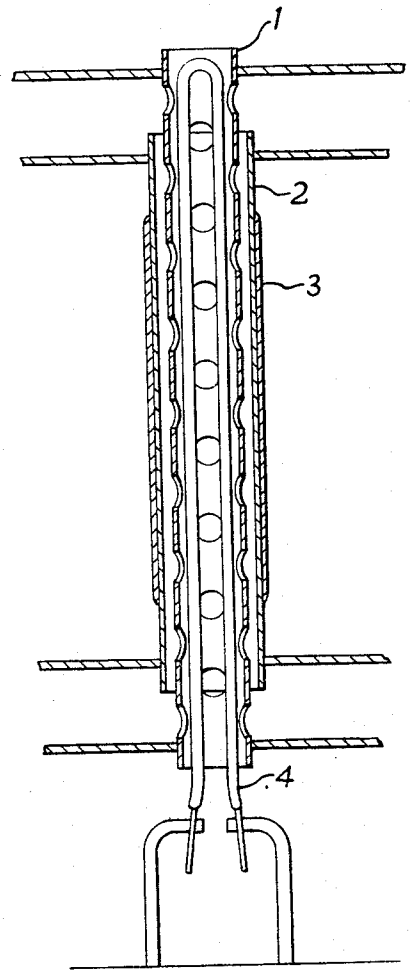
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INDIRECTLY-HEATED CATHODE ASSEMBLIES

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INDIRECTLY-HEATED CATHODE ASSEMBLIES

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The present invention relates to indirectly-heated cathode assemblies of the type in which the cathode surrounds the heater.

The internal heater of such an assembly must be supported inside the cathode in such a way as to be insulated electrically therefrom. The usual way of achieving this is to maintain a vacuum space between the cathode and heater, the heater being disposed inside a ceramic or metal tube or wound around a ceramic rod.

These methods suffer from the disadvantage that they either fail to give adequate electrical performance or, because of the mass of material used, make the warming-up time of the cathode excessively long.

The present invention provides a cathode assembly having a heater support, of low thermal capacity, which surrounds the heater, there being perforations in the support through which the heater radiates to the cathode. The support preferably consists of molybdenum or some other material having a good strength when hot.

It is therefore an object of the invention to provide an assembly having a support for the heater which provides for a vacuum to exist between the heater and cathode, and does not lead to a long "warming-up" time.

The invention will now be described by way of example with reference to the accompanying drawing in which the sole figure is a section through a cathode assembly embodying the invention. Referring to the drawing, an indirectly-heated cathode assembly comprises a perforated tube **1** of molybdenum, or like material having a good strength when hot, mounted coaxially within and electrically insulated from a cathode sleeve **2** having thereon an emissive coating **3**. An insulated heater **4** is inserted into the tube **1**. The insulation may be alumina. The tube **1** has a small mass (as it is perforated) and therefore a low thermal capacity. As the tube is perforated, the heater, which is at a higher temperature than the tube, can radiate heat freely to the cathode sleeve **2**. These two factors enable the assembly to warm up more quickly than the previously used assemblies. Suitable dimensions for a tube for use with a cathode sleeve 0.16 inch in diameter and 1.4 inches long would be 0.1 inch in diameter and 1.6 inches long with a metal thickness .001–.003 inch and a perforation diameter of 0.04 inch.

What is claimed is:

1. An indirectly heated cathode assembly adapted for use in an electron discharge device comprising:

an electrical heater having an outer layer of electrical insulating material;

a hollow cylindrical cathode surrounding and in coaxial alignment with said heater, said cathode having a layer of potentially emissive material on the outer surface thereof; and

a tube of a metal having a relatively high hot strength disposed intermediate and coaxially aligned with said heater and said cathode, said tube being at least partially within said cathode and supporting and electrically insulated from said heater by said insulating material and electrically insulated and spaced from said cathode and having a plurality of perforations formed to provide a path for energy flow in the form of heat from said heater to said cathode whereby said heater is supported by said metal tube and said tube has a relatively low mass to provide a relatively rapid warming up of the cathode.

2. An indirectly heated cathode assembly adapted for use in an electron discharge device comprising:

an electrical heater having an outer layer of insulating material;

a hollow cylindrical cathode surrounding and in coaxial alignment with said heater, said cathode having a layer of potentially emissive materials on the outer surface thereof; and

a metal tube of relatively low mass and high hot strength disposed intermediate and in coaxial alignment with said heater and said cathode, said tube supporting and electrically insulated from said heater and spaced from said cathode and including a plurality of perforations spaced throughout the longitudinal length thereof and formed to provide a path for energy flow in the form of heat from said heater to said cathode.

3. An indirectly heated cathode assembly adapted for use in an electron discharge device comprising:

an electrical heater having an outer layer of alumina;

a hollow cylindrical cathode surrounding and in coaxial alignment with said heater, said cathode having a layer of potentially emissive material on the outer surface thereof; and

a molybdenum tube disposed intermediate and in coaxial alignment with said heater and said cathode, said tube supporting and being electrically insulated from said heater and electrically insulated and spaced from said cathode and including a plurality of perforations spaced throughout the longitudinal length thereof and formed to provide a path for energy flow in the form of heat from said heater to said cathode.

4. An indirectly heated cathode assembly adapted for use in an electron discharge device comprising:

an electrical heater having an outer layer of alumina affixed thereto;

a hollow cylindrical cathode surrounding and coaxially aligned with said heater; and

a molybdenum tube having a thickness in the range of about 0.002 to 0.003 inch disposed intermediate and coaxially aligned with said heater and said cathode, said tube supporting said heater and spaced from said cathode and including a plurality of perforations having a diameter of about 0.04 inch said perforations being spaced along the longitudinal length of said tube to provide a path for energy flow in the form of heat from said heater to said cathode.

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