

July 13, 1937.

W. H. FRANK

2,086,796

DISTRIBUTION PANEL

Filed Jan. 13, 1936

4 Sheets-Sheet 1

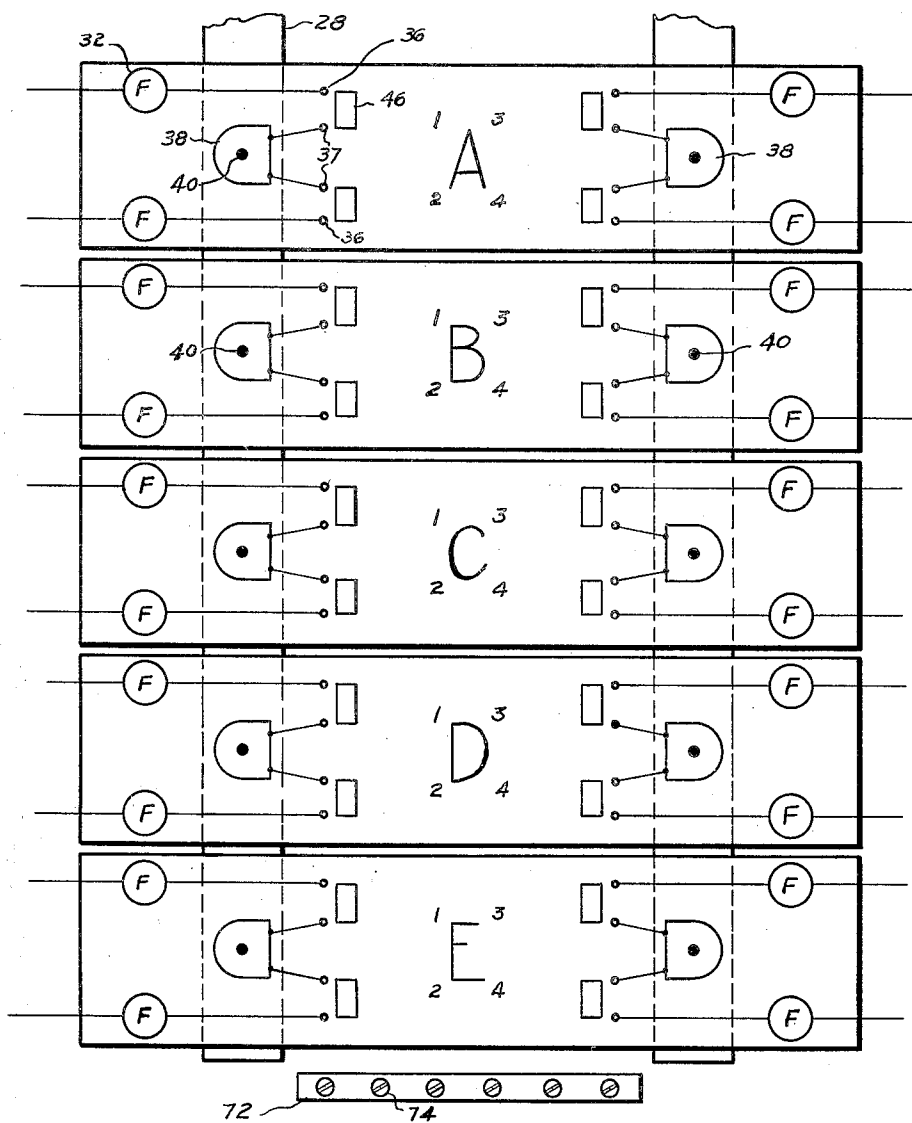


Fig. 1

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4 Sheets-Sheet 2

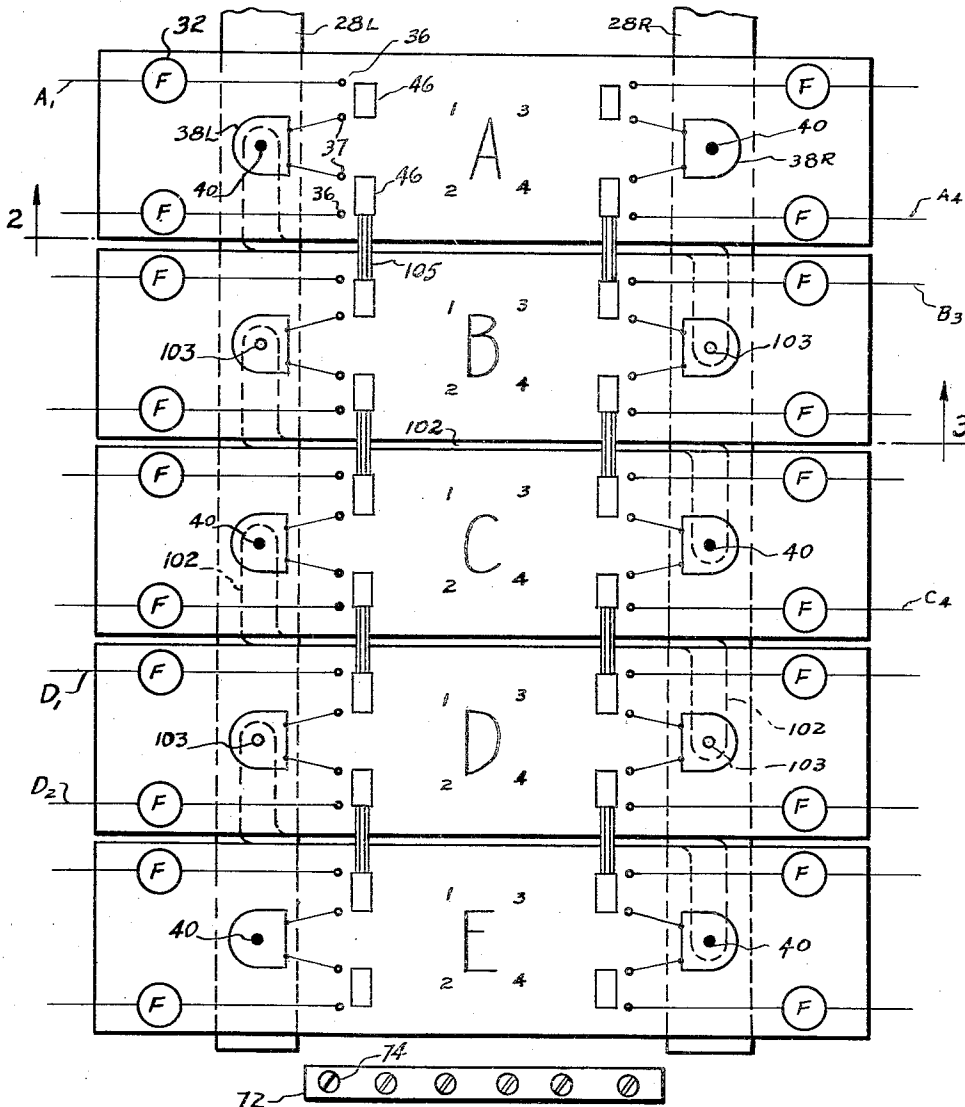


Fig. 1a

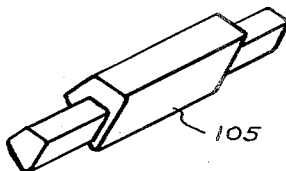


Fig. 7

