

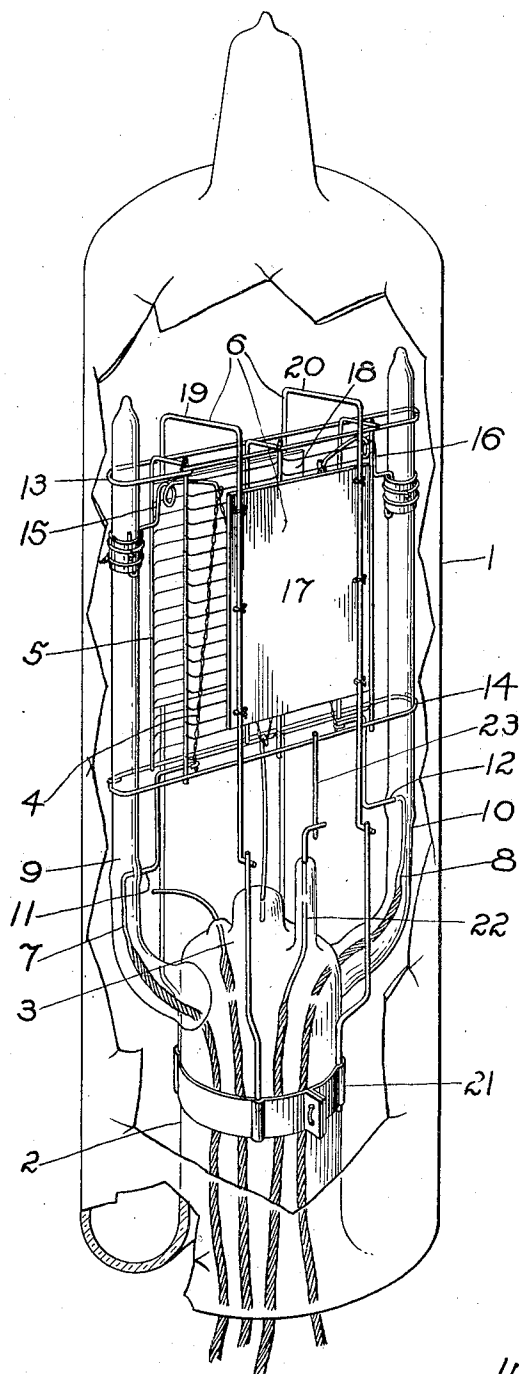
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ELECTRON DISCHARGE DEVICE

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Inventor:
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UNITED STATES PATENT OFFICE.

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ELECTRON-DISCHARGE DEVICE.

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The invention relates to electron discharge devices and particularly to devices of this type for operation with high voltages.

In the general case a vacuum tube of the audion type is designed for operation with a space current or electron current produced by a voltage of 100 or less. High power tubes, however, such as are contemplated by the present invention, are designed to operate with a cathode-anode voltage of 500 or more. When high voltages are impressed between the electrodes, a large current flows and considerable heating of the tube and its parts is produced. It has been found that the glass structure within the tube is heated by the operating current to a point where the glass becomes slightly electrically conducting and a leakage current flows between the leading-in wires across the glass in which they are sealed. This conduction results in a disintegration of the glass which cracks where the leading-in wire is sealed in and air rushes in through this crack, destroying the vacuum within the tube.

An object of the present invention is to prevent the above-mentioned breakage of the tube due to large operating currents to the end that the life of the tube may be prolonged.

This is accomplished by reducing the leakage current to a minimum by providing a wide separation of the leading-in wires. Preferably the inwardly projecting neck of the vacuum tube in which the leading-in wires are housed, is terminated in a dome rather than a so-called press or squash. A wide separation of the leading-in wires may be secured by reason of the dome construction, since these wires are not so closely related as in the press construction. A further advantage may be secured, however, by sealing a glass tube or tubes into the neck or dome, the leading-in wires not being sealed in the dome but carried along inside the tube and sealed therein at a point distant from the neck or dome. Preferably the glass tube has a low electrical conductivity to reduce the leakage currents. The tubes, for instance, may be of soda glass rather than a high conductivity glass, such as lead glass which has heretofore been employed.

Another feature of the invention relates to a mounting for the electrode or electrodes without the use of a glass supporting struc-

ture. In this case wire extensions are provided from the plate electrode, these extending wires being clamped by a metallic band or collar surrounding the neck of the vacuum tube.

The drawing illustrates in perspective a vacuum tube embodying the features of this invention.

Referring in detail to the drawing, the vacuum tube 1 is provided with an inwardly projecting tubular portion or neck 2, which terminates in a dome 3. This electron discharge device is illustrated as of the audion type and comprising the M-shaped filament 4, the double grid 5 and the double plate or anode 6. The leading-in wires 7 and 8 for the cathode 4 are sealed into the vitreous tubular portions 9 and 10 respectively, which in turn are sealed into and form extensions of the dome 3. As above described, the tubular portions 9 and 10 are preferably of low conductivity glass, such as soda glass, whereas the dome 3 may be of lead glass which is easier to work with from the glass-blower's standpoint and which has a relatively high electrical conductivity. This provides a wide separation of the points 11 and 12 at which the leading-in wires 7 and 8 are sealed into the tubes 9 and 10 from the sealing-in points of the leading-in wires for the grid and anode, thereby offering a path of high impedance to the transmission of electrical currents between these points, due to the conductivity of the glass at high temperature such as encountered when high operating voltages are employed.

The grid 5 may be supported in any suitable manner, for instance, by the wires 13 and 14 welded to the ends of the grid and surrounding the tubular portions 9 and 10. The upper ends of the filament are shown as resiliently supported by the spring arms 15 and 16 suitably fastened at their outer ends to the tubular portions 9 and 10.

No glass structure in this case is employed for supporting the anode 6, the plate portions 17 and 18 thereof being supported by the wires 19 and 20 which are extended to the outer surface of the dome 3 and which are clamped by the metallic collar or band 21.

Since the high operating voltage is applied between cathode and plate, it is sufficient to widely separate the leads of one of

these with respect to the other and by way of illustration this has been shown as applied to the cathode, although this same expedient may be employed for the leading-in wire to the anode if desired. As a further precaution in some cases, it has been found desirable to employ the vitreous tubular portion 22, preferably of soda glass, in order that the lead-in wire 23 for the grid may be sealed into the glass structure at a point remote from the other sealing-in points.

What is claimed is:

1. An electron discharge device comprising an enclosing vessel composed of lead glass and having an inwardly projecting dome, hollow soda glass members projecting from said dome into the interior of said vessel and communicating with the interior of said dome, electrodes within said vessel, and leading-in wires for one of said electrodes

passing through said soda glass members and being sealed in the walls thereof at points remote from said dome.

2. A vacuum tube comprising an enclosing vessel having an inwardly projecting neck of lead glass, oppositely disposed tubular portions of soda glass projecting from said neck into the interior of said vessel and communicating with the interior of said neck, cathode, anode and control electrodes within said vessel, leading-in wires for said cathode passing through said tubular members and sealed in the walls thereof, metallic supporting members extending from said anode, and a metallic band adapted to clamp said members to said neck.

In witness whereof, I hereunto subscribe my name this 11th day of August A. D., 1919.

ROBERT W. KING.