April 10, 1951 H. JACOBS 2,548,110

METHOD OF ACTIVATING OXIDE COATED CATHODES

Filed March 16, 1949

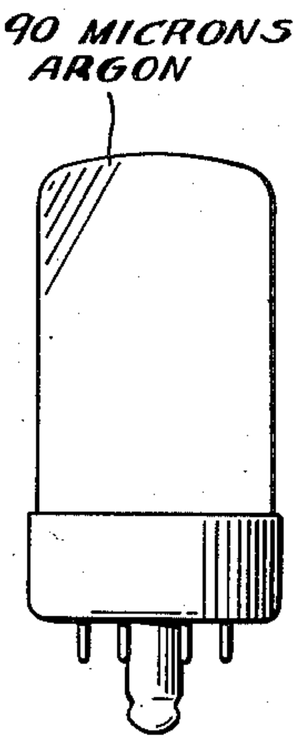

FIG_1

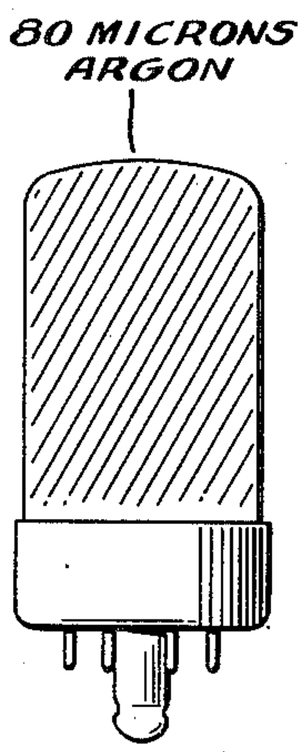

FIG_2

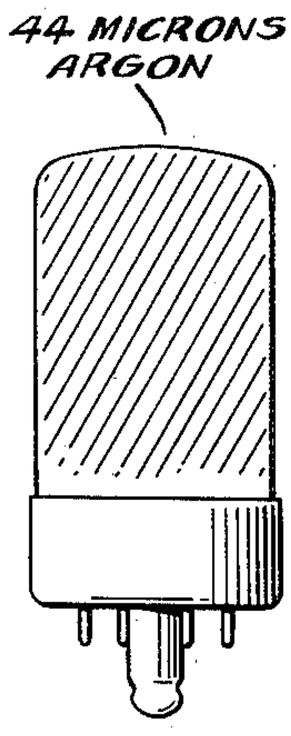

FIG_3

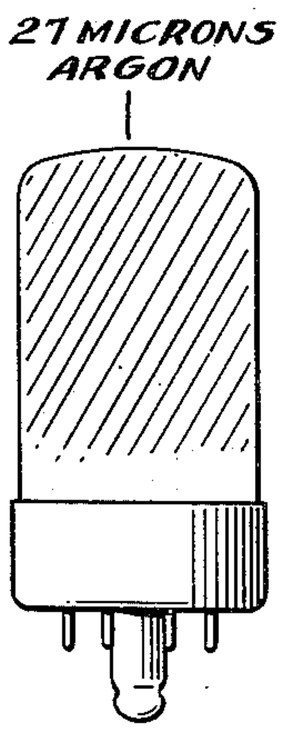

FIG_4

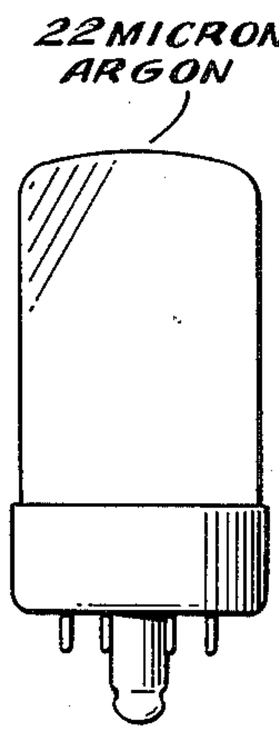

FIG_5

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METHOD OF ACTIVATING OXIDE COATED CATHODES

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2 Claims. (Cl. 250—27.5)

1

This invention relates to a method of activating oxide coated cathodes; more particularly it relates to a method of activation of cathodes having an alkaline earth metal oxide coating by the utilization of inert gases.

It has been well recognized that there is a distinct need for the discovery and development of new materials which will provide both copious thermionic emission as well as have desirable hot tensile strength characteristics. This need has manifested itself in that the filamentary cathodes of the prior art had a tendency to break or cause short circuits due to their poor strength qualities while operating in a heated condition. Furthermore since most of these filamentary type tubes are operated by batteries, it is well recognized that it would be of advantage to develop filaments which would give high performance with a minimum of required wattage. It has also been recognized that it would be helpful to obtain a filament which would activate quickly and easily to a condition of high stable emission capabilities. From a production standpoint, this would save costly time in activation, processing in on exhaust and on aging.

