

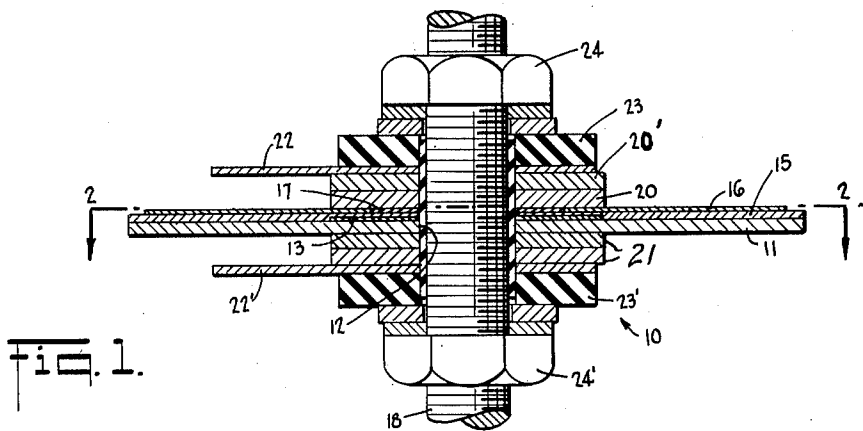
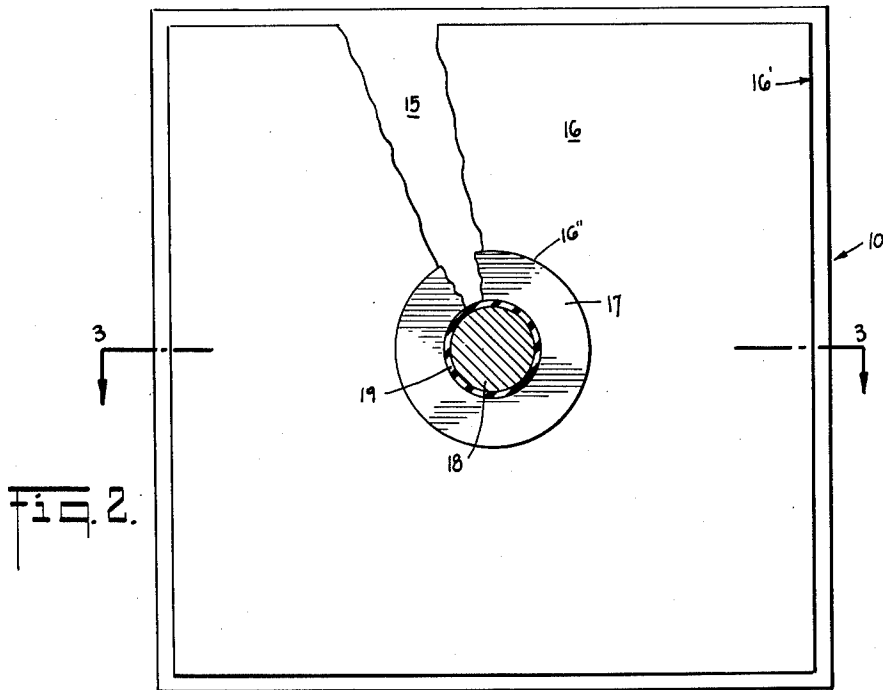
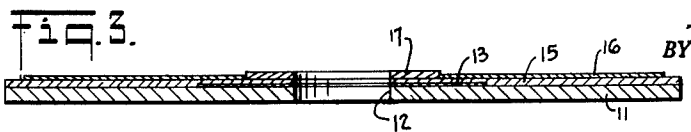
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RECTIFIER

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RECTIFIER

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This invention relates to dry disc or dry plate rectifiers and, more particularly, to an improved construction of such rectifiers greatly increasing the life and reliability thereof.

As presently constituted, one particular type of rectifier comprises a conductive metal base plate (for example, aluminum), coated on one side with a semi-conductive layer (for example, selenium). Upon the exposed surface of the semi-conductive layer, to which there has been applied the infinitesimally thin barrier layer, there is applied a conductive metal layer forming a counter-electrode.

