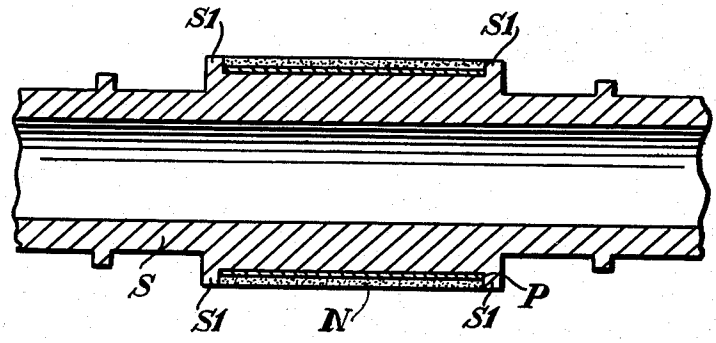
Jan. 31, 1956 S. AISENSTEIN ET AL 2,733,378

THERMIONIC CATHODES FOR ELECTRONIC DISCHARGE DEVICES

Filed Dec. 6, 1951



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United States Patent Office 2,733,378
Patented Jan. 31, 1956

2,733,378

THERMIONIC CATHODES FOR ELECTRONIC DISCHARGE DEVICES

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Application December 6, 1951, Serial No. 260,284

Claims priority, application Great Britain January 8, 1951

2 Claims. (Cl. 313—346)

This invention relates to thermionic cathodes for electron discharge devices and has for its object to provide improved cathodes which will give long life and good performance in tubes in which they are subjected to very high duty—notably though not exclusively in magnetrons.

One of the best of the known types of thermionic cathode suitable for use in conditions of high duty—for example in magnetron oscillators—is the so-called "matrix" or "mush" type. In this well known type of cathode a porous layer of pure nickel powder is moulded and sintered on to a nickel support and then impregnated with the electron emitting coating proper, for example a mixture of barium and strontium carbonates.

A known matrix cathode as above described is limited in performance and length of life by two main features, namely the low thermal conductivity of the basic nickel support and the mechanical weakness of nickel at high temperatures. The low thermal conductivity limits the amount of heat which can be conducted away down the support and hence the power which can be dissipated by the cathode at a given operating temperature. The mechanical weakness of nickel at high temperatures makes accurate alignment of the cathode difficult to maintain. Malalignment of the cathode is, of course, particularly objectionable in a magnetron. The difficulty of maintaining alignment is particularly serious if the cathode has magnetic end plates or shields attached to it, as is the case in some forms of magnetron. The present invention seeks to avoid these defects and limitations.

According to this invention a thermionic cathode suitable for use in magnetrons and in other cases of high duty conditions, consists of a support of molybdenum or tungsten coated with a thin layer of platinum or platinum alloy to which is sintered nickel powder which is then impregnated with a suitable emissive coating material.

The molybdenum or tungsten support may be a rod or tube—more usually a tube.

The thin layer between the support and the sintered-on nickel powder may be an alloy of ruthenium and platinum.

The invention is illustrated in the accompanying drawing which shows in sectional elevation with the ends broken away, one form of cathode structure in accordance with the invention.

Referring to the drawing S is the main support, which is made of molybdenum or of tungsten and is tubular in form. At the bottom of a shallow cylindrical recess formed between cheeks S1 is a thin platinum layer or tube P on which is sintered nickel powder N which is then impregnated with electron emissive coating material (not separately shown).

The use of a support tube or rod made of molybdenum or tungsten results in much greater strength than one made of nickel more especially at high temperatures. Moreover tungsten and molybdenum are better thermal conductors than nickel. If, however, nickel powder were sintered directly to molybdenum or tungsten fairly rapid deterioration would take place due to chemical action at the joint face. The provision of a thin layer of platinum or ruthenium-platinum over the surface of the basic molybdenum or tungsten and between this basic material and a sintered-on layer of pure nickel powder prevents the occurrence of deleterious chemical action and the result is a cathode structure capable of long life and of very high duty.

We claim:

1. A thermionic cathode comprising a support consisting of a hollow cylindrical tube having a shallow cylindrical recess formed in the external surface thereof terminating at opposite ends in annular cheeks and a thin layer of electron emissive material confined between said cheeks on the external surface of said tube, said layer of material being laterally confined within the external diametrical limits of said annular cheeks.

2. A thermionic cathode comprising a support consisting of a hollow cylindrical tube having a central portion and a pair of integrally connected end portions, said central portion having an external diameter exceeding the external diameters of said end portions, said central portion having a cylindrical recess therein terminating in annular cheeks separating said central portion from said end portions and a thin layer of electron emissive material disposed in the cylindrical recess between said cheeks and having an external diameter substantially conforming with the external diameters of said annular cheeks.

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