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(54) **AC CIRCUIT BREAKER PANELS AND TELECOMMUNICATIONS EQUIPMENT CABINETS HAVING AC CIRCUIT BREAKER PANELS**

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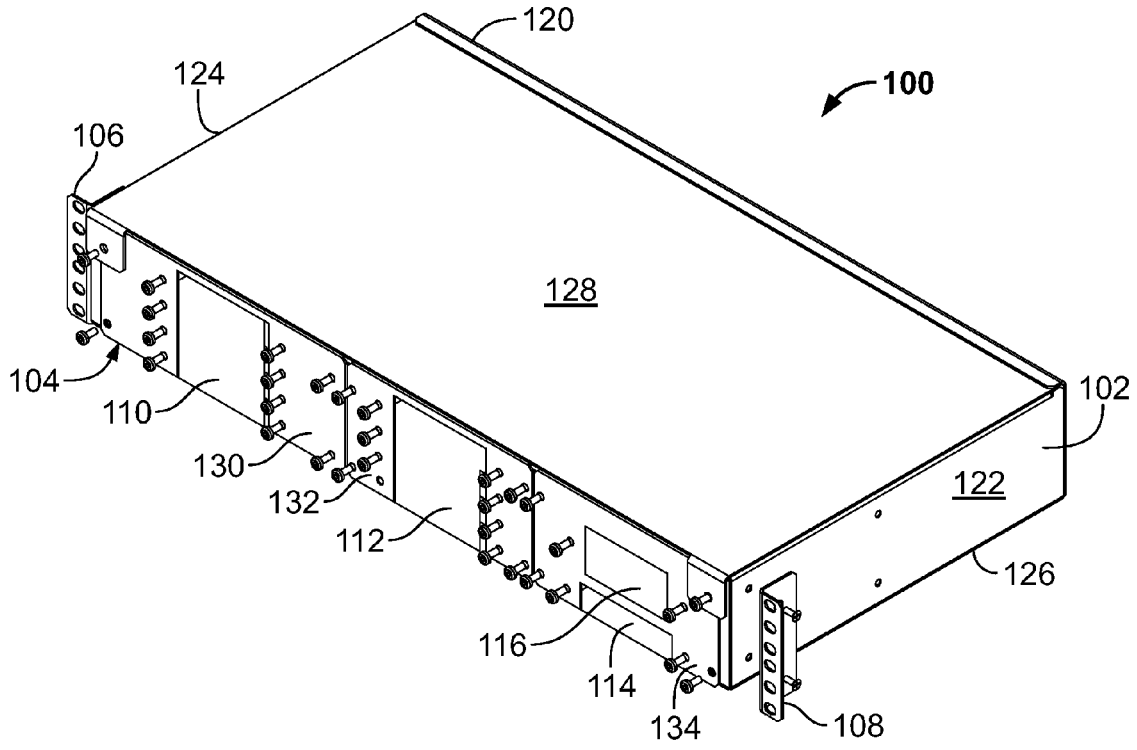
CPC ***H02B 1/32*** (2013.01); ***H02H 3/162*** (2013.01); ***H02H 3/22*** (2013.01); ***H02H 7/22*** (2013.01)

(57) **ABSTRACT**

An AC circuit breaker panel includes a housing having a front side, a bus bar positioned in the housing, and one or more terminal blocks positioned in the housing. The housing has brackets adapted for mounting the AC circuit breaker panel to an equipment rack in a telecommunications equipment cabinet. The front side of the housing defines a plurality of openings for mounting a plurality of circuit breakers. The AC circuit breaker panel further includes a first circuit breaker mounted in one of the plurality of openings and wired to the bus bar, and a second circuit breaker mounted in one of the plurality of openings and wired to the bus bar and one of the terminal blocks. Further, a telecommunications equipment cabinet includes an equipment rack and one of the various AC circuit breaker panels disclosed herein.



