June 27, 1933. T. J. BOSTWICK 1,915,918

BUS BAR

Filed Dec. 24, 1930

Fig. 1.

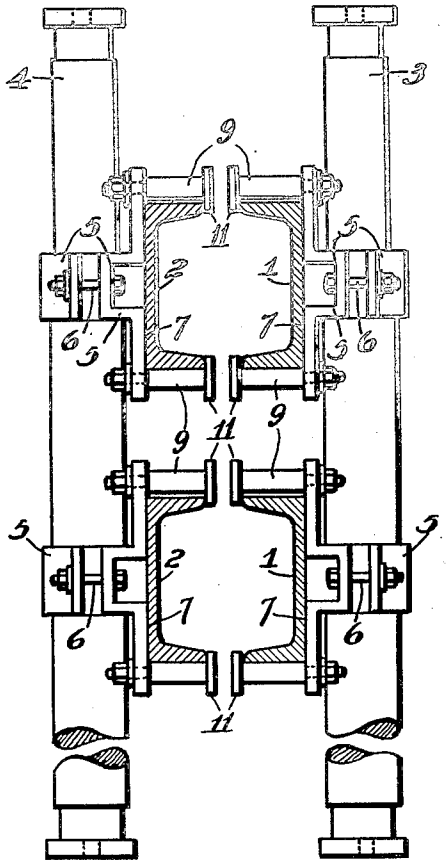


Fig. 2.

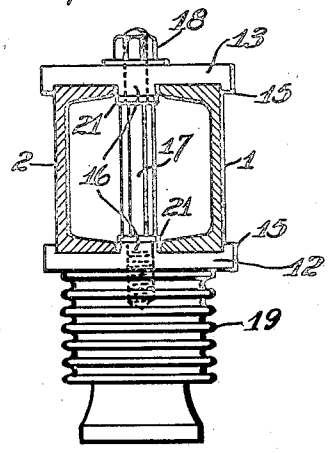


Fig. 3.

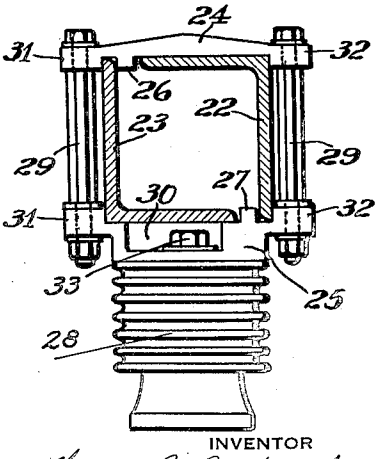
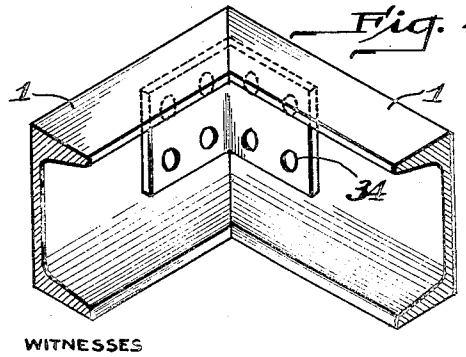


Fig. 4.



WITNESSES

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Patented June 27, 1933 1,915,918

UNITED STATES PATENT OFFICE

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BUS BAR

Application filed December 24, 1930. Serial No. 504,485.

This invention relates to electrical conductors, and more particularly to conductors of the type known in the art as bus bars.

The primary object of the invention is to provide a bus bar or conductor of that character which, although not necessarily so limited, is more especially intended for use in alternating current circuits, which is simple and sturdy of construction, economical to manufacture, which is exceptionally easy to assemble and install, and in addition is both well ventilated and so formed as to produce such a distribution of current that the skin effect of the current for the cross-sectional area of conducting material employed, as well as the temperature rise in the bar, is reduced to substantially a minimum, whereby an economy is effected in the use of material as well as in the manufacturing and installation costs.

A more particular object is to provide a hollow ventilated conductor which complies with the well known and best accepted theories of alternating current conductor design, and which comprises chiefly only two standard structural shapes which are very simple and easy to manufacture and assemble.

