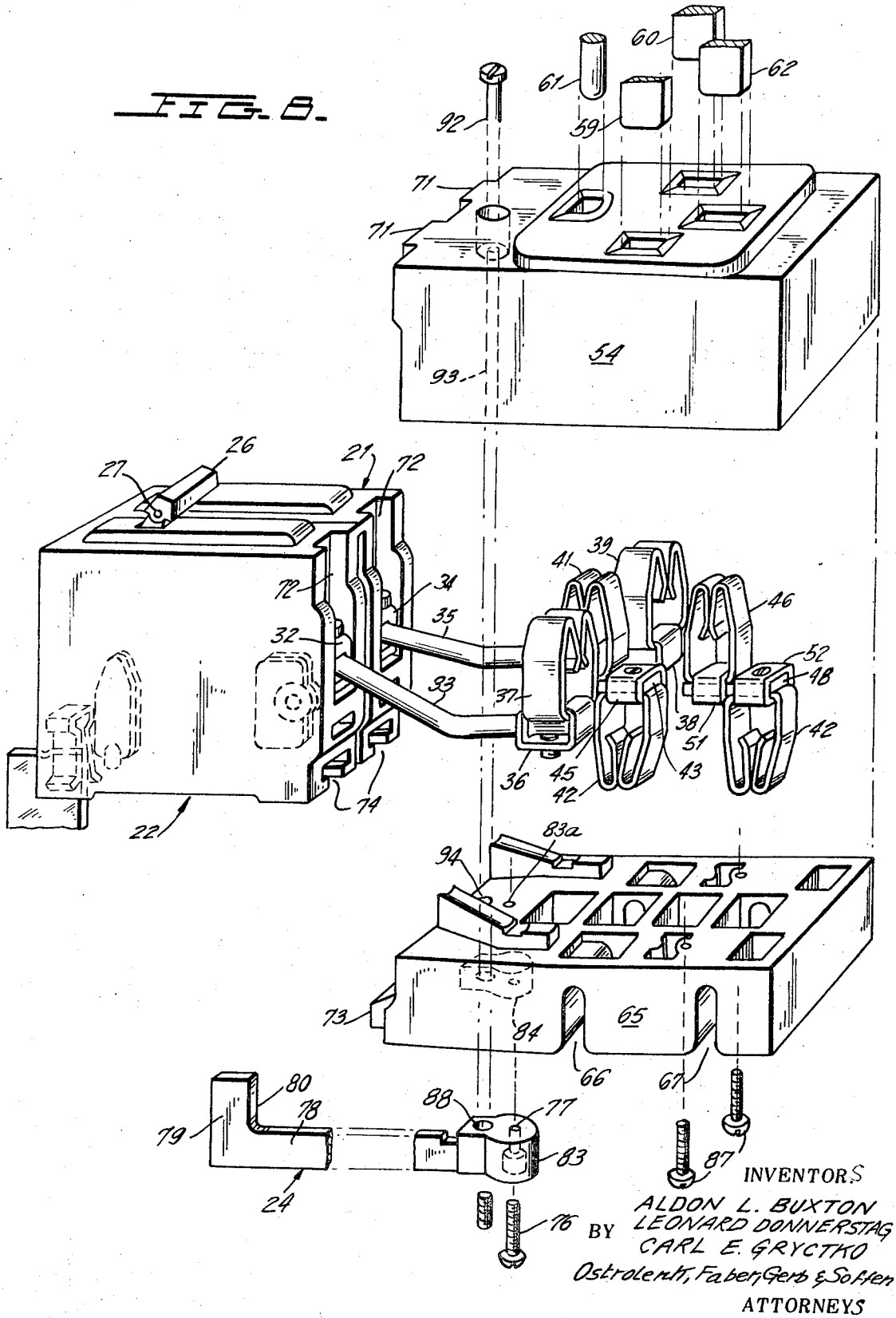
FIG. 3.

