June 20, 1944. L. W. DYER ET AL 2,351,942

PANELBOARD CONSTRUCTION

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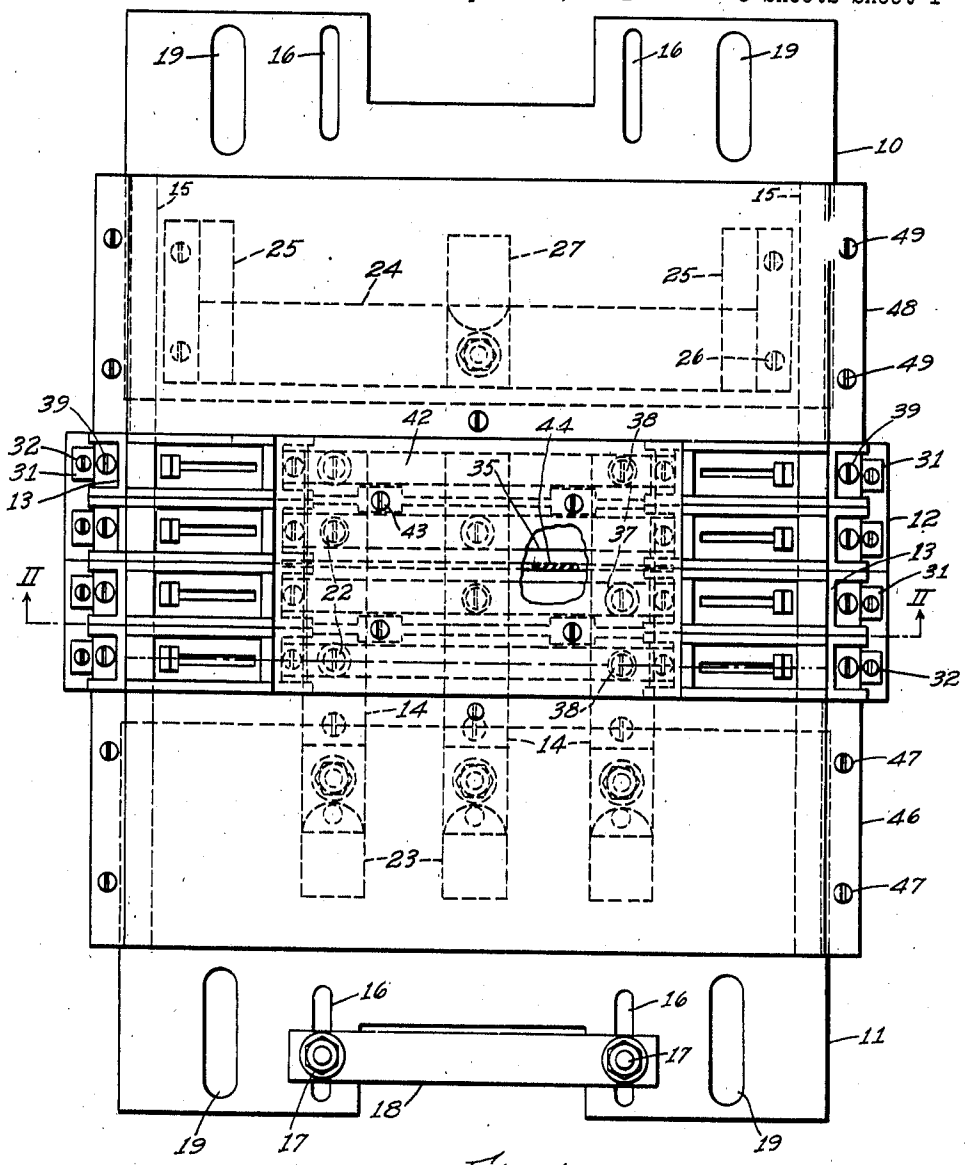


Fig. 1.

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Fig. 2.