The assembled rectifier is formed with a central aperture through which passes a stud or spindle surrounded by an insulated sleeve, the base plate, semi-conductor and counter-electrode layers being formed with a central aperture in relation to the spindle. An annular disc, preferably of paper and defining an insulation member, is generally disposed between the base plate and the semi-conductive layer, and an annular contact washer is placed against the exposed surface of the counter-electrode, both annular members being positioned adjacent the periphery of the central aperture.

Rectifiers as so constructed often fail electrically and mechanically due to melting and running off of the soft metal alloy of the counter-electrode, when safe design operating temperatures are exceeded. The melting counter-electrode alloy usually runs toward and into the central aperture and by bridging the selenium layer and the metal base plate, causes electrical failure. The melted counter-electrode alloy, in developing the unwanted bridging effect aforesaid, causes arcing adjacent the insulating sleeve which covers the mounting spindle passing through the central aperture of the rectifier, and such arcing effects a mechanical break-down of the insulating sleeve and the mounting stud or spindle, thereby causing a total mechanical failure of the rectifier.

In accordance with the present invention, the counter-electrode layer is formed to be co-extensive with the semi-conductor upon which it is superimposed; the counter-electrode, however, as formed, is of less radial distance from its outer periphery to its inner periphery than that of the semi-conductor layer, the difference in area being evidenced by providing an annular zone adjacent the central aperture wherein the semi-conductor is not superimposed by the counter-electrode. Within this zone there is disposed a compressible annular insulation disc, the outer periphery of

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which contacts the inner periphery of the counter-electrode, and the inner periphery of which is in line with the outer periphery of the central aperture of the rectifier. The insulating disc or washer is initially of slightly greater thickness than that of the counter-electrode layer, so that when the rectifier is assembled and the usual contact washer is applied by superimposition in the zone of the aforesaid insulation washer and the counter-electrode contiguous thereto, the former is compressed to the same thickness as the counter-electrode layer and in such capacity serves both as a packing and as a compressed medium resisting the flow of melted counter-electrode alloy toward the center of the rectifier, in the event that the same decomposed due to excessive heat effect developed in the rectifier.

By virtue of the foregoing, arcing, short circuiting and the resultant burning away of the insulating sleeve and stud is thereby avoided and the reliability and life of the rectifier is increased.

For a more complete understanding of the invention, reference is made to the following detailed description of an embodiment thereof as illustrated in the accompanying drawing, in which:

Fig. 1 is a central transverse sectional view; and Fig. 2 is a plan view taken along the lines 2—2 of Fig. 1 with certain of the contact parts eliminated; and

Fig. 3 is a central transverse view taken along lines 3—3 of Fig. 2.

Referring to the drawing, rectifier unit 10 includes a base plate 11 of conductive metal such as aluminum. Plate 11 has mounted thereon at its central aperture 12, as by pressure or adhesion and pressure, an annular paper insulation washer 13. The surface of plate 11 carrying washer 13 is coated with a semi-conductor 15 such as selenium. A preferred mechanism and method for forming a plate of this character is shown in my copending U. S. application Serial No. 54,231, filed on October 13, 1948.

In accordance with the present invention, a counter-electrode layer 16 comprised of a conductive alloy is applied as a coating for the semi-conductor layer 15 aforementioned, the radial distance between the outer periphery 16' and the inner periphery 16'' of the counter-electrode layer being less than the radial distances of the semi-conductor layer 15. To superimpose a counter-electrode layer of this character upon the semi-conductor layer 15, to which has been applied a barrier layer of infinitesimal thickness, a masking cone or mushroom is disposed in the

central aperture 12 and the counter-electrode sprayed or otherwise applied over the barrier layer coated exposed face of the selenium semiconductor 15, the diameter of the mushroom mask being such that after the counter-electrode is applied, an annular boss formation, defined as having a base of semi-conductor material 15 and a circular sidewall of counter-electrode 16 is provided, into which is disposed a compressible insulation disc or washer 17, the initial thickness of which is some .0005 greater than the thickness of the counter-electrode layer 16, the radial distance between the outer and inner peripheries of the compressible insulation disc or washer being such as will permit the disc or washer to fit into the boss with its outer periphery in line with the inner periphery of the counter-electrode and its inner periphery in line with the outer periphery of the central aperture.