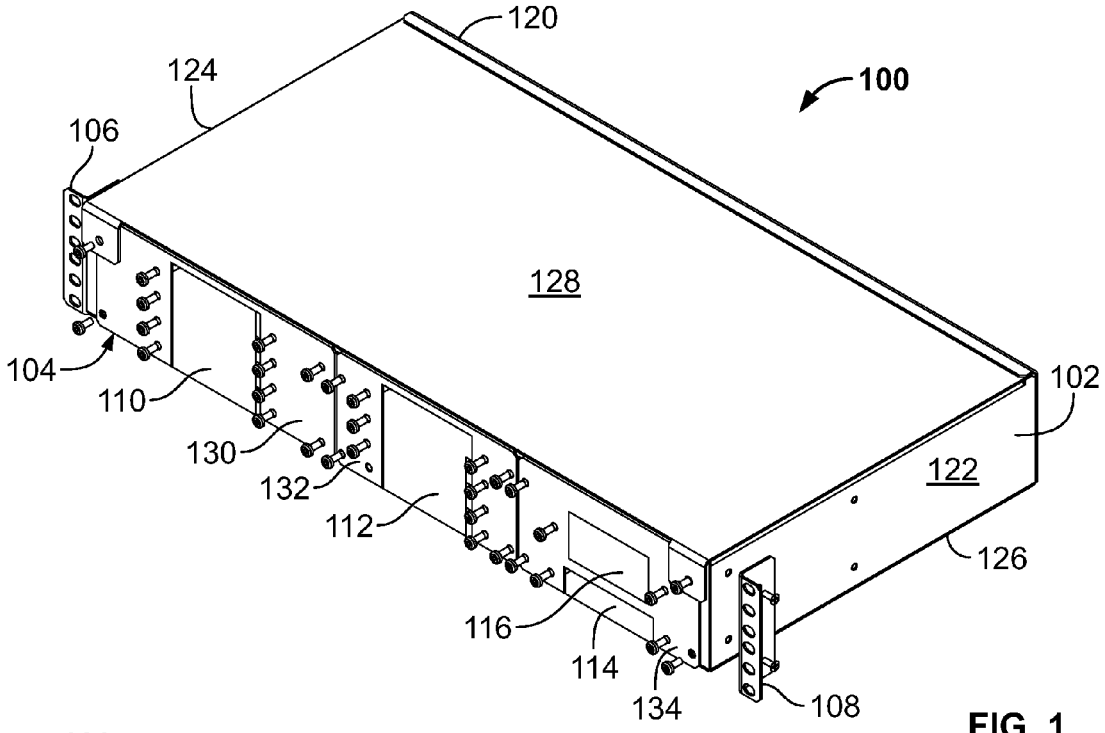


FIG. 1

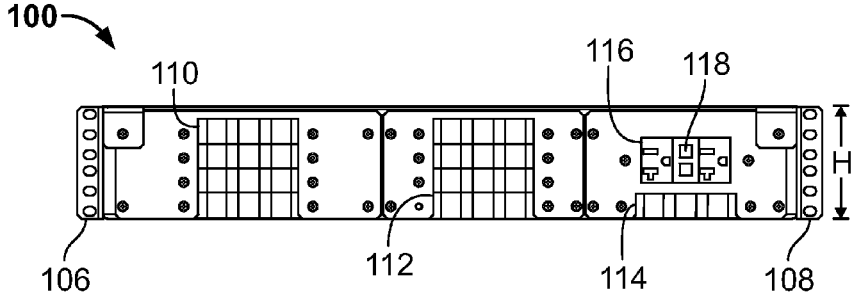


FIG. 2

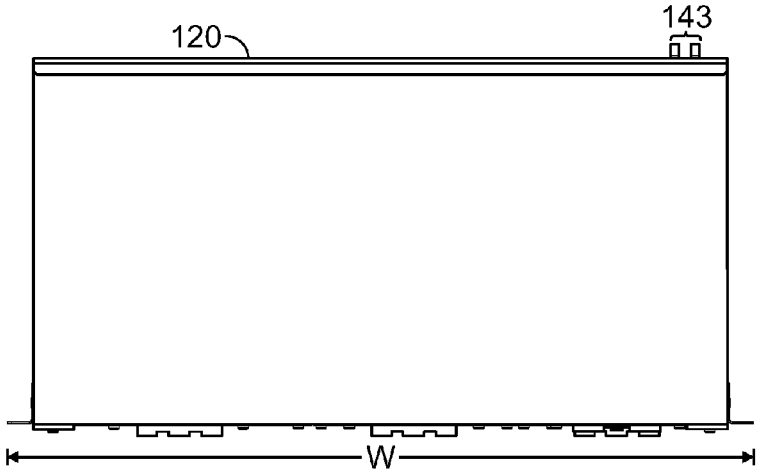


FIG. 3

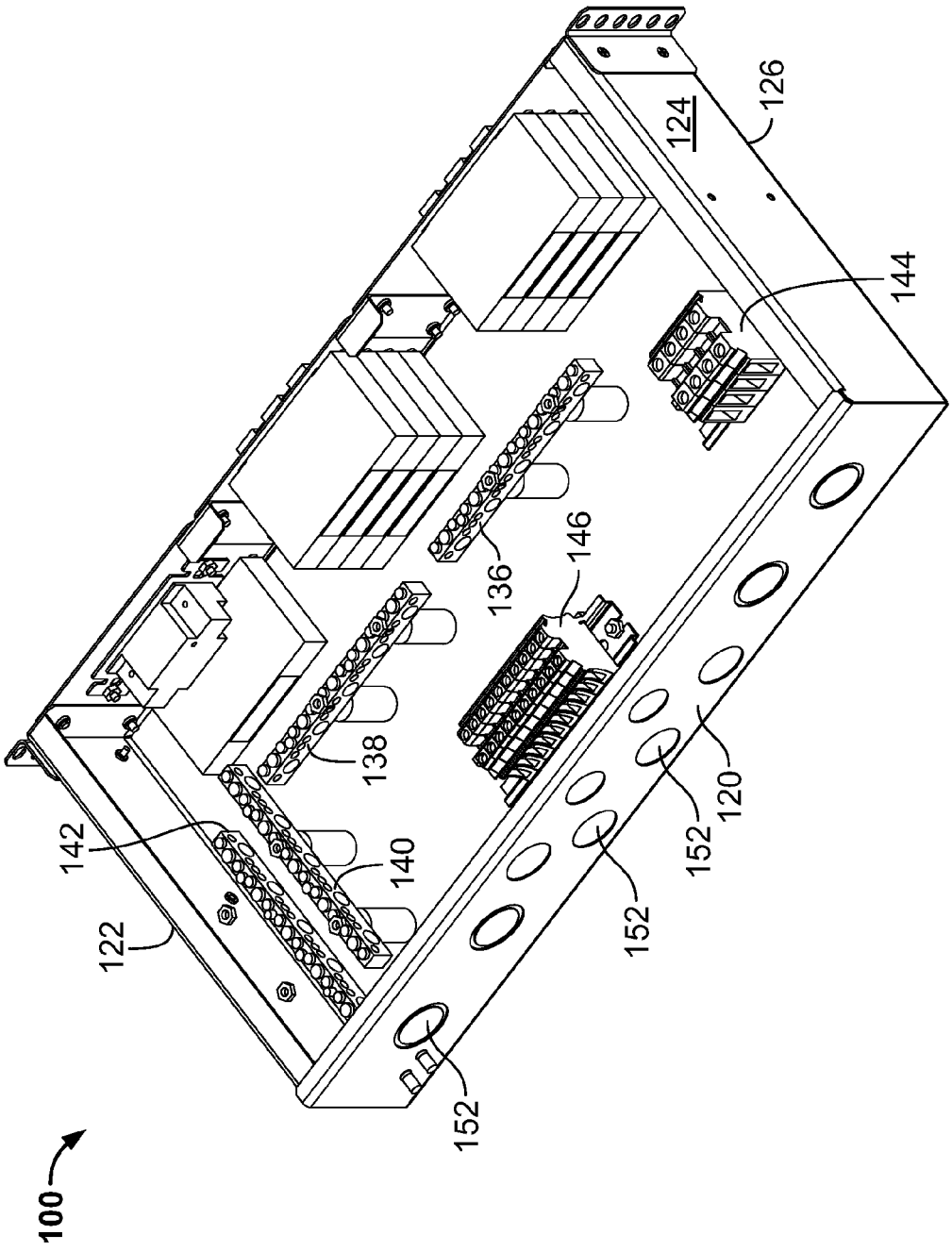


FIG. 4

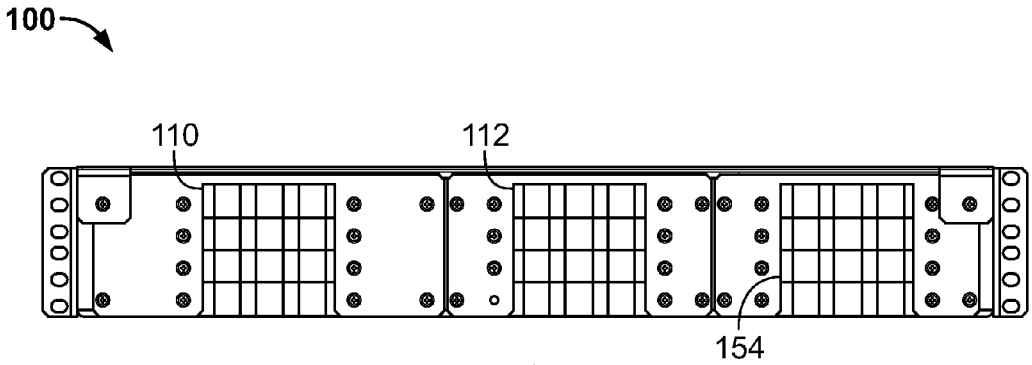


FIG. 5

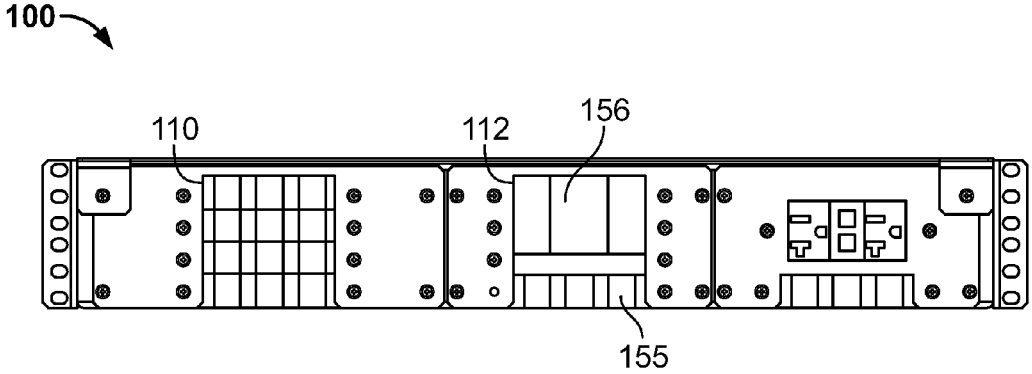


FIG. 6

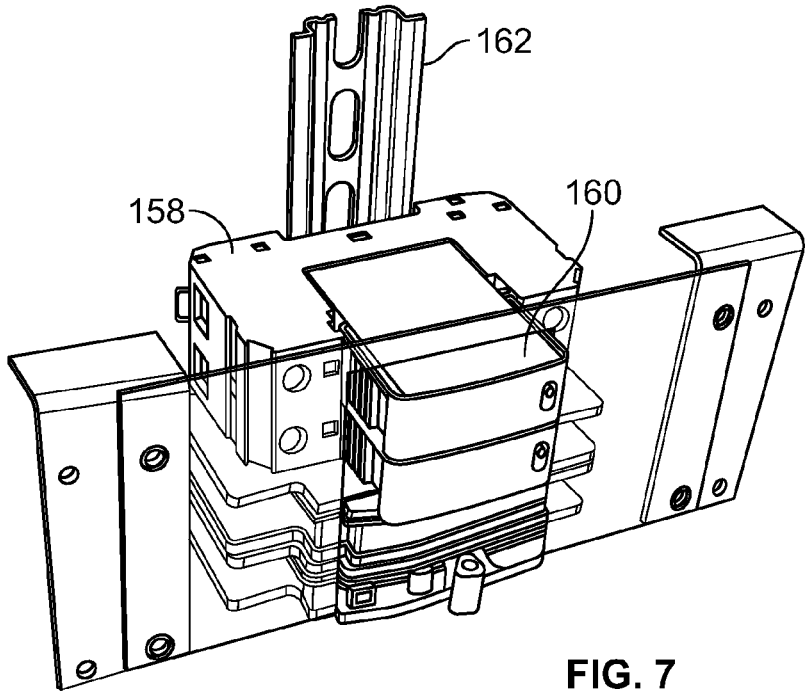

162
158
160

FIG. 7

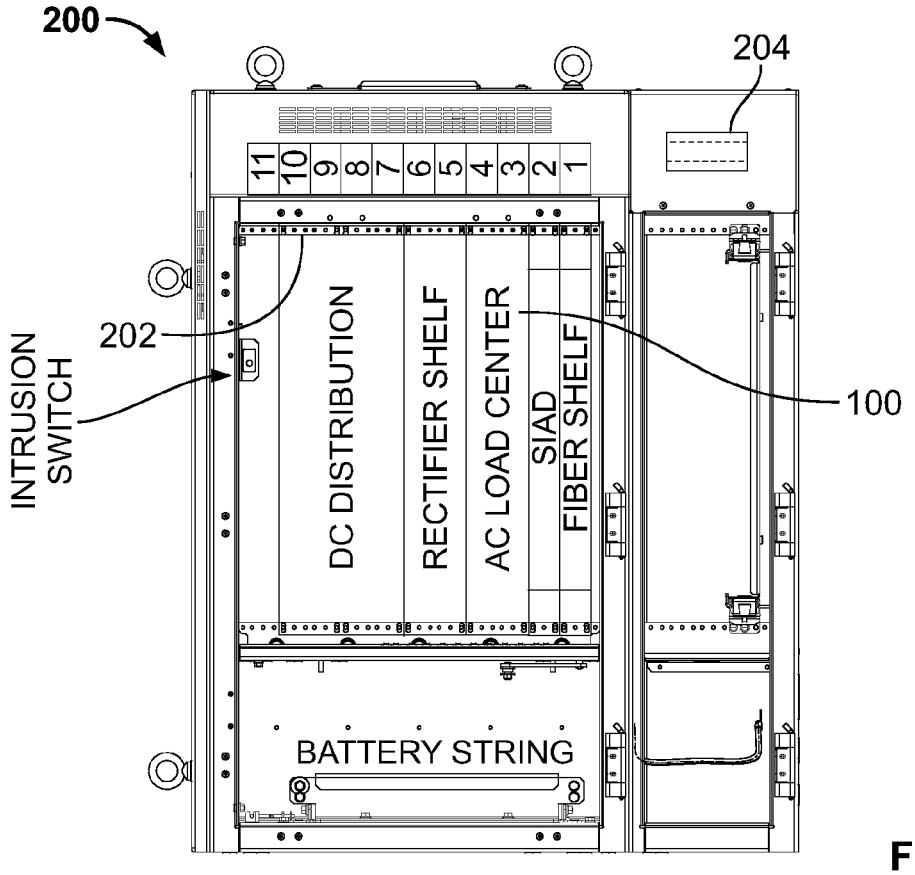