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4 Sheets-Sheet 3

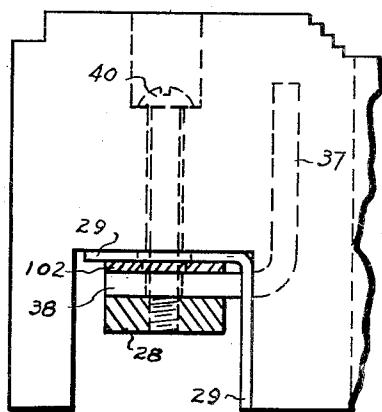


Fig. 2

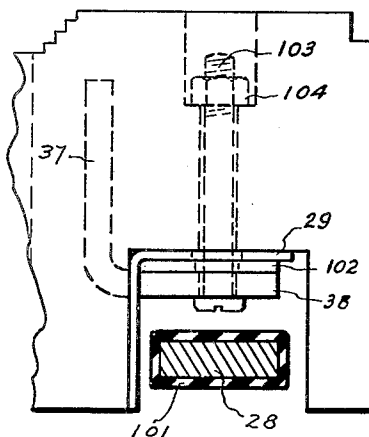


Fig. 3

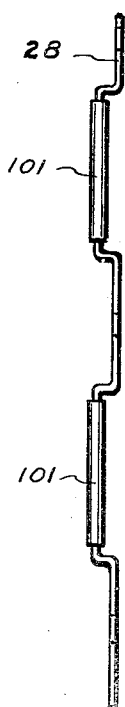


Fig. 6

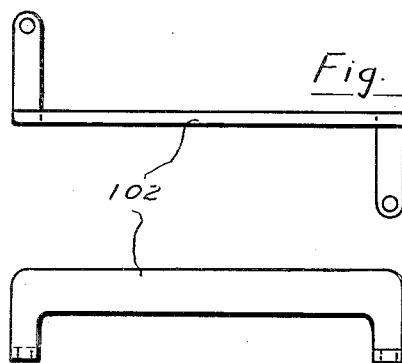


Fig. 5

Fig. 4

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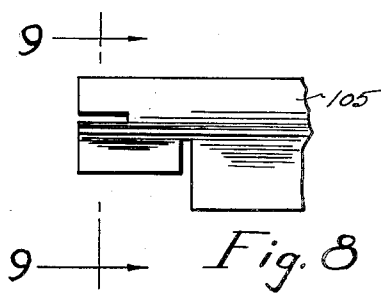
