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BUS-BAR SUPPORTS

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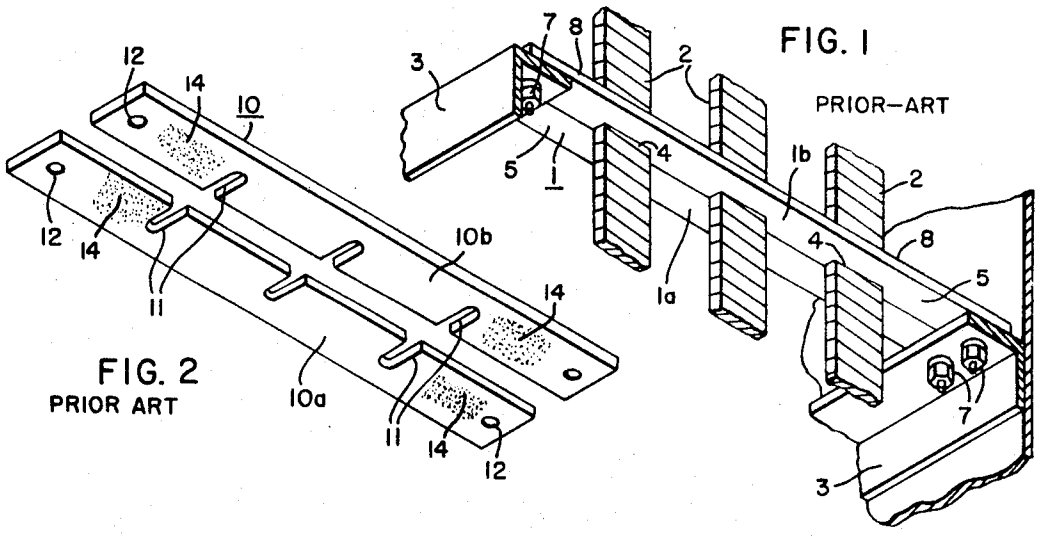

