July 16, 1946. H. J. DAILEY ET AL 2,404,042

ELECTRON DISCHARGE DEVICE

Filed Oct. 12, 1944

Fig. 1.

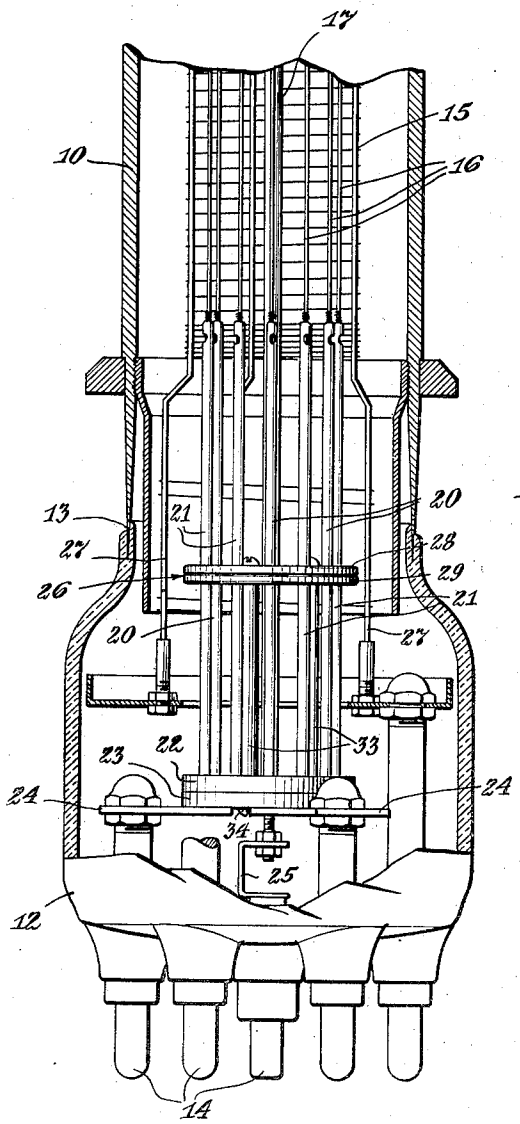


Fig. 2.

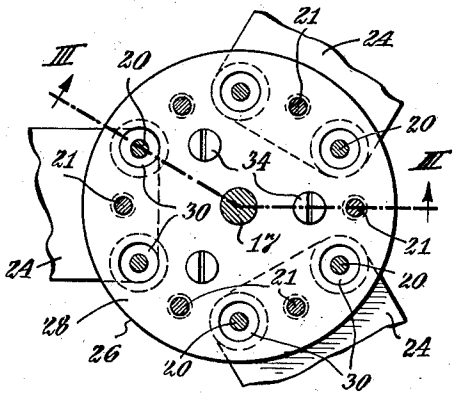


Fig. 3.

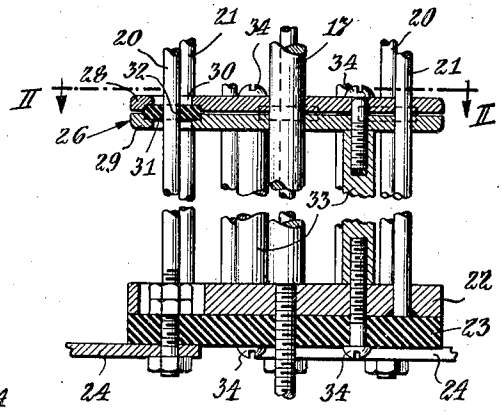


Fig. 4.

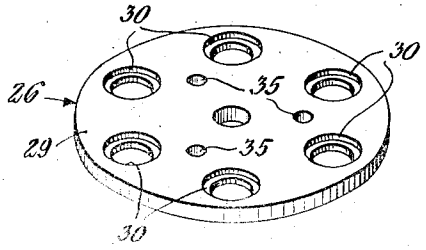
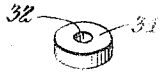


Fig. 5.



INVENTORS
H. J. DAILEY
E. G. WERNER.
BY
ATTORNEY

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ELECTRON DISCHARGE DEVICE

Hampton J. Dailey and Leo C. Werner, Bloomfield, N. J., assignors to Westinghouse Electric Corporation, East Pittsburgh, Pa., a corporation of Pennsylvania

Application October 12, 1944, Serial No. 558,300

6 Claims. (Cl. 250—27.5)

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This invention relates to electron discharge devices and particularly to spacers therein for the filament leads which have, of necessity, close relation to the grid or its supports and are subject to a high frequency field between filament and grid. The invention is an improvement upon sole application of inventor Hampton J. Dailey herein, whose application Serial No. 509,649 was filed in the United States Patent Office November 10, 1943 and assigned to the same assignee as the present joint invention.

In its general aspect, the present invention has for an object greater security against possible effects of a high frequency field creating a shorting path to the filament lead from the grid lead nearest thereto.

More specifically, an object of the invention is to imbed the insulating spacer in a metallic spacer for maximum protection against exposure of the insulating spacer to the high frequency field.

Another object of the invention is to avoid presence of conductive connections in contact with the insulators and having an edge exposure toward the most adjacent part of the grid.

Still further objects of the invention will appear to those skilled in the art to which it appertains as the description progresses, both by direct reference thereto and by implication from the context.

Referring to the accompanying drawing in which like numerals of reference indicate similar parts throughout the several views;

Figure 1 is an elevational section of an electron discharge device embodying the present invention;

Figure 2 is a plan of the spacer member with the filament lead-in wires or posts and taken as a section on line II—II of Fig. 3;

Figure 3 is a sectional view on line III—III of Fig. 2;

Figure 4 is a perspective view of one of the spacer members; and

Figure 5 is a perspective view of one of the insulators.