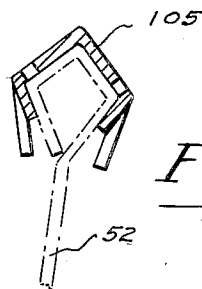
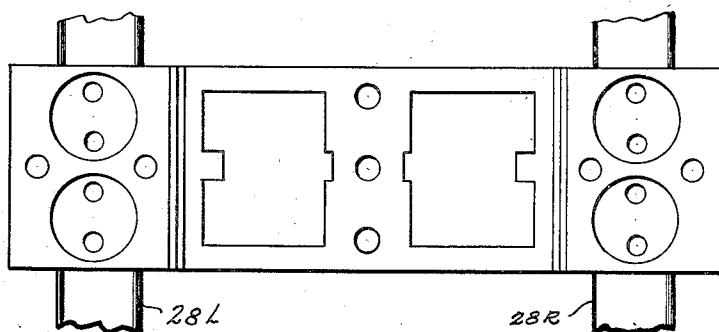
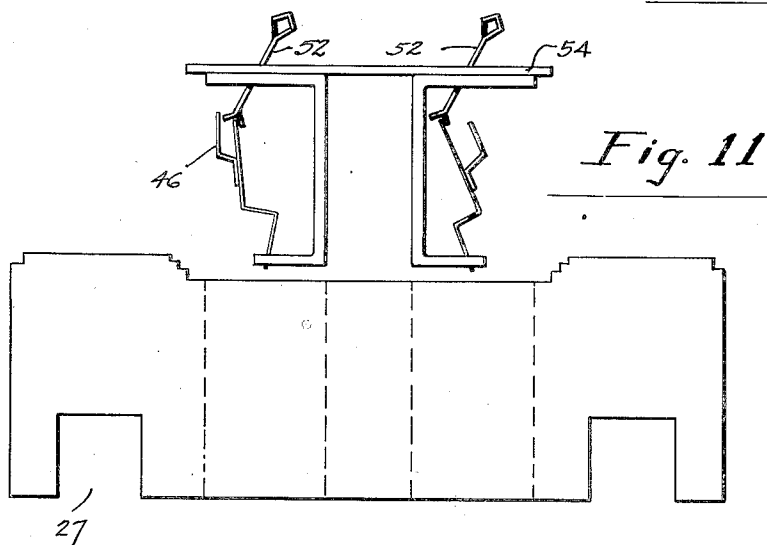
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DISTRIBUTION PANEL

Filed Jan. 13, 1936

4 Sheets-Sheet 4



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2,086,796

DISTRIBUTION PANEL

William H. Frank, Detroit, Mich.

