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2,886,747

RECTIFIER MOUNTING MEANS

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FIG. 1

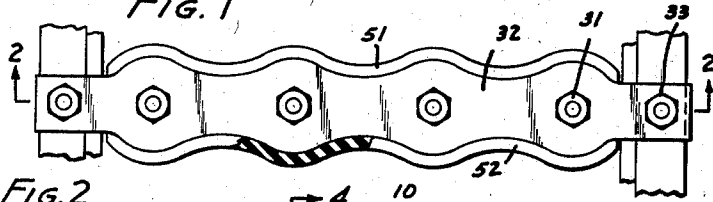


FIG. 4

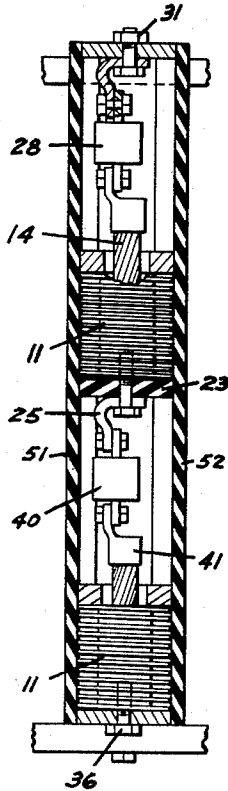


FIG. 2

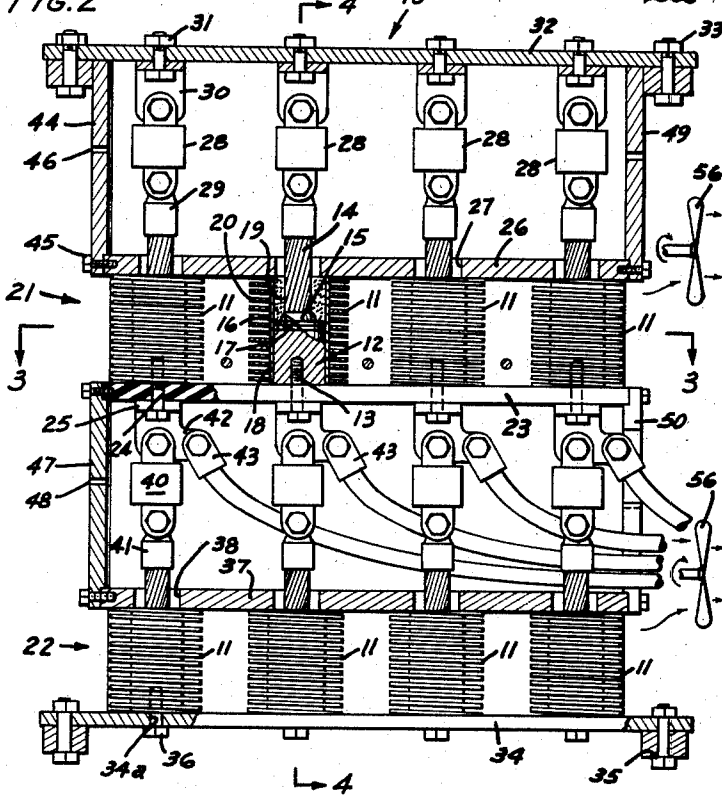
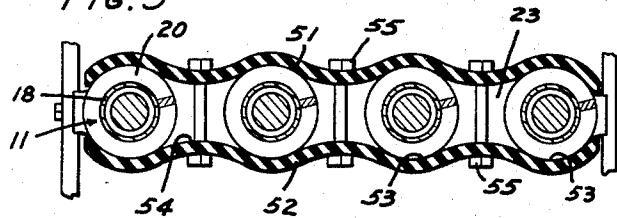


FIG. 3



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RECTIFIER MOUNTING MEANS

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5 Claims. (Cl. 317-234)

This invention relates to a means for mounting a plurality of rectifiers to form a unitary assembly, and has for an object to provide an inexpensive assembly which is of rugged construction, and which can be provided with means for cooling the rectifiers.

This invention is carried out in combination with a plurality of rectifiers, each of which has cooling fins thereon, which rectifiers are to be held in a fixed position relative to each other. A pair of substantially rigid sheets is disposed, one sheet on each side of the rectifiers, and the rectifiers are clamped between the sheets. At least one of the sheets is provided with depressions for receiving a portion of the rectifiers so as to hold the rectifiers in some desired position. Space is left between the said sheets in order to permit a coolant, such as air, to flow between and over the surface of the fins for cooling.

According to a preferred but optional form of the invention, both sheets are corrugated, and the fins on the rectifiers are round, so that the rectifiers are held in the depressions of the corrugations in both of the opposed sheets.