FIG. 2
PRIOR ART

FIG. 1
PRIOR-ART

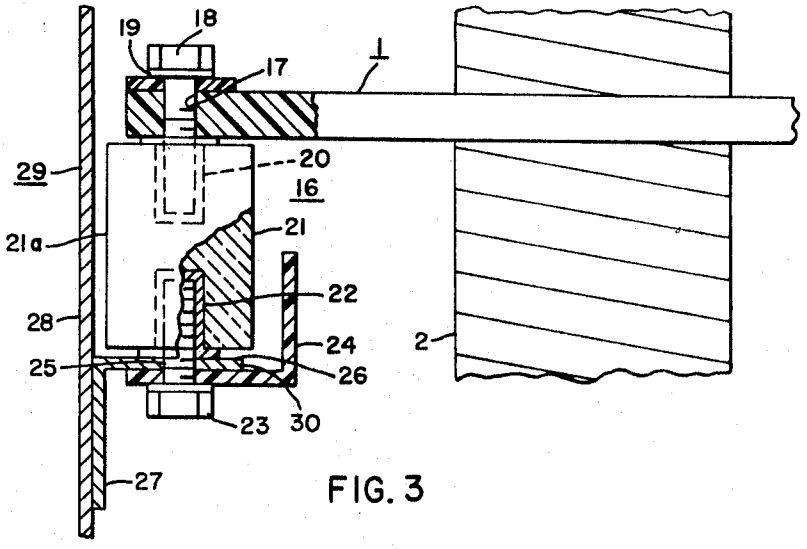

FIG. 3

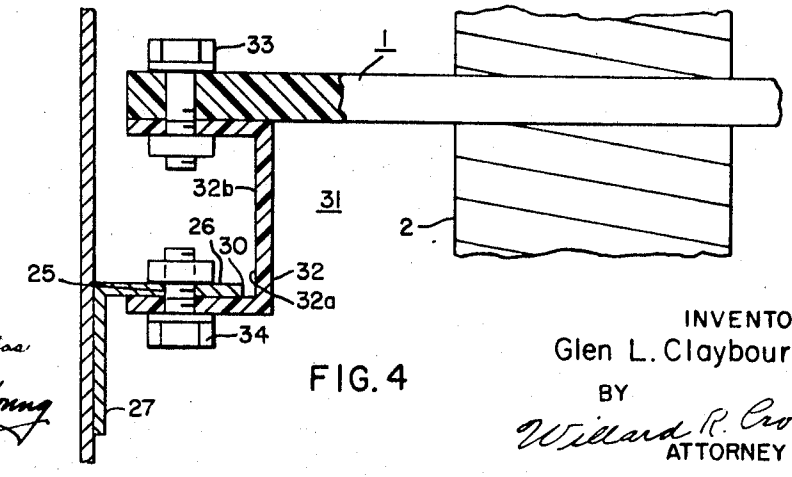

FIG. 4

WITNESSES

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BUS-BAR SUPPORTS

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ABSTRACT OF THE DISCLOSURE

An insulating tie member, supporting one or more high-voltage bus bars, has its ends spaced from angle clips attached to side-frame supports by means of spacing means, either assuming the form of a standoff insulator, or a channel-shaped insulating spacing member, and additionally providing shielding means for relieving the potential gradient adjacent the inner sheared edge of the angle clip to prevent voltage breakdown.

This invention relates generally to bus-bar supports and, more particularly, to improved bus-bar supports in which an insulating tie member, supporting the one or more bus bars, is spaced from angle clips to provide vertical insulating surfaces and also to relieve the potential gradient adjacent the inner edges of the side angle clips.

A general object of the present invention is to provide an improved supporting means for bus bars.

A more specific object of the present invention is to provide an improved bus-bar support in which the voltage gradient adjacent the side supporting angle clips is relieved and, additionally, a long creepage path is provided between the ends of the members and the metallic side supporting clips.

Still a further object of the present invention is the provision of an improved bus-bar support in which a standoff insulator is interposed between the end of the insulating tie member and the side supporting angle clip, together with angular potential gradient shielding means.

Yet a further object of the present invention is the provision of an improved bus-bar supporting means in which channel-shaped insulating shielding means is employed to space the ends of the tie members to the side angle brackets and additionally to relieve the potential gradient.

In accordance with a preferred embodiment of the invention, the insulating tie member, which supports the one or more high-voltage insulating conductors, has its ends secured to standoff insulators, preferably formed of porcelain, the latter being affixed to metallic side angle brackets; and an insulating angular potential gradient shield is additionally employed to shield the inner sheared edge of the steel angle brackets.

According to another embodiment of the invention, an insulating channel-shaped insulating member is employed to not only space the ends of the insulating tie member, but additionally serves a potential gradient shielding function.

Further objects and advantages will readily become apparent upon reading the following specification, taken in conjunction with the drawing, in which:

FIGURE 1 illustrates a prior-art bus-bar supporting means which leads to deleterious tracking and carbonization action due to corona formation;

FIG. 2 is an inverted plan view of the upper surface of a typical prior-art mating tie-member construction in which the tracking and ultimate voltage breakdown are readily apparent;

FIG. 3 illustrates an embodiment of the present invention in which a standoff insulator is employed as a

vertical spacing means interposed between the ends of the tie member and the adjacent metallic angle clips; and,

FIG. 4 is an alternate embodiment of the invention in which an insulating channel-shaped spacing member is employed to not only space the tie member from the side angle clips, but aditionally to provide a potential gradient shielding function.

Referring to the drawing, and more particularly to FIG. 1 thereof, the reference numeral **1** generally designates a tie member, which is used to support a plurality, such as three bus bars **2**, to side frame members **3**. As shown, the tie-member construction may comprise two mating members **1***a*, **1***b* having solts **4** therein to encompass the three bus bars **2**, and are affixed at their ends **5** to the side-angle bars, or struts **3** by bolts **7**. This is a typical prior-art construction, which has led to voltage breakdown between the high-voltage bus bars **2** and the grounded side frame members **3** by a tracking, or "treeing" action, which occurs on the horizontal surfaces of the tie members **1***a*, **1***b*. It will be noticed that due to the horizontal disposition of the tie members **1***a*, **1***b*, and accumlation of salt, dust or other contaminants may occur upon the upper horizontal surfaces **8** of the tie members **1***a*, **1***b*, thereby being conducive to voltage breakdown.