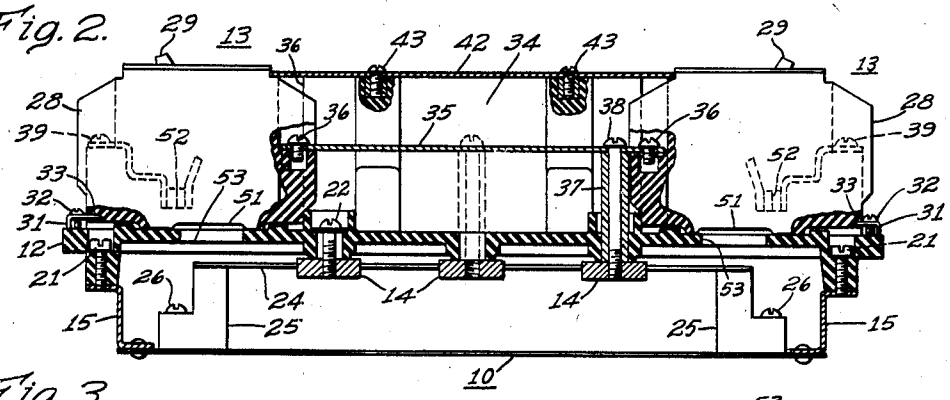


Fig. 3.

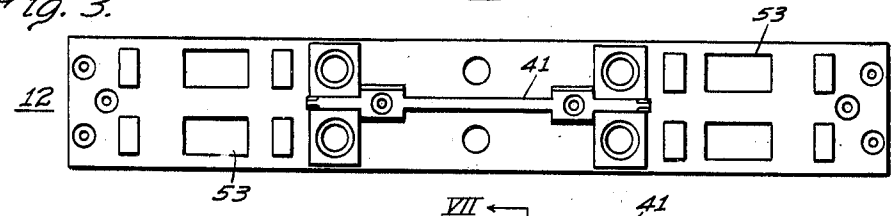


Fig. 4.

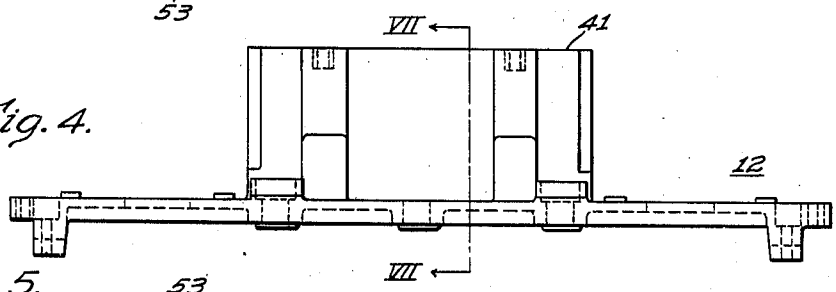


Fig. 5.

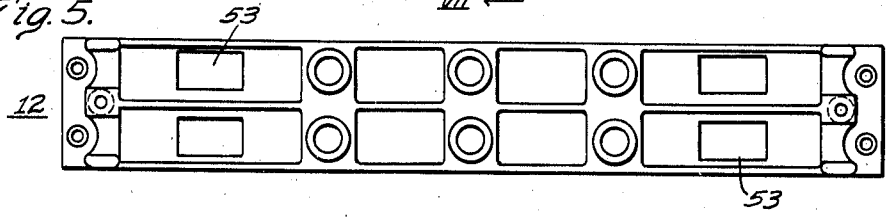


Fig. 6.

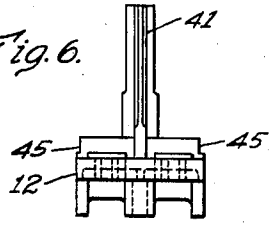
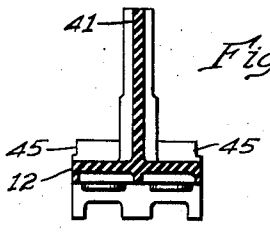


Fig. 7.



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Fig. 8.