These and various other objects and novel features, as well as advantages of the invention, will become more apparent when the following detailed description is read in conjunction with the accompanying drawing, of which Fig. 1 is an end view, partly in elevation and partly in section of a portion of a bus bar structure, particularly adapted for use in connection with adjacent groups of conductors, which is constructed in accordance with the invention; Figs. 2 and 3 are views similar to Fig. 1 of modified forms of the invention; and Fig. 4 a perspective view of a portion of a corner joint in a bus bar formed of channel sections.

In accordance with what is now considered to be the preferred embodiment of the invention, a bus bar or conductor is provided comprising mainly a pair of simple standard structural channel sections 1 and 2 which are arranged parallel to one another with their flanges extending towards each other, and forming thereby a hollow conductor of rectangular cross section. By reason of such formation, in accordance with the best accepted and well known theories of alternating current conductor design, a distribution of the current is produced whereby the objectionable effect of surface flow, commonly referred to as skin effect, is reduced to substantially a minimum. Furthermore, this arrangement of the channel sections 1 and 2 also presents a maximum resistance to bending when the individual bus bars are supported one above the other.

In order to further enhance the conducting qualities and efficiency of the bar the channel sections 1 and 2 are spaced from one another in such a manner as to provide sufficient ventilation between them to maintain their temperature rise due to the current flow, at a minimum, and, to afford a more perfect interior ventilation, the channels are arranged so that the ventilating openings are positioned in the top and bottom of the bar.

While other methods and means may be employed in the mounting and assembling of the bars, where for various reasons it is desirable to arrange a number of buses adjacent to one another, spaced upright supports 3 and 4, such as shown in Fig. 1, may be employed. In accordance with this construction the uprights are anchored in any suitable manner at their respective ends, and arranged with sufficient space between them to afford the proper ventilating opening between channel sections 1 and 2 when in place. For attaching the conductor-forming channel sections to these uprights 3 and 4, two-part clamping brackets 5, secured by bolts 6, are employed. The faces 7 of these brackets are made flat and against them the backs of the channels are placed, studs 9 being secured in the brackets adjacent the flanges of the channel to hold the channels against both vertical and horizontal displacement. For the latter purpose heads 11 are formed on the free ends of the studs.

To prevent the channel sections from warping or buckling due to uneven expansion or contraction occasioned by uneven temperature conditions or the like, the studs 9 are re-

duced in size where they pass through the faces 7 of the brackets, thus providing shoulders which, when the studs are sufficiently long, prevent the drawing of the heads 11 tightly against the edges of the channel flanges. This permits the channel sections to move freely in a lengthwise direction to compensate for any expansion and contraction which may take place. However, as will be readily appreciated, through the use of washers or different length studs the channels may be firmly secured in the brackets if desired.

Another method in which channel sections may be assembled to form a conductor similar to the one shown in Fig. 1 is that illustrated in Fig. 2. According to this modification of the invention, the channels are bound together by a pair of clamping members 12 and 13 which are designed to fit on the flange ends of the sections 1 and 2, and, through the agency of flanges 15 and lug 16 provided thereon, designed to hold the sections in their proper spaced relation. For binding clamps 12 and 13 in place a bolt 17 is employed, a nut 18 being secured to its upper end, and, in the structure shown, its lower end is threaded into a suitable insulating support 19. Bolt 17, like studs 9 referred to hereinbefore, is preferably made with reduced end portions, which pass through the clamp members so that with or without the aid of washers 21 the channels may be either loosely or tightly held by the clamps.

So far in the specification, but bar installations, wherein the individual bars are mounted one above the other, have been considered. It is often necessary to arrange the bus bars in horizontal parallel relationship such as along a roof or between floors and the like. Such an installation as this would result in bending in a horizontal plane in view of the electromagnetic stresses set up in a pair of adjacent bus bars, and since the conductors, for proper ventilation, are arranged with the webs of the channel sections 1 and 2 extending towards one another, the resistance to bending would be less than in the vertical mounting shown in Fig. 1. By clamping the channel sections 1 and 2 rigidly together at a suitable number of points between supports, to mechanically simulate a box girder, the resistance to bending is greatly increased and the channels are electrically equalized without in any way impairing the efficiency of the bus bars to proper ventilation and freedom to longitudinal expansion within their supporting clamps.