Although new materials such as cobalt, aluminum alloys and nickel aluminum alloys now have been developed for use as base metals for making cathodes having copious thermionic emission and desirable hot tensile strength characteristics, these materials have been found to be particularly difficult to activate.

The object of this invention is to provide a method of activation which will be superior to those heretofore used.

Another object of this invention is to provide a method of activating oxide coated cathodes which will enhance the emission characteristics of the materials.

A still further object of this invention is to provide a method of activating oxide coated cathodes particularly those having a nickel or cobalt aluminum filamentary core which will be satisfactory from a production standpoint.

In accordance with this invention, it has been found that these and other objects and advantages can be obtained by processing the tube in which the cathode is to be used in such manner that a free low work function metal such as alkaline earth metal or alkali metal is dispersed onto the cathode surface as the final step in the operation after breakdown and degassing has occurred.

In the drawings,

2

Fig. 1 illustrates a front elevation of a "lock-in" type electronic tube showing the area over which the metal is dispersed by means of a getter flash.

Figs. 2, 3, 4 and 5 are similar views showing the effects of varying percentages of inert gas at the time the getter is flashed.

There are, of course, many methods in accordance with which a free alkaline earth metal such as barium or an alkaline metal such as cesium could be dispersed in the coating and on the surface to enhance the thermionic emission in accordance with this invention. In accordance with the preferred procedure described herein the barium is so distributed during the getter flash period with the aid of a barium aluminum getter and an inert gas such as argon, helium, neon and krypton during the period of the getter flash.

In experiments which were carried out to determine the pressures of the gas needed and the effects produced, a filament was used which consisted of a standard 0.005 inch tensite core metal, coated with the standard triple carbonate which consists of 38.6 mol percent barium carbonate, 15.2 mol percent calcium carbonate and 46.2 mol percent strontium carbonate.

The carbonate can of course be applied to the core metal in many ways. The method normally used and which is preferred by applicant is the electrophoretic method in which the triple carbonate is suspended in a lacquer and applied by electrophoresis. After this the processed filament was mounted in a tube, the tube was exhausted and various pressures of inert gas such as argon were introduced into the system and after the processing such as breakdown and degassing had occurred, the getter which had been placed in the tube structure with the barium aluminum getter facing the upper corner was flashed in the presence of the inert gas as the final step. A flashing of the getter in inert gas at the proper pressure dispersed the barium metal over the entire structure in the tube with the exception of the base but including the cathode filament.

As a result of the tests performed, it has been found that the pressure of inert gas is quite critical. When argon is used for example, the critical range lies between 25 microns to about 80 microns. It has been found that if the pressure is much less than 25 microns, the scattering of the barium will not take place. This is readily apparent when viewing the drawings which portray the results obtained and show that barium is widely distributed over the side of the tube element when the pressure of the argon is kept at

about 27 microns. This is shown in Fig. 4 of the drawing whereas Fig. 5 of the drawing shows that when the pressure is down to about 22 microns, the barium does scatter but is kept within a small area in the tube structure. Fig. 1 clearly indicates that the pressure of argon over 80 microns produces a like effect and prevents the barium from scattering and coating the desired cathode areas whereas good results seem to have been obtained in accordance with the showing made in Fig. 2 at 80 microns pressure.

In the case of the tubes studied, it was found that those tubes which had been flashed in the critical pressure range, namely between 25 and 80 microns, approximately double emission could be obtained over that obtained with standard tensite core material in which no special effort had been made to disperse free barium over the surface of the oxide coating.

While the above description and the drawings submitted herewith disclose preferred and practical embodiments of the method of activating oxide coated cathodes of this invention, it will be understood by those skilled in the art that the specific details described are by way of illustration and are not to be construed as limiting the scope of the invention.

What is claimed is:

1. The method of activating oxide coated cathodes comprising introducing argon under a pressure of 25–80 microns into a tube structure after initial breakdown and degassing has occurred, and subsequently dispersing free barium metal onto the coated cathode surface by means of a getter flash.

2. The method of activating oxide coated cathodes comprising introducing argon under a pressure of 25–80 microns into a tube structure after initial breakdown and degassing has occurred, and subsequently dispersing free cesium metal onto the coated cathode surface by means of a getter flash.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,917,854	Rentschler	July 11, 1933
1,965,581	Foulke	July 10, 1934
2,167,777	Rentschler	Aug. 1, 1939