Application January 13, 1936, Serial No. 58,871

8 Claims. (Cl. 175—371)

This application relates to distribution panels. For an understanding of the invention of this application, a brief summary will be given of the art of panelboard design.

5 In the patent to Frank, No. 1,974,154 of September 18, 1934, there is disclosed a panel into opposite side ends of which are entered branch circuit leads, these being connected by switches to opposite polarity (+110 v. and -110 v.) bus bars behind and central of the panel. When 10 a circuit is to be a 110 v. circuit, one of its leads is connected to a neutral bar and the other of its leads is connected selectively to one of the bus bars through a single pole switch; this switch 15 has relatively separated stationary contacts spaced horizontally in a line across the panel, with one stationary contact connected to a branch circuit lead and with the other stationary contact connected to a bus bar central of the panel 20 through a connector strap central of and extending across the panel, and the movable part of each switch connects these stationary contacts. When a circuit is to be a 220 v. circuit, it is necessary that both leads of the circuit be 25 connected to the bus bars, and therefore both leads of the circuit are connected to the bus bars through a double pole switch comprising two single pole switches operated by a common handle.

30 It will thus be seen that the panel disclosed in Patent #1,974,154 may be converted from 110 v. supply to 220 v. supply and vice versa, merely by replacing two single pole switches by one double pole switch and vice versa.

35 The panel of Patent #1,974,154 necessarily is of considerable length, measured from side end to side end, and this is due, in part, to the facts that the stationary contacts controlling the branch circuit leads are spaced horizontally along the 40 units, that the connectors for connecting the stationary contacts to the bus bars also extend horizontally of the units, and that there are disposed in one straight line, across the panel, two sets of spaced stationary contacts and a connector 45 serving to connect a central bus bar to each of these two sets.

50 As a matter of space and material economy, it is desirable to provide a panel which is narrower horizontally than is the panel illustrated in patent #1,974,154 and for this reason the panel of application Serial No. 16,330, of April 15, 1935 was developed. Space and material economy was accomplished by having the bus bars, not centrally disposed, but disposed near the ends of the 55 units, by having the stationary contacts of each

circuit lead switch arranged and spaced not across the panel horizontally but vertically or in a direction paralleling the runs of the bus bars, with the movable contact of each lead switch being arranged to extend vertically or 5 parallel to the runs of the bus bars rather than horizontally or across the runs of the bus bars and the panel.

However, it was found that due to the design of the panel, it was not possible to switch a pair 10 of branch circuit leads across the two bus bars, which is necessary in the event that that pair of branch circuit leads is to form a 220 v. circuit, and consequently it appeared that panelboards of the character disclosed in application Serial 15 No. 16,330 would be limited in their use to feeding circuits of 110 v. only, these being fed from one bus bar and a neutral bar.

After considerable study, I invented a way of 20 converting a panel of the character disclosed in application Serial No. 16,330 for 220 v. distribution. I realized that in order to do this, it would be necessary to have one of each pair of branch circuit leads connected to the bus bar remote 25 from the one to which its mate is connected, and I therefore provided, for certain of the branch leads, a means for connecting the panel and extending from a lead terminal adjacent one bus bar to the remote or other bus bar. 30 Because of the special design of the panel, and particularly because of the thick central wall separating the switch cavities on one side of the panel from those on the other, and because the mounting and operating parts of the switches are 35 between the stationary contacts controlled by the switches and the bus bars remote from these stationary contacts, I found it impossible to dispose the cross connectors inside the units of the panel, and therefore I disposed the cross connectors outside of and between the units. 40

When a cross connector is utilized to connect the stationary contact of one switch adjacent one bus bar to the remote bus bar, the polarity of the branch circuit lead which is connectible 45 to that contact through a switch is not what it ordinarily would be, namely that of the adjacent bus bar, but is that of the remote bus bar. Consequently where two branch leads enter a panel, and are ordinarily connected to the same bus bar so as to be of the same polarity, by the 50 use of the cross connector herein disclosed, one of these leads is connected not to the adjacent bus bar but to the remote bus bar.

