United States Patent

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[54] **NEUTRAL BAR ASSEMBLY**
11 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** **339/198,** 317/118, 339/19, 339/242
[51] **Int. Cl.** **H01r 9/00**
[50] **Field of Search** ..... 339/198, 198.6, 198 G; 174/72; 317/118

[56] **References Cited**

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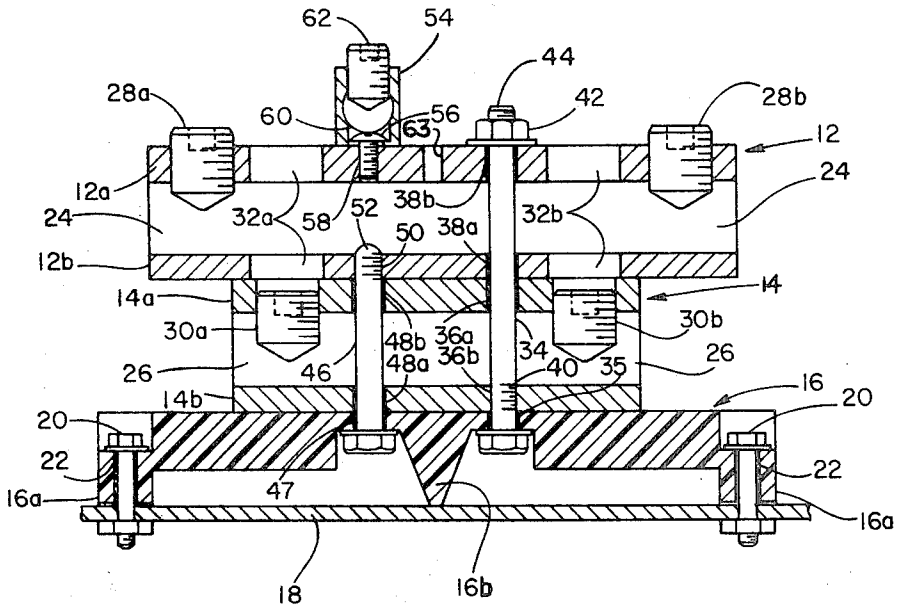
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ABSTRACT: A system of components which can be grouped into sets for assembly in various configurations to provide electrical neutral bar assemblies of different shapes and having different numbers of neutral-wire-receiving openings. The system, which is particularly suitable for use with neutral wires of relatively large ampacity, includes a plurality of insulating bases, a plurality of neutral bars of different lengths, and an interconnecting plate. One or more of the bases and one or more of the neutral bars with or without the interconnecting plate are arranged to be secured together in different configurations by bolts.



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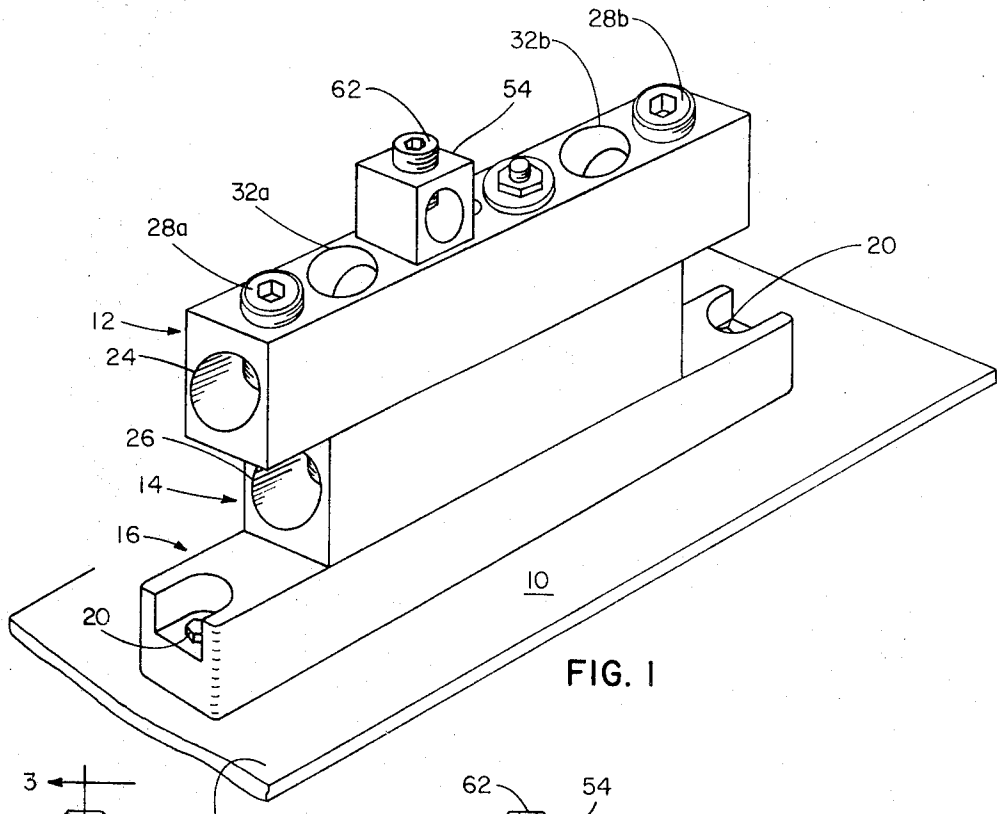


