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DISPENSER CATHODE

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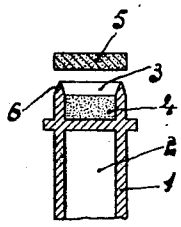

Fig. 1

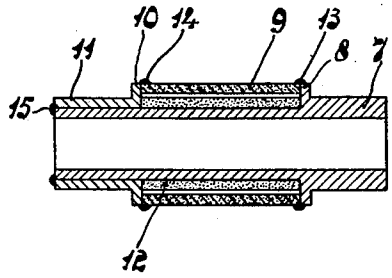

Fig. 2

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DISPENSER CATHODE

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4 Claims. (Cl. 313—346)

This invention relates to a dispenser cathode having a cavity which contains a supply of alkaline-earth metal compounds, the wall of the cavity being constituted in part by a porous body of one of the refractory metals tungsten, molybdenum, tantalum, hafnium or niobium, which body has been sintered at a high temperature and the pores of which constitute the largest apertures in the wall of the cavity. The invention furthermore relates to a method of manufacturing such a cathode.

Dispenser cathodes of the above-mentioned kind are known for their favourable properties in regard to life and emission and also for the easy workability of the emission surface into the desired shape. The filling of the cavity in the dispenser cathode consists of carbonates which are disintegrated into oxides during the exhaustion of the discharge tube.

More particularly for cathodes intended for working temperatures higher than 1200° C. it is desirable that the porous body should have a low porosity in order to limit the evaporation of barium. However, a low porosity involves the disadvantage that the carbon dioxide developed during the disintegration of the carbonates exhibits a comparatively high pressure in the cavity and nevertheless escapes only slowly. At the high temperatures occurring, the carbon dioxide can cause oxidation of the porous body or other parts of the wall of the cavity, so that the formation of free alkaline-earth metal may be impeded, whilst furthermore other unpleasant phenomena may be involved.

The object of the invention is to provide a cathode which does not exhibit the above-mentioned disadvantages.

According to the invention, in a dispenser cathode having a cavity which contains a supply of alkaline-earth metal compounds and of which the wall is constituted in part by a porous body of one of the refractory metals tungsten, molybdenum, tantalum, hafnium or niobium, which body has been sintered at a high temperature and the pores of which constitute the largest apertures in the wall of the cavity, the supply consists of a compact mass of alkaline-earth oxide which has been sintered together.

The sintered compact mass of alkaline-earth oxide may be obtained by pressing alkaline-earth carbonate and subsequently heating it for some time in a vacuum oven or in an indifferent atmosphere at a high temperature. The heating may be effected either in a crucible of any suitable metal, for example platinum, or in the cavity of the dispenser cathode itself before being closed by the porous body, which cavity is formed, for example, by a molybdenum body, but in this case it is desirable that the carbonates should be disintegrated at a comparatively low temperature, which may be followed by sintering together at a higher temperature. The question as to whether it is necessary to work in vacuo or in an indifferent atmosphere is dependent inter alia upon the pressure that is used and the resultant time required for compact sintering in connection with evaporation of the oxides.

The compact mass of alkaline-earth oxide which has been sintered together is comparatively well resistant to air, so that it can be worked in dispenser cathodes in the air without any special precautions being necessary.

Dispenser cathodes comprising such a presintered mass of alkaline-earth oxide split off very little gas only during their preparation in the tube, since disintegration of the carbonates is not necessary and the oxide mass has been well predegassed due to the treatment at high temperature.

In order that the invention may be readily carried into effect, it will now be described with reference to the accompanying drawing showing, by way of example, two cathodes each comprising a supply according to the invention.

In Fig. 1, reference numeral **1** indicates a molybdenum body, in which **2** is the space intended for a filament and **3** is a cavity containing a supply of alkaline-earth oxide **4**. Above the cavity there is shown a porous tungsten body **5** which, after the supply **4** has been provided, is secured by butt welding to a sharp edge **6**. The supply **4** may be formed by either of the two following methods. The first method is the following: a pressed pastille of barium strontium carbonate containing at least 25 at.% of strontium carbonate is heated in a platinum crucible in a vacuum oven at 1500° C. for 5 minutes. The pastille is subsequently provided in the cavity **3**. The second method is the following: a quantity of barium strontium carbonate is pressed into the cavity **3**, whereafter the molybdenum body containing the supply is at first heated at 1000° C. for 1 hour and subsequently at a temperature of 1500° C. for 5 minutes. The durability of the pastille obtained by the first method as well as that of the open space with the supply provided therein is at least 100 hours in air.

In Fig. 2, reference number **7** indicates a cylindrical molybdenum body having a flat flange **8** which is engaged by a porous tungsten body **9**, a flat flange **10** of a molybdenum cylinder **11** engaging the other side of the tungsten body. The cavity between the body **9** and the cylindrical body **7** contains a supply of alkaline-earth oxide, indicated by **12**, which is obtained by precipitation in a compact form. The precipitation is followed by heating in the same manner as in the case of the pressed carbonate shown in Fig. 1. It is alternatively possible for a mass of alkaline-earth carbonate of the desired shape to be heated in a vacuum oven and provided around the body **7**. If sufficient allowance is made for contraction, it is possible to obtain a small cylinder of oxide of the correct size, or a plurality of sectors of a cylinder, or it is possible to provide a plurality of profiled rods between the bodies **7** and **9**. After the supply has been provided, the cathode is closed at **13**, **14** and **15** by means of a circular welding seam.

What is claimed is:

1. In the method of manufacturing a dispenser cathode comprising a body of refractory metal having an internal cavity and at least one emissive surface portion, one wall portion surrounding said cavity being porous, the pores of said latter wall portion constituting the largest passageways connecting the cavity to said surface, the steps of forming a mixture of alkaline earth carbonates, sin-

tering said mixture in a non-reactive atmosphere to convert the same to a coherent body of alkaline earth oxides substantially impervious to reactive gases, and closing said cavity after placing the sintered body therein whereby said cathode can be activated substantially without the release of gases.

2. The method of claim 1 in which the mixture consists essentially of barium carbonate and at least about 25% of strontium carbonate.

3. The method of claim 1 in which the sintered body is formed outside of the cavity.

4. The method of claim 1 in which the sintered body is formed within the cavity but before the cavity is sealed.

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