200
204
11
10
9
8
7
6
5
4
3
2
1
202
INTRUSION SWITCH
DC DISTRIBUTION
RECTIFIER SHELF
AC LOAD CENTER
SIAD
FIBER SHELF
100
BATTERY STRING

FIG. 8

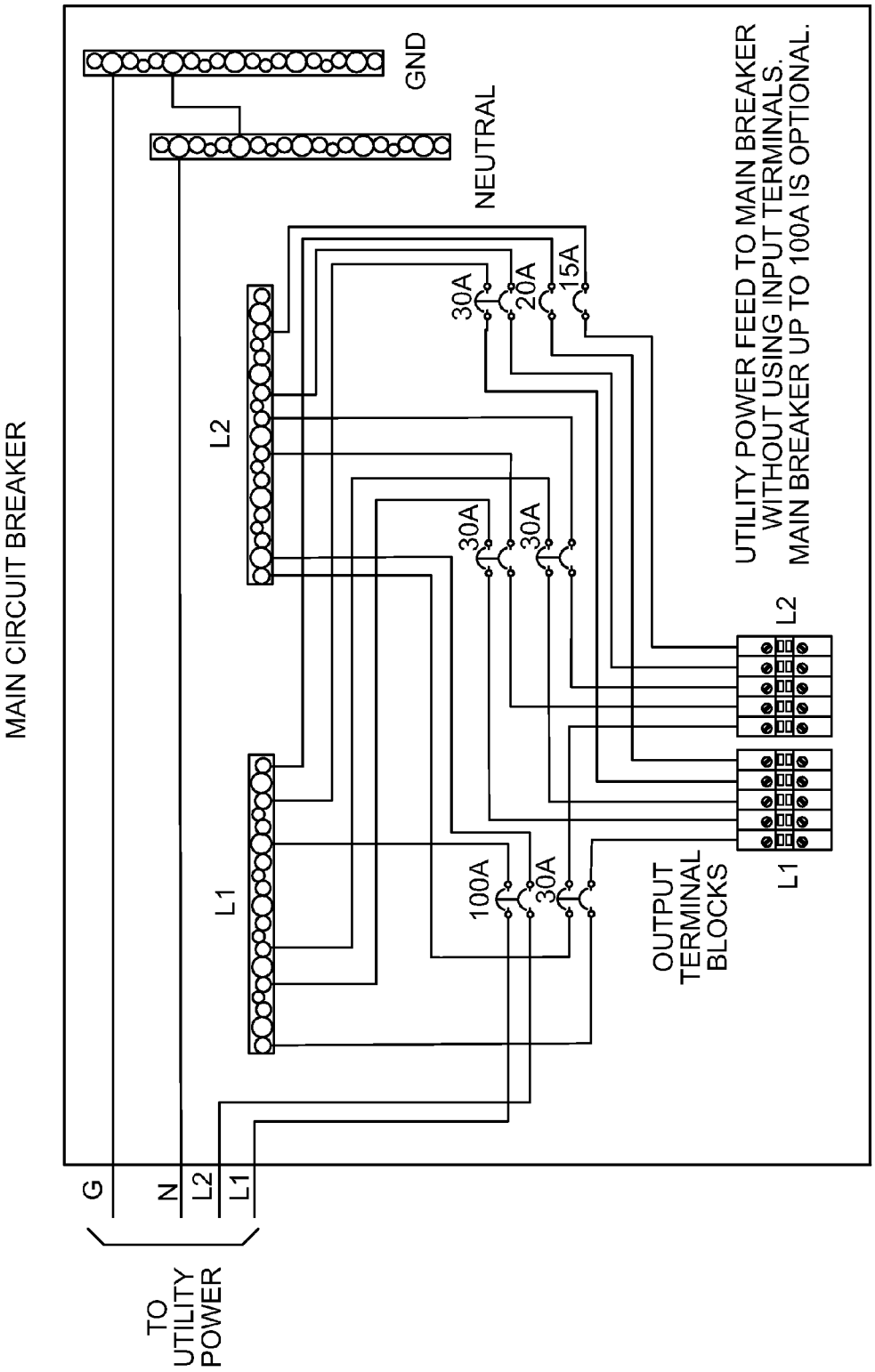

MAIN CIRCUIT BREAKER
GND
NEUTRAL
L2
30A
20A
15A
30A
30A
L1
100A
30A
UTILITY POWER FEED TO MAIN BREAKER
WITHOUT USING INPUT TERMINALS.
MAIN BREAKER UP TO 100A IS OPTIONAL.
L2
L1
OUTPUT
TERMINAL
BLOCKS
G
N
L2
L1
TO
UTILITY
POWER