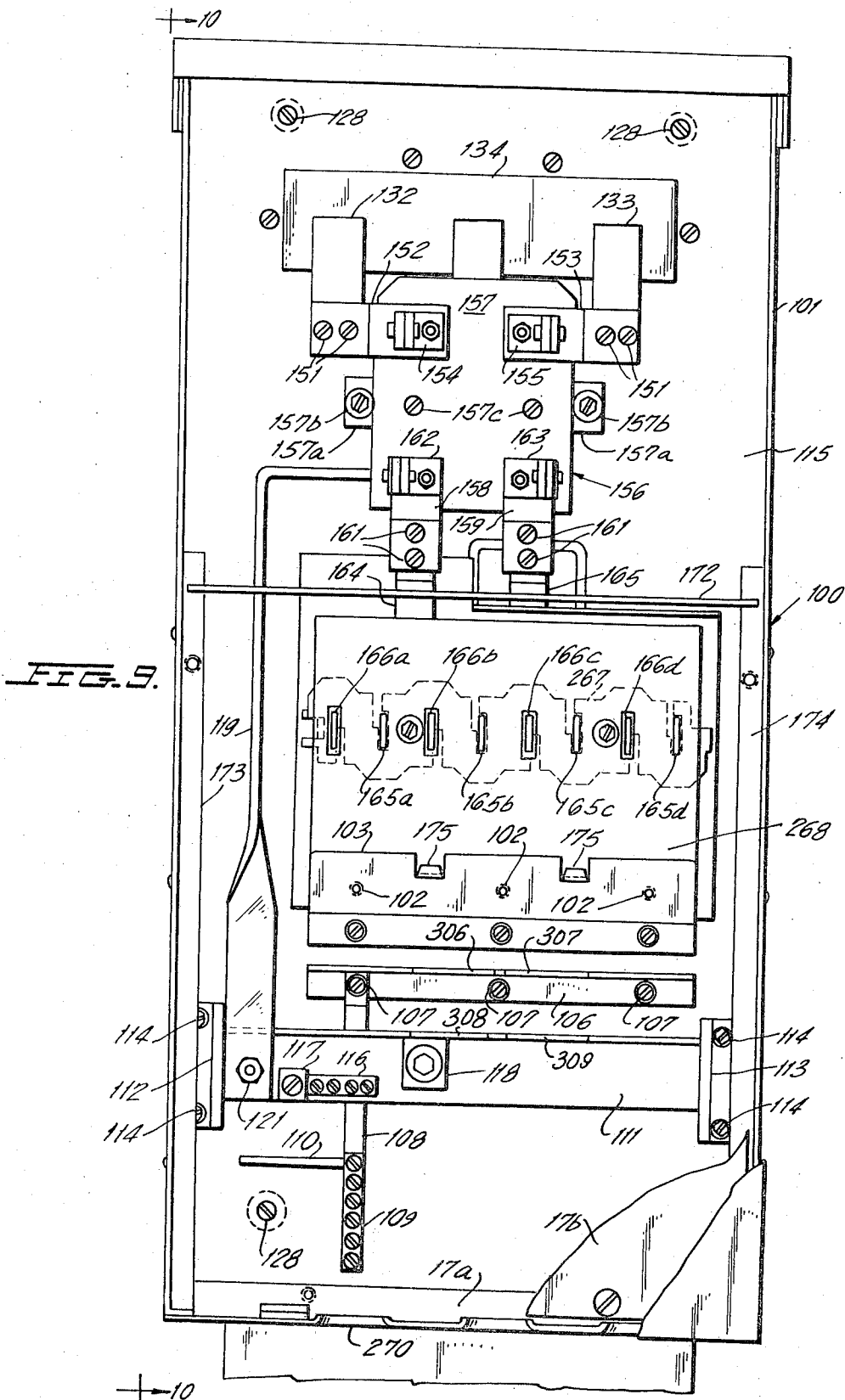


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FIG. 8.