FIG. 1

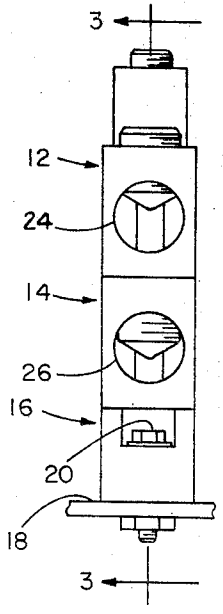


FIG. 2

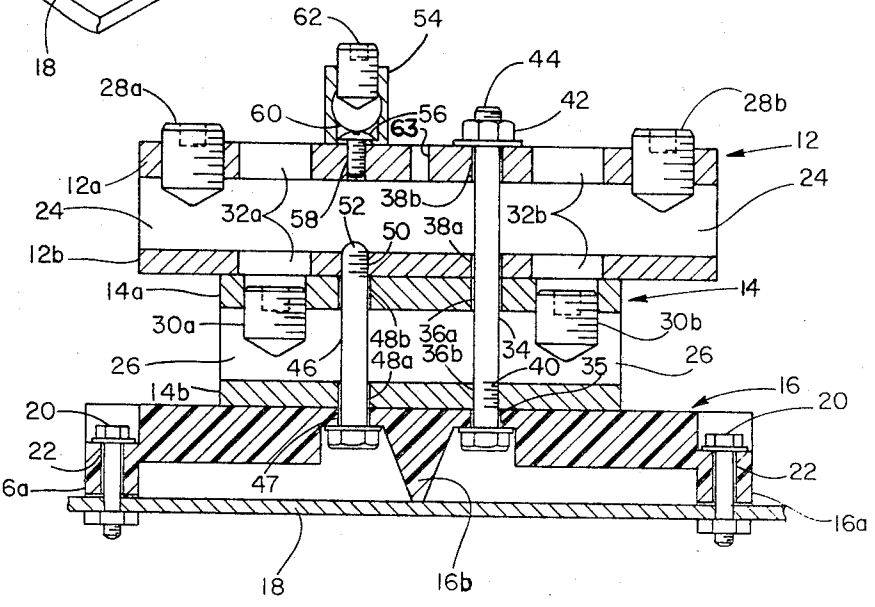


FIG. 3

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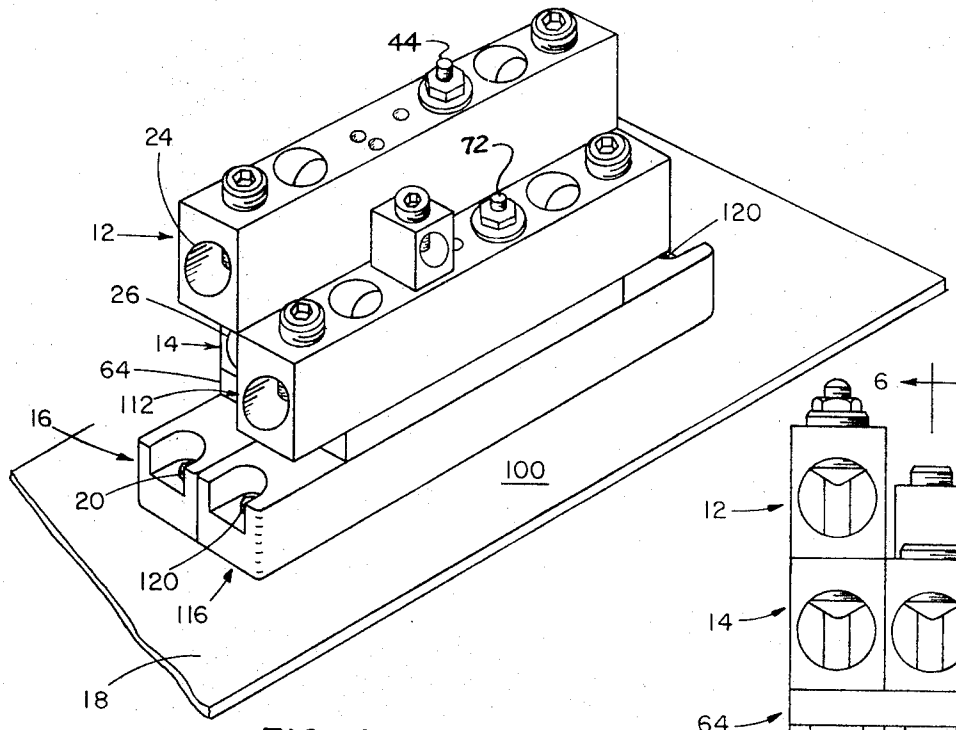


