

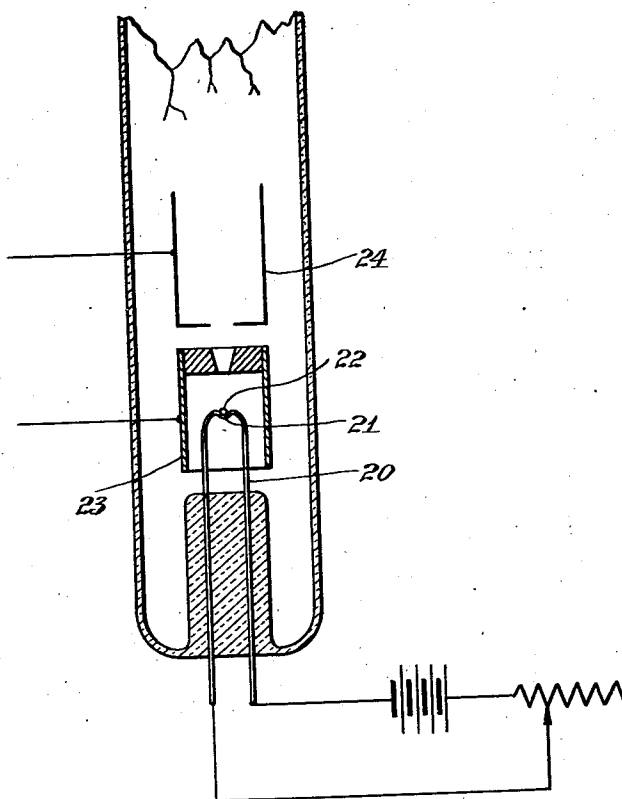
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ELECTRODE

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ELECTRODE

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3 Claims. (Cl. 250—27.5)

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This invention relates to new and useful improvements in electrodes and more particularly to improvements in the construction of electrodes for high voltage cathode ray tubes.

In cathode ray tubes of television receivers employing high voltages (of the order of 50,000 volts) anomalous field emission from electrodes sometimes referred to as cold emission or auto-electronic discharge causes the production of ghost images with consequent loss of contrast and definition and instability of the function of the tube. This instability often leads to breakdowns and the destruction of the tube.

The field emission occurs only when very high field strength exists on an electrode. "Anomalous" field emission is a flickering, intermittent type of field emission, which occurs at field strength below the field strength which produces stable field emission. While the causes for such anomalous field emission are not fully understood, it is known that it occurs at certain points of the electrode which are probably loci of absorbed gas or metallic impurities which have a low work function.

The anomalous field emission of certain metals can be reduced or even eliminated if the metal is heated in very hard vacuum to a temperature of approximately 1900° K. It has been found, for instance, that if tungsten or molybdenum is heated to 2000° K. to 2400° K. in a vacuum of approximately 10^{-7} mm./Hg they will subsequently exhibit the anomalous field emission to a lesser degree than the untreated metal.

However the forming of electrodes of such metals to the required shapes is very expensive, and in the case of metals like tungsten, technically well-nigh impossible. Metals having lower melting points such as nickel or nickel alloys would melt if they were heated to a temperature at which anomalous field emission is eliminated.

In accordance with the present invention the electrodes of high voltage cathode ray tubes are formed of the customary easily malleable metals such as iron or nickel. The nickel electrode or the like is then provided with a deposit of molybdenum or some other metal of high work function and high melting point. The depositing is accomplished by heating molybdenum in a high vacuum until it evaporates and then condenses on the entire surface or the critical parts of the electrode to be coated. To insure the required result the evaporation must take place at a temperature exceeding approximately 1900° K. Instead of molybdenum, platinum, tantalum, tungsten or other metals may be used, which have a high work function and preferably also a high melting point.

The nickel electrode may be coated in a separate vacuum tube because experiments have shown that the exposing of the treated electrode

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to air does not spoil the result. The coating of the electrode may be accomplished in conjunction with the first vacuum de-gassing. The heating of the coating metal, e. g. molybdenum, is accomplished by inserting it in a spiral heater of tungsten wire.

The coating operation can be performed also in the finished tube envelope provided that the heating means can be withdrawn or will not disturb the functioning if left in space. For example, in a high voltage cathode ray tube having a tungsten cathode, a piece of platinum wire can be fastened to the cathode and evaporated on to the grid diaphragm (from which the anomalous field emission usually takes place) by heating the cathode. Similar results can be obtained by heating low-melting point metals e. g., silver, which has a high work function, to approximately 2000° K. and depositing it on the electrode to be treated. Since silver melts before it attains this temperature, the heater must be shaped as a container to hold the molten metal.

The important point is that if the surface of the electrode so treated consists wholly or in part of metals which have been previously heated to approximately 2000° K., then no anomalous field emission will occur.

The drawing illustrates diagrammatically one embodiment of the invention.

20 is the cathode of a high voltage tube. The cathode is of tungsten and is provided with a small cup 21 which contains the metal 22 to be heated to 1900° K. by passing current through 20. The metal will evaporate and deposit on grid 23. 24 is the high voltage anode.

What I claim is:

1. The method of minimizing anomalous field emission from an electrode of low melting point metal which comprises the following steps: enclosing said electrode in an evacuated envelope, and evaporating in said vessel a high melting point metal at a temperature exceeding approximately 1900° K.

2. The method of minimizing anomalous field emission from an electrode of low melting point metal which comprises the following steps: enclosing said electrode in an evacuated envelope, and evaporating in said envelope a high work function metal at a temperature exceeding approximately 1900° K.

3. The method of minimizing anomalous field emission from an electrode of nickel which comprises the following steps: enclosing said electrode in an envelope evacuated to a pressure of approximately 10^{-7} mm./Hg and evaporating in said envelope a high work function and high melting point metal at a temperature exceeding approximately 1900° K.

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