FIG. 9

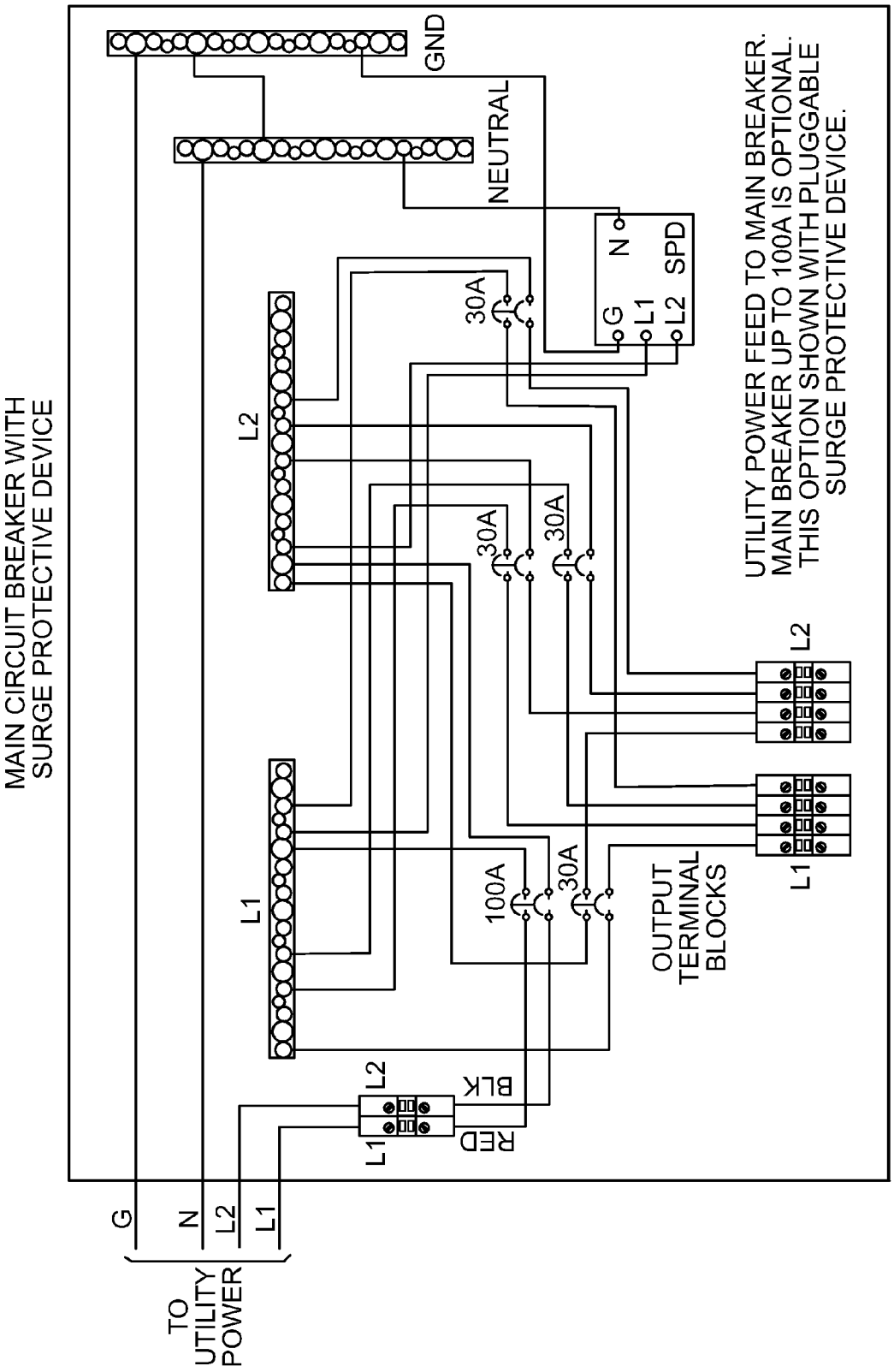

MAIN CIRCUIT BREAKER WITH
SURGE PROTECTIVE DEVICE
GND
NEUTRAL
G
N
L1
L2
SPD
30A
30A
30A
100A
30A
L2
L1
L2
L1
BLK
RED
OUTPUT
TERMINAL
BLOCKS
UTILITY POWER FEED TO MAIN BREAKER.
MAIN BREAKER UP TO 100A IS OPTIONAL.
THIS OPTION SHOWN WITH PLUGGABLE
SURGE PROTECTIVE DEVICE.
G
N
L2
L1
TO
UTILITY
POWER

FIG. 10

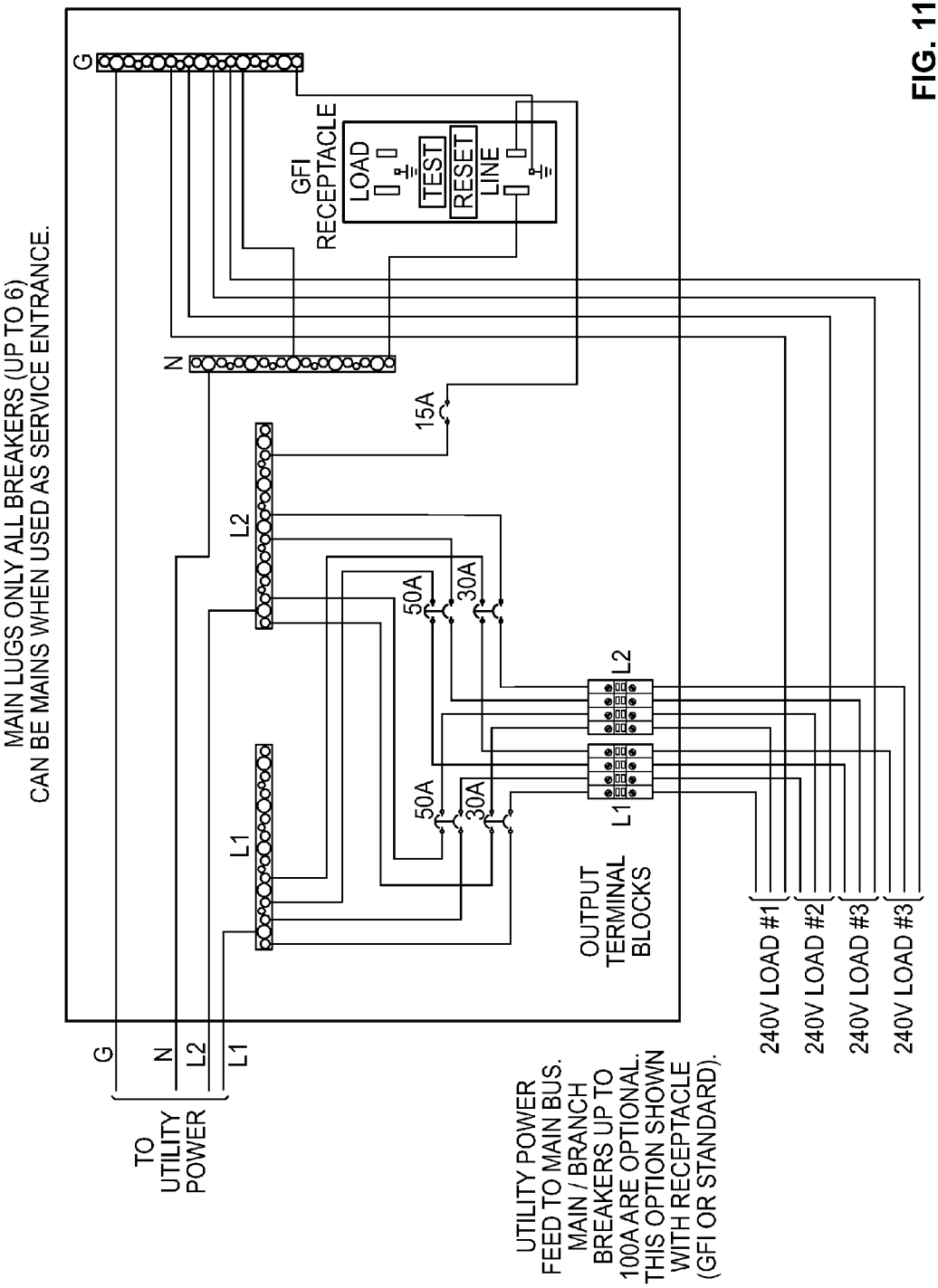

MAIN LUGS ONLY ALL BREAKERS (UP TO 6)
CAN BE MAINS WHEN USED AS SERVICE ENTRANCE.
G
N
L2
L1
GFI RECEPTACLE
LOAD
TEST
RESET
LINE
15A
50A
30A
50A
30A
OUTPUT TERMINAL BLOCKS
240V LOAD #1
240V LOAD #2
240V LOAD #3
240V LOAD #3
TO UTILITY POWER
UTILITY POWER FEED TO MAIN BUS. MAIN / BRANCH BREAKERS UP TO 100A ARE OPTIONAL. THIS OPTION SHOWN WITH RECEPTACLE (GFI OR STANDARD).

