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ELECTRON DISCHARGE DEVICE

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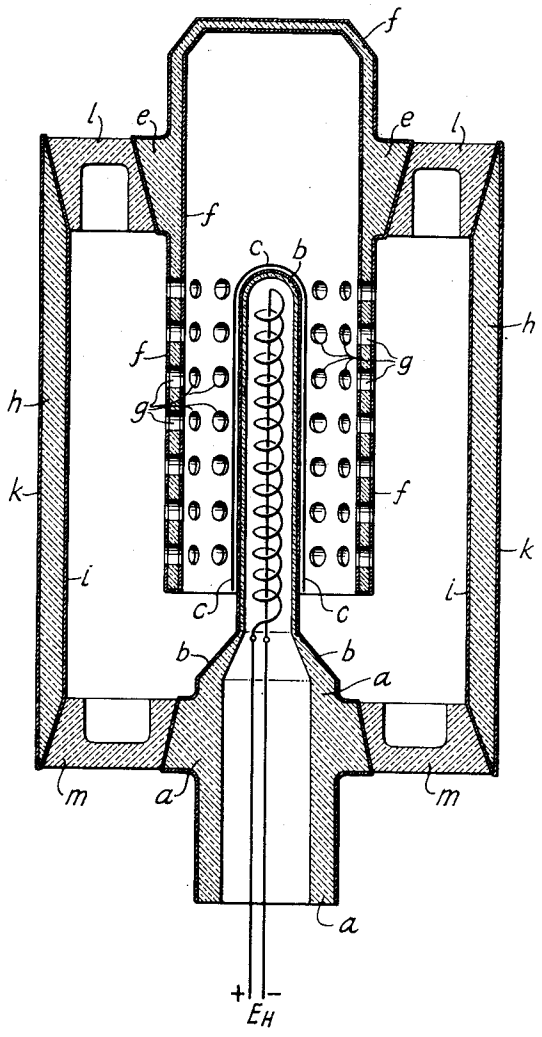

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ELECTRON DISCHARGE DEVICE

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1 Claim. (Cl. 250—27.5)

This invention is directed to the construction of discharge tubes for the generation, amplification and rectification of alternating currents.

The use of ceramic materials such as porcelain in the construction of envelopes for discharge tubes is known. It is also known in the prior art to make the anodes by depositing a metallic layer on the side of a ceramic envelope facing the cathode.

High frequency oscillatory systems, containing condensers and inductances are easily disturbed in their resonance frequency with changes of temperature of the parts of the system. It is difficult to operate a tube at optimum frequency if change of temperature influences interelectrode spacing and capacities. This difficulty is minimized according to this invention by so constructing the tube parts that little changes of electrode shapes and spacings are caused by temperature changes.

According to this invention all electrodes are made of ceramic material coated with metallic layers. It is proposed to solidly support upon ceramic material all metal parts within the envelope.

The characteristic features of this invention are illustrated in the drawing which shows by way of example one form of tube. The cathode of the discharge tube is represented by a tubular ceramic body *a* whose exterior surface is coated with a metallic layer *b*. That part of the cathode extending into the discharge space supports an active emission layer *c* which may consist for example of thorium or alkaline earth oxide. In side hollow body *a* is disposed heating element *d* to heat the cathode to the emission temperature of active layer *c*. Hollow body *a* may remain open so that heating element *d* may be exchanged without difficulty, or it may be closed and filled with an inert gas. Surrounding the cathode is a cylindrical grid electrode consisting of a molded ceramic body *e*. Body *e* is closed at the upper end and is perforated in the discharge space opposite the cathode. The surface of the ceramic body is provided inside and/or outside with a metallic coating *f*. The envelope of the device comprises a ceramic cylinder *h* interiorly and exteriorly plated with metallic coating *i*, *k* to form an anode.

The cathode grid and anode above described may conveniently be assembled by tapering the electrodes at their ends and fitting them together with tapered insulating rings *l* and *m*. The tapered surfaces of the rings and the electrodes may be joined gas-tight by fusing the surfaces with intermediate layers of glass or solder with flux. The surfaces to be connected are coated with a solder and are pressed together when heated to the melting temperature of the solder. For degassing this novel tube, an exhaust tube may be connected to one of pieces *l*, *m*, or to one of the electrodes.

External connections of the electrodes to the various circuit elements is accomplished in a most simple manner in the embodiment shown, since all metallic layers serving as electrodes extend through the envelope and are easily accessible without the usual lead-in wires. The connections may be made for instance by clamps placed around the elements in question. It is evidently not necessary to metallize the whole outer side of the individual ceramic supporting bodies but it is desirable to extend the metallizing in the form of a band to that place where the connections are to be made with the exterior circuits. Suitable contact elements may be embedded in the ceramic materials.

Tubes constructed according to this invention may be made by machines with very small tolerances. The various ceramic bodies may be pressed and sealed together in a very simple manner and the metal coatings may be easily and uniformly applied. Ground tapered joints permit accurate spacing of the electrodes. An advantage of ceramic materials for tube parts lies in their small temperature expansion coefficient, which results in small deformations of the tube parts during use with the consequential stability of the tuning of connected oscillating systems. Different parts of the tube may be made of ceramic material of different composition, whose temperature expansion coefficients are different so that a complete compensation for heat distortions may be effected.

I claim:

In an electron discharge device, an indirectly heated cathode comprising a metal coated sleeve of insulating material, a grid electrode comprising a metal coated cup-shaped ceramic member of larger diameter than and concentric with said cathode and perforated opposite said cathode, and an anode comprising a metal coated ceramic cylinder, and a ceramic ring for insulatingly sealing said cathode tube intermediate its ends in one end of said cylinder and a second ceramic ring for insulatingly sealing gas-tight said grid electrode intermediate its ends in the other end of said cylinder.

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