FIG. 4

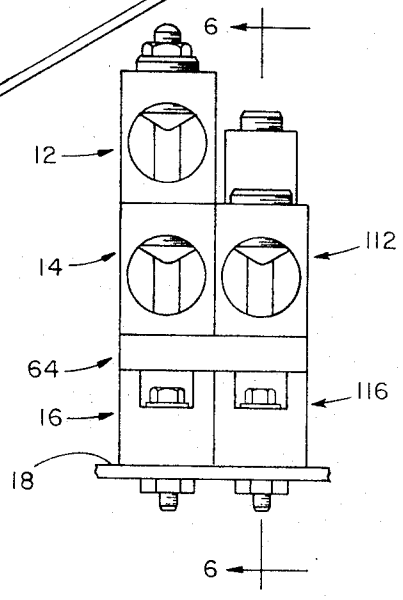


FIG. 5

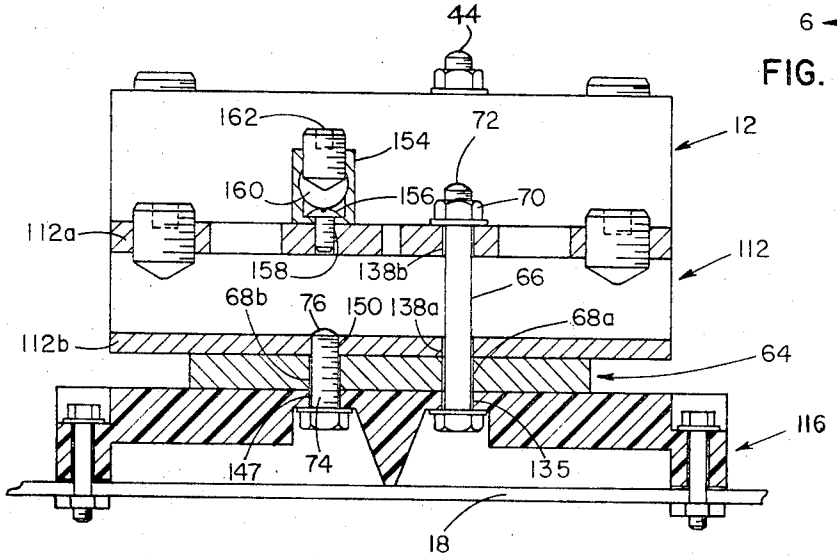


FIG. 6

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NEUTRAL BAR ASSEMBLY

This invention relates to an improved system of neutral bar components from which sets of the components may be selected to form various neutral bar assemblies for use with neutral conductors of relatively large ampacity.

In the manufacture of electrical switching devices of various complexities it is necessary to provide neutral bar assemblies capable of receiving various numbers of neutral conductors. For switching devices of relatively small ampacity, different neutral bar assemblies can be constructed by providing relatively long neutral bars which can be readily cut into various lengths with one or more of the shorter neutral bars mounted on a supporting bracket. HOwever, when the neutral bars must be capable of accommodating neutral conductors of large size and it is desired to have neutral-wire-receiving openings in the end faces of the bars, the desired flexibility in the creation of different assemblies has not heretofore been obtained.

An object of the invention is to provide an improved system of components capable of being grouped to form various sets of neutral bar components with each set of components being useable to construct a neutral bar assembly of a desired configuration and having a predetermined number of neutral-wire-receiving openings.

Another object is to provide an improved neutral bar assembly comprising at least two neutral bars stacked upon each other and upon a base member and held together by bolts.