Now, inasmuch as these two leads are separately controlled by separate single pole switches, 55

the addition of a common operating means to the handles of these two switches is all that is necessary to create a 220 v. double pole switched circuit out of these two branch leads. It is observed that the omission of such common operating means will leave these two leads, though they are of different polarity, separately switched, and if two circuits are made up, each employing one of these leads and a lead connected to the neutral bar, then each circuit will be a 110 v. circuit controlled by a single pole switch, whereas if the common operating means be added these two leads may be utilized as opposite leads of one circuit connected across a supply of 220 v. through a double pole switch.

The principal object of the present invention, therefore, is to provide, in a panel wherein the bus bars of the panel are near opposite ends of the panel, wherein the operating parts of the switches are disposed between the stationary contacts they control and the bus bars remote from these stationary contacts, and wherein it is impractical to cross connect a stationary switch contact at one end of the panel to a bus bar at the other by cross connectors within the blocks or units of the panel, means in the form of cross connectors disposed outside of and between the units for cross connecting stationary switch contacts to remote bus bars, so that the polarity of a stationary switch contact and the branch lead connected thereto is reversed from what it would be if such cross connector were omitted, whereby, by the addition or subtraction of common operating means for switch handles in a proper manner, conversion of circuits from 110 v. supply to 220 v. supply may be readily effected.

It is the preferred practice to ship the panelboards completely equipped with a full complement of cross connectors and a full complement of common operating means for the switch handles, so that all of the convertible circuits are established at the outset as 220 v. circuits. The installer or operator may then, at his discretion, omit suitable ones of the common operating means and by this simple act alone convert switched leads from 220 v. supply to 110 v. supply; the common operating means of this application are inexpensive, and may be discarded with no feeling of economic loss; and a panelboard may be converted readily and economically and without the necessity for maintaining in storage a supply of interchangeable single pole switches and double pole switches.

Two forms of tie bars are here disclosed. One form is such that its addition to or removal from switch handles requires removal of switch assemblies from the panel; another form of tie bar herein disclosed is such that it may be applied to or removed from a pair of switch handles which are selectively interconnectible merely by operations performed completely outside of the units without necessitating the removal of the switch assemblies from the panel; conversion of the instant panelboard when tie bars of this character are used is therefore a very simple matter requiring no excessive manipulation of parts and no removal of parts from their permanently assembled positions.

For an understanding of the inventions, reference should be had to the appended drawings. In these drawings,

Fig. 1 is a diagrammatic elevation view of a panelboard of the character disclosed in application Serial No. 16,330 connected and equipped for 110 v. distribution with single-pole switches;

Fig. 1a is a similar view of the same kind of panelboard equipped with cross connections and handle tie bars by means of which all but the end circuits of the panel are connectible across the bus bars for 220 v. distribution;

Figs. 2 and 3 are sections as if on lines 2 and 3 of Fig. 1a;

Figs. 4 and 5 show a cross connector in elevation and plan and of an exaggerated thickness;

Fig. 6 shows a bus bar formation and the manner of insulating it;

Fig. 7 shows a tie bar of such a character that its addition to or subtraction from switch handles requires removal of switch assemblies from units;

Figs. 8 and 9 show a tie bar of such a character that its addition to or subtraction from switch handles does not require removal of switch assemblies from units;

Fig. 10 is a front view of the base of a unit;

Fig. 11 is an elevation view of the same with a switch assembly shown above it ready to be inserted into and assembled with respect to the block.

The panelboard herein disclosed includes units A—E having at their side ends back slots 27 which align to form continuous channels in which are disposed the main bus bars 28L and 28R, these being shielded by the channelled liners of insulation 29.

Each unit is provided with four fuses 32 which connect the terminals of branch circuit leads to stationary switch contacts 36, adjacent which are other stationary switch contacts 37 which are formed integral with and terminate in plate-like parts 38L and 38R disposed in back slots 27 adjacent bus bars 28L and 28R respectively.

For bridging the adjacent stationary switch contacts 36—37 in pairs are U-shaped bridging contacts 46 manipulable to and from their adjacent pairs of stationary contacts by switch levers or handles 52 formed as parts of switch assemblies, a plurality of which are mounted on and form a unit with a cover plate 54.

At one end of the panel is a neutral bar 72 having binding screws 74 by means of which the terminals of branch circuit leads may be connected to the neutral bar.