FIG. 11

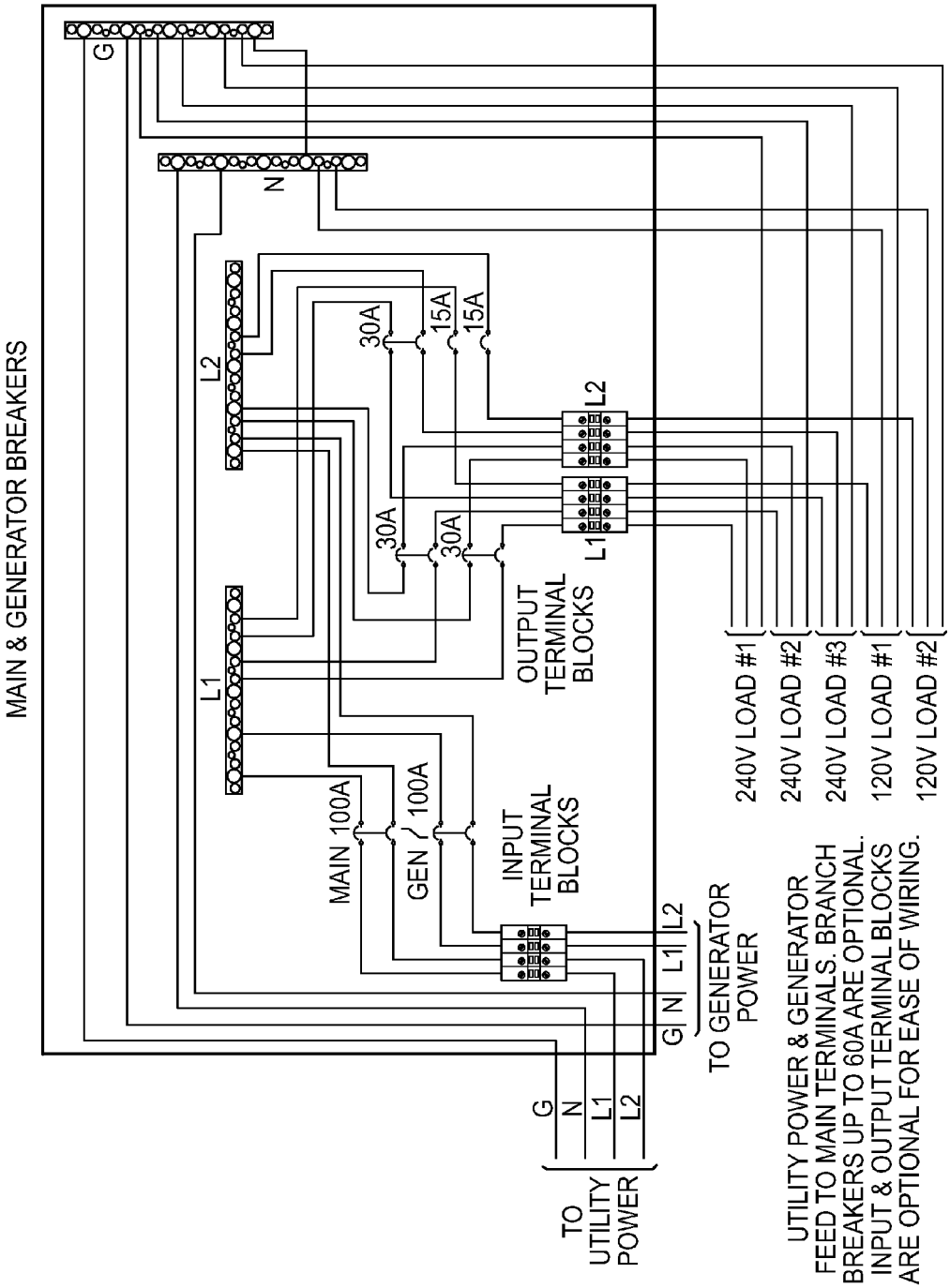

MAIN & GENERATOR BREAKERS
G
N
L2
L1
30A
15A
15A
30A
30A
L2
L1
OUTPUT TERMINAL BLOCKS
MAIN 100A
GEN 100A
INPUT TERMINAL BLOCKS
G N L1 L2
TO GENERATOR POWER
240V LOAD #1
240V LOAD #2
240V LOAD #3
120V LOAD #1
120V LOAD #2
G
N
L1
L2
TO UTILITY POWER
UTILITY POWER & GENERATOR FEED TO MAIN TERMINALS. BRANCH BREAKERS UP TO 60A ARE OPTIONAL. INPUT & OUTPUT TERMINAL BLOCKS ARE OPTIONAL FOR EASE OF WIRING.