A further object is to provide an improved neutral bar assembly comprising a plurality of neutral bars stacked upon each other in at least two side-by-side tiers which are electrically interconnected by a plate member common to all of the tiers.

A further object is to provide an improved neutral bar assembly comprising a plurality of neutral bars each having wire-receiving openings in their opposite end faces and with accessibility to all connections provided even when the neutral bars are stacked one upon another.

OTher objects of this invention will become apparent from the following specification wherein reference is made to the drawings, in which:

FIG. 1 is a perspective view of one configuration of a neutral bar assembly incorporating components of the neutral bar system of this invention;

FIG. 2 is an end view of the neutral bar assembly of FIG. 1 taken generally from the left thereof;

FIG. 3 is a sectional view taken generally along the line 3–3 of FIG. 2;

FIG. 4 is a perspective view of another configuration of a neutral bar assembly incorporating components of the neutral bar assembly incorporating components of the neutral bar system of this invention;

FIG. 5 is an end view of the neutral assembly of FIG. 4 taken generally from the left thereof; and

FIG. 6 is a sectional view taken generally along the line 6–6 of FIG. 5.

The neutral bar assembly incorporating components of the neutral bar system of this invention shown at 10 in FIGS. 1, 2 and 3, comprises a relatively long neutral bar 12, a relatively short neutral bar 14, and an insulating base 16 stacked in "-building block " fashion to form a single tier secured together by securing means in a manner to be described. The assembly 10 is shown as fastened to a base plate 18, representative of a wall of an enclosure of an electrical switching device, by two bolts 20 extending through openings 22 located respectively in foot portions 16*a* at opposite end portions of the base 16. The base 16 may also have a central foot portion 16*b*.

The neutral bars 12 and 14 are preferably square in transverse cross section and tubular having longitudinal wire-receiving openings 24 and 26, respectively. THe openings 24 and 26 are preferably circular and are eccentric with respect to the longitudinal axes of the respective neutral bars 12 and 14 so that an upper wall 12*a* of the bar 12 is thicker than a lower wall 12*b* and an upper wall 14*a* of the bar 14 is thicker than a lower wall 14*b*. Neutral wires or cables (not shown) may be inserted into respective end portions of the openings 24 and 26 and securely held in position and in electrically conductive relation to the neutral bars by wire-clamping binding screws 28*a*–28*b* and 30*a*–30*b*, respectively the binding screws 28*a* and 28*b* being threaded into respective openings extending through opposite end portions of the upper wall 12*a* of the neutral bar 12 and the screws 30*a* and 30*b* being similarly threaded into respective openings extending through opposite end portions of the upper wall 14*a* of the neutral bar 14.

An aligned pair of access openings 32*a* and an aligned pair of access openings 32*b* are provided in the walls 12*a* and 12*b* of the long bar 12 to provide access by a tool to the binding screws 30*a* and 30*b* in the bar 14 so that neutral wires inserted into the respective end portions of the wire-receiving openings 26 in the bar 14 can be clamped or unclamped without prior removal of the bar 12. It is thus apparent that "stacking " of the long neutral bar 12 on top of the short neutral bar 14 provides for ease of access to both sets of binding screws 28*a* –28*b* and 30*a* –30*b* without interference from neutral wires (not shown) inserted in the respective openings 24 and 26.

As shown best in FIG. 3, the neutral bars 12 and 14 are secured to the base 16 and to each other by a bolt 34 which passes through a bolt-receiving opening 35 in the base 16 and aligned pairs of bolt-receiving openings 36*a*–36*b* and 38*a*–38*b* in the bars 14 and 12, respectively, the bolt and openings thus constituting a securing means. The bolt-receiving opening 36*b* is in the lower wall 14*b* of the bar 14 and is threaded to accept a complementary threaded portion 40 of the bolt 34. This threaded coupling secures the short bar 14 to the base 16. The long bar 12 is secured firmly in position by a hexagonal nut 42 threaded on an upper threaded portion 44 of the bolt 34.

Additional securing means for the bars 12 and 14 and the base 16 comprise a bolt 46 which is received through an opening 47 in the base 16, an aligned pair of bolt-receiving openings 48*a* –48*b* in the bar 14, and an aligned bolt-receiving opening 50 in the bar 12. The opening 50 is in the lower wall 12*b* of bar 12 and is threaded to engage a threaded portion 52 of the bolt 46. The bolts 34 and 46 thus locate the bars 12 and 14 in fixed position with respect to each other and to the base 16 and secure the components firmly in assembled relation with good electrical 5 conductivity between the bars 12 and 14. The completed assembly 10 can then be attached to the base plate 18 as previously described. It should be noted that the foot portion 16*b* provides additional insulation between the heads of the bolts 34 and 46.

