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[54] **X-RAY TUBE ANODE**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** **252/520;** 106/63; 106/73.33; 117/127; 165/133; 313/330

[51] **Int. Cl.**[2] **H01J 35/12**

[58] **Field of Search** 313/330; 117/212, 127; 252/520; 106/73.33, 63, 133

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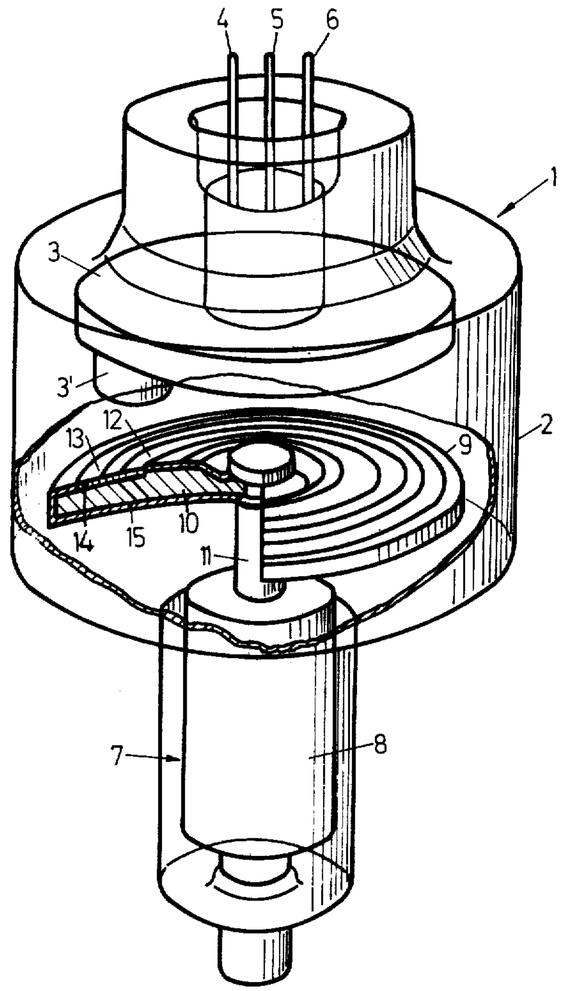
[57] **ABSTRACT**

An X-ray tube anode consists of a difficultly meltable plate which carries a layer of black substance outside of the focal point path, specifically upon its under surface. The invention is particularly characterized in that the black substance of the layer consists of a heating product of a mixture which includes titanium dioxide and additions of at least one other oxide which melts with difficulty.

3 Claims, 1 Drawing Figure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X-RAY TUBE ANODE

This invention relates to an X-ray anode consisting of a plate which melts with difficulty and which is coated outside of the focal point path, specifically on its underside with a layer of black material.

It is known that when X-rays are produced in an X-ray tube, the used up electrical energy is transformed into heat to a great extent. This heat is contained in the anode and is finally removed, or transmitted by radiation to the surroundings. In order to increase the amount of heat transmitted radiation, the anodes have been coated outside of the focal point path with black coatings, such as carbon, pulverized metals, etc. However, all these coatings have the drawbacks that they either form compounds with the material of the anodes and thus disappear from the surface or that they adhere to the surface with difficulty if at all. Furthermore the degree of blackening is mostly comparatively small.

An object of the present invention is to eliminate these drawbacks.

Other objects will become apparent in the course of the following specification.

