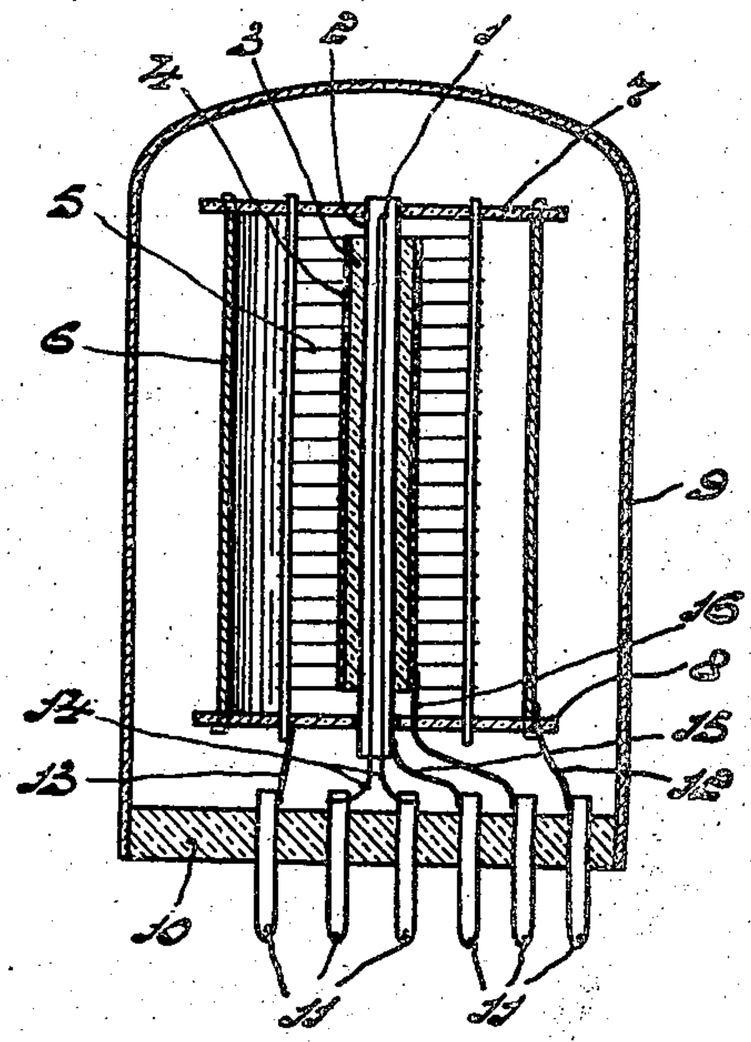
Oct. 25, 1949. J. L. H. JONKER 2,486,292

CATHODE STRUCTURE FOR ELECTRIC DISCHARGE TUBES

Filed July 20, 1946



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Patented Oct. 25, 1949

2,486,292

UNITED STATES PATENT OFFICE

2,486,292

CATHODE STRUCTURE FOR ELECTRIC DISCHARGE TUBES

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Application July 20, 1946, Serial No. 685,157
In the Netherlands December 31, 1943

Section 1, Public Law 690, August 8, 1946
Patent expires December 31, 1963

2 Claims. (Cl. 250—27.5)

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This invention relates to an electric discharge tube and particularly to the cathode of such a tube.

It is often desirable that the thickness of the emitting layer of a cathode for discharge tubes, particularly rectifier and amplifier valves, should be a minimum in order to ensure a low resistance across the layer and in addition satisfactory adherence of this layer to the support. A very thin emitting layer may, however, have the disadvantage that the quantity of the emitting substance is low so that the cathode has a low life.

It is known to provide cathodes with a large supply of emitting material by housing this material in a small thin-walled tube which is heated direct and in which the active metal is outwardly diffused through the wall of this tube; while the cathode is in use; such a cathode acts as though it comprises a thin emitting layer, whilst at the same time a large supply of emitting material is internally available for subsequent supply. This subsequent supply, however, proceeds comparatively slowly so that nevertheless fatigue phenomena may occur.