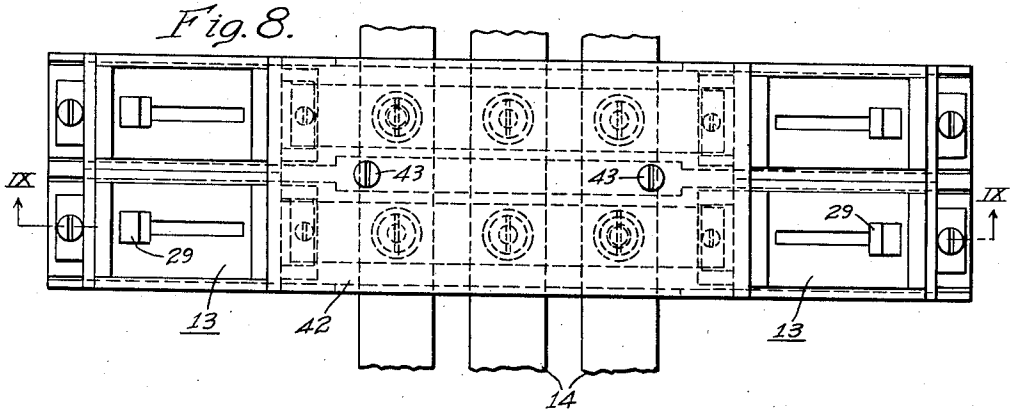


Fig. 9.

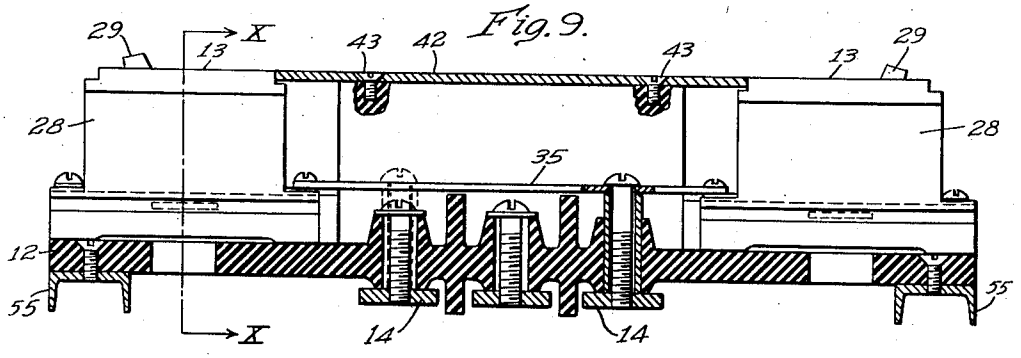


Fig. 10.

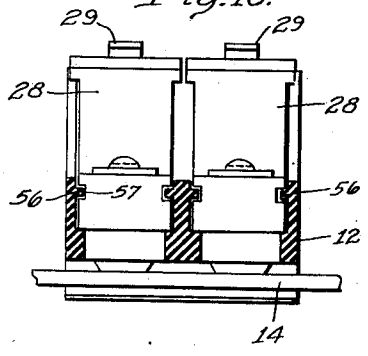
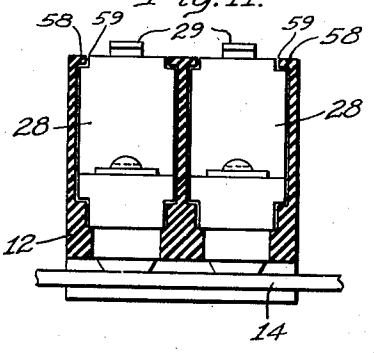


Fig. 11.



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Patented June 20, 1944

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UNITED STATES PATENT OFFICE

2,351,942

PANEL-BOARD CONSTRUCTION

Lloyd W. Dyer, Wilkinsburg, and Thomas F. Brown, Forest Hills, Pa., assignors to Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., a corporation of Pennsylvania

Application April 11, 1941, Serial No. 388,088

13 Claims. (Cl. 175—371)

Our invention relates, in general, to panelboards and more particularly, to panelboards of the dead-front type in which all the current-carrying conductors are enclosed so as to prevent accidental contact therewith.