An X-ray tube anode produced in accordance with the principles of the present invention is characterized in that the black material of the layer consists of a heating product of a mixture which contains titanium dioxide and additions of at least one other oxide which melts with difficulty. As such additions can be used aluminum oxide Al_2O_3, and calcium oxide CaO. When heating, for example, a mixture of 50 percent TiO_2 and 50 percent Al_2O_3, a deeply black substance is produced which has a high reflection coefficient in the entire temperature range. Furthermore, this material does not enter into any reactions below the melting point of the layer with materials generally used for the making of rotary anodes, such as molybdenum, tungsten, tantalum and niobium, and steam pressure is very small. A further advantage is that these substances excellently adhere to the cleaned and roughened outer surfaces of these materials. The roughening is usually accomplished by sand jets and the cleaning by defattening, treatment with ultrasound, cauterizing or glowing. The additions of TiO_2 greatly increase the stability of the layer without affecting the reflection action to any substantial extent, as long as the TiO_2 content does not drop below about 20 percent. A mixture of 68 percent CaO and 32 percent TiO_2, for example, has a melting point of above 2100°C. Thus the substances used for blackening in accordance with the present invention have all the desired properties which were not combined in any of the materials used heretofore.

X-ray tube anodes can be coated with the material of the present invention preferably for example, by plasma spraying or a similar process. However, enamelling methods are also useable in that, for example, a mixture of the two oxides is applied as a pulverulent layer by means of a binder upon the surfaces to be coated and then is heated for about one half hour at a temperature of about 1600°C. The selections of the temperature and of heating duration are not critical, they must be only provided so as to attain the desired reaction and adhesion. Then the coating which was originally white will have a deep black well reflecting coloring. The thickness of the larger is so measured

that a good covering is provided. Depending upon the granulation of the material thicknesses from a few μ to about 100 μ are sufficient.

The invention will appear more clearly from the following detailed description when taken in connection with the accompanying drawing the sole FIGURE of which is a perspective view of an X-ray tube **1** with a partly broken off case and a broken off rotary anode plate.

Parts of the tube are blackened in accordance with the present invention outside of the focal point paths.

The glass case **2** carries at one end the cathode **3** with connecting lines **4, 5** and **6** and at the other end the rotary anode **7** consisting of the rotor **8** and the anode plate **9**. The case **2**, the cathode **3** and the rotary anode **7** are all constructed in the usual known manner.

The plate **9** has a carrying body **10** of a molybdenum-tungsten alloy which contains 5 percent tungsten and 95 percent molybdenum in addition to unavoidable impurities. Surfaces **12** and **13** struck by electrons are inclined at different angles to the plate axle **11** and are coated with a layer **14** which is 1.5 mm thick and consists ot a tungsten alloy containing 10 percent rhenium. The plate **9** is coated upon its bottom side, at the edge and also upon its inner upper surface limited by the surface **12**, with a layer **15** which is a reaction product of 56 percent Al_2O_3 and 44 percent TiO_2; it is applied according to one of the above-described methods and is 20 μ thick.

As in known tubes rays are produced by applying high voltage between the cathode **3** and the anode **7**. The heating voltage of the glow cathodes located in the screen **3'** of the cathode **3**, is put on between the line **5** and one of the lines **4, 6**. Then the focal point paths **12, 13** located upon the upper surface of the plate **9** can be struck separately or jointly by electrons in order to send out X-rays. The paths **12** and **13** differ from each other only in that the path **12** is lowered by 10° relatively to the vertical line of the plate axle **11**, while in the path **13** this angle amounts to 15°. As already stated, during the striking of the surfaces **12, 13** by electrons in addition to X-rays a great deal of heat is produced which heats the plate **9**. The application of the black coating **15** accelerates the ray emission and the heating, so that the cooling time period is shortened. As compared to a plate which does not have a coating **15**, the cooling time period of 1500°to 1000°C is already reduced to less than one half even when the coating is applied only to the bottom side of the plate.

What is claimed is:

1. An anode for an X-ray tube, having a zone available for electron bombardment and, distinct from said zone, an external layer of black material comprising the reaction product obtained by heating a mixture containing not less than 20 percent of titanium dioxide and at least one of the refractory oxides, aluminum oxide and calcium oxide.

2. An anode according to claim **1**, wherein said mixture consists of 50 percent titanium dioxide and 50 percent aluminum oxide.

3. An anode according to claim **1**, wherein said mixture consists of 32 percent titanium dioxide and 68 percent calcium oxide.

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