In the specific embodiment of the invention illustrated in said drawing, the general organization of the electron discharge device provides a vacuum tight container formed by an outer metal tube 10 which acts as the anode and which is closed at its upper end as usual and closed at its lower end by means of a glass bowl or base 12 which is sealed to it in suitable manner as by a feather-edge joint 13. From the bottom of the bowl, at the exterior thereof, project the usual

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prongs 14 for making connection with the internal electrodes.

Coaxially within the anode is a grid 15, and inside the grid is a cathode 16 formed as a plurality of hairpin sections each with parallel wires or legs and all said legs symmetrically disposed in cylindrical arrangement relatively close proximity to the grid. On the axis of the coaxial electrodes is a metallic post 17 which constitutes a center support for the upper end of the cathode. Each filament section has one leg secured at its lower end to a post 20 and the other leg secured at its lower end to a similar post 21, the several posts extending downwardly into the bowl 12. All posts constituting one set pass through in contact with and are secured in a metallic supporting plate 22 forming a common electrical connection thereto and the other set pass with clearance through said plate and are secured to an insulative plate 23 juxtaposed at the under side of said metallic supporting plate, the posts 20 being secured to brackets 24 which support the two plates thereabove. These brackets are carried by inwardly projecting parts of a plurality of the aforementioned prongs 14 and thereby have electrical connection to the exterior. Said metallic supporting plate 22 has connection 25 to another one of said prongs. Of course one set of posts will be at a considerably higher potential than the other set for obtaining current flow in the several filament sections.

Intermediate the ends of the several posts 20 and 21 and also on the central post 17 is a transverse and preferably circular spacer 26. The grid supporting wires or legs 27 pass to the bowl at the outside of the spacer out of contact therefrom, but because of limited space, necessarily near to the same and likewise near to the filament parts. There is a high electrical gradient or radio frequency electrostatic field between the posts of one set and the grid. While said spacer in the sole application referred to above substituted metal for the prior art insulating spacer, for counteracting the electrostatic field, the present invention not only utilizes the metal spacer, but gives added protection against discharge of the electrostatic field across the surface of the ceramic and avoids projections and other structure which might tend to promote shorting of the high frequency across or through the ceramic.

According to the present invention, the metal spacer is shown as a pair of juxtaposed substantially flat sections 28, 29 each having registering stepped recesses 30 therethrough, of which the larger parts of the recesses are at the juxtaposed

faces of the sections and the smaller parts of the recesses are toward the exposed faces of said sections. Thus, when the sections are assembled, the registering larger parts of said recesses form pockets, and in each such pocket is located a ceramic disc 31 of substantially the same size, shape and dimensions as the pocket so as to be retained in the pocket merely by virtue of inclusion therein with a portion of the section around the recess overlapping the edge of the disc, and by retention of said spacer sections from separating. By utilization of ceramic discs 31 of slightly greater thickness than the depth of the pockets, said discs may be rigidly held by clamping the spacer sections toward each other. Each said disc 31 has a central hole 32 therethrough for the filament post and substantially the same diameter as said post.

Both support and clamping of the sections 28, 29 constituting the spacer 26 are obtained by studs 33 perpendicular to and between said metallic spacer 26 and metallic supporting plate 22. Screws 34 extending through holes 35 in said spacer and in said supporting plates threading into opposite ends of the studs clamp the several parts together as a rigid structure, the lower screws preferably also passing through the insulative plate 23 and clamping it to the supporting plate.

It may now be observed that the ceramic discs or insulators are in effect embedded in the metallic spacer so that exposed surfaces of said insulators are offset inwardly from the flat exposed surfaces of the said spacer. Thus the insulators are removed from the high frequency field in their entirety and cannot form any part of a shorting path therefor to the filament post either across a surface of the insulator or through the body of the insulator. Furthermore, support for the spacer is obtained by studs which are further from the grid wires than the filament posts, and no slip coils are required or are present on the filament posts either to retain the insulators or to position the spacer. This has the beneficial effect of avoiding any projections on the filament posts which might tend to lower the space resistance to shorting of high frequency from the grid to the filament.

We claim:

1. An electron discharge device having a grid and a cathode within the grid, a spacer transverse to a part of said cathode and in proximity to a part of said grid, and an insulator in said spacer embedded inwardly of exposed surfaces of said spacer.

2. A spacer for filament posts comprising a metallic flat structure having a recess therethrough, and an insulator within said recess with a part of the recess above and below said insulator.

3. A spacer for filament posts comprising a metallic flat structure having top and bottom faces, and having a recess extending through said structure from one of said faces to the other, said recess being enlarged intermediate its ends, and an insulator in the enlarged part of said recess.

4. A spacer for filament posts comprising a pair of juxtaposed sections having registering recesses therethrough, the juxtaposed part of said recesses of the two sections being of greater diameter than the parts of said recesses most remote from each other, and an insulator included between said sections in the said parts of said recesses of greater diameter.

5. A spacer for filament posts comprising a pair of juxtaposed metallic sections having registering recesses therethrough, an insulative disc in said recesses and overlapped by parts of said metallic sections, and means for clamping said sections together and retaining said disc in said recesses.

6. A spacer for filament posts comprising a pair of juxtaposed metallic sections having stepped recesses therethrough, the larger portion of the recesses being next the juxtaposed surfaces of the said sections, and insulative disc in said larger portion and larger than the smaller portion of the stepped recesses, and means holding said sections assembled and the discs retained in the said recesses.

HAMPTON J. DAILEY.
LEO C. WERNER.