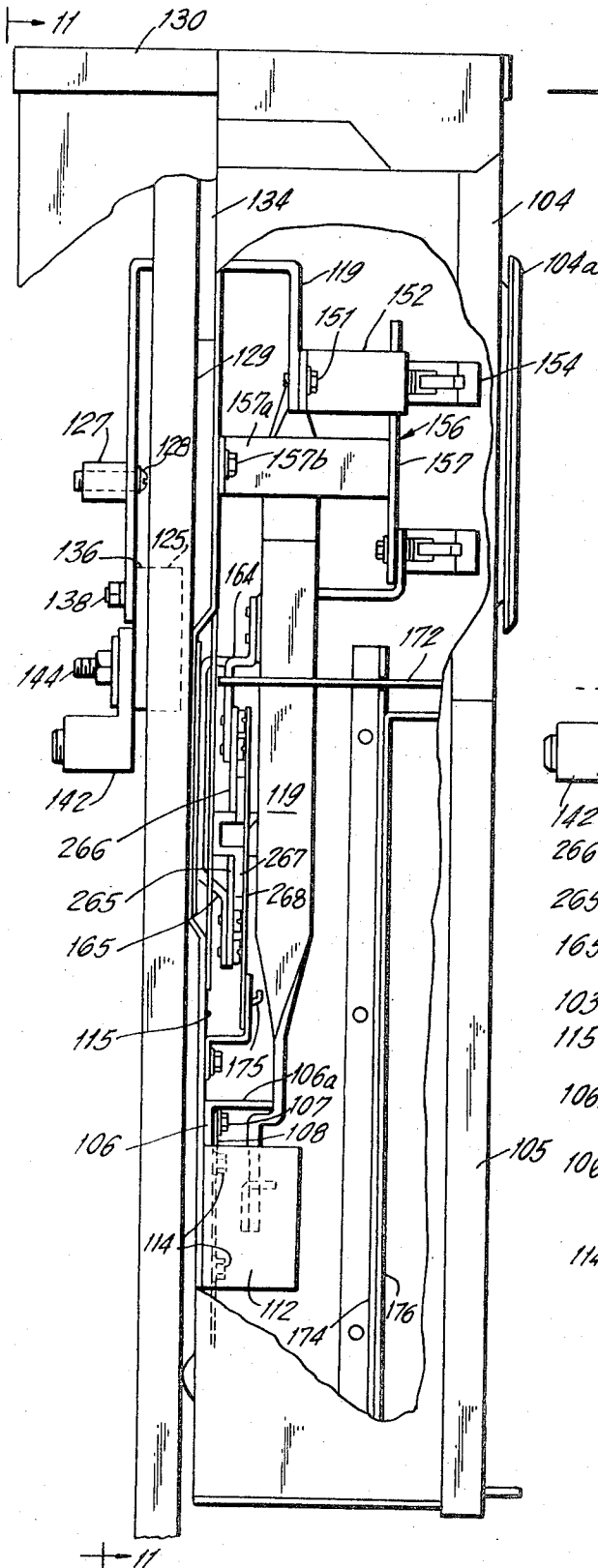
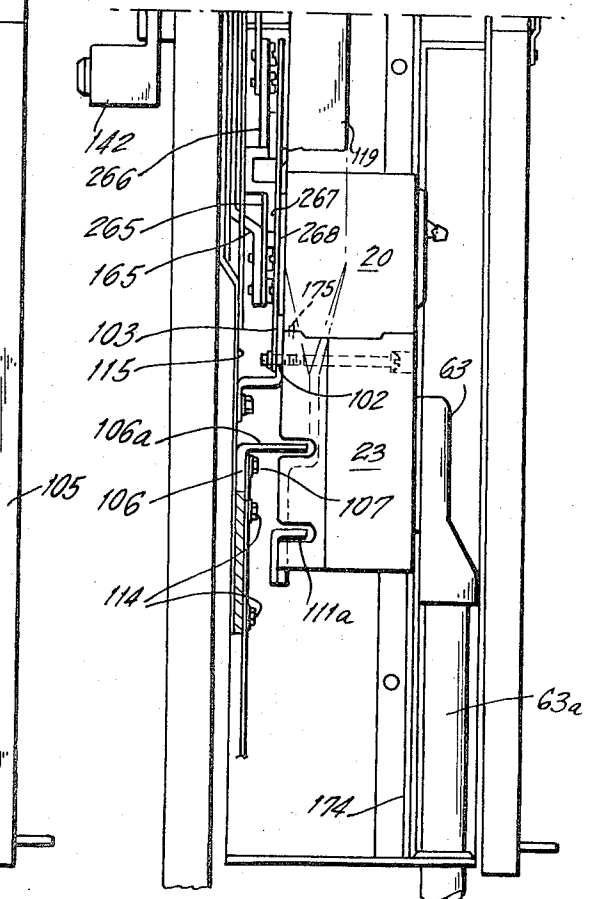


FIG. 10.

FIG. 13.