FIG. 2 shows a slightly alternate prior-art construction **10** in which the mating tie members **10***a*, **10***b* have transverse mating slots **11** provided therein, which again encompass the three bus bars (not shown), and have their ends suitably apertured, as at **12**, so as to accommodate bolts, which again would be used to become attached to side-angle frame members, such as the frame member of FIG. 1. It will be noted that the discoloration and the carbonization **14**, as indicated in FIG. 2, leads to a lowering of the dielectric strength of the tie members **10***a*, **10***b*, and is conducive to voltage breakdown between the high-voltage bus bars **2** and the grounded side frame supports **3**.

The present invention is directed to the elimination of the flashover problem occurring in bus-bar supports by interposing a spacing-member construction **16**, which not only leads to a greater creepage path, but additionally provides a voltage-gradient relieving action, and also preferably is vertically disposed, so as not to permit the accumulation of contaminants. As is well known, contaminants tend to accumulate on horizontal surfaces and not on vertical surfaces.

With reference to FIG. 3 of the drawing, it will be noted that the insulating tie member has its end perforated, as at **17**, and it is bolted, as by a mounting bolt and washer **18**, **19**, to the insert **20**, which is provided at the upper end of the standoff insulator **21**, which perferably is composed of porcelain. At the lower end of the porcelain standoff insulator **21**, it will be noted that there is provided a second insert **22**, which accommodates a mounting bolt **23**, which passes through an insulating angular potential gradient shield **24**, and additionally passes through an aperture **25** provided in the horizontal surface **26** of a welded steel support bracket, or clip **27** suitably affixed to the steel side sheet, or side frame support member **28**. As is well known by those skilled in the art, in metal-clad switchgear, in which circuit breakers or other equipment is moved into metallic housings or cubicles, it is necessary to suitably insulatingly support the bus bars from the interior side wall surfaces of the cubicle. FIG. 3 only shows a portion of such a cubicle construction, the steel side sheet **28** constituting a side wall member of the associated cubicle **29**.

It will be observed, with reference to FIG. 3, that the angular insulating potential gradient shield **24** serves to relieve the potential stress at the sharp sheared steel edges **30** of the angle bracket **27**, and prevents voltage

breakdown occurring, due to corona formation, between the grounded angle bracket **27** and the high-voltage insulated conductor **2**.

Also, with reference to FIG. 3, it will be noted that the vertical surfaces **21***a* of the porcelain standoff insulator **21** provide vertical surfaces, which will tend to remain clean and prevent the accumulation thereon of contaminants, which otherwise would be conducive to voltage breakdown.

FIG. 4 shows an alternate embodiment of the invention **31** in which an insulating channel-shaped support and spacing member **32** is provided, being affixed by bolts **33** to the ends of the insulating tie member **1**, and additionally being affixed by bolts **34** to the mounting holes **25** provided in the horizontal surface **26** of the associated welded steel support bracket **27**. Again, the sharp edges, as at **30**, are shielded by the adjacent surface portion **32***a* of the channel-shaped supporting member **32**, which will prevent voltage breakdown. Corona formation is conducive at sharp edges, and unless the voltage condition is relieved by the interposition of a high dielectric material **32**, voltage flashover may occur. By the provision of the insulating channel shielding and supporting member **32**, which is preferably made of a molded glass polyester material, the voltage condition is relieved. The provision of vertical insulation surfaces **32***b* will minimize the collecting of dust and/or contaminants or moisture on the surfaces.