In assembling the unit, a stud or spindle 18 surrounded by an insulation sleeve 19 is mounted centrally of the assembled unit, with the insulation sleeve in contact with the inner peripheries of, respectively, the base plate 11, washer 13, semi-conductor 15 and the insulating paper washer 17. The contact washer 20 of the set 20, 20' overlies the exposed surface of the counter-electrode layer 16 and compression disc or washer 17, and in the assembly, as the contact washer is mounted on the insulation sleeve 19, that part of the under-surface thereof co-extensive with the compression washer acts thereon to compress it to an amount so that the upper surface of the compression washer is at the same level as the exposed surface of the counter-electrode, said disc or washer 17 thereby, in effect, becoming additionally a packing washer.

The usual contact washers 21 are applied to the underside of the base member and conductor strips 22, 22' are connected to lead from contact washers 20 and 21. The usual apertured insulation washers 23 and 23' are interposed between the contact strips and the locking nuts 24, 24', serving to lock the assembly. Although there is shown in the drawing but a single rectifier element, it is within the province of this invention to mount a series thereof in bank formation.

Should the metal of the counter-electrode melt, by virtue of the development of excessive temperatures, the compressed washer 17 blocks the flow of metal from the counter-electrode inwardly toward the central aperture 12, thereby avoiding electrical and mechanical failure at the insulating sleeve 19 and mounting stud 18.

While specific embodiments of the invention have been shown and described in detail to illustrate the application of the invention principles thereto, it should be understood that the invention may be otherwise embodied without departing from such principles.

What is claimed is:

1. A dry disc rectifier in combination with a base plate having a mounting edge, a layer of semi-conductor material superimposed on one surface of said base plate and extending to the mounting edge thereof, a layer of counter-electrode material superimposed on at least a portion of the exposed surface of said semi-conductor excepting that zone thereof adjacent the mounting edge, and a layer of compressible insulating material superimposed on the exposed portion of the semi-conductor adjacent the mounting edge said insulating material being initially of slightly greater thickness than the

counter-electrode layer and being compressible in assembly to the thickness of the counter-electrode layer.

2. A dry disc rectifier in combination with a base plate having a mounting edge, a layer of semi-conductor material superimposed on one surface of said base plate and extending to the mounting edge thereof, a layer of counter-electrode material superimposed on at least a portion of the exposed surface of said semi-conductor excepting that zone thereof adjacent the mounting edge, and a compressible paper washer superimposed on the exposed portion of the semi-conductor adjacent the mounting edge said washer being initially of slightly greater thickness than the counter-electrode layer and being compressible in assembly to the thickness of the counter-electrode layer.

3. A dry disc rectifier in combination with a base plate having a central mounting aperture therein, a semi-conductor layer on one surface of said base plate, the inner periphery of which extends to the outer periphery of the central aperture of the base plate, and a counter-electrode layer superimposed on the exposed face of said semi-conductor layer, the inner periphery of said counter-electrode layer being disposed in spaced relationship from the outer periphery of the central aperture of the base plate, whereby to provide an annular exposed surface of said semi-conductor adjacent the central aperture of the base plate, and a layer of compressible insulation material on said exposed surface of the semi-conductor layer adjacent the central aperture, the outer periphery of said compressible insulation layer being bounded by the inner periphery of the counter-electrode layer said insulating material being initially of slightly greater thickness than the counter-electrode layer and being compressible in assembly to the thickness of the counter-electrode layer.

4. A dry disc rectifier in combination with a base plate having a central mounting aperture therein, a semi-conductor layer on one surface of said base plate, the inner periphery of which extends to the outer periphery of the central aperture of the base plate, and a counter-electrode layer superimposed on the exposed face of said semi-conductor layer, the inner periphery of said counter-electrode layer being disposed in spaced relationship from the outer periphery of the central aperture of the base plate, whereby to provide an annular exposed surface of said semi-conductor adjacent the central aperture of the base plate, and an annular compressible paper washer on said exposed surface of the semi-conductor layer and adjacent the central aperture, the outer periphery of said washer being bounded by the inner periphery of the counter-electrode layer said washer being initially of slightly greater thickness than the counter-electrode layer and being compressible in assembly to the thickness of the counter-electrode layer.