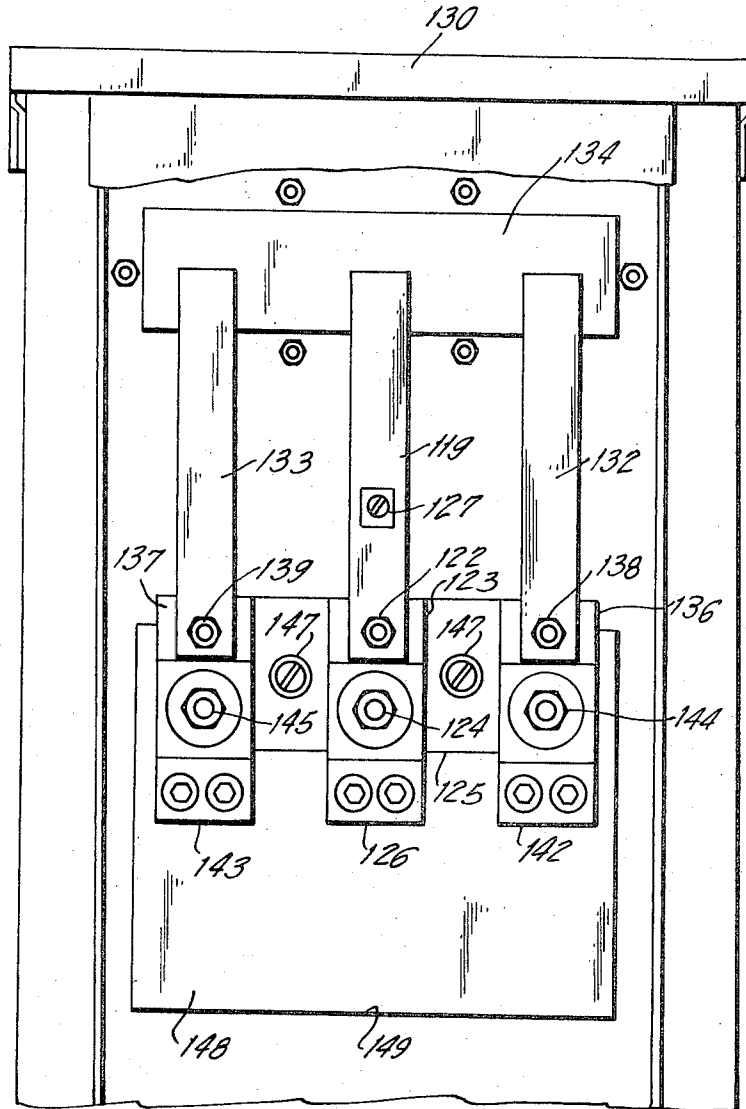
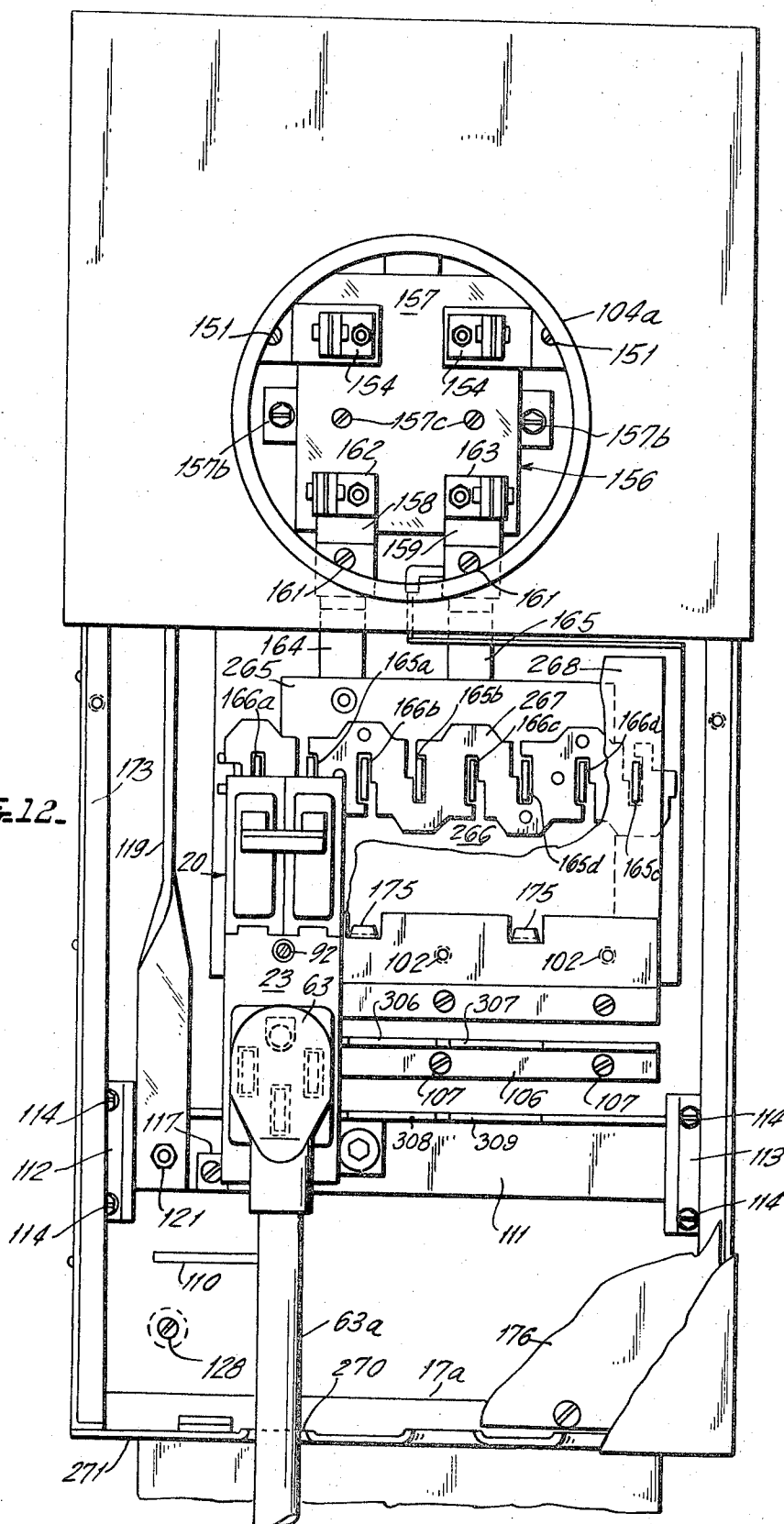


FIG. 11.

