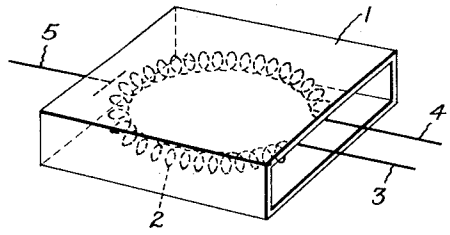
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CATHODE STRUCTURE OF ELECTRIC DISCHARGE APPARATUS

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CATHODE STRUCTURE OF ELECTRIC DISCHARGE APPARATUS

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4 Claims. (Cl. 250—27.5)

The present invention relates to cathode structure of electric discharge apparatus, particularly to cathodes of large electron-emitting area.

Certain types of tubes, such as cathode ray devices, require an electron stream of uniform cross-sectional intensity. The electrons may be obtained from a flat ribbon cathode of the directly heated type. However, when these cathodes are energized by alternating current, it is found that the alternating magnetic field of the heating current tends to deflect or otherwise distort the cathode rays. These effects are particularly noticeable in the case of low voltage devices. In cathode ray oscillographs which employ electron beams focused to a point, the magnetic distortion may cause an elongation of the point into a line.

In order to reduce the magnetic effects as much as possible, it has been proposed heretofore to employ a cathode of the indirectly heated type having large thermal inertia. Such a cathode has taken the form of a heater wire surrounded by a cylindrical insulator and carrying a metal cylinder. The latter usually is coated with electon-emitting material. While cathodes of this sort are satisfactory from the magnetic field standpoint, they are open to the objection of failing to provide an electron stream of uniform cross-sectional intensity. It is evident that regardless of the position of the anode with respect to the cylindrical cathode, the latter necessarily presents effectively an unsymmetrical surface to the anode.

The general object of the present invention is to provide a cathode which is adapted to produce an electron stream of large cross-sectional area and of uniform intensity, and which is not subject to magnetic effects.

More specifically, the object is to improve on cathodes of the indirectly heated type with a view to obtaining an electron stream suitable for use in cathode ray and other relatively low voltage tubes.

These objects are attained in brief, by introducing a spiral heater into a flat box-like enclosure. The invention will be better understood when reference is made to the following description and the accompanying drawing which shows in perspective a view of the improved cathode.

In the drawing, numeral 1 designates a box, preferably of flat rectangular form and consisting of a suitable metal such as nickel. The box is completely closed except for one side which provides an opening for the introduction of a heating spiral 2. The heater may consist of a tungsten helix bent to circular form or other closed shape suitable for insertion into the box. In order to prevent short circuit between the heater and the interior of the box, the latter may be oxidized or provided with an insulating layer of an oxide, such as barium oxide (BaO) or magnesium oxide (MgO). Electrical separation of the heater from the box may also be effected by the use of a foil containing an insulating material such as mica. The heater is provided with a pair of conductors 3, 4, and the current to the cathode is carried by a conductor 5.

A cathode of the type shown and described is adapted to provide an electron stream of large cross-section and of uniform intensity when co-operating with an anode presented normal to one of the flat surfaces. The cathode surface which faces the anode preferably is coated with electron emitting material, such as alkaline earth oxide. The box may be made in relatively small dimensions, if necessary, for example, with a length and breadth of only 2 mm. and a height of 0.4 mm. On account of the compactness with which the heater and enclosure lend themselves, the operating efficiency of the cathode is relatively high so that the heating current is reduced to a minimum. Moreover, the box-like casing contains sufficient metal to retain a large amount of heat so that the fluctuating effects of the alternating current heating energy are substantially eliminated. The circular configuration of the heating element, substantially closed upon itself, also provides further reduction of the objectionable effects produced by the magnetic field of the heating current.

What I claim as new and desire to secure by Letters Patent of the United States is:—

1. An indirectly heated cathode comprising a flat rectangular enclosure of an oxidizable metal and containing a coiled heater of closed circular configuration, said enclosure being oxidized on the interior whereby the heater is insulated from the enclosure.

2. An indirectly heated cathode comprising a flat rectangular enclosure containing a heater which consists of a coil of closed circular configuration.

3. An indirectly heated cathode comprising a flat rectangular enclosure of nickel containing a heater, said enclosure being coated with electronically active material, said heater consisting of a tungsten helix of a closed circular configuration and insulated from the interior of the enclosure.

4. An indirectly heated cathode comprising a flat rectangular enclosure of nickel containing a heater, said enclosure being coated on one side with electronically active material, said heater consisting of a tungsten helix of circular configuration and insulated from the interior of the enclosure by foil containing mica.

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