A box-type terminal lug 54 may be secured to the outer surface of the upper wall 12*a* of the bar 12 by a screw 56 threaded into an opening 58 in the wall 12*a*. The lug 54 has a wire-receiving opening 60 for receiving a ground or other wire (not shown) which may be held securely in position by means of a binding screw 62 threaded into an opening in the upper wall of the lug 54. A opening 63 in the upper wall 12*a* of the bar 12 is provided for securing a self-tapping screw which may be used to secure a bonding wire (not shown) to the assembly when such is required.

FIGS. 4, 5, and 6 illustrate another neutral bar assembly incorporating a set of components of the neutral bar system of this invention. The assembly 100 of FIGS. 4, 5, and 6 has provision for an increased number of neutral conductors. In this second embodiment, additional components identical with those of the assembly 10 of FIGS. 1, 2, and 3 are identified by the same reference characters plus 100. In the second embodiment, insulating bases 16 and 116 are secured in side-by-side relation to one another on the base plate 18. Stacked in overlying relation on both of the bases 16 and 116 is a conductive connecting plate 64. On the plate 64 at one side edge portion thereof is one of the short neutral bars 14, and a relatively long neutral bar 12 is positioned on top of the short neutral bar 14. On the connecting plate at the other side edge thereof is a long neutral bar 112.

The portion of the assembly **100** to the left of the plane defined by the abutting walls of the short neutral bar **14** and the long neutral bar **112** is similar to the assembly shown in FIGS. **1**, **2**, and **3**. Although the connecting plate **64** is interposed between the base **16** and the short bar **14**, the bars **12** and **14** of the assembly of FIGS. **4**, **5**, and **6** are secured together in the same manner as that previously described except that the bolts **34** and **46** are longer to accommodate the plate **64**.

Referring to FIG. **6**, a bolt **66** received through an opening **135** in the base **116** passes through an opening **68***a* in the connecting plate **64** and an aligned pair of openings **138***a* and **138***b* in the neutral bar **112**, and a hexagonal nut **70** is threaded on an upper portion **72** of the bolt **66**. An additional securing means for the bar **112** comprises a bolt **74** received through an opening **147** in the base **116**, an opening **68***b* in the plate **64**, and an opening **150** in the lower wall **112***b* of the neutral bar **112**. The opening **150** is threaded and engages a threaded end portion **76** of the bolt **74**. Thus the bolts **66** and **74** and the associated openings locate the bar **112** and the plate **64** in fixed position with respect to the base **116** and secure the components firmly in fixed relation.

A box-type terminal lug **154** may be secured to the outer surface of the top wall **112***a* of the bar **112** by a screw **156** which is threaded into an opening **158** in the wall **112***a*. The lug **54** has a wire-receiving opening **160** for receiving a ground or other wire (not shown) which may be held securely in position by means of a binding screw **162** which is threaded into an opening in the upper wall of the lug **154**.

After assembly, the neutral bar assembly **100** can be attached to the base plate **18** by means of screws **20** and **120** inserted respectively through openings **22** and **122** located respectively in opposite end portions of the bases **16** and **116**.

It should be noted that the spatial relationship of the components is determined by openings (not shown) in the plate **64** which bear the same relationship to the bars **12** and **14**, plate **64**, and the base **16** as do the openings **68***a* and **68***b* to the bar **112**. Thus the plate **64** serves to maintain the spatial relationship of the components of the assembly **100** and serves to insure good electrical conductivity between the two tiers.

Although only two configurations of neutral bar assemblies are illustrated in the drawings, it is obvious that others can be constructed using different sets of the components of the improved system. The two configurations shown are particularly suitable for use in a narrow wiring channel at the side of a switch mounted in an enclosure into which relatively stiff large wires enter through knockouts in the top or bottom walls of the enclosure.