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FIG. 12.



ELECTRICAL PANEL BOARD WITH GROUND AND NEUTRAL PLUG-IN BUSES

This is a continuation of application Ser. No. 181,696, filed Sept. 20, 1971, now abandoned.

In recent years local regulatory agencies have become more active in setting standards for electric service equipment for temporary hookups as required for boat docks, marinas, trailer parks, and mobile home parks. In particular, such a temporary service panel must be flexible enough so as to readily connect thereto either by utilization of plugs or by direct wiring.

Typically, the equipment in a trailer or mobile home park is called upon as the hookup point for basic electric service requirements in a single phase four-wire system, including a neutral and an equipment ground. For 40 or 50 ampere service the park equipment must accept either a cord set or direct wiring; for 100 ampere service either two 50 ampere cord sets or direct wiring; for 150 ampere service, three 50 ampere cord sets or direct wiring; and for 200 ampere service, direct wiring only. Thus, the park equipment must provide seven alternative service connections. To make matters even more difficult, the park equipment must be factory wired so that only extremely limited field modification may take place, and in particular there is a prohibition against field wiring between receptacles and circuit breakers to achieve interchangeability.

The most flexible prior art approach appears to be one in which plug-in units were provided. Each of these units comprised a relatively large mounting plate carrying circuit breakers and receptacles. These plug-in units were relatively bulky and expensive. In addition, these prior art devices were difficult to manufacture to reasonable dimensional tolerances because of size. Quite often these plug-in units did not operate properly, in that poor connections were made resulting in a floating neutral and/or poor ground integrity especially when screw pressure was used to make connections by forcing abutting steel parts together.

In accordance with the instant invention the trailer or mobile home park is provided with panels having bussing so arranged that plug-in type circuit breaker units of the desired combination may readily be mounted. For direct wiring conventional circuit breakers are mounted in the panel and for cord sets power outlet fittings are mounted in the panel. Each of these power outlet fittings consists of an assembly of two conventional single pole circuit breakers and a receptacle for receiving a four-prong plug. Each of these single pole units is provided with a plug-in type line terminal and the receptacle section is provided with plug-in type neutral and ground terminals.

Accordingly, a primary object of the instant invention is to provide novel flexible electrical service equipment for temporary service requirements.

Another object is to provide a novel construction for a panel that may be used for direct wiring or cord sets.

Still another object is to provide a novel construction for a panel which mounts receptacle type power outlet fittings.

A further object is to provide a novel construction for a panel that mounts four prong receptacle plug-in type power outlet fittings.

These objects as well as other objects of this invention will become readily apparent after reading the fol-

lowing description of the accompanying drawings in which:

FIG. 1 is a front elevation of a four-prong receptacle type power outlet fitting constructed in accordance with teachings of the instant invention.

FIG. 2 is a side elevation of the power outlet fitting looking in the direction of arrows 2—2 of FIG. 1.

FIG. 3 is an end view of the power outlet fitting looking in the direction of arrows 3—3 of FIG. 2.

FIG. 4 is a rear elevation of the power outlet fitting.

FIG. 5 is a view similar to FIG. 4 with the receptacle section rear housing part removed.

FIG. 6 is a rear elevation of the front housing part for the receptacle section.

FIG. 7 is a side elevation of the securing insert number showing its operative relationship with adjacent portions of the receptacle section and the single-pole circuit breakers.

FIG. 8 is an exploded perspective showing the main elements of the power outlet fitting of FIGS. 1—7.

FIG. 9 is a front elevation, with the front covers removed, of an electrical panel specially adapted for use in trailer parks and mobile home parks, and capable of utilizing the power outlet fitting of FIGS. 1—8.

FIG. 10 is a side elevation, with housing portions cut away, of the electric panel, looking in the direction of arrows 10—10 of FIG. 9.

FIG. 11 is a rear elevation looking in the direction of arrows 11—11 of FIG. 10 with rear portions of the pedestal cut away to reveal the bussing through which the electric panel of FIGS. 9 and 10 is energized.

FIG. 12 is a view similar to that of FIG. 9 with the upper front cover in place and a power outlet fitting mounted in the panel with a cord set connected to the fitting.

FIG. 13 is a view similar to that of FIG. 10 showing the major elements of FIG. 12.

Now referring to the figures and more particularly to FIGS. 1—8. Four-prong receptacle type power outlet fitting indicated generally by reference numeral 20 comprises single pole circuit breakers 21, 22 and four-prong receptacle 23, secured together by means including hook-like retainer insert 24 (FIGS. 7 and 8) to form a unitary structure.