In the modification of the invention illustrated in Fig. 3, instead of channel sections L-shaped angles 22 and 23 are employed, the angles being arranged like the channel sections to form a hollow conductor of rectangular cross section. Like in the mounting shown in Fig. 2, clamps 24 and 25, bound together by bolts 29, are employed for holding the angles in place, the clamps being provided with lugs 26 and 27 and with flanges 31 and 32 for maintaining the alignment and spacing of the angles. While the lower clamp 25 may take the same shape as the upper one where used as a binder only, if employed also for attaching the bar to an insulating support 28, it is provided with a depression 30 and equipped with a bolt 33, which is threaded into the insulating support.

Another feature of a conductor constructed of structural shapes in the manner referred to is the simple and sturdy fashion in which the sections may be spliced and carried about corners, as illustrated by the joint shown in Fig. 4. This, together with the well known qualities of mechanical strength inherent in such shapes, makes it possible to cover spans of great length with such bars and thereby reduce the number of supports required for the conductor, and hence avoid in a corresponding degree the possibility of flashovers which are frequently produced at such points.

Among the outstanding advantages of the invention is its efficient and effective utilization of conducting material, which may be aluminum, copper or any other suitable medium, its simple economic and sturdy construction brought about by the use of standard structural shapes, and the easy and dependable way in which it may be assembled and installed.

According to the provisions of the patent statutes, I have explained the principle and mode of operation of my invention, and have illustrated and described what I now consider to represent its best embodiment. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than is specifically illustrated and described.

I claim:

1. A bus bar comprising a pair of L-sections disposed with the horizontal leg of one section parallel to the horizontal leg of the other section to form a hollow divided conductor of rectangular cross section, clamping means associated with said L-sections, said clamping means comprising members having flanges for engaging the horizontally extending legs of the L-sections and positioning them in definite spaced relationship to provide diagonally opposed ventilation openings through the hollow conductor, and binding means associated with the clamping members to permit relative lengthwise movement of the L-sections.

2. A bus bar comprising a pair of channel sections disposed with the flanges of one extending toward the flanges of the other to form a hollow divided conductor of rectangular cross-section, said channel sections being spaced apart sufficiently to provide a

ventilating space therebetween, clamping means for maintaining the channel sections in the aforesaid spaced relationship, said flanges being of considerable extent, whereby they cooperate with the said clamping means in maintaining alignment of the channel sections.

3. In a current-carrying conductor a pair of similarly shaped structural members each being characterized by a vertical upstanding portion and at least one integral horizontally extending portion of substantial length adjacent an extremity of the upstanding portion and extending only in one direction therefrom, said structural members being arranged in spaced relationship with their horizontal portions extending inwardly to provide a hollow rectangular conductor, clamping members associated with said structural members, said clamping members being provided with flanges for engaging said horizontally extending portions of the structural members and positioning them in definite spaced relationship to provide ventilation openings through the hollow conductor, and binding means associated with the clamping members to permit relative lengthwise movement of the structural members.

4. In a current-carrying conductor a pair of similarly shaped structural members each being characterized by a vertical upstanding portion and at least one integral horizontally extending portion of substantial length adjacent an extremity of the upstanding portion and extending only in one direction therefrom, said structural members being arranged in spaced relationship with their horizontal portions extending inwardly to provide a hollow rectangular conductor, clamping members associated with said structural members, said clamping members being provided with flanges for engaging said horizontally extending portions of the structural members and positioning them in definite spaced relationship to provide ventilation openings through the hollow conductor, and binding means associated with the clamping members, said binding means comprising a bolt member the extremities of which are provided with shoulder portions adjacent its ends adapted to maintain the clamping members in definite spaced relationship to permit relative lengthwise movement of the structural members.

In testimony whereof, I sign my name.

THOMAS J. BOSTWICK.