The above and other features of this invention will be fully understood from the following detailed description and the accompanying drawings, of which:

Fig. 1 is a plan view partly in cut-away cross-section of a rectifier assembly according to the invention;

Fig. 2 is a cross-section view partly in elevation, taken at line 2-2 of Fig. 1;

Fig. 3 is a cross-section view taken at line 3-3 of Fig. 2; and

Fig. 4 is a cross-section view taken at line 4-4 of Fig. 2.

According to the preferred embodiment of the invention, a rectifier assembly 10 (see Fig. 2), comprises a unitary bank of eight individual rectifiers 11. As shown in this drawing, these rectifiers are electrically connected as a bridge circuit, which will be further described below.

This assembly 10, has been found to be particularly useful with a type of rectifier having fins for aircooling which is more particularly shown in the co-pending Kurt Kadelburg patent application Serial No. 498,880, filed April 4, 1955 entitled "Air-Cooled Rectifier Assembly" which is assigned to the same assignee as this instant invention and now abandoned. Certain details of one of such rectifiers is shown in Fig. 2, all the others being of similar construction. For more complete details of these rectifiers, reference may be had to the above-identified patent application.

Such a rectifier comprises a copper plug 12 which receives a threaded terminal screw 13 in a threaded hole. A flexible terminal cable 14 is attached to the other end of the rectifier. This cable is soldered or otherwise attached to an electrode 15 which may be an indium pellet. This indium pellet is soldered to a germanium wafer 16, which wafer is attached to a base plate 17. The base plate is then soldered or otherwise fixed to the plug 12. A tubular enclosure 18 contains the plug 12, and part of the cable 14. The tubular enclosure 18 may be sweated onto the plug, if desired, and a wax composition 19 is

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poured in between the cable 14 and the said tubular enclosure. Spiral fins 20 having a circular outer contour (see Fig. 3) are fixed to the tube 18. Tubing having such a spiral fin is a commercially available product, a suitable length of which may simply be cut off and applied to the rectifier as shown. Other types of fins may be attached to enclosure 18, if desired, such as flat discs.

The rectifiers 11 are provided in two rows 21 and 22. The rectifiers of row 21 are mounted upon an insulated air guide 23 which may be of any desired insulating structural material. Holes 24 through the air guide pass the terminal screws 13. These screws 13 also serve to electrically connect a terminal member 25 to the conductive plug. Cables 14 and screws 24 or 36 (or plug 12) will be recognized as the terminals of rectifiers 11.

Another air guide member 26 bears against the upper end of the rectifiers of the upper row 22 and has holes 27 therethrough for passing the terminal cables 14 of the rectifiers. These holes 27 are of lesser dimensions than the enclosure 18. The air guides 23 and 26 both have a sinuous outline, and fit closely to the ends of the rectifiers 11. As will be further shown below, this forms a passage for cooling air.

The terminal cables 14 of each of the rectifiers of the upper row 21 are attached to fuses 28, which fuses are designed to break the circuit to individual ones of the rectifiers under overload conditions. These fuses are connected between terminal lugs 29 on the terminal cables 14, and lugs 30, which lugs 30 are connected by means of nut and bolt assembly 31 to a conductive air guide member, sometimes referred to as bus bar 32. The bus bar 32 is provided with electrical connections 33.

The lower row 22 of rectifiers 11 is supported by a conductive air guide member, sometimes referred to as bus bar 34, which bus bar will preferably have a sinuous outline for reasons further disclosed below. Electrical connections 35 are provided for this bus bar. Terminal screws 36 pass through holes 34a in bus bar 34 so as to mount the rectifiers thereon and also to connect them electrically thereto.

An air guide 37 rests snugly atop the rectifiers 11 of the lower row 22, this air guide having a sinuous outline similar to that of air guide 26. It has holes 38 of lesser diameter than the enclosure 18 of the rectifiers for passing the terminal cables.

Fuses 40 interconnect a terminal lug 41 on the terminal cables to a terminal member 25. An ear 42 is connected to a lead 43 which lead is a source of A.C. current to be rectified. It will be understood from the above, and from the drawings, that the connections and the components of each of these rectifiers is similar to all of the others, and therefore only one of each has been described. There are, however, four separate leads, each of which provides A.C. current to be rectified to a pair of rectifiers 11.

An air baffle 44 is mounted to the air guide 26 by means of screws 45, and has a bleed hole 46 therein. A similar air baffle 47 is mounted to air guides 23 and 37, and also has a bleed hole 48 therethrough. Similar air baffles 49 and 50 are mounted opposite baffles 44 and 47, respectively.

As best shown in Fig. 3, a pair of sheets 51, 52, is disposed, one sheet on each side of the rectifiers 11. These sheets are each provided with a plurality of depressions 53 and elevations 54. The rectifiers 11 fit in the depressions 53 and are embraced thereby when the sheets are placed in opposition on opposite sides of the rectifiers and are bolted to some structure such as to the air guides 23 and 26 by means of screws 55.