When a panelboard is fabricated as disclosed in the aforesaid application, and in Fig. 1 hereof, all of the plates 38 are electrically connected to all of the bus bars 28 by screws 40 which thread through the plates 38 and into the bus bars 28. Consequently to each bus bar is electrically connected all of the branch circuit leads at the side end of the panelboard adjacent which is the bus bar being considered; one lead of each branch circuit therefore is supplied through a fuse 32, a contact 36, a bridging contact 46, a stationary contact 37, a back plate 38, and a bus bar; the other lead is supplied from the neutral bar 72. Each switch handle controls only one lead or pole of each branch circuit, and each switch therefore is a single pole switch.

The panelboard herein disclosed, as distinguished from that of the aforesaid application, has certain of its leads connected by cross connectors, not to adjacent bus bars, but to remote bus bars so as to have their polarities reversed from what would be the case if these leads were connected to the adjacent bus bars. The bus bars are offset and staggered, Fig. 6, so that alternate portions thereof are distant from or close to alternate plates 38; each bus bar portion that is close to a plate 38 is formed with a tapped hole receiving the end of a screw 40 which clamps

the bus bar to that plate 38; each bus bar portion that is distant from a plate 38 is insulated therefrom by a sleeve 101 of insulation.

As illustrated, the bus bar portions of units A, C, and E are close to the plates 38 of these units and are connected thereto by screws 40, whereas the bus bar portions of units B and D are distant from and are shielded from the plates 38 of these units.

The plate 38 at the left of each unit is electrically connected by means of cross connector 102 to the plate 38 at the right of the unit next therebelow, substantially as indicated; the terminal of each cross connector is disposed between a plate 38 and an insulator 29 and is clamped in place, either by the screw 40, or by a screw 103 which replaces screw 40 and is surmounted by a nut 104.

The cross connectors enable leads to be connected to remote bus bars rather than to adjacent bus bars, so that their polarities will be reversed for 220 v. distribution. For use with these cross connectors, there are provided tie bars 105, which connect adjacent switch handles and are optionally addible or subtractable for conversion purposes, it being observed that of properly paired switch handles, one controls a lead connected to an adjacent bus bar and the other controls a lead connected to a remote bus bar, and therefore the contacts controlled by the two handles of the pair have a 220 v. difference between them.

As indicated diagrammatically, all possible conversions have been effected with the following results. Switches A¹, A³, E², and E⁴ remain single pole; leads A¹, A³, E², and E⁴ are connected through these switches to adjacent bus bars; each of these leads may form one side of a 110 v. branch circuit whose other side will comprise a lead connected to the neutral bar. Switches A²—B¹, A⁴—B³, B²—C¹, B⁴—C³, C²—D¹, C⁴—D³, D²—E¹, and D⁴—E³ are double pole switches with each controlling two leads, one of which is connected to an adjacent bus bar directly and the other of which is connected to a remote bus bar through a cross connector. For example, switch A²—B¹ forms a double pole 220 v. switch controlling a 220 v. circuit whose leads are A² and B¹. Lead A² is connected to the adjacent bus bar 28L by plate 38L—A and lead B¹ is connected, not to the adjacent bus bar 28L, in which case it would have the same polarity as that which it would have if the cross connector were omitted, but to the remote bus bar 28R through plate 38L—B, cross connector 102B—C, and plate 38R—C.

All but the end leads may be utilized for 220 v. distribution selectively as desired. If tie bars 105 be used to connect adjacent switch handles in a properly paired manner, then one of these handles will control contacts connecting a lead and an adjacent bus bar of one polarity and the other handle will control contacts connecting a lead with a remote bus bar of opposite polarity, for 220 v. distribution. For example, tie bar A²—B¹ may be operated to close the switches A²—B¹ which connect lead A² to bus bar 28L and lead B¹ to bus bar 28R for 220 v. distribution.

The addition or subtraction of a tie bar, if the same be made as illustrated in Fig. 7, requires the removal of switch assemblies from the panel, in a manner illustrated in Figs. 10 and 11. If desired, a tie bar such as is illustrated in Figs. 8—9 may be utilized, in which case the addition or subtraction of a tie bar to switch handles will

not require removal of switch assemblies from units.