An object of our invention, generally stated, is to provide a panelboard which shall be simple and efficient in operation and which may be economically manufactured and installed.

A more specific object of our invention is to provide a panelboard adapted for utilizing automatic circuit breakers to control the power circuits.

Another object of our invention is to properly insulate all of the current-conducting parts of a panelboard assembly.

A further object of our invention is to provide a combined mounting and insulating base for the circuit controlling devices and the bus-bars in a panelboard assembly.

Still another object of our invention is to provide a panelboard structure in which the circuit controlling devices may be readily connected to any desired bus-bar.

A still further object of our invention is to provide a panelboard assembly from which the circuit controlling devices may be removed individually or in predetermined groups.

Other objects of our invention will be explained fully hereinafter or will be apparent to those skilled in the art.

In accordance with our invention a plurality of individual breaker units are mounted on a common sub-base, which may be moulded from insulating material and mounted on channels or Z-bars secured to a flat pan adjustably mounted in a housing or cabinet. Each breaker unit is enclosed by a separate housing and the housings are disposed side-by-side at each end of the sub-base, thereby providing space between the inner ends of the breaker housings for bus-bars which are disposed on the bottom side of the sub-base and held in position by screws extending through the sub-base. The breaker units are connected to the bus-bars by cross-connecting straps having holes so disposed in alignment with holes in the sub-base and bus-bars that each strap may be connected to any one of the bus-bars.

For a fuller understanding of the nature and objects of our invention, reference may be had to the following detailed description, taken in conjunction with the accompanying drawings, in which:

Figure 1 is a view, in plan, of a portion of a panelboard structure embodying our invention;

Fig. 2 is a view, partially in section and partially in elevation, the section being taken along the line II—II of Fig. 1;

Fig. 3 is a top plan-view of one of the insulating sub-bases utilized in the panelboard structure;

Fig. 4 is a view, in side elevation, of the sub-base shown in Fig. 3;

Fig. 5 is a bottom plan view of the sub-base;

Fig. 6 is a view, in end elevation, of the sub-base;

Fig. 7 is a sectional view, taken along the base VII—VII of Fig. 4;

Fig. 8 is a view, in plan, showing a modification of our invention;

Fig. 9 is a view, partially in section and partially in elevation, the section being taken along the line IX—IX of Fig. 8;

Fig. 10 is a sectional view, taken along the line X—X of Fig. 9; and

Fig. 11 is a view, in section, showing another modification of our invention.

Referring to the drawings, and particularly to Figs. 1 to 7, inclusive, the structure shown therein comprises a mounting plate or pan which may be divided in two sections 10 and 11, a plurality of sub-bases 12 on which are mounted a plurality of individual current-controlling-apparatus units 13 and bus-bars 14 for conducting current to the apparatus units 13. The apparatus units 13 are preferably automatic circuit breakers and may be of the type described in the copending applications of O. S. Jennings, Serial No. 339,466, filed June 8, 1940, and Serial No. 345,264, filed July 13, 1940.

As shown, the mounting plate is divided into two sections 10 and 11 which are spaced apart and spanned by a pair of Z-bars 15. The sections 10 and 11 of the mounting plate are provided with elongated openings 16 for adjustably mounting the pan in a panelboard cabinet (not shown) by means of bolts 17 and a strap 18. Additional openings 19 are provided in the mounting plates to facilitate mounting in cabinets of different types. The mounting plates may be composed of sheet metal or other suitable material.

In the present structure each one of the sub-bases 12 is designed to support four circuit breaker units. The sub-bases may be molded from a suitable insulating material, and each base is removably secured to the top of the Z-bars 15 by means of screws 21, thereby spacing the sub-bases from the mounting plates 10 and 11.

The bus-bars 14 are mounted underneath the sub-bases 12 and secured thereto by screws 22

which extend through openings provided in the sub-bases. As shown in Fig. 2, the screws 22 are accessible from above the sub-base without removing the circuit breaker units. Terminal members 23 are provided for connecting power conductors to the bus-bars 14 in the usual manner.