The above structure forms passageways between the air guides 23 and 26 and air guides 34 and 37 which passageways have their sides closed by the sheets 51 and 52. Fans 56 can thereby draw air through said pas-

sageways and over the surface of the cooling fins on the rectifiers 11.

In some installations it is desirable also to cool the fuses 28 and 40, and for this purpose, bleed holes are provided in the air baffles. These baffles substantially enclose the fuses such that, along with the air guide and the side sheets 51 and 52 no air would reach these fuses without the bleed holes, all cooling air being drawn across the rectifiers. However, the bleed holes permit a small flow of air or other cooling fluid across the fuses so as to cool the same. The fuses require less cooling than the rectifiers.

With respect to row 22, air guides 34, 37 and 23 are sometimes referred to as a conductive first closure member, second closure member, and third closure member, respectively. With respect to row 21, air guides 23, 26 and 32 are sometimes referred to as a conductive first closure member, second closure member, and third closure member, respectively.

The leads 43 may be connected to any desired source of A.C. voltage. The electrical circuit illustrated will be recognized as a simple bridge circuit, the bus bar 32 being a positive terminal and the bus bar 34 being a negative terminal. It will be understood that circuit configuration other than that one which is shown can be utilized, still being within the spirit of this invention.

It will also be understood that outer configurations of rectifiers other than circular and depressions in the sheets 51 and 52 other than sinuous could be used. However, it has been found that corrugated sheets such as 51 and 52 are easily obtained in commercial products made of insulating material, can be quickly and easily cut to size and make a strong and convenient mounting means.

Also more or fewer rectifiers may be provided as desired. A plurality of rectifier assemblies of this type may be stacked side by side so that air does not leak therebetween in any significant quantities so that the fans can cool more than one of these rectifier assemblies at the same time.

Therefore this invention is not to be limited by the embodiments shown in the drawings and described in the description, but only in accordance with the scope of the appended claims.

I claim:

1. A rectifier assembly comprising a plurality of rectifiers, each rectifier including a circular cooling fin and a pair of conductive terminals, a pair of substantially rigid corrugated sheets disposed one on each side of said rectifiers so as to embrace the cooling fins and thereby hold the rectifiers therebetween in said corrugations, air guide means having sinuous edges registered with the corrugations in the sheets, said air guide means being disposed one on each side of said rectifiers, so as to guide air between said sheets and said air guide means so that cooling fluids can flow substantially exclusively through a passageway formed thereby, one of said air guide means being a conductive bus bar which is electrically connected to one terminal of some of said rectifiers.

2. Apparatus according to claim 1 in which one terminal of each of said rectifiers is connected to a fuse,

said fuses being enclosed in a passageway defined between a pair of corrugated sheets, and two air guide means having sinuous edges in registration with said sheets, the ends of the last-mentioned passageway being closed by baffles which have bleed holes for the passage of cooling air through said baffles to said fuses.

3. A rectifier assembly comprising: a plurality of rectifiers, each rectifier including a pair of terminals and a plurality of fins which have a substantially circular outer periphery, said fins being stacked generally parallel to and spaced from each other, the stack of fins having a central axis which is substantially perpendicular to the fins; a pair of substantially rigid sheets, each sheet having a plurality of generally parallel sinuous corrugations, the rectifiers being embraced by said sheets so that the edges of the fins fit in said corrugations with the central axis of the rectifiers parallel to the corrugations so that coolant fluid can flow across the fins in a direction transverse to said central axis, the depth of the corrugations being less than the radius of the fins so that the opposed sheets are separated by the rectifiers to leave space for coolant fluid to flow between said sheets; a conductive first closure member extending between said sheets and in sealing contact therewith, said first closure member being conductively connected to a first terminal of each of said rectifiers, the rectifiers bearing against said first closure member forming a row, a second closure member having holes therethrough for passing a second of said terminals from each of said rectifiers, said second closure member extending between said sheets, in sealing relationship with both sheets, on the opposite side of said rectifiers from the first closure member, whereby coolant flow is restricted to the region between said sheets, and first and second closure members so as to flow over said fins when a differential pressure is exerted across the ends of the row; a third closure member extending between said sheets in sealing relationship with both sheets and spaced from said second closure member; and a pair of baffles mounted to said sheets and extending between the sheets and the second and third closure members; a fuse connected to each of the second terminals, each baffle having a bleed hole therethrough to permit restricted coolant flow to and across said fuses, whereby coolant fluid can flow over the fuses at a rate limited by the baffles when a differential pressure is exerted across the ends of the row.

4. Apparatus according to claim 3 in which the third closure member is a conductive bus bar connected to the said second terminals through the fuses.

5. Apparatus according to claim 3 in which blower means are provided for moving coolant fluid between the sheets.

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