

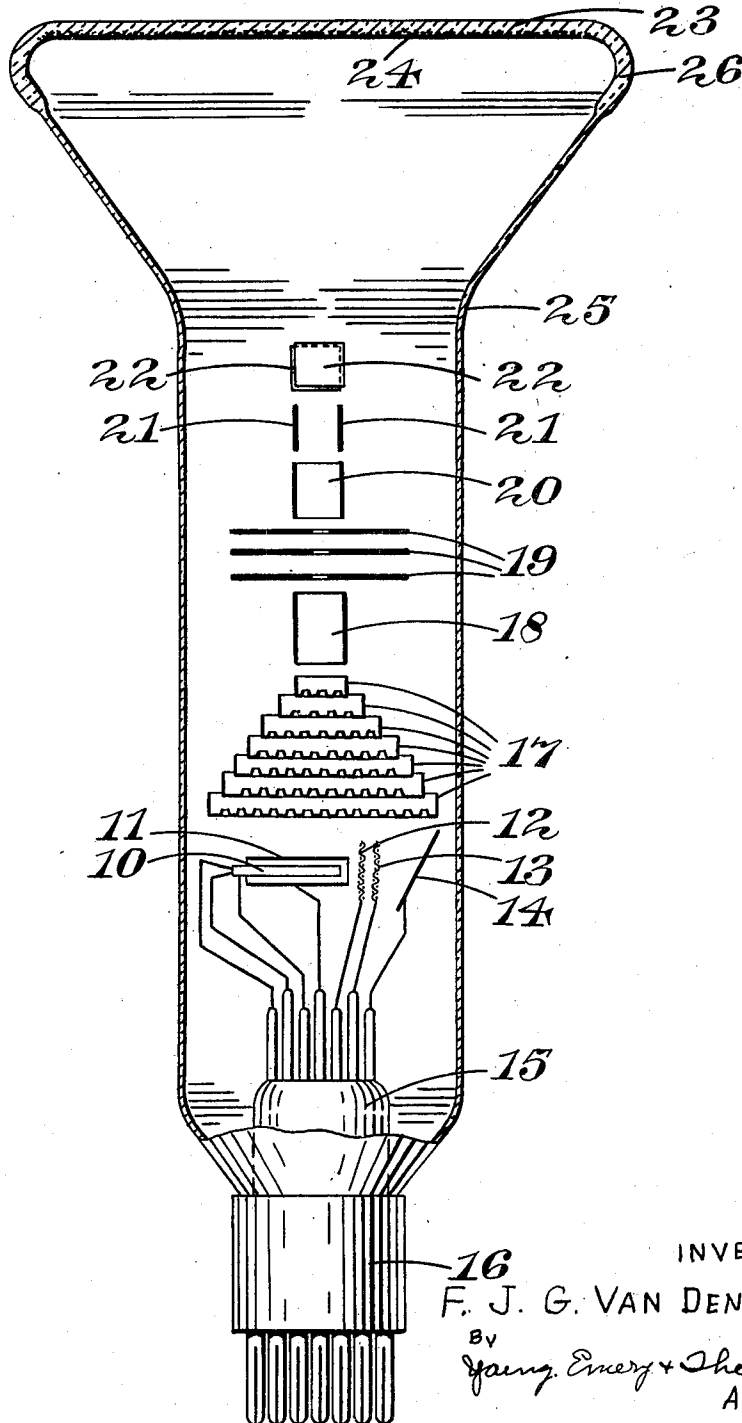
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F. J. G. VAN DEN BOSCH

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CATHODE RAY TUBE

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INVENTOR

F. J. G. VAN DEN BOSCH

By

Young, Emery & Thompson
ATTYS.

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CATHODE RAY TUBE

François Joseph Gerard van den Bosch, London,
England, assignor to Vacuum-Science Products
Limited, London, England, a British company

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5 Claims. (Cl. 250—150)

This invention relates to cathode ray tubes and an object of the invention is to provide a cathode ray tube producing sufficient light for the picture to be projected by ordinary optical means on to a remote screen.

According to the present invention there is provided a cathode ray tube comprising a screen which is formed of quartz glass and is provided with a layer of a high melting point metal or metallic compound in finely divided form. This layer, under bombardment of the electrons, becomes highly incandescent and produces sufficient light for useful projection by optical means on to an external screen. The use of quartz glass enables the requisite cooling to be achieved.

It is preferably to employ a metal or metallic compound having a melting point above 2000° K. Tantalum carbide is preferably employed, but other high melting point metals or metallic compounds, such as tungsten or molybdenum, may be used.