A neutral bus 24 is mounted on the mounting plate 10 at the top of the panelboard structure for making the usual neutral connections in a three-phase four-wire system. The bus 24 is supported by insulating blocks 25 which are secured to the mounting plate 10 by screws 26. A terminal connection 27 is provided for connecting an external conductor to the neutral bus 24.

As explained hereinbefore, each sub-base or assembly unit 12 supports four circuit breaker units. Each of the circuit breaker units is individually enclosed by a housing 28 and is provided with an operating handle 29 which projects from an opening in the top of the housing 28. Each one of the housings 28 is removably secured to a sub-base 12 by means of an L-shaped clip 31 and a screw 32. As shown in Fig. 2, one end of the L-shaped clip 31 is inserted into a slot 33 provided in the housing 28.

As shown in Figs. 1 and 2, the circuit breaker units are disposed side by side in two rows on the sub-bases 12 with an intervening space 34 between the inner ends of the housings 28. In the present structure only two sub-bases are illustrated, thereby accommodating eight circuit breaker units. It will be understood that the panelboard may be readily designed to accommodate additional circuit breaker units by increasing the length of the Z-bars 15 and adding additional sub-bases 12 for supporting additional circuit breaker units. In this manner the number of circuit breaker units may be increased in multiples of four, since each sub-base supports four individual circuit breaker units. It will, of course, be understood that each of the sub-bases may be designed to support either two, four, six, or any multiple of two, circuit breaker units without departing from the scope of the present invention.

In order to provide for so connecting the circuit breaker units to the bus-bars 14 that the connections may be readily changed without removing the panel, or the circuit breakers, or the sub-bases from the panelboard cabinet, a cross connecting strap 35 may be provided for each oppositely disposed pair of circuit breaker units. The straps 35 are disposed in the space 34 between the two rows of housings 28 and each end of a strap is connected to one terminal of a circuit breaker unit by means of a screw 36. Each strap is provided with three clearance holes, one directly over each bus-bar 14. The bus-bars 14 are provided with tap holes directly in line with the holes in the cross connecting straps. Each sub-base 12 is also provided with holes which are in alignment with the holes in the cross connecting straps 35 and the bus-bars 14.

Thus, by inserting a tubular conducting member 37 in the proper hole in the sub-base 12 and then securing the cross connecting strap to the bus-bar 14 by means of a screw 38, which extends through the tubular member 37 as shown in Fig. 2, any desired connections may be made to the bus-bars 14, that is, each pair of branch circuits may be connected to any one of the bus-bars 14, thereby dividing the load between the bus-bars 14 in any desired manner. Furthermore, the bussing arrangement may be readily changed at any time without removing the circuit breaker units. It will be seen that the cross connecting straps 35 not only conduct current to the individual circuit breaker units, but also hold one end of the units in place, since each strap is fastened to one of the bus-bars 14 which is, in turn, secured to the sub-base 12, and one end of the strap is secured to the circuit breaker unit by the terminal connection 36. Terminal screws 39 are provided for making the desired connections to the outer terminals of the circuit breaker units.

In order to properly insulate adjacent connecting straps 35 from each other, each one of the sub-bases 12 is provided with an upwardly extending projection 41 which is integral with the base member 12. The projection 41 is disposed between the two connecting straps 35 on each sub-base 12, thereby insulating the straps from each other. A cover plate 42 is removably secured to each projection 41 by screws 43 for protecting the cross-connecting straps 35. As shown in Fig. 1, an insulating barrier 44 is disposed between the sub-bases 12 to insulate the straps 35 on adjacent sub-bases. As shown in Figs. 6 and 7, notches 45 are provided in the sub-bases for the barriers 44. A channel-shaped cover plate 46 is removably secured to the Z-bars 15 by screws 47 for protecting the line terminals 23 and a similar cover plate 48 is also removably secured to the Z-bars by screws 49 to protect the neutral bus 24 and the line terminal 27.