FIG. 12

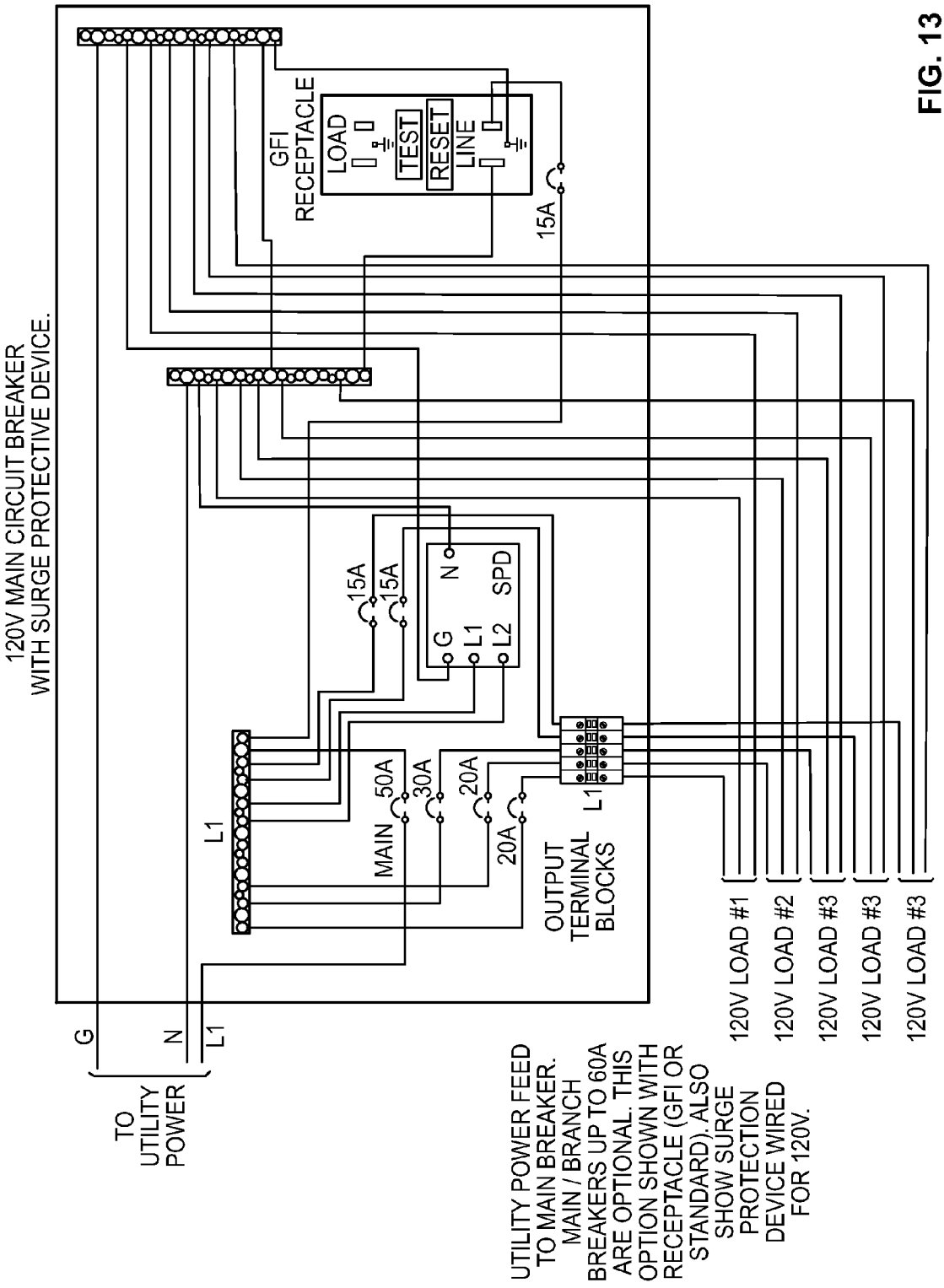

120V MAIN CIRCUIT BREAKER
WITH SURGE PROTECTIVE DEVICE.
GFI
RECEPTACLE
LOAD
TEST
RESET
LINE
15A
15A
15A
G
N
L1
L2
SPD
MAIN
50A
30A
20A
20A
L1
OUTPUT
TERMINAL
BLOCKS
120V LOAD #1
120V LOAD #2
120V LOAD #3
120V LOAD #3
120V LOAD #3
G
N
L1
TO
UTILITY
POWER
UTILITY POWER FEED
TO MAIN BREAKER.
MAIN / BRANCH
BREAKERS UP TO 60A
ARE OPTIONAL. THIS
OPTION SHOWN WITH
RECEPTACLE (GFI OR
STANDARD). ALSO
SHOW SURGE
PROTECTION
DEVICE WIRED
FOR 120V.

FIG. 13

AC CIRCUIT BREAKER PANELS AND TELECOMMUNICATIONS EQUIPMENT CABINETS HAVING AC CIRCUIT BREAKER PANELS

FIELD

[0001] The present disclosure relates to AC circuit breaker panels and telecommunications equipment cabinets having AC circuit breaker panels.

BACKGROUND

[0002] This section provides background information related to the present disclosure which is not necessarily prior art.

[0003] AC circuit breaker panels are commonly used in telecommunications equipment cabinets for distributing AC power to various equipment via one or more protected circuits. These AC circuit breaker panels typically include circuit breakers and/or AC surge suppressors, as well as brackets adapted for mounting the AC circuit breaker panel to an equipment rack in a telecommunications equipment cabinet.

SUMMARY

[0004] This section provides a general summary of the disclosure, and is not a comprehensive disclosure of its full scope or all of its features.

[0005] According to one aspect of the present disclosure, an AC circuit breaker panel includes a housing having a front side, a bus bar positioned in the housing, and one or more terminal blocks positioned in the housing. The housing has brackets adapted for mounting the AC circuit breaker panel to an equipment rack in a telecommunications equipment cabinet. The front side of the housing defines a plurality of openings for mounting a plurality of circuit breakers. The AC circuit breaker panel further includes a first circuit breaker mounted in one of the plurality of openings and wired to the bus bar, and a second circuit breaker mounted in one of the plurality of openings and wired to the bus bar and one of the terminal blocks.

[0006] According to another aspect of the present disclosure, an AC circuit breaker panel includes a housing having a front side, a first bus bar positioned in the housing, a second bus bar positioned in the housing, and a plurality of terminal blocks positioned in the housing. The housing has brackets adapted for mounting the AC circuit breaker panel to an equipment rack in a telecommunications equipment cabinet. The front side of the housing defines a plurality of openings for mounting a plurality of circuit breakers. The AC circuit breaker panel further includes a first circuit breaker mounted in one of the plurality of openings and wired to the first and second bus bars, and a second circuit breaker mounted in one of the plurality of openings and wired to the first and second bus bars and to two of the terminal blocks.

[0007] According to yet another aspect of the present disclosure, a telecommunications equipment cabinet adapted for outdoor use includes an equipment rack and one of the various AC circuit breaker panels disclosed herein.

[0008] Further aspects and areas of applicability will become apparent from the description provided herein. It should be understood that various aspects of the disclosure may be implemented individually or in combination with one or more other aspects. It should also be understood that the description and specific examples in this summary are intended for purposes of illustration only and are not intended to limit the scope of the present disclosure.

DRAWINGS

[0009] The drawings described herein are for illustrative purposes only of selected embodiments and not all possible implementations, and are not intended to limit the scope of the present disclosure.

[0010] FIG. **1** is a front perspective view of an AC circuit breaker panel according to one example embodiment of the present disclosure.

[0011] FIG. **2** is a front view of one example configuration of the circuit breaker panel of FIG. **1**.

[0012] FIG. **3** is a top view of the circuit breaker panel of FIG. **2**.

[0013] FIG. **4** is a rear perspective view of the circuit breaker panel of FIG. **2**.

[0014] FIGS. **5** and **6** are front views of additional example configurations of the circuit breaker panel of FIG. **1**.

[0015] FIG. **7** is a front perspective view of an AC surge protector mounted in an opening of the circuit breaker panel of FIG. **1**.

[0016] FIG. **8** is a front view of an example telecommunications equipment cabinet having an AC circuit breaker panel mounted therein.

[0017] FIGS. **9-13** are wiring diagrams illustrating example configurations of the AC circuit breaker panels disclosed herein.

[0018] Corresponding reference numerals indicate corresponding parts throughout the several views of the drawings.

DETAILED DESCRIPTION

[0019] Example embodiments will now be described more fully with reference to the accompanying drawings.

[0020] Example embodiments are provided so that this disclosure will be thorough, and will fully convey the scope to those who are skilled in the art. Numerous specific details are set forth such as examples of specific components, devices, and methods, to provide a thorough understanding of embodiments of the present disclosure. It will be apparent to those skilled in the art that specific details need not be employed, that example embodiments may be embodied in many different forms and that neither should be construed to limit the scope of the disclosure. In some example embodiments, well-known processes, well-known device structures, and well-known technologies are not described in detail.

[0021] The terminology used herein is for the purpose of describing particular example embodiments only and is not intended to be limiting. As used herein, the singular forms "a," "an," and "the" may be intended to include the plural forms as well, unless the context clearly indicates otherwise. The terms "comprises," "comprising," "including," and "having," are inclusive and therefore specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof. The method steps, processes, and operations described herein are not to be construed as necessarily requiring their performance in the particular order discussed or illustrated, unless specifically identified as an order of performance. It is also to be understood that additional or alternative steps may be employed.

[0022] Although the terms first, second, third, etc. may be used herein to describe various elements, components, regions, layers and/or sections, these elements, components, regions, layers and/or sections should not be limited by these terms. These terms may be only used to distinguish one element, component, region, layer or section from another region, layer or section. Terms such as "first," "second," and other numerical terms when used herein do not imply a sequence or order unless clearly indicated by the context. Thus, a first element, component, region, layer or section discussed below could be termed a second element, component, region, layer or section without departing from the teachings of the example embodiments.

[0023] Spatially relative terms, such as "inner," "outer," "beneath," "below," "lower," "above," "upper," and the like, may be used herein for ease of description to describe one element or feature's relationship to another element(s) or feature(s) as illustrated in the figures. Spatially relative terms may be intended to encompass different orientations of the device in use or operation in addition to the orientation depicted in the figures. For example, if the device in the figures is turned over, elements described as "below" or "beneath" other elements or features would then be oriented "above" the other elements or features. Thus, the example term "below" can encompass both an orientation of above and below. The device may be otherwise oriented (rotated 90 degrees or at other orientations) and the spatially relative descriptors used herein interpreted accordingly.

[0024] An AC circuit breaker panel according to one example embodiment of the present disclosure is illustrated in FIG. **1** and indicated generally by reference number **100**. As shown in FIG. **1**, the panel **100** includes a housing **102** having a front portion **104**, and brackets **106**, **108** adapted for mounting the AC circuit breaker panel to an equipment rack in a telecommunications equipment cabinet. The front portion **104** defines at least three openings **110**, **112**, **114**, as shown in FIG. **1**.