A further feature of the invention consists in incorporating the high melting point metal or metallic compound wholly or partially within the quartz glass. The layer of metal or metallic compound is conveniently of the molecular type and may be incorporated in the quartz glass by being deposited on the surface of the quartz and retained thereon by fusion of at least this surface to envelop the metal or metallic compound wholly or partially in the quartz. A finely divided fluorescent material, for example, zinc sulphide, may be mixed with the high melting point metal or metallic compound of the screen to assist in cooling.

It is convenient to provide the cathode ray tube with an envelope comprising a graded seal between the quartz glass screen and the pinch so as to enable a soda or lead glass pinch to be used for mounting of the electrodes.

In one construction, the cathode ray tube comprises, in addition to a primary cathode, at least one secondary cathode for providing a secondary electron emission which is directed on to the screen. The use of such electron multiplication is advantageous in that the life of the cathode is considerably longer than in cases where the primary source of electrons alone is used.

One specific embodiment of the invention is illustrated by way of example in the accompanying drawing.

Referring to the single figure of the drawing, there is shown a cathode ray tube incorporating an electron multiplier of the form described in

my co-pending application, Serial No. 276,883, filed June 1, 1939. An electrode assembly comprising a primary cathode 10, a tubular control electrode 11, control grids 12 and 13 and a reflector 14 is carried by a pinch 15 mounted on a plug base 16. A plurality of perforated secondary electron emitting electrodes 17 are provided constituting successive multiplier stages for primary electrons directed on to the first of these electrodes by the reflector 14.

The electron emission from the final one of these secondary cathodes is directed through a focussing cylinder 18 by means of a plurality of electrodes 19 operating as accelerators to provide an electronic beam which may be further focussed by another cylindrical electrode 20 to maintain a high concentration. The beam leaving the focussing electrode 20 and controlled for example by means of deflecting plates 21 and 22, impinges on a screen 23.

The screen 23 is formed of quartz glass and has on its inner surface a layer 24 of very finely divided tantalum carbide with which may be mixed a finely divided fluorescent material such as zinc sulphide. This layer is conveniently formed by applying the metal to the surface of the quartz glass sheet and fusing this surface so that the metallic particles are partially embedded in the glass and are thus mechanically locked in position. The quartz glass screen 23 is joined to the main portion of the envelope 25 of the cathode ray tube by means of a graded seal indicated at 26 so that an ordinary soda or lead glass pinch 15 may be employed. The electrodes not supported by this pinch may be supported in any convenient manner, for example, by means of additional pinches or seals at the side of the tube.

Owing to the very high melting point of quartz glass, it is possible for a television picture of very high brilliance to be obtained by means of this cathode ray tube. It enables a very high beam current to be obtained with an initial low cathode emission and initial low voltage. This high beam current makes very high accelerating voltages unnecessary and permits a high rate of dissipation with comparatively low acceleration voltages, for instance, a maximum voltage of 25,000 volts. The use of the metallic particles in the quartz screen provides for a very high intrinsic brilliance and the light thus provided may be focussed by ordinary optical means on to an external screen.

It will be understood that the invention is not restricted to the specific embodiment described

with reference to the accompanying drawing. For example, instead of employing electron multiplication, the primary electron emission from the cathode may be employed directly to bombard the screen.

I claim:

1. A cathode ray tube of the projection type, comprising a cathode emitting electrons, means for focussing the electrons in a beam and a screen on which the beam is directed by said focussing means, which screen comprises a quartz glass member and a layer of tantalum carbide in finely divided form carried by the quartz glass.

2. A cathode ray tube of the projection type, comprising a cathode emitting electrons, means for focussing the electrons in a beam and a screen on which the beam is directed by said focussing means, which screen comprises a quartz glass member and fine particles of tantalum carbide incorporated at least partially within the quartz glass.

3. A cathode ray tube of the projection type, comprising a cathode emitting electrons, means for focussing the electrons in a beam and a screen on which the beam is directed by said focussing means, which screen comprises a quartz glass member and fine particles of tantalum carbide deposited on a surface of the quartz glass and re-

tained thereon by fusion of this surface to at least partially envelop the tantalum carbide particles in the quartz glass.

4. A cathode ray tube of the projection type, comprising a primary cathode, at least one secondary cathode emitting secondary electrons under bombardment of electrons from said primary cathode for electron multiplication, means for focussing said secondary electrons in a beam and a screen on which the beam is directed by said focussing means, which screen comprises a quartz glass member and a layer of tantalum carbide in finely divided form carried by the quartz glass.

5. A cathode ray tube of the projection type, comprising a primary cathode, at least one secondary cathode emitting secondary electrons under bombardment of electrons from said primary cathode for electron multiplication, a screen, and at least one electrode between said secondary cathode and said screen for accelerating said secondary electrons onto said screen, which screen comprises a quartz glass member and a layer of tantalum carbide in finely divided form carried by the quartz glass.

FRANCOIS JOSEPH GERARD

VAN DEN BOSCH.