Nov. 2, 1965 J. MONTGAILLARD 3,215,885

CATHODE STRUCTURE

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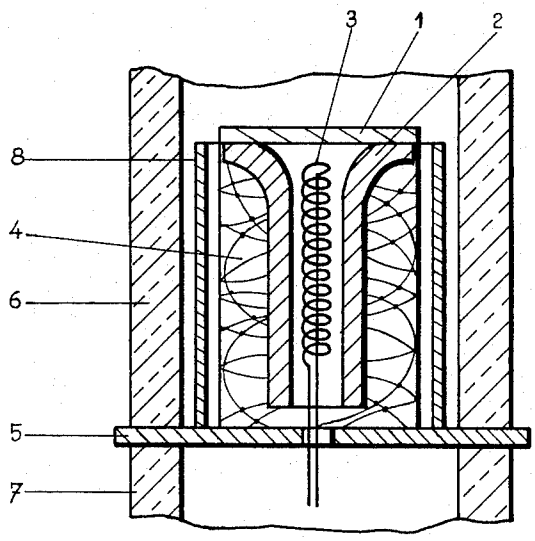

FIG. 1

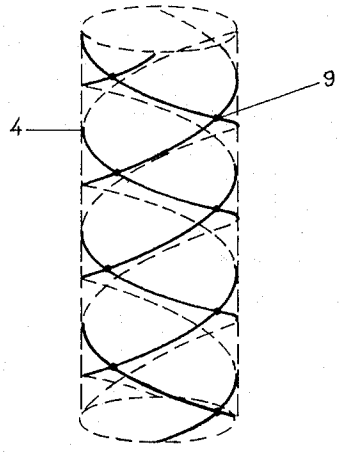

FIG. 2

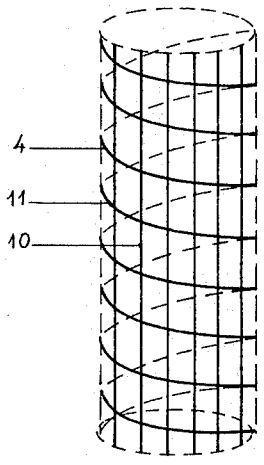

FIG. 3

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CATHODE STRUCTURE

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The cathode of certain electron tubes is often constituted by an emissive cylinder or disk, supported in an over hung or suspended manner by a hollow cylinder normally referred to as "skirt"; this skirt is secured to a solid or rigid piece, frequently taken out through the insulating enclosure of the tube to serve as cathode connection.

The present invention relates to cathodes of this type, particularly to those of which the radial and/or axial dimensions do not exceed the order of magnitude of a few milimeters.

It is known that the skirt cools in a non-negligible manner the emissive surface, at the same time by radiation and by thermal conduction to the solid or rigid support. It has already been proposed in the French Patent No. 1,053,508, of Apr. 7, 1952, assigned to the assignee of the present application, to remedy this inconvenience by providing within a portion of the skirt slots cut into a solid metallic wall. However, this solution, which is applicable when the dimensions of the skirt are sufficiently large, is totally unrealizable when these dimensions are of the order of a few millimeters, for obvious technological reasons.

The present invention has as aim the realization of a skirt for cathodes of millimetric dimensions which avoids the technological difficulties of the known system while preserving a rigidity sufficient to maintain firmly the emissive surface of the cathode.

Accordingly, it is an object of the present invention to provide a cathode structure of the type described hereinabove involving millimetric dimensions which obviates the shortcomings and inadequacies encountered with the prior art constructions when applied to tubes of such dimensions.

It is another object of the present invention to provide a cathode structure, and more particularly a skirt for supporting the emissive structure on a rigid support which may be readily used with cathode structures of millimetric dimensions and which may be readily manufactured without great expenditures or difficulties.

A further object of the present invention resides in the provision of a cathode structure involving millimetric dimensions which is simple, prevents excessive heat losses either by radiation or thermal conduction yet assures sufficient rigidity to maintain the cathode structure in place.

These and other objects, features and advantages of the present invention will become more obvious from the following description when taken in connection with the accompanying drawing which shows, for purposes of illustration only, two embodiments in accordance with the present invention, and wherein

FIGURE 1 is an axial cross sectional view through a cathode provided with a skirt in accordance with the present invention;

FIGURE 2 is a perspective view of one embodiment of a skirt in accordance with the present invention, and

FIGURE 3 is a perspective view of another embodiment of the skirt in accordance with the present invention.

Referring now to the drawing wherein like reference numerals are used throughout the various views to designate like parts, and more particularly to FIGURE 1,

reference numeral 1 designates therein an emissive cathode which, in the illustrated embodiment, is in the form of a disk, heated by the intermediary of a heating cylinder 2, itself heated by a filament 3.

The assembly so far described is supported by the skirt 4, fixed on a solid support 5, in the form of a disk sealed between two cylinders 6 and 7, for example, of ceramic material and forming part of the envelope of the tube. A shield 8 is disposed about the skirt 4 to limit the rediation of the heating cylinder 2.

The skirt 4 has a diameter of the order of 2 to 4 millimeters and a height also of the order 2 to 4 millimeters.

In the known prior art cathodes of such dimensions, the skirt was constituted by a solid metal cylinder with a thickness of the order of 5 to 15 microns. Not only a heat loss by flow to the support resulted therefrom, as the piercing of slots according to the aforementioned French Patent 1,053,508 was impossible by reason of the smallness of the dimensions, but also there resulted a difficulty in proper assembly and welding of the skirt to the emissive element and the support.