[0025] In the particular example shown in FIG. **1**, the three openings **110**, **112**, **114** are arranged side-by-side, and each opening is adapted for mounting one or more circuit breakers therein. For example, openings **110**, **112** are each adapted for mounting up to four 1-pole circuit breakers, two 2-pole circuit breakers, or a combination thereof. Opening **114** is adapted for mounting a single 1-pole breaker. An additional opening **116** provided above opening **114** is adapted for mounting a receptacle. In other embodiments, however, the panel **100** may be provided with more or less openings that are arranged as desired for a given application. For example, openings **114** and **116** can be replaced by a single opening adapted for mounting up to four 1-pole circuit breakers, two 2-pole circuit breakers, or a combination thereof. Further, any of the various openings may be adapted for mounting devices in addition to (or instead of) circuit breakers and receptacles. For example, one or more openings may be adapted for mounting an AC surge suppressor, as further explained below.

[0026] FIG. **2** illustrates an example configuration of the panel **100**, where four 1-pole circuit breakers are mounted in opening **110**, four 1-pole circuit breakers are mounted in opening **112**, and a single 1-pole circuit breaker is mounted in opening **114**. Additionally, a duplex receptacle **118** is mounted in opening **116**. The receptacle **118** may be a ground fault interrupt (GFI) receptacle, as shown in FIG. **2**.

[0027] The housing **102** may also include a rear portion **120**, side portions **122**, **124**, a bottom portion **126**, and a removable (or non-removable) top cover **128**, as shown in FIG. **1**.

[0028] In the example of FIG. **1**, the front portion **104** of the housing is formed by three cover panels **130**, **132**, **134**, with cover panel **130** defining the opening **110**, cover panel **132** defining the opening **112**, and cover panel **134** defining the openings **114**, **116**. Alternatively, the front portion of the housing and its openings may be formed using more or less cover panels, or without using cover panels (e.g., by forming the front portion **104** and the rear portion **120**, side portions **122**, **124**, top cover **128** and/or bottom portion **126** from a single sheet of material, such as steel or another suitably conductive material.

[0029] As shown in FIG. **3**, the panel **100** may have a width W of about twenty-three inches, so the panel **100** is mountable to a 23-inch equipment rack. Alternatively, the panel **100** may be provided with another suitable width, such as nineteen inches (e.g., so the panel **100** is mountable to a 19-inch equipment rack).

[0030] Further, the panel **100** preferably has a height H of about 3½ inches, as shown in FIG. **2**, so the panel **100** will advantageously occupy only two rack units (2RU, also referred to as simply **2**U) of space in the equipment rack of a telecommunications equipment enclosure.

[0031] Additionally, the AC circuit breaker panels disclosed herein preferably meet all applicable requirements for service equipment, including UL 869A, so one or more circuit breakers mounted to the panel **100** can be wired directly (i.e., with no intervening circuit breakers) to utility power, such as a utility meter, and function as main circuit breaker(s).

[0032] One or more bus bars and terminal blocks may be positioned in the housing **102**. For example, FIG. **4** illustrates a panel **100** having four bus bars **136**, **138**, **140**, **142** for making electrical connections to a first line voltage L**1**, a second line voltage L**2**, neutral, and ground, respectively. The L**1**, L**2** and neutral bus bars may be spaced from the housing **102** using electrical isolators. The ground bus bar **142** may be electrically connected to the housing **102** and/or to ground terminals **143** provided on the rear portion **120** of the housing **102** (shown in FIG. **3**).

[0033] The panel of FIG. **4** also includes four terminal blocks **144** for making input connections, and ten terminal blocks **146** for making output connections. The input terminal blocks **144** are mounted to a first DIN rail **148**, and the output terminal blocks **146** are mounted to a second DIN rail **150**. Alternatively, more or less DIN rails (including only one DIN rail) may be employed, or the terminal blocks **144**, **146** may be mounted in the housing **102** without using DIN rails. Similarly, more or less bus bars and terminal blocks may be employed in any given implementation of these teachings. The bus bars are preferably spaced from conductive portions of the housing **102** using electrical isolators.

[0034] FIG. **4** also illustrates several knock-outs **152** on the rear portion **120** of the housing **102**, which can be selectively removed to form wire passage openings through the rear portion **120** (i.e., for routing wires to/from the terminal blocks, bus bars and/or circuit breakers). While not shown in FIG. **4**, knockouts can also (or instead) be provided on the side portions **122**, **124**, bottom portion **126** and/or top cover **128** (not shown in FIG. **4**) of the housing **102** as may be desirable for a given implementation.

[0035] FIG. **5** illustrates an example configuration of the panel **100** similar to FIG. **2**, except the openings **114**, **116** in FIG. **2** are replaced by opening **154** in FIG. **5**. Further, each of the openings **110**, **112** and **154** in the example of FIG. **5** have four 1-pole circuit breakers, two 2-pole circuit breakers, or a combination thereof mounted therein.

[0036] FIG. **6** illustrates another example configuration of the panel **100** similar to FIG. **2**. However, in the example of FIG. **6**, a single 1-pole circuit breaker **155** and an AC surge protector **156** are mounted in the opening **112**. If the opening **112** is defined by a cover panel, such as cover panel **132** shown in FIG. **1**, an additional cover plate (not shown) may be used to cover any open space between the surge protector **156** and the cover panel. As shown in FIG. **7**, the AC surge protector **156** preferably has a multi-piece construction including a wired base portion **158** and a plug portion **160** that can be selectively coupled to and removed from the base portion **158**—from a front side of the housing **102**—without removing any wiring. Therefore, the plug portion **160** can be removed and replaced without requiring a qualified electrician. Preferably, the plug portion **160** can also be coupled to and removed from the base portion **158** without removing any cover panel, such as cover panel **132** shown in FIG. **1**, and without removing the circuit breaker **155**. An additional cover plate (if employed) may need to be removed before the plug portion **160** can be coupled to or removed from the base portion **158**. Further, the AC surge protector **156** may be mounted in the opening **112** using a vertically oriented DIN rail **162**, as shown in FIG. **7**. The AC surge protector **156** may be a 240V AC surge protector.

[0037] Alternatively, the AC surge protector may be located external to the AC circuit breaker panel **100** and wired to the panel **100** as desired. For example, an external AC surge protector may be wired to a circuit breaker directly or via one or more output terminal blocks, wired to the L**1** and L**2** bus bars **136**, **138**, etc.

[0038] FIG. **8** illustrates one example embodiment of a telecommunications equipment cabinet **200** having an equipment rack **202** (comprising a pair of mounting rails) to which the AC circuit breaker panel **100** is mounted. While the panel **100** is shown mounted in a vertical orientation in the example of FIG. **7**, the panel may instead be mounted in another orientation, including a horizontal orientation.

[0039] As shown in FIG. **8**, the telecommunications equipment cabinet **200** may include a receptacle **204** mounted external to the AC circuit breaker panel **100**. In that event, the AC circuit breaker panel **100** may include a circuit breaker wired to the receptacle **204**. The receptacle **204** may be a GFI receptacle. Further, the receptacle **118** shown in FIG. **2** may be unnecessary and omitted from the AC circuit breaker panel **100**.

[0040] The cabinet **200** is preferably a NEMA 3R type outdoor cabinet, and the equipment rack **202** in the cabinet is preferably a 23-inch or 19-inch rack.

[0041] With further reference to FIG. **8**, the circuit breakers mounted to the front portion **104** of the AC circuit breaker panel **100** are preferably removable from a front side of the housing **102** when the AC circuit breaker panel **100** is mounted to the equipment rack **202**. In other words, the circuit breakers can be removed and replaced from a front side of the housing **102** without removing the AC circuit breaker panel **100** from the cabinet **200**. Similarly, if the panel **100** includes an AC surge protector **156**, the plug portion **160** of the AC surge protector is preferably removable and replaceable from a front side of the housing **102**, without removing the AC circuit breaker panel **100** from the cabinet **200**.