Circuit breakers 21 and 22 are stacked side by side with cap 26 and rivet 27 mechanically tying the handles of both circuit breakers 21 and 22 together for movement in unison. In addition, circuit breakers 21, 22 have interconnected automatic overload tripping units, so that a fault condition in one of the circuit breakers 21, 22 will automatically cause tripping of both. This construction is illustrated in detail in U.S. Pat. No. 2,996,589 issued Aug. 15, 1961 to F.E. Myers for a "Pivoted Bimetal."

Circuit breakers 21, 22 are identical units, each having a plug-in type line terminal 28, whose jaws are engageable with plate-like stab 29 of a distribution panel. Circuit breaker 22 is also provided with load terminal 31 having wire grip 32 which clamps one end of stiff conductor 33 into firm electrical engagement with load terminal 31. Similarly, wire grip 34 clamps one end of stiff conductor 35 into firm electrical engagement with the load terminal of circuit breaker 22.

Clamp 36 at the other end of conductor 33 clamps blade receiving jaw-type terminal 37 into firm electrical engagement with the right end of conductor 33 as

viewed in FIG. 8. Similarly, clamp 38 electrically connects jaw-type terminal 39 to the right end of conductor 35. Jaw-type terminals 41, 42, extending in opposite directions from the plane of conducting bar 43, are connected to opposite ends thereof by the respective clamps 44, 45. Similarly, jaw-type terminals 46, 47 extend in opposite directions from the plane of conducting bar 48 and are secured to opposite ends thereof by the respective clamps 51, 52.

The portions of receptacle housing 54, 65 are held together by one way screws, 76, 87, 87 received by threaded apertures 89, 91, 91 in forward housing part 54. The latter is provided with four plug prong receiving openings 55, 56, 57 and 58, aligned with terminals 37, 39, 41, and 46, respectively, so that these terminals will be engaged by the respective prongs 59, 60, 61 and 62 of four-prong plug 63 as these prongs are inserted into receptacle section 23 of power outlet fitting 20.

Rear molded insulating housing part 65 is provided with parallel transverse slots 66, 67 at the rear thereof. Jaw portions of terminals 42 and 47 extend into the respective slots 66, 67 from the interior of housing 54, 55 for reasons which will be hereinafter explained. Formations 71, 71 extending to the left from forward housing part 54 are received in complementary recesses 72 at the load end of circuit breakers 21, 22. Similar locating formations 73, 73 extend to the left from rear housing part 65 into complementary formations 74 at the load end of circuit breakers 21, 22.

A major portion of the mechanical securing of receptacle section 23 to the subassembly of circuit breakers 21, 22 is accomplished by generally hook or L-shaped retainer insert 24 (FIGS. 4, 7 and 8) which is fastened to rear housing part 65 by screw 76 which extends through clearance aperture 77 in enlarged cylindrical portion 83 at the right end of insert arm 78 through clearance aperture 83a in rear housing part 65, and is received by threaded aperture 89 in front housing part 54. The other arm 79 of insert 24 extends into space 79a between circuit breakers 21, 22 formed by abutting embossments similar to embossments 81, 82 (FIG. 7). Included surface 80 of retainer arms 78, 79 is adjacent to embossments 82, cooperating therewith to prevent receptacle section 23 from being moved to the right of subassembly 21, 22.

Enlargement 83 and the portion of arm 78 to the right thereof rest against recessed ledge 84, at the rear of housing part 65, cooperating therewith to form a dividing wall between gas expansion chambers 84a, 84b (FIG. 4). These chambers 84a, 84b communicate with the load end of venting passages 96, 96 (FIG. 2) in the respective circuit breakers 21, 22 through apertures 97a, 97b, respectively (FIG. 3), in rear housing part 65. Thus, arcing gases formed upon separation of movable contact 15 from stationary contact 16, in circuit breaker 21, travel from arc chute 17 through passage 96 and aligned aperture 97b into chamber 84b where these gases expand and are deflected rearward by the curved wall at the right of chamber 84b.

Screw 92 extends through threaded aperture 93 in forward housing part 54, through clearance aperture 94 in rear housing part 65 and clearance aperture 88 in insert leg 78, and is threadably received in one of the threaded apertures 102 in the forward leg of Z-shaped mounting ledge 103 of electrical service panel 100 (See FIGS. 9-13).

Now referring more particularly to FIGS. 9-13, panel 100 includes generally rectangular housing 101 having upper and lower removable covers 104, 105 at the front thereof. Elongated ground bus 106 extends parallel to and is laterally spaced from transverse circuit interrupter mounting ledge 103. Screws 107, extending through the rear leg of ground bus 106, secure the latter flush against the rear surface of housing 101. The leftmost screw 107 in FIG. 9 also secures the upper end of grounding strap 108 to bus 106. Terminal strip 109 and bonding wire 110 are secured to the lower end of grounding strap 108.

