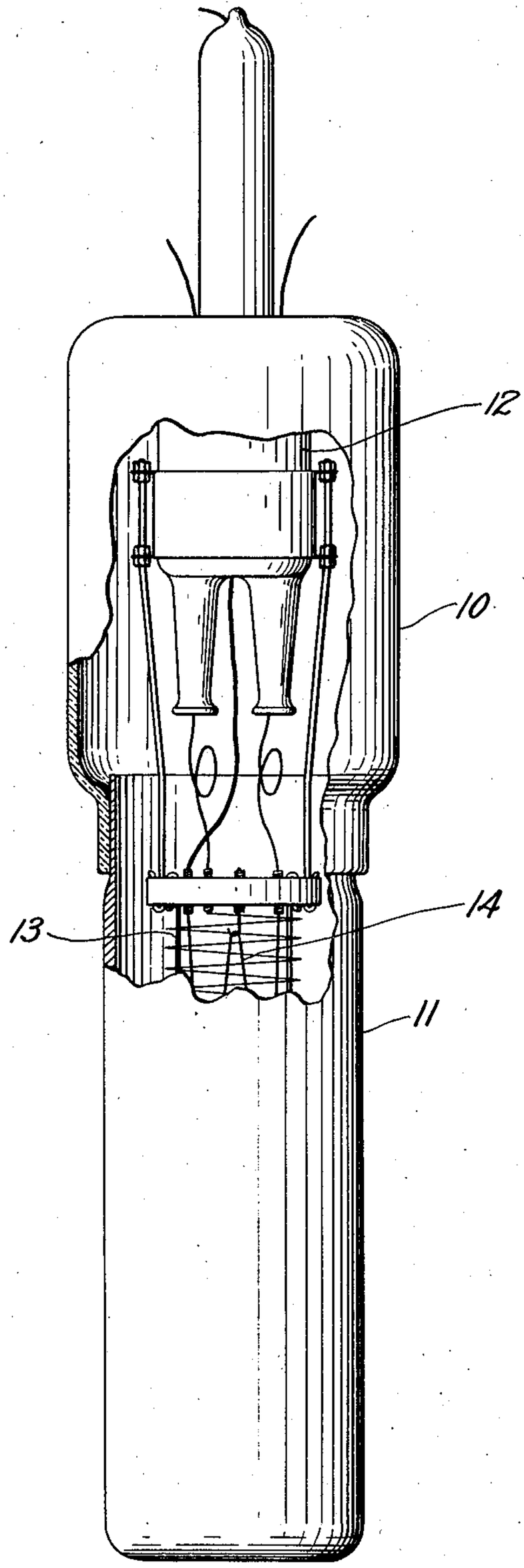
Nov. 10, 1925. 1,560,690

W. G. HOUSKEEPER

ELECTRON DISCHARGE DEVICE

Filed April 21, 1923



Inventor:
William G. Houskeeper,
by Joel C. R. Palmer Atty.

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UNITED STATES PATENT OFFICE.

WILLIAM G. HOUSKEEPER, OF NEW YORK, N. Y., ASSIGNOR TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

ELECTRON-DISCHARGE DEVICE.

Application filed April 21, 1923. Serial No. 633,654.

To all whom it may concern:

Be it known that I, WILLIAM G. HOUSKEEPER, a citizen of United States, residing at New York, in the county of New York, State of New York, have invented certain new and useful Improvements in Electron-Discharge Devices, of which the following is a full, clear, concise, and exact description.

This invention relates to electron discharge devices and more particularly to such devices of the external anode type.

The object of this invention is to unite a metal and a vitreous material to form a vacuum tight seal.

This object is attained by fusing the vitreous material to the metal in such a manner that the edge of the metal is completely out of contact with the surface of the vitreous material. A seal of this character joining together materials having different coefficients of expansion maintains its tightness up to the fusing temperature of either of its components.

Referring now to the drawing, the single figure discloses an electron discharge device constructed in accordance with the invention.

The enclosing vessel of the electron discharge device comprises a substantially cup-shaped portion 10 of vitreous material and a metallic cup-shaped portion 11 which are joined together at their open ends by fusion or welding. The joining together of the two portions 10 and 11 is preferably accomplished by inserting the open end of the portion 11 well within the open end of the portion 10, heating the rim of the portion 11 to soften it and compressing it against the surface of the portion 11 to fuse it thereto. The operation of compressing the vitreous material against the surface of the member 11 is accomplished in such a manner that the rim of the member 11 is completely out of contact with the surface of the member 10. The seal is made in this manner so that no portion of the rim of the member 11 can be embedded in any of the material of the member 10, for, with materials having different coefficients of expansion, if any appreciable amount of the metallic member is embedded in the vitreous member, the seal will fail or crack upon the change of temperature. As is clearly shown in the drawing, the rim of the portion 11 extends a substantial distance into the interior of the portion 10 and is out of contact therewith. It is, of course, apparent that the vitreous material may be fused to the interior of the portion 11 rather than to its exterior surface as is shown in the drawing. In either event, however, the rim of the metal portion 11 is maintained completely out of contact with the vitreous material.

The metallic cup-shaped portion is preferably composed of copper and is preferably of less thickness adjacent its edge where the vitreous material, preferably glass, is fused thereto. There is a considerable difference between the coefficients of expansion of these materials, but with the type of seal above disclosed, a vacuum tight union is maintained between the members 10 and 11 up to the temperature of fusion of the glass.

The glass portion 10 is provided with a re-entrant stem 12 from which are supported a grid 13 and a cathode 14, the metal portion 11 serving as the anode of the device. The supporting structure for the grid and cathode is not disclosed in detail but may be of the type disclosed in my copending application Serial No. 578,292, filed July 29, 1922.

The invention claimed is:

An electron discharge device comprising a metallic cup-shaped anode, a cup-shaped glass member joined to said metallic member to form therewith a vacuum tight enclosing vessel, said glass member having a portion fused to the exterior of said anode at a point removed from its edge, the diameter of said glass member being increased adjacent the edge of said anode whereby said edge is out of contact with said glass member, and an electrode supported by said glass member.

In witness whereof, I hereunto subscribe my name this 19th day of April A. D. 1923.

WILLIAM G. HOUSKEEPER.