I claim:

1. A system of neutral bar assembly components capable of being grouped in various quantities into sets for construction of neutral bar assemblies of various configurations, said components comprising a plurality of identical relatively short neutral bars, a plurality of identical relatively long neutral bars, a conductive plate upon which the neutral bars may be mounted in side-by-side relation, and a plurality of insulating bases, securing means for securing the plate on a pair of the bases, securing the short neutral bars either singly directly on a base or in side-by-side relation directly on the plate, and for securing the long neutral bars either singly directly on a base, in side-by-side relation directly on the plate, or in stacked relation respectively on the short neutral bars, each of the neutral bars having wire-receiving openings in its end walls, respectively, and each having screw-receiving openings in its top wall intersecting the respective wire-receiving openings, screw threaded into the screw-receiving openings, respectively, and access openings extending through each of the long neutral bars positioned so as to be in alignment respectively with the screw-receiving openings of the relatively short neutral bars when any one of the long neutral bars is secured by the securing means in stacked relation on any one of the short neutral bars thereby to expose the screws for access by a tool.

2. A neutral bar assembly comprising an insulating base, a relatively short neutral bar of rectangular cross section mounted on the base, a relatively long neutral bar of rectangular cross section mounted on the short neutral bar, securing means securing the base and the neutral bars together in fixed relation, each of the neutral bars having wire-receiving openings in its opposite end walls, respectively, and each having screw-receiving openings in its upper wall intersecting the wire-receiving openings, access openings extending through the long neutral bar and positioned in vertical alignment with the respective wire-clamping screws of the relatively short neutral bar, when the bars are secured in said fixed relation by the securing means, thereby to expose the screws for access by a tool.

3. A neutral bar assembly as in claim **2** wherein each of the neutral bars is tubular having a longitudinal opening and wherein opposite end portions of the longitudinal opening respectively define the wire-receiving openings.

4. A neutral bar assembly as in claim **2** wherein the securing means includes a tapped opening in one of the neutral bars and a bolt having a threaded portion received in said tapped opening.

5. A neutral bar assembly as in claim **2** wherein the securing means includes a pair of longitudinally spaced transverse openings extending through the relatively short neutral bar from the bottom wall to the top wall thereof, and a pair of longitudinally spaced transverse openings in the relatively long neutral bar one of which extends inwardly of the bar from the bottom wall and the other of which extends through the bar from the bottom wall to the top wall thereof, the transverse openings of the relatively short neutral bar being spaced the same distance apart as the transverse openings of the relatively long neutral bar.

6. A neutral bar assembly as in claim **5** wherein one of the transverse openings in the relatively short neutral bar and said one transverse opening in the relatively long neutral bar are threaded only at the respective portions thereof near the lower walls of the respective bars.

7. A neutral bar assembly as in claim **5** wherein each of the longitudinally spaced transverse openings in the bars is equally spaced from a transverse centerline of its respective bar.

8. A neutral bar assembly as in claim **2** wherein the securing means comprises transverse bolt-receiving openings in the base and bars, respectively, which are aligned when the base and bars are positioned to be secured in said fixed position, and a bolt received in the aligned openings with a lower threaded portion of the bolt threaded into the opening in the relatively short neutral bar.

9. A neutral bar assembly as claimed in claim **8** wherein the securing means comprises transverse bolt-receiving openings in the base and bars, respectively, which are aligned when the base and bars are positioned to be secured in said fixed position, and a bolt received in the aligned openings with an upper threaded portion of the bolt threaded into the opening in the relatively long neutral bar.

10. A neutral bar assembly as in claim **2** wherein the securing means comprises first transverse bolt-receiving openings in the base and bars, respectively, which are aligned with each other when the base and bars are positioned to be secured in said fixed relation, a first bolt received in the first aligned bolt-receiving openings with a lower threaded portion threaded into the first bolt-receiving opening in the relatively short neutral bar, second transverse bolt-receiving openings in the base and bars, respectively, longitudinally spaced from the first bolt-receiving openings, and aligned with each other when the base and bars are positioned to be secured in said fixed relation, and a second bolt received in said second bolt-receiving openings with an upper threaded portion of the bolt threaded into the second bolt-receiving opening in the relatively long neutral bar.

11. A neutral bar assembly comprising an insulating base means, a conductive plate mounted on the base means, two lower neutral bars of rectangular cross section mounted in

side-by-side relation on the plate, at least one of the lower neutral bars being relatively short, a relatively long upper neutral bar mounted on the relatively short neutral bar, securing means securing the base means, plate and neutral bars together in fixed relation, each of the neutral bars having wire-receiving openings in its opposite end walls, respectively, and each having screw-receiving openings in its upper wall intersecting the cable-receiving openings, respectively, screws threaded respectively into the screw-receiving openings, access openings extending through the relatively long neutral bar positioned in alignment respectively with the screws of the relatively short neutral bar on which it is mounted, and to which it is secured in said fixed relation, thereby to expose the screws for access by a tool.