L-shaped neutral bar 111 is positioned below grounding bus 106 and extends parallel thereto. Molded insulating brackets 112, 113 secured to the rear wall of housing 101 by screws 114 engage neutral bus 111 at opposite ends thereof to space the latter forward of rear wall 115 and above grounding strap 108. Neutral strip 116 and wire grips 117, 118 are mounted to the rear leg of neutral bus 111 on the forward surface thereof. One end of twisted neutral strap 109 is connected by screw 121 to neutral bus 111, at the left thereof, and the other end is connected by screw 122 to strap 123 (FIG. 11). Screw 124 connects strap 123 to insulating block 125 positioned adjacent the forward wall of pedestal 130 and also secures wire grip 126 to strap 123. Another wire grip 127 is mounted by screw 128 to neutral conductor 119 at a portion thereof within pedestal 130.

A plurality of screws 128 extend through the rear wall of panel housing 101 to secure the latter on forward surface 129 of pedestal 130. Neutral conductor 119 as well as hot conductors 132, 133 are bent over at right angles at points intermediate their ends, with the horizontal portions of the bends extending between the interiors of housing 101 and pedestal 130 and in doing so extend through insulating gasket 134 sandwiched between the rear of housing 101 and the front of pedestal 130.

Screws 138, 139 secure the pedestal ends of the respective conductors 132, 133 to the respective straps 136, 137 which are connected by screws 144, 145, respectively, to insulating block 125. Screws 144, 145 also secure the respective wire grips 142, 143 to straps 136, 137, respectively. Screws 147 secure block 125 to insulating sheet 148 covering window 149 in the front wall of pedestal 130.

The ends of conductors 132, 133 within housing 101 are connected by screws 151 to the respective straps 152, 153 to which plug-in connectors 154, 155, respectively, of meter block 156 are mounted. The latter includes insulating mounting sheet 157 to which straps 152, 153, 158, 159 are secured in spaced relationship. Brackets 157a, secured to the rear wall of housing 101 by screws 157b, are connected by screws 157c to insulating sheet 157 to support the latter in operative positions spaced forward of housing rear wall 115 and parallel thereto. Housing cover 104 is provided with meter sealing ring 104a in front of sheet 157.

Plug-in connectors 162, 163 are connected to straps 158, 159 which are connected by screws 161 to additional straps 164, 165 respectively, connected to conducting sheets 265, 266 from which the respective stabs 165a, 166a are formed. Conducting sheet 265 also provides stabs 165b-d. Similarly, conducting sheet 266 provides stabs 166b-d. The stabs from these respective conducting sheets are interleaved and are dis-

posed in a row parallel to mounting ledge 103 being spaced by rigid insulator 267. Flexible insulating sheet 268 overlies conducting sheets 265, 266. The construction of these conducting sheets and the manner in which stabs 165a-d and 166a-d are maintained in their operative positions and insulated from one another is described in detail in U.S. Pat. No. 3,349,292 issued Oct. 24, 1967 to J.F. Meacham for "Load Center."

Mounting ledge 103 is provided with a pair of spaced mounting hooks 175, 175, in line with stabs 165c and 166b, which are intended to mount a circuit breaker extending over four adjacent ones of the stabs 165a-d and 166a-d. Such a circuit breaker is illustrated in U.S. Pat. No. 3,573,415 issued Apr. 6, 1971 to C.E. Grytko for a Parallel Pole Circuit Breaker.

The portion of housing 101 containing meter block 156 is separated from the remainder of housing 101 by transverse insulating sheet 172 which is separately notched to fit over bus elements 119, 164, 165 etc. and is held in operative position by fitting into notches at the upper end of ledges 173, 174 which extend inward of housing 101 partway along the sides thereof. These ledges 173, 174, in combination with another ledge 17a extending inwardly of housing 101 along the bottom thereof, support face plate 176 which provides a dead front over the hot bussing in the region where load connections are to be made.

When panel 100 is to be used, from one to three power outlet fittings 20 may be mounting therein. As seen in FIG. 12, one power outlet fitting 20 is mounted so that the circuit breaker sections 21, 22 engage the leftmost stabs 165a, 166a. The leftmost portion 106a (FIG. 9) of the forwardly extending leg of ground bus 106 is clamped between the jaws of receptacle section grounding contact 42 (FIG. 13) and the forwardly extending portion 111a at the left of neutral bus 111 is engaged by the jaws of neutral contact 47 in receptacle section 23. The prongs of four-prong plug 63 are inserted into receptacle section 23, and flexible cable 63a connected to plug 63 extends downward through the leftmost notch 207 in the bottom wall 271 of housing 101. In accordance with practices well known to the art of distribution panels, all of those notches in face plate 176 that are not covered by a power outlet fitting 20 or other circuit interrupter, are covered with snap-in type dummies to preserve the integrity of the dead front. It is noted that the spacing between mounting hooks 175, 175 is sufficient to permit a single power outlet fitting 20 to be mounted with the line terminals thereof in engagement with stabs 165b and 166c.