I claim:

1. A panel having bus bars near and extending along opposite ends thereof, branch leads entering the panel at these ends and terminating in stationary switch contacts, other stationary switch contacts at these ends, connectors for connecting certain of the stationary switch contacts to the bus bar thereadjacent and cross connectors extending across the bus bars and from end to end of the panel for connecting others of the stationary switch contacts to the bus bar remote therefrom, the stationary switch contacts being spaced and extending along the direction of the bus runs, and movable switch contact mechanisms for bridging the stationary switch contacts to connect leads to the bus bars.

2. A panel having bus bars near and extending along opposite ends thereof, branch leads entering the panel at these ends and terminating in stationary switch contacts, other stationary switch contacts at these ends, connectors for connecting certain of the stationary switch contacts to the bus bar thereadjacent and cross connectors extending across the bus bars and from end to end of the panel for connecting others of the stationary switch contacts to the bus bar remote therefrom, cooperating stationary switch contacts being spaced and extending along the direction of the bus runs, and movable switch contact mechanisms between the stationary switch contacts and the bus bars remote therefrom for bridging the stationary switch contacts to connect leads to the bus bars.

3. A panel having bus bars near and extending along opposite ends thereof, branch leads entering the panel at these ends terminating in stationary switch contacts at these ends, other stationary switch contacts at these ends, connectors for connecting certain of the stationary switch contacts to the bus bar thereadjacent and cross connectors extending across the bus bars and from end to end of the panel for connecting others of the stationary switch contacts to the bus bar remote therefrom, the stationary switch contacts being parts of single pole switches having accessible handles, and readily attachable and detachable means for interconnecting switch handles so that two single pole switches controlling stationary switch contacts connected to bus bars of different polarity may be operated in unison as a double pole switch.

4. A panel having bus bars near and extending along opposite ends thereof, branch leads entering the panel at these ends terminating in stationary switch contacts at these ends, other stationary switch contacts at these ends, connectors for connecting certain of the stationary switch contacts to the bus bar thereadjacent and cross connectors extending across the bus bars and from end to end of the panel for connecting others of the stationary switch contacts to the bus bar remote therefrom, the stationary switch contacts being parts of single pole switches having accessible handles, and readily attachable and detachable means for interconnecting switch handles so that two single pole switches controlling stationary switch contacts connected to bus bars of different polarity may be operated in unison as a double pole switch, the panel being divided into units and the cross connectors being disposed between adjacent units.

5. In a sectional panelboard composed of units and having two opposite polarity live lines, two

rows of single pole switches, each switch being connected to a live line, the switches being arranged with two switches of each row to a unit, and with the switches on a unit and of one row being connected to a live line other than the one to which the switches of that unit and of the other row are connected, each intermediate switch that is, a switch between the end switches of the row, having an exposed handle and a means optionally applicable to the handles of any two adjacent switches, provided such two are in the same row and include a handle from each of two adjacent units, for converting the two switches thus selected into a double pole switch controlling two lines of opposite polarity.

6. In a panelboard having two opposite polarity live lines, a row of single pole switches, each connected to a live line, each of the intermediate switches, that is, switches between the end switches of the row, having an exposed handle, adjacent pairs of switches of each row being connected to opposite polarity live lines, and a means optionally applicable to the handles of any two adjacent opposite polarity switches for converting the two switches thus selected into a double pole switch controlling two opposite polarity lines.

7. In a sectional panelboard composed of units and having two opposite polarity live lines, two rows of single pole switches, each switch being connected to a live line, the switches being arranged with two switches of each row to a unit, and with the switches on a unit and of one row being connected to a live line other than the one to which the switches of that unit and of the other row are connected, and a means optionally applicable to any two adjacent switches, provided such two are in the same row and include a switch from each of two adjacent units for converting the two switches thus selected into a double pole switch controlling two lines of opposite polarity.

8. In a panelboard having two opposite polarity live lines, a row of single pole switches, each connected to a live line, adjacent pairs of switches, of the row being connected to opposite polarity live lines, and means optionally applicable to any two of adjacent opposite polarity switches for converting the two switches thus selected into a double pole switch controlling two opposite polarity lines.

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