[0042] If the AC circuit breaker panel **100** includes a main circuit breaker and a generator circuit breaker, a mechanical interlock is preferably employed so that at any given time, only the main circuit breaker or the generator circuit breaker is on, and not both. One example of a suitable interlock is the Square D type QOU2DTILA.

[0043] The AC circuit breaker panels described herein may employ NEMA Type 1 enclosures. In one example embodiment, the AC circuit breaker panel **100** may include up to twelve 1-pole circuit breakers, six 2-pole circuit breakers, or a combination thereof, optionally including main and generator 2-pole circuit breakers up to 100 A. Further, the panel **100** may be rated for an input voltage of up to 240V AC (50/60 Hz) and an input current of up to 100 A. The output/branch breakers may include 2-pole circuit breakers up to 60 A and/or 1-pole circuit breakers up to 30 A, and may have an interrupt rating of 10kAIC. Preferred breakers include Square D type QOU (UL File # E 84967), and preferred surge protectors include the pluggable base type (UL # VZCA & VZCA2). The input terminal blocks accept wire sizes 16 to 1/0 AWG (UL CCN # XCFR2), and the output terminal blocks accept wire sizes 24 to 4 AWG (UL CCN # XCFR2). The bus bars may include up to twelve positions for wire size 14 to 6 AWG, or five positions for wire size 14 to 1/0. Suitable bus bars include Eaton type BRGBK39512 or equivalent. Suitable bus isolators for spacing the bus bars from the housing **102** include NEMA Grade FR4 Glass Epoxy Laminate (UL CCN # QMTR2). The receptacles (when employed) may be 15 A or 20 A standard duplex type or GFI type.

[0044] Some example wiring configurations for the AC circuit breaker panel **100** will now be described with reference to FIGS. **9**-**13**.

[0045] In the example of FIG. **9**, line voltages L**1** and L**2** are fed directly to a main 100 A 2-pole breaker without using terminal blocks. The main circuit breaker is also wired to L**1** and L**2** bus bars, which feed several branch circuit breakers, including four 30 A 2-pole 240 VAC circuit breakers, and two 1-pole 120 VAC circuit breakers (15 A and 20 A). The 1-pole circuit breakers may each be wired to receptacles external to the panel **100** (e.g., receptacles in the telecommunications equipment cabinet **200**). The various branch breakers are wired to output terminal blocks. The neutral and ground lines from the utility source are wired to the neutral and ground bus bars, respectively. Further, the neutral bus bar is electrically coupled (e.g., wired) to the ground bus bar.

[0046] FIG. **10** illustrates an example similar to FIG. **9**, except the main 100 A circuit breaker is connected to utility power via two input terminal blocks, and the circuit includes a 240 VAC surge protector wired to the L**1**, L**2**, neutral and ground bus bars.

[0047] In the example of FIG. **11**, line voltages L**1** and L**2** are fed directly to the L**1** and L**2** bus bars which, in turn, are wired to four 2-pole 240 VAC circuit breakers (two 50 A breakers and two 30 A breakers) and a 1-pole 120 VAC circuit breaker feeding a GFI receptacle in the panel **100**.

[0048] FIG. **12** illustrates an example similar to FIG. **9**, except the main 100 A circuit breaker is connected to utility power via two input terminal blocks, and a generator 100 A circuit breaker is connected to generator power via two other input terminal blocks.

[0049] FIG. **13** illustrates a 120V example where line voltage L**1** is fed directly to a main 50 A 1-pole circuit breaker

without using terminal blocks. The main circuit breaker is also wired to the L1 bus bar, which feeds several 1-pole branch circuit breakers, including a 15 A breaker connected to a GFI receptacle in the panel **100**. Additionally, an AC surge protector is coupled to the L1, neutral and ground bus bars. Except for the 15 A breaker feeding the GFI receptacle, the branch circuit breakers are wired to output terminal blocks. For this particular example, the L2 bus bar can be omitted.

[0050] The foregoing description of the embodiments has been provided for purposes of illustration and description. It is not intended to be exhaustive or to limit the disclosure. Individual elements or features of a particular embodiment are generally not limited to that particular embodiment, but, where applicable, are interchangeable and can be used in a selected embodiment, even if not specifically shown or described. The same may also be varied in many ways. Such variations are not to be regarded as a departure from the disclosure, and all such modifications are intended to be included within the scope of the disclosure.

1. An AC circuit breaker panel, comprising:
- a housing having a front side, and brackets adapted for mounting the AC circuit breaker panel to an equipment rack in a telecommunications equipment cabinet;
- the front side defining a plurality of openings for mounting a plurality of circuit breakers;
- a bus bar positioned in the housing;
- a first circuit breaker mounted in one of the plurality of openings and wired to the bus bar;
- one or more terminal blocks positioned in the housing; and
- a second circuit breaker mounted in one of the plurality of openings and wired to the bus bar and one of the terminal blocks.

2. The AC circuit breaker panel of claim **1**, wherein the plurality of openings include a first opening, a second opening and a third opening, and wherein each of the first, second and third openings is sized to receive up to four single pole circuit breakers.

3. The AC circuit breaker panel of claim **1**, wherein the AC circuit breaker panel qualifies as service equipment under applicable UL standards.

4. The AC circuit breaker panel of claim **1**, wherein the first circuit breaker is a main circuit breaker wired directly to a utility meter.

5. The AC circuit breaker panel of claim **1**, wherein the first circuit breaker is a main circuit breaker, and wherein one of the terminal blocks is wired directly to a utility meter and to the main circuit breaker.

6. The AC circuit breaker panel of claim **1**, wherein the first circuit breaker is removable from said one of the plurality of openings from the front side of the housing when the AC circuit breaker panel is mounted to the equipment rack of a telecommunications equipment cabinet.

7. The AC circuit breaker panel of claim **1**, further comprising an AC surge protector mounted in one of the plurality of openings.

8. The AC circuit breaker panel of claim **1**, further comprising a receptacle mounted in one of the plurality of openings.

9. The AC circuit breaker panel of claim **8** wherein the receptacle is a GFI receptacle.

10. The AC circuit breaker panel of claim **9** further comprising a third circuit breaker wired to the bus bar and to the GFI receptacle.

11. The AC circuit breaker panel of claim **7**, wherein the AC surge protector includes a plug portion and a wired base portion, and wherein the plug portion is removable and replaceable from the front side of the housing when the AC circuit breaker panel is mounted to the equipment rack of a telecommunications equipment cabinet.

12. The AC circuit breaker panel of claim **1**, wherein the AC circuit breaker panel has a height dimension corresponding to two rack units (2RU).

13. The AC circuit breaker panel of claim **1**, wherein the first circuit breaker and the second circuit breaker are 2-pole circuit breakers.

14. The AC circuit breaker panel of claim **1**, wherein the brackets are adapted for mounting the AC circuit breaker panel to a 23-inch equipment rack.

15. An AC circuit breaker panel, comprising:
- a housing having a front side, and brackets adapted for mounting the AC circuit breaker panel to an equipment rack in a telecommunications equipment cabinet;
- the front side defining a plurality of openings for mounting a plurality of circuit breakers;
- a first bus bar positioned in the housing;
- a second bus bar positioned in the housing;
- a first circuit breaker mounted in one of the plurality of openings and wired to the first and second bus bars;
- a plurality of terminal blocks positioned in the housing; and
- a second circuit breaker mounted in one of the plurality of openings and wired to the first and second bus bars and to two of the terminal blocks.

16. A telecommunications equipment cabinet adapted for outdoor use, the cabinet comprising:
- an equipment rack; and
- the AC circuit breaker panel of claim **1** mounted to the equipment rack.

17. The cabinet of claim **16** further comprising a receptacle mounted in the cabinet external to the AC circuit breaker panel, wherein the AC circuit breaker panel includes a circuit breaker wired to the receptacle.

18. The cabinet of claim **17** wherein the receptacle is a GFI receptacle.

19. The cabinet of claim **16** wherein the AC circuit breaker panel is mounted in the cabinet in a vertical orientation.

20. The cabinet of claim **16** wherein the cabinet is a NEMA 3R type outdoor cabinet.

21. The cabinet of claim **16** wherein the equipment rack is a 23-inch rack.

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