For direct wiring, neutral connections are made to wiring devices 116-118 and ground connections are made to terminal strip 109. The hot wire connections are made to two-pole circuit breakers secured by one or both of the mounting hooks 175, 175. Such circuit breakers may be rated up to 100 amps per pole and are of the type illustrated in the aforesaid U.S. Pat. No. 2,996,589. In ratings between 100 and 200 amps the circuit breakers are of the type illustrated in the aforesaid U.S. Pat. No. 3,573,415.

Thus, it is seen that this invention provides a novel construction for a panel that may be direct wired or may provide means for cord set hookup utilizing receptacle plug-in type power outlet fittings. While this invention has been described in connection with a three wire single phase system, it should now be apparent to those skilled in the art that teachings of the instant in-

vention may be utilized for three phase and other multiphase applications.

Although there have been described preferred embodiments of this novel invention, many variations and modifications will now be apparent to those skilled in the art. Therefore, this invention is to be limited not by the specific disclosure herein, but only by the appending claims.

The embodiments of the invention in which an exclusive privilege or property is claimed are defined as follows:

1. An electric panel including an enclosure and within said enclosure an elongated neutral bus, an elongated grounding bus, and conductor means defining hot contact points; within said enclosure, said contact points being electrically insulated from said buses said buses being transversely spaced and parallel to each other with said contact points positioned to one side of said buses; said conductor means and said buses being operatively positioned so that said contact points are engageable by line terminals of receptacle type power outlet fittings having plug-in type neutral and ground terminals engageable with the neutral and ground buses, respectively; one of said buses being positioned between the other of said buses and said contact points; each of the buses being generally of L-shaped cross-section with a forwardly extending leg thereof engageable by plug-in type terminals of receptacle type power outlet fittings having at least three prong engaging contact elements.
2. An electric panel as set forth in claim 1 in which the hot contact points are disposed in a row parallel to and transversely spaced with respect to said buses.
3. An electric panel as set forth in claim 2 in which the hot contact points are alternately phased and are engageable by plug-in type line terminals of a receptacle type power outlet fitting.
4. An electric panel as set forth in claim 3 including a mounting ledge within said enclosure extending parallel to said buses and positioned between said hot contact points and said buses; said mounting ledge having a forward surface provided with securing formations for mechanical securement of receptacle type power outlet fittings.
5. An electric panel as set forth in claim 1 including a mounting ledge within said enclosure extending parallel to said buses and positioned between said hot contact points and said buses; said mounting ledge having a forward surface provided with securing formations for mechanical securement of receptacle type power outlet fittings.
6. An electric panel as set forth in claim 5 including a meter socket positioned on the side of said contact points remote from said mounting ledge; said meter socket having terminals electrically connected to said conductor elements.
7. An electric panel as set forth in claim 5 in which the mounting ledge is provided with first and second forwardly extending mounting hooks for mechanically engaging a circuit breaker whose width spans at least four consecutive ones of said contact points said mounting hooks being positioned between said securing formations.
8. An electric panel as set forth in claim 7 in which the mounting hooks are spaced apart by a distance sufficient to permit a receptacle type power outlet fitting for a plug having at least three prongs, to be secured to

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the forward surface of said mounting ledge in a position between said mounting hooks.

9. An electric panel as set forth in claim 8 in which the forward surface of the mounting ledge is long enough to secure at least three receptacle type power outlet fittings for a plug having at least three prongs positioned side-by-side.

10. An electric panel as set forth in claim 7 in which each of the L-shaped cross-section with a forwardly extending leg engageable by plug-in type terminals of a receptacle type power outlet fitting having at least three prong engaging contact elements; each of said contact points comprising a forwardly extending sheet-like stab disposed in a plane transverse to said legs of said buses.

11. An electric panel as set forth in claim 7 in which

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each of the L-shaped cross-section with a forwardly extending leg engageable by plug-in type terminals of a receptacle type power outlet fitting having at least three prong engaging contact elements; each of said forwardly extending legs having notches in line with said mounting hooks.

12. An electric panel as set forth in claim 10 in which the mounting hooks are spaced apart by a distance sufficient to permit a receptacle type power outlet fitting, for a plug having at least three prongs, to be secured to the forward surface of said mounting ledge in a position between said mounting hooks.

13. An electric panel as set forth in claim 10 in which the hot contact points are disposed in a row parallel to and transversely spaced with respect to said buses.

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