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V. L. RONCI

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ELECTRON DISCHARGE DEVICE

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FIG. 1

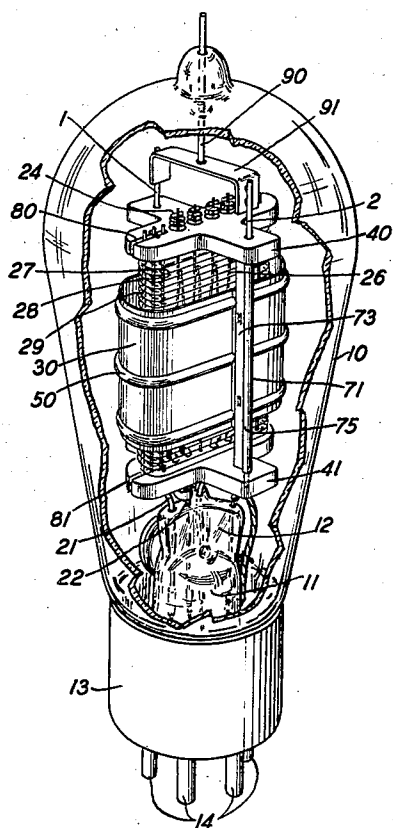


FIG. 2

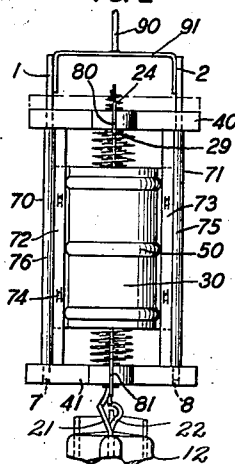
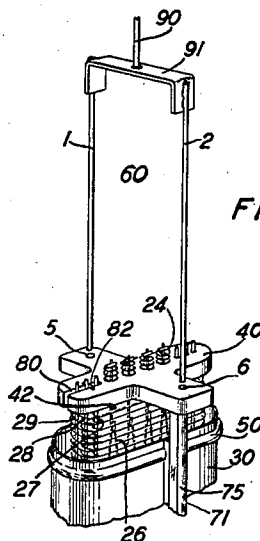


FIG. 3



INVENTOR
V. L. RONCI
BY
Walter C. Kiesel
ATTORNEY

UNITED STATES PATENT OFFICE

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ELECTRON DISCHARGE DEVICE

Victor L. Ronci, Brooklyn, N. Y., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York

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3 Claims. (Cl. 250—27.5)

This invention relates to electron discharge devices and more particularly to such devices capable of handling considerable power without distortion.

5 An object of the invention is to maintain high efficiency in operation under adverse conditions of use.

Another object of the invention is to insure accurate alignment of the electrodes of the device and proper space relationship between the electrodes.

10 In accordance with this invention, an electrode unit is held in a definite position at opposite ends of an enclosing vessel to eliminate variations in lateral alignment of the electrodes which may be subjected to severe shock. The unit may be constructed with the usual group of elements, such as a cathode, grid and anode, which are coupled to suitable spacing members at opposite ends and mounted on a stem at one end of the vessel. Guiding means is rigidly held in the opposite end of the vessel and is provided with two parallel arms which extend through the upper spacing member, anode and lower spacing member, respectively, to maintain the electrode unit in alignment with the axis of the vessel while permitting the electrodes to expand and contract, due to the ability of the unit to slidably move along the arms of the guiding member and thereby compensate for temperature differences during operation.

These and other features of the invention will be more clearly understood from the following detailed description taken in connection with the accompanying drawing in which:

Fig. 1 illustrates in a perspective view a discharge device embodying features of this invention and having a portion of the enclosing vessel broken away to more clearly illustrate the details of the construction;

Fig. 2 shows in elevation a side view of the electrode unit and a press portion of its associated stem; and

Fig. 3 is a perspective view of the upper end of the electrode unit with the guiding means in an expanded state.

Referring to the drawing, the device of this invention as shown in Fig. 1, includes an enclosing vessel 10 having an inwardly projecting stem 11 terminating in a press 12. The vessel is secured to a base 13 carrying a plurality of prongs or terminals 14 for connecting the electrodes to an external circuit. Mounted within the vessel are a plurality of electrodes including a filamentary cathode 26, a control grid 27, a shield

grid 28, a suppressor grid 29 and an anode 30. These electrodes are mounted between and held in spaced relationship by cross-shaped insulators 40 and 41. The electrodes and insulating members form a unitary structure which is rigidly mounted on the press 12 through the instrumentality of lead wires, such as 21 and 22.