According to the present invention, the skirt 4 is realized as a grid-like structure made of wires of which two embodiments are illustrated in perspective in FIGURES 2 and 3. In FIGURE 2, the skirt 4 is formed by two layers of wires wound in opposite directions tangentially to a cylinder surface whereby the wires of each layer are parallel. The wires are brazed to each other at each point of contact such as 9.

In FIGURE 3, the skirt 4 is formed by a series of wires 10 disposed along the generatrices of a cylinder on which is wound in helix form another series of parallel wires 11. For example, the wires 10 may be of tungsten with a diameter of 25 microns spaced from one another by 0.4 millimeter, and the wires 11 may also be of tungsten of 64 microns in diameter.

Tests have shown that the skirts in accordance with the present invention which may be manufactured automatically with the aid of machines known under the name of "winding" machines, combined with a brazing furnace, diminish very considerably the losses by flow of heat and consequently reduce the heating power necessary for proper operation of the tube while simultaneously preserving a mechanical resistance at least equal to that of the skirts made of plain or solid metal of comparable dimensions, taking into consideration the inevitable crumbling or wrinkling thereof during the operations of their emplacement and being at the same time more easy to manufacture and to secure without major damage.

While I have shown and described two embodiments in accordance with the present invention, it is understood that the same is not limited thereto, but is susceptible of many changes and modifications within the spirit and scope thereof as known by a person skilled in the art. Thus, the present invention is in particular applicable also to cathodes of which the emissive element has the form of a cylinder of which the periphery is supported by the skirt. Other configurations of woven grid structures brazed at the cross-over points are comprised within the scope of the present invention to the extent that the configuration thereof has recourse only to currently known, conventional techniques. Additionally, the selection of materials and dimensions is also left to the appreciation of a technician skilled in the art without the exercise of invention.

Thus, while I have shown and described two embodiments in accordance with the present invention, it is obvious that the same is not limited thereto, but is susceptible of many changes and modifications within the spirit and scope thereof, and I therefore do not wish to

be limited to the details shown and described herein, but intend to cover all such changes and modifications as are encompassed by the scope of the appended claims.

I claim:

1. An indirectly heated cathode assembly for electron discharge devices, comprising:

first substantially cylindrical hollow support means having dimensions in length and diameter thereof of the order of a few millimeters, heating means within said hollow support means, electron emissive means secured to said first support means,

and second substantially cylindrical support means secured to the periphery of said first support means and formed by a grid-like structure of fine wires.

2. An indirectly heated cathode assembly for electron discharge devices, comprising:

first substantially cylindrical hollow support means having dimensions in length and diameter thereof of the order of a few millimeters, heating means within said hollow support means electron emissive means secured to said first support means,

and second substantially cylindrical support means secured to the periphery of said first support means and formed by a grid-like structure of fine wires wound in substantially opposite directions approximately tangentially to a substantially cylindrical surface.

3. An indirectly heated cathode assembly for electron discharge devices, comprising:

first substantially cylindrical hollow support means having dimensions in length and diameter thereof of the order of a few millimeters, heating means within hollow support means electron emissive means secured to said first support means,

and second cylindrical support means secured to the periphery of said first support means and formed by a grid-like structure of fine wires, one series of said wires being disposed substantially along the generatrices of a cylinder, and another series of wires wound over the wires of said series.

4. An indirectly heated cathode assembly for electron discharge devices, comprising:

first substantially cylindrical hollow support means having dimensions in length and diameter thereof of the order of a few millimeters, heating means within said hollow support means, electron emissive means secured to said first support means,

and second substantially cylindrical support means secured to the periphery of said first support means and formed by a grid-like structure of fine tungsten wires of the order 15 to 95 microns in diameter wound in substanially opposite directions approximately tangentially to a substantially cylindrical surface.

5. An indirectly heated cathode assembly for electron discharge devices, comprising:

first substantially cylindrical hollow support means having dimensions in length and diameter thereof of the order of a few millimeters, heating means within said hollow support means, electron emissive means secured to said first support means,

and second cylindrical support means secured to the periphery of said first support means and formed by a grid-like structure of fine tungsten wires, one series of said wires of about 25 microns in diameter being disposed substantially along the generatrices of a cylinder, and another series of wires of about 64 microns in diameter wound over the wires of said first series.

6. In an indirectly heated cathode structure having a cathode emissive portion adapted to emit electrons upon application of heat, a relatively fixed hollow support for said portion, heating means within said support and a supporting structure supporting the electron emissive portion on the support,

the improvement essentially consisting of said supporting structure having dimensions of the order of a few millimeters and constituted by a grid-like network of fine wires securely fixed to each other at cross over points.

7. An indirectly heated cathode assembly for electron discharge devices, comprising:

first substantially cylindrical hollow support means having dimensions in length and diameter thereof of the order of a few millimeters, heating means within said hollow support means, electron emissive means secured to said first support means,

and second cylindrical support means secured to the periphery of said first support means and formed by a grid-like structure of fine tungsten wires, one series of said wires of about 25 microns in diameter being disposed substantially along the generatrices of a cylinder, and another series of wires of about 64 microns in diameter wound substantially helically over the wires of said first series, the wires of said another series being spaced from each other by a few tenths of a millimeter.

References Cited by the Examiner

UNITED STATES PATENTS

2,516,841	8/50	Arditi et al.	313—348
2,882,436	4/59	Dorgelos	313—346

FOREIGN PATENTS

653,707	5/51	Great Britain.

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