5. A dry disc rectifier in combination with a base plate having a central mounting aperture therein, a centrally apertured layer of semi-conductor superimposed on one surface of said base plate, a centrally apertured layer of counter-electrode having substantially the same outer periphery as that of the semi-conductor layer but of less radial distance from outer to inner periphery, superimposed on the exposed surface of said semi-conductor, and a centrally apertured compressible insulation layer superimposed on the exposed portion of the semi-conductor be-

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tween the inner periphery of the counter-electrode and the central aperture of the base plate said insulating material being initially of slightly greater thickness than the counter-electrode layer and being compressible in assembly to the thickness of the counter-electrode layer.

6. A dry disc rectifier in combination with a base plate having a central mounting aperture therein, a centrally apertured layer of semi-conductor superimposed on one surface of said base plate, a centrally apertured layer of counter-electrode having substantially the same outer periphery as that of the semi-conductor layer but of less radial distance from outer to inner periphery, superimposed on the exposed surface of said semi-conductor, and a centrally apertured compressible paper washer superimposed on the exposed portion of the semi-conductor between the inner periphery of the counter-electrode and the central aperture of the base plate said washer being initially of slightly greater thickness than the counter-electrode layer and being compressible in assembly to the thickness of the counter-electrode layer.

7. A dry disc rectifier comprising, in combination, a base plate having a mounting aperture therein, a layer of semi-conductor on one surface of said base plate, a counter-electrode layer on said semi-conductor and having an aperture aligned with and larger in diameter than such mounting aperture, an annular packing of insulating material lying in the counter-electrode aperture against said semi-conductor layer said insulating material being initially of slightly greater thickness than the counter-electrode layer and being compressible in assembly to the thickness of the counter-electrode layer, and a contact washer overlying said counter-electrode layer and said washer.

8. A dry disc rectifier comprising, in combination, a base plate having a mounting aperture therein, a layer of semi-conductor on one surface of said base plate, a counter-electrode layer on said semi-conductor and having an aperture aligned with and larger in diameter than such mounting aperture, an annular paper packing lying in the counter-electrode aperture against said semi-conductor layer said paper packing being initially of slightly greater thickness than the counter-electrode layer and being compressible in assembly to the thickness of the counter-electrode layer, and a contact washer overlying said counter-electrode layer and said washer.

9. A dry disc rectifier comprising, in combination, a base plate having a mounting aperture therein, a first paper washer surrounding such aperture, a layer of semi-conductor on one surface of said base plate overlying said first washer, a counter-electrode layer on said semi-conductor and having an aperture aligned with and larger

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in diameter than such mounting aperture, and a second annular paper washer lying in the counter-electrode aperture against said semi-conductor layer.

10. A dry disc rectifier comprising, in combination, a base plate having a mounting aperture therein, a first paper washer surrounding such aperture, a layer of semi-conductor on one surface of said base plate overlying said first washer, a counter-electrode layer on said semi-conductor and having an aperture aligned with and larger in diameter than such mounting aperture, and a compressible second annular paper washer of slightly greater thickness than the counter-electrode layer lying in the counter-electrode aperture against said semi-conductor layer.

11. A dry disc rectifier comprising, in combination, a base plate having a mounting aperture therein, a first paper washer surrounding such aperture, a layer of semi-conductor on one surface of said base plate overlying said first washer, a counter-electrode layer on said semi-conductor and having an aperture aligned with and larger in diameter than such mounting aperture, a second annular paper washer lying in the counter-electrode aperture against said semi-conductor layer, and a contact washer overlying said counter-electrode layer and said second washer.

12. A dry disc rectifier comprising, in combination, a base plate having a mounting aperture therein a first paper washer surrounding such aperture, a layer of semi-conductor on one surface of said base plate overlying said first washer, a counter-electrode layer on said semi-conductor and having an aperture aligned with and larger in diameter than such mounting aperture, a compressible second annular paper washer of slightly greater thickness than the counter-electrode layer lying in the counter-electrode aperture against said semi-conductor layer, and a contact washer overlying said counter-electrode layer and said second washer and compressing the latter.

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