As shown in Fig. 2, a vent 51 is provided in the bottom of each of the housings 28 to permit the escape of the gases formed by the arc drawn between contact members 52 of the circuit breaker when the contact members are separated. Corresponding openings 53 are provided in the sub-bases 12 in alinement with the openings 51 to facilitate the expulsion of gas from the circuit breakers.

In the modification of the invention shown in Figs. 8, 9 and 10, the sub-bases 12 are mounted on channels 55 instead of on Z-bars. As shown in Fig. 10, tongues 56 are moulded in the sub-base which fit into grooves provided in the housings 28 of the breaker units. The breakers are slid into the sub-base from the ends and cannot be removed from the face of the panel. They are held in place by the cross-connecting straps 35 which are connected to the bus-bars 14 in the manner hereinbefore described. The use of the tongue and groove arrangement makes it unnecessary to provide mounting clips and screws for mounting the circuit breaker units. Otherwise the structure shown in Figs. 8, 9 and 10 is similar to that shown in Figs. 1 to 7, inclusive.

In the modification shown in Fig. 11, flanges 58 at the top of the sub-base 12 cooperate with notches 59 in the breaker housing to hold the breaker units in the sub-base. The breaker units are slid into the base from the end, as in the modification shown in Figs. 8, 9 and 10.

From the foregoing description, it is apparent that we have provided a dead-front panelboard structure in which all current-carrying parts are properly insulated in a simple manner and the circuit controlling devices may be readily connected to any desired bus-bar. Furthermore, the circuit controlling devices may be removed from the panelboard individually or in predetermined groups.

Since many modifications may be made in the apparatus and arrangement of parts without departing from the spirit of our invention, we do

not wish to be limited other than by the scope of the appended claims.

We claim as our invention:

1. In a panelboard, in combination, a mounting plate, a unitary base removably secured to said plate for supporting a plurality of current controlling apparatus units, means for spacing said base from said plate, said apparatus units having individual housings removably mounted on top of said base, a plurality of power conductors disposed underneath said base, means extending through said base and accessible exteriorly of said housings for securing said conductors to said base, additional means extending through said base exteriorly of said housings for connecting said apparatus units to said power conductors, a barrier formed integrally with said base for separating the connecting means for adjacent apparatus units, and cover means removably secured to said barrier for protecting said connecting means.

2. In a panelboard, in combination, a mounting plate, a unitary base removably secured to said plate for supporting a plurality of current controlling apparatus units, means for spacing said base from said plate, said apparatus units having individual housings removably mounted on top of said base, a plurality of power conductors disposed underneath said base, means extending through said base and accessible exteriorly of said housings for securing said conductors to said base, additional means extending through said base exteriorly of said housings for connecting said apparatus units to said power conductors and cover means removably secured to said base for protecting said connecting means.

3. In a panelboard, in combination, a mounting plate, a unitary base removably secured to said plate for supporting a plurality of current controlling apparatus units, and means for spacing said base from said plate, said apparatus units having individual housings removably mounted on top of said base, each of said housings having an opening in the bottom thereof, said base having openings therein disposed underneath the openings in said housings for ventilating said housings.

4. In a panelboard, in combination, a mounting plate, a plurality of unitary bases removably secured to said plate for supporting a multiple of two current controlling apparatus units, said apparatus units having individual housings removably mounted on top of said bases in two parallel rows with an intervening space between the two rows of housings, a plurality of power conductors disposed underneath said bases, straps disposed in said intervening space for connecting oppositely disposed apparatus units, said straps having holes therein in alignment with a hole in each one of said power conductors, means inserted in one of said holes for connecting each one of said straps to one of said power conductors, insulating barriers disposed between adjacent bases for insulating adjacent straps, and cover means removably secured to said bases for protecting said straps and said connecting means.