From the foregoing description it will be apparent that an object of the present invention is to provide an increased creepage path to ground over a porcelain insulating surface **21***a*, or an insulating channel-shaped member **32** for the high-voltage conductor tie-support member **1**, especially suitable in confined unit assemblies. This supporting assembly **16**, **31** also makes it possible to install a glass polyester gradient shield at the highly stressed ground plane area. Flat insulation surfaces, that have collected dust and/or contaminants, such as salt will introduce a low-resistance path to ground when operating at high voltage under high humidity conditions. It is, therefore, very desirable to introduce, or provide a vertical porcelain surface **21***a* in the tie-support assembly **16**, as shown in FIG. 3, that will dry off very rapidly due to leakage current, and will not carbonize or track. Additionally, in confined assemblies, it is necessary to provide an insulation shield **24**, **32** between the high-voltage insulated conductor **2** and the sharp steel edges **30** of the tie support **27**. This shield **24**, **32** is to provide an improved dielectric gradient at the area during switching and lightning surges. Moreover, the constructions indicate a novel method of getting an elongated vertical creepage surface for leakage resistance, and additionally providing a voltage gradient assembly, which shields the sharp steel edges **30** of the side angle clips **27**. The provision of vertical insulation surfaces **21***a*, **32***b* will minimize the collecting of dust and/or contaminants or moisture on the surfaces, and provide a high resistance leakage path to ground.

The construction illustrated in FIG. 4 illustrates a simple and novel method of getting an elongated vertical creepage surface and a shielding member **32** all provided by one molded insulation member, preferably formed of glass polyester material.

I claim as my invention:

1. A bus-bar supporting structure comprising, in combination, at least one high-voltage bus bar, a horizontally disposed insulating tie member affixed to said high-voltage bus bar and serving to rigidly support the same in operative position, vertically disposed metallic side supporting means having an angular metallic support member secured thereto, vertically disposed insulating supporting means spacing the outer end of said horizontally disposed insulating tie member vertically with respect to said angular support member, and said vertically disposed insulating supporting means having an insulating voltage gradient shield plate portion as a component part thereof shielding the inner edge of said angular support member from the high-voltage bus bar to minimize the formation of corona.

2. A bus-bar supporting structure comprising, in combination, a least one high-voltage bus bar, a horizontally disposed insulating tie member affixed to said high-voltage bus bar and serving to rigidly support the same in operative position, vertically disposed metallic side supporting means having an angular metallic support member secured thereto, a vertically arranged standoff insulator spacing the outer end of said horizontally disposed insulating tie member vertically with respect to said angular support member, and said vertically arranged standoff insulator having an insulating voltage gradient shield (**24**) shielding the inner edge (**30**) of said angular support member from the high-voltage bus bar to minimize the formation of corona.

3. The combination of claim **2**, wherein the insulating voltage gradient shield is an insulating angular member (**24**) and the inner end (**30**) of the metallic angular support member is adjacent the inner apex portion of the insulating angular member (**24**) and shielded thereby.

4. The combination of claim **3**, wherein the standoff insulator is porcelain.

5. The combination of claim **2**, wherein the standoff insulator is porcelain.

6. A bus-bar supporting structure comprising, in combination, at least one high-voltage bus bar, a horizontally disposed insulating tie member affixed to said high-voltage bus bar and serving to rigidly support the same in operative position, vertically disposed metallic side supporting means having an angular metallic support member secured thereto, a vertically arranged insulating channel member (**32**) spacing the outer end of said horizontally disposed insulating tie member vertically with respect to said angular support member, and said vertically arranged insulating channel having an insulating voltage gradient shield portion (**32***b*) shielding the inner edge (**30**) of said angular support member from the high-voltage bus bar to minimize the formation of corona.

7. The combination of claim **6**, wherein the inner end of the metallic angular support member is disposed in the bight portion of the insulating channel member (**32**) and electrically shielded thereby.

8. The combination of claim **7**, wherein the insulating channel member is formed of glass polyester.

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LARAMIE E. ASKIN, Primary Examiner

U.S. Cl. X.R.

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