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INDIRECTLY HEATED CATHODE

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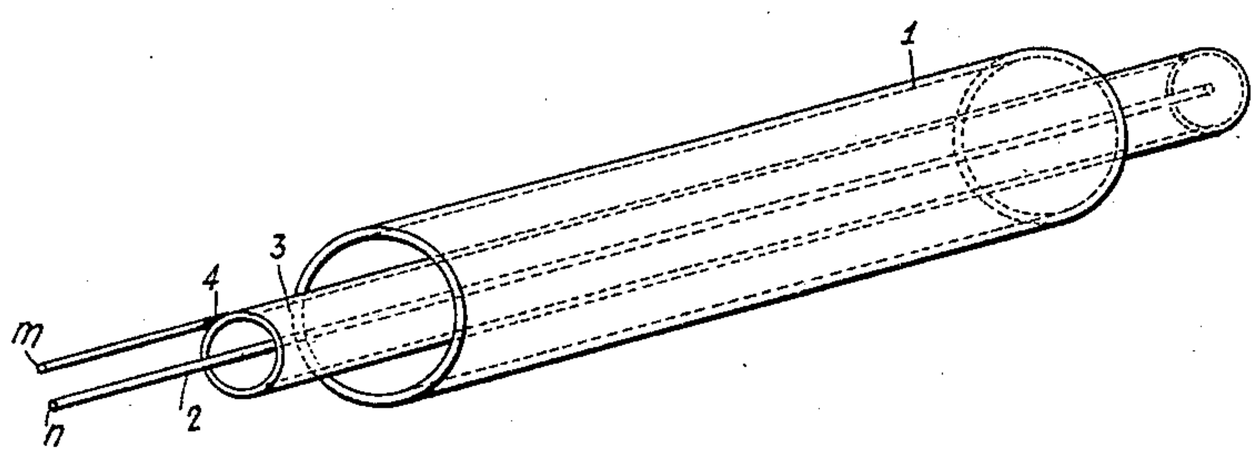

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INDIRECTLY HEATED CATHODE

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In indirectly heated discharge tubes of the kind employed, for instance, for amplifier and rectifier purposes in wireless telegraphy work, alternating current is usually employed for heating. The heater or glower body incandesced by the alternating current in turn heats the cathode proper either by direct thermal radiation or by electron bombardment, the cathode being coated with the electron-emitting layer or film. Unfortunately, the alternating current flowing through the heater sets up electric and magnetic alternating current fields inside the discharge vessel, and these fields tend to affect the electron discharge process, with the result that the latter is subject to fluctuations, and these, in turn, manifest themselves by disturbances in the transmission of the signals.

The present invention discloses ways and means whereby the disturbing action of the alternating current can be eliminated, and both the field influence due to the variations in the fall of potential at the cathode, as well as that due to the magnetic alternating current field in the interior of the tube, can be prevented.

In order to accomplish this end, the glower or heater of the resistance type is surrounded by a metallic protective envelope, the latter consisting, for instance, of a cylinder surrounding the heater, the cylinder being either in the form of a metal grating or network (gauze), or else it may be made entirely of metal. The protective envelope is so disposed that it is situated between the glower or heater resistance heating element and the cathode emitting the electrons, so that the glower is screened from the electrodes of the discharge vessel. In this scheme, the protective envelope must be brought out of the tube in such a way that it can be connected with a constant potential. It is possible in this manner to shield the interior of the discharge tube from the influence of the alternating current potentials prevailing at the glower.

The adoption of this means alone is not yet adequate, however, since the magnetic alternating current field which is set up around the glower (which is usually of filamentary form), may affect the electronic discharge in the vacuum tube either by direct action of the electrons or else by virtue of the fact that eddy-currents are induced in the metallic cylinder which, in turn, lead to voltage variations. In order that these sources of trouble may also be avoided, the metallic envelope itself is utilized as the lead for the return of the current used to heat the filamentary glower so that there is produced a compensation or neutralization of the magnetic field set up around the glower. This is insured by connecting one end of the glower with the protective envelope.

One embodiment of the invention is illustrated in the drawing. Referring to the latter, 1 denotes the cathode of cylindrical form and coated with an electron-emissive film; 2 is the filamentary glower heated by electric current; and 3 the metallic protective envelope. As can be seen from the drawing, the glower is connected with one end of the said protective cylinder at 4 so that the heating current may be supplied through the leads *m* and *n* brought out of the discharge vessel. Care should be taken that the protective envelope exhibits a high degree of conductivity in order that the heating current which passes through the protective envelope may not set up any potential drops in the envelope.

I claim:

1. A thermionic electron emitter comprising a cylindrical cathode, filamentary means for indirectly heating the cathode, positioned along the longitudinal axis of the cathode, and cathode shielding means comprising a cylindrical metallic envelope concentric with the heater and within the cathode, said shielding means being electrically connected with the means for heating the cathode.

2. A thermionic electron emitter comprising a cylindrical cathode, filamentary means for indirectly heating the cathode, positioned along the longitudinal axis of the cathode, and cylindrical shielding means comprising a cylindrical metallic envelope concentric with the heater and within the cathode, one end of the cylindrical shielding means being closed and connected to the heating means,

the open end of the shielding means serving as a lead-in for the heating current.

3. In a thermionic cathode, the combination with a tubular electron emitting sleeve, of a heater comprising a resistance heating element disposed along the longitudinal axis of said sleeve, and a tubular current supply lead surrounding said heating element and interposed between said sleeve and said resistance element and electrically connected in series with said resistance element.

4. A thermionic cathode comprising a resistance heating element, a current supply lead formed as a metal envelope surrounding and electrically connected in series with said heating element, and an electron emitting member surrounding said envelope in position to be heated by said heating element.

5. In a thermionic cathode, the combination with a tubular electron emitting sleeve, of a heater comprising a heating filament extending lengthwise of said sleeve, a current supply lead in the form of a metallic protective envelope surrounding said filament and disposed between it and said sleeve and connected at one end with the adjacent end of said filament, and current supply connections to the other ends of said filament and of said metallic envelope.

6. A thermionic cathode comprising a tubular electron emitting sleeve, a tubular current supply lead inside and concentric with said sleeve, and a resistance heating element inside and concentric with said tubular lead and connected at one end to said tubular lead, and a current supply lead connected to the other end of said heating element.

7. A thermionic cathode comprising a tubular electron emitting sleeve, a deep metal cup constituting a current supply lead and positioned inside said sleeve, and a heating filament inside and concentric with said cup and connected at one end to the bottom of said cup.

8. A cathode comprising a cylindrical current supply conductor, a heating element coaxially disposed within said cylindrical conductor and conductively connected thereto, and an electron emitting element enclosing said cylindrical conductor.

9. A cathode comprising a hollow cylindrical current supply conductor with one extremity closed, a heating element coaxially disposed within said conductor and conductively connected to the closed extremity thereof, and an electron emitting element disposed adjacent said cylindrical conductor.

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