The anode or plate electrode 30, which is in the form of a flattened cylinder and may be provided with corrugations, such as 50 to stiffen it, is formed of two similar U-shaped flanged sections held together by two members 70 and 71 having substantially cylindrical hollow portions forming sockets 76 and 75 respectively, and flange portions, such as 72 and 73 respectively. These flanged portions fit over the flanges of the U-shaped sections and are suitably secured to said flanges of the U-shaped sections, as by welding, or by self-locking punchings as shown at 74.

The upper and lower insulators 40 and 41 rest against the upper and lower ends of the members 70 and 71 respectively and hold the electrodes in spaced relationship. The cathode is rigidly secured to the lower insulator 41 and resiliently secured to the upper insulator 40, and the grids 27, 28 and 29 are slidably held in both of said insulators so that a unitary structure including said insulators and electrodes is provided.

The insulating members 40 and 41, which rest against the upper and lower ends of the members 70 and 71, are provided with holes 5, 7, 6 and 8 that are in alignment with the cylindrical openings in the members 70 and 71 respectively, so as to receive guide rods to be later described.

The cathode 26 which may be a continuous filament of thoriated tungsten comprises two M-shaped sections disposed in a medial plane of the anode. The filament is resiliently supported at its upper end by springs, such as 24, resting on the upper insulating member 40, as shown and described in detail in Patent 2,019,492 to Hale et al., issued November 5, 1935. The lower ends of the filament are supported from the lower insulating member in the manner also shown and described in said patent. The control, shield and suppressor grids 27, 28 and 29, respectively, each comprise a pair of straight rods around which is wound a helical wire, said grids being in the form of flattened cylinders. One rod of each pair of the grids fits in apertures in the insulating members 40 and 41 and the other rod of each grid fits loosely in slots 80 and 81 in said members, respectively. Stubs, such as 82 (see Fig. 3), suitably secured as by welding to the upper

or lower ends of the rods adjacent the insulators, hold the rods in place longitudinally.

To permit longitudinal expansion and contraction of the electrodes and still hold the electrodes in axial alignment, a forked member comprising a pair of rods or arms 1, 2, a yoke member 91 connecting them, and a rod 90, which is sealed rigidly in the upper end of the vessel, is provided. The rod 1 passes through the hole 5 in the insulating member 40, the cylindrical opening 76 in member 70 and the hole 7 in insulating member 41, and the rod 2 passes through the hole 6 in member 40, the cylindrical opening or socket 75 in the member 71 and the hole 8 in member 41.

When the electrodes are heated, they expand, as is well known. Due to the electrode structure, including the insulating members and the anode, being slidably connected to the rods 1 and 2, lateral distortion of the electrodes is prevented, and axial alignment of the electrodes is ensured, since the electrodes are free to expand and contract longitudinally.

While this invention has been disclosed with reference to a single embodiment, it will be understood that it is not specific thereto, but is to be considered as limited only by the scope of the appended claims.

What is claimed is:

1. An electron discharge device comprising an enclosing vessel, an electrode structure including a cathode, a grid and an anode mounted in and from one end of said vessel, an insulating member at each end of the structure for spacing said electrodes, said cathode being resiliently supported from one of said insulating members, said

anode having sockets extending longitudinally of its surface, and means at the other end of said envelope cooperating with said sockets to support said structure laterally but allowing longitudinal expansion and contraction of said anode.

2. An electron discharge device comprising an enclosing vessel, an electrode structure including a cathode, a grid and an anode supported in said vessel from one end thereof, an insulating member at each end of said structure for spacing said electrodes, said anode having oppositely positioned flanges with cylindrical passageways therein, the insulating members resting against the ends of said flanges, said cathode being resiliently supported from one of said insulating members, and a pair of rods extending through said passageways and insulating members for laterally supporting the upper end of said structure in slidable relation on said rods and allowing expansion and contraction of said electrodes.

3. An electron discharge device comprising an enclosing vessel having a stem, a unitary electrode structure including a cathode, a grid and an anode mounted on said stem, said anode having flanges containing substantially cylindrical passageways, insulating members at opposite ends of said unitary structure for spacing said electrodes and having apertures in alignment with said cylindrical openings, and means rigidly mounted in the vessel opposite the stem and having portions extending through said apertures and said passageways for steadying said structure against lateral displacement.

VICTOR L. RONCI.