5. In a panelboard, in combination, a mounting plate, a unitary insulating base removably secured to said plate for supporting a plurality of current controlling apparatus units, said apparatus units having individual housings removably mounted on top of said base in two parallel rows with an intervening space between the two rows of housings, a plurality of power conductors disposed underneath said base, a strap disposed in said intervening space for connecting oppositely disposed apparatus units, said strap having holes therein in alinement with a hole in each one of said power conductors, means inserted in one of said holes for connecting said strap to one of said power conductors, and means formed integrally with said base and disposed between said straps for insulating them from each other.

6. In a panelboard, in combination, a plate, a unitary base removably secured to said plate for supporting a plurality of current controlling apparatus units, said apparatus units having individual housings removably mounted on top of said base in two parallel rows with an intervening space between the two rows of housings, a plurality of power conductors disposed underneath said base, said base having means formed integrally therewith for slidably engaging said apparatus unit housings, and means disposed in said intervening space for connecting said apparatus units to said power conductors.

7. In a panelboard, in combination, a mounting plate, a unitary insulating base removably secured to said plate for supporting a plurality of current controlling apparatus units, said apparatus units having individual housings removably mounted on top of said base in two parallel rows with an intervening space between the two rows of housings, a plurality of power conductors disposed underneath said base, a strap disposed in said intervening space for connecting oppositely disposed apparatus units, said strap having holes therein in alignment with a hole in each one of said power conductors, means inserted in one of said holes for connecting said strap to one of said power conductors, barrier means formed integrally with said base and disposed between said straps for insulating them from each other, and cover means removably secured to said barrier means for protecting said straps and said connecting means.

8. In a panelboard, in combination, a mounting plate, a plurality of unitary bases removably secured to said plate for supporting a multiple of two current controlling apparatus units, said apparatus units having individual housings removably mounted on top of said base in two parallel rows with an intervening space between the two rows of housings, a plurality of power conductors disposed underneath said base, straps disposed in said intervening space for connecting oppositely disposed apparatus units, said straps having holes therein in alignment with a hole in each one of said power conductors, means inserted in one of said holes for connecting each one of said straps to one of said power conductors, barriers disposed between adjacent bases for insulating the straps on said adjacent bases, an integral barrier on each base for insulating the straps on said base, and cover means removably secured to said barriers for protecting said straps and said connecting means.

9. In a panelboard, in combination, a plate, a unitary base removably secured to said plate for supporting a plurality of current controlling apparatus units, said apparatus units having individual housings removably mounted on top of said base in two parallel rows with an intervening space between the two rows of housings, a plurality of power conductors disposed underneath said base, said base having means formed integrally therewith for slidably engaging said apparatus unit housings, means disposed in said intervening space for connecting said apparatus

units to said power conductors, an integral barrier disposed on said base between said connecting means, and cover means removably mounted on said barrier for protecting said connecting means.

10. In a panelboard, in combination, a unitary base for supporting a plurality of current controlling apparatus units, means for supporting said base, said apparatus units having individual housings removably mounted on top of said base, a plurality of power conductors disposed underneath said base, means extending through said base and accessible exteriorly of said housings for securing said conductors to said base, additional means extending through said base exteriorly of said housings for connecting said apparatus units to said power conductors, a barrier formed integrally with said base for separating the connecting means for adjacent apparatus units, and cover means removably secured to said barrier for protecting said connecting means.

11. In a panelboard, in combination, a unitary base for supporting a plurality of current controlling apparatus units, means for supporting said base, said apparatus units having individual housings removably mounted on top of said base, each of said housings having an opening in the bottom thereof, said base having openings therein disposed underneath the openings in said housings for ventilating said housings.

12. A unitary base for supporting a plurality of rows of current controlling apparatus units having an intervening space between said rows, said base having an integrally formed barrier longitudinally disposed in said space and openings adjacent to said barrier for receiving means for connecting said apparatus units to power conductors disposed underneath said base, said barrier having openings therein for receiving means for removably securing a cover to said barrier.

13. A unitary base for supporting a plurality of rows of current controlling apparatus units having an intervening space between said rows, said base having an integrally formed barrier longitudinally disposed in said space and openings disposed therein underneath said apparatus units for ventilating said units.

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