

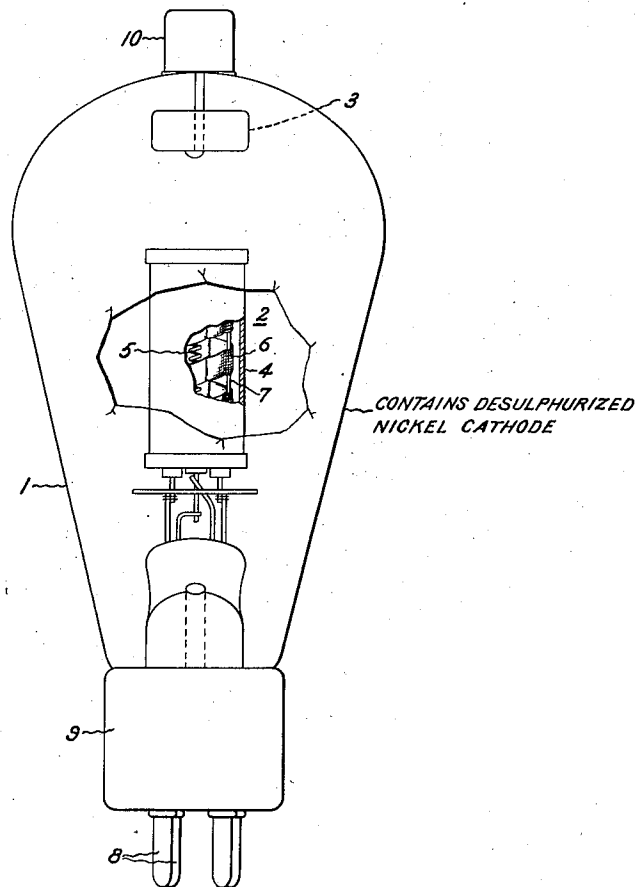
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THERMIONIC CATHODE TREATMENT

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THERMIONIC CATHODE TREATMENT

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3 Claims. (Cl. 250—27.5)

The present invention is an improvement in thermionic cathodes of the activated type in which the base material consists of nickeliferous material, that is, nickel or an alloy of nickel.

Oxide-coated cathodes, sometimes known as Wehnelt cathodes, when employed in gaseous discharge lamps, in cathode ray tubes, or in other thermionic devices, after a period of use lose their electron emissivity. In some cases cathodes which no longer are effectively electron-emissive can be observed still to be coated with oxide.

I have discovered that one of the causes of loss of activity of oxide-coated cathodes is the deleterious effect of sulphur which is present ordinarily in the metal base or core. Commercial nickel contains appreciable quantities of sulphur which known metallurgical processes are not capable of removing sufficiently to avoid such deleterious effect on cathodes made therefrom.

In accordance with the method step constituting my invention, residual sulphur is removed substantially entirely from articles of nickel, such as nickel wire strip or sheet material, or in any event to such extent that any remainder is harmless to electron emission of cathodes made from such material.

The accompanying drawing illustrates conventionally a thermionic device to which my invention is applicable. In carrying out my invention the nickeliferous material is heated in contact with a reagent which is reactive towards sulphur at high temperature. For example, the wire strip, wire or other article of nickel, or one of its alloys, is heated at a temperature of about 1000° C. while embedded in an oxygenous alkaline earth compound which is sulphur-reactive, the heating preferably taking place in an inert atmosphere or in a vacuum. Finely divided carbonate of barium or other alkaline earth metals, and similarly the oxides of such metals in powdered form, may be used as the sulphur-reactive reagent.

The length of time of heating will vary with the thickness of the nickeliferous material. For a material having a thickness of about 0.5 millimeter or less, good results can be obtained by heat treatment under the described conditions continued for about 1 hour.

Nickel or nickel alloy metal, after having been subjected to this process, is fabricated into form suitable for the production of cathodes and is coated with activating material, for example, a carbonate of barium, strontium, or calcium, or an

appropriate mixture. The coating subsequently is converted to an oxide and is treated to become active or electron-emitting in accordance with well understood methods.

The drawing illustrates a rectifier as one form of thermionic cathode device to which my invention is applicable. It comprises a container 1 in which is mounted a cathode assembly 2 and an anode 3. The cathode assembly comprises a heat shield 4, in which are disposed a heater 5 and an oxide-coated ribbon cathode 6 which is wound on a support 7. The cathode is treated in accordance with the present invention. The heater and ribbon cathode are connected electrically as usual to external contacts 8 which are mounted on a base 9. The anode 3 is connected to an external contact 10. The container contains an appropriate gas filling. A charge of mercury (not shown) which furnishes vapor during operation commonly is used. Electrons emitted from the heated cathode 6 pass through an opening in the shield 4 (not shown) to the anode 3.

Cathodes made from sulphur-free metal have longer useful operating lives in thermionic devices than cathodes containing cores or base metal made of commercial metal which contains sulphur.

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

1. The step in the process of manufacturing oxide-coated cathodes which consists in subjecting the nickeliferous base metal for such cathodes to a heat treatment at about 1000° C. while packed in oxygenous alkaline earth compound until the residual sulphur in such metal has been substantially eliminated.

2. A step in the manufacture of oxide-coated thermionic cathodes comprising nickeliferous base metal which comprises heating base metal for such cathodes to about 1000° C. while packed in barium carbonate and preliminary to coating such material with an oxide layer.

3. The method of manufacturing cathodes for electric discharge devices from nickel bases containing sulphur which consists in subjecting said bases to a purifying treatment for about one hour at about 1000° C. while packed in oxygenous alkaline earth compound whereby sulphur is substantially eliminated and thereafter coating said bases with activating material.

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