In addition, for the purpose of avoiding cathode disintegration due to bombardment by electrons with cathodes for X-ray tubes, amplifier valves or the like, it is known to coat the emissive layer applied to the conductive substratum with a very thin metal layer. This, however, does not introduce any change in the essential construction of the cathode since the resistance across the emissive layer keeps on being important because only the support of the emitting layer is provided with a current conductor and the emission current must traverse the layer of the emissive material.

According to the invention, these disadvantages can be obviated by the use of a cathode in which a metal supporting body has applied to it an emitting layer which in turn is coated with a metal film or a conductive coating of different shape and in which this coating is provided with a current supply conductor.

This simple construction has several advantages. The emission current being carried off direct by the metal external layer, it is possible to use such a thick emitting layer as is required for the obtainment of a sufficiently high life, whereas the emission proper ensues from an extremely thin layer that is formed on the outer side of this metal film while the cathode is in use.

As set out hereinbefore, the film on the emitting material must have connected to it a current conductor; in this case it is not essential that

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such a conductor should also be connected to the conductive support of the emitting layer but particular advantages may be secured thereby. If indeed the two conductive bodies are connected to separate current conductors, the resistance across the layer and thus the subsequent supply and the emission may be favourably influenced if a low potential difference is applied between the two conductors. This potential difference is for example lower than 10 volts and at any rate lower than 100 volts of direct tension. This tension results in a certain electrolysis of the emissive oxides and this assists in the subsequent supply of emissive substance to the surface of the external layer.

For the supporting body and the emissive layer use may be made of the same materials from which an oxide cathode is generally built up; thus, for example, the support may be constituted by nickel, copper, tungsten, molybdenum or similar metals and the emissive layer by one or more alkaline earth oxides. The external layer applied to this emissive layer may also be constituted by a metal such as nickel and may be of widely different form and structure. Thus for example, it may be constituted as a foil having a thickness of a few microns; according to one embodiment of the present invention, by which important advantages are secured, this layer is, however, constituted by a nickel wire gauze which is applied to the emissive layer; a further embodiment consists for example in a wire which is wound around the cathode in the form of a spiral or of a helix.

In order that the invention may be clearly understood and readily carried into effect it will now be described more fully with reference to the accompanying drawing, in which the single figure diagrammatically shows an electrode system of a tube according to the invention.

Referring to the figure, **1** designates a heating element which by means of insulating material may be separated from the support **2** for the emissive layer **3**; this emissive layer **3** has applied to it a conductive film **4** constituted by a nickel wire gauze folded and welded around the cathode. The cathode thus constructed is surrounded by a grid **5** and an anode **6**; the electrodes are centered by means of mica discs **7** and **8**. The aggregate is housed in a bulb **9** sealed by a disc **10**. This disc has sealed in it the contact members **11** of the tube and these contact members are connected on the inside of the tube to the various current supply conductors of the electrodes, to wit the conductor **12** for the anode, the conductor **13** for the grid, the conductors

14 for the heating element and finally the conductors 15 and 16 which are connected respectively to the support of the emitting material and the conductive film on the emitting material; the corresponding connecting conductors of the tube may have the desired potential difference applied between them.

What I claim is:

1. An electric discharge device comprising an anode and an indirectly heated cathode, said cathode embodying a heater, a conductive support adjacent to the heater, but electrically insulated therefrom, a layer of a readily emitting substance on the support, a conductive coating on said substance, a current supply conductor connected to said conductive coating and having a terminal for connection to an external circuit, and a separate supply conductor connected to the conductive support for the cathode and having a terminal for connection to an external circuit.

2. An electric discharge device comprising an anode and an indirectly heated cathode, said cathode embodying a centrally located heater, a cylindrical conductive support about said

heater, but electrically insulated therefrom, a layer of a readily emitting substance on the support, a conductive coating of metal wire gauze about said substance, a current supply conductor connected to said conductive coating and having a terminal for connection to an external circuit, and a separate supply conductor connected to the conductive support for the cathode and having a terminal for connection to an external circuit, whereby a potential difference may be applied between the conductive support and the conductive coating on the emissive material.

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