April 19, 1938. K. SCHLESINGER 2,114,609

BRAUN TUBE

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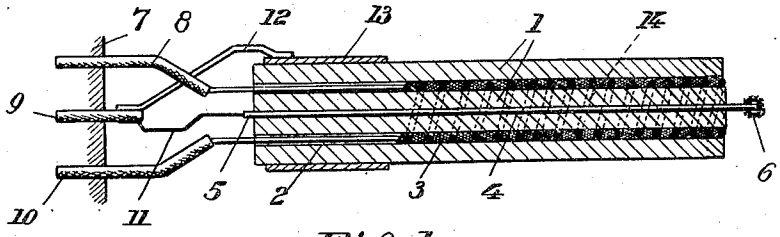


Fig. 1.

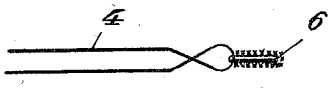


Fig. 2.



Fig. 3.

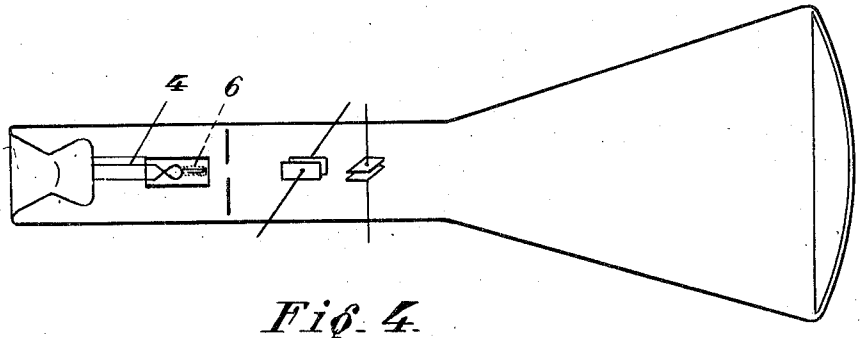


Fig. 4.

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BRAUN TUBE

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3 Claims. (Cl. 250—27.5)

The subject matter of the invention is a Braun tube having an indirectly heated cathode. Owing to the fact that according to the invention the cathode is heated indirectly and possesses a relatively large thermal capacity, it is possible to produce a ray of very constant intensity. The maintenance of a constant intensity of the inoperative ray is of essential importance, particularly when using the Braun tube for television purposes according to those methods which make use of intensity modulation.

According to the invention, the emissive surface of the cathode is heated to the emission temperature by the conduction of heat from a heating element. In this connection the heating element (the incandescent filament) may be provided either in a special insulating sleeve or arranged freely in the air. According to the invention, the emissive surface is heated either by direct conduction of heat from the heating element, with which the same may be connected, for example by welding or the like, or by heat conduction with the interposition of an insulating member, so that electrical contact does not exist at all between the heating element and the emissive coating. Further, according to the invention, the cathode system is first completed in itself, and not until the completion (possibly after assembly of the system) is the highly emissive substance (for example, earth metal oxide or a mixture of such oxides) applied to the surface of the cathode intended for purposes of emission.

Certain forms of embodiment of the cathode according to the invention are illustrated by way of example in the drawing.

Fig. 1 shows an indirectly heated cathode, in which a special insulating layer is interposed between the filament and the emissive body.

Fig. 2 shows a further form of embodiment of the cathode according to the invention, in which the emissive body is connected with the filament in direct fashion, for example by welding.

Fig. 3 shows a modified emissive element in respect of the arrangement according to Fig. 1.

Fig. 4 shows a diagrammatical view of a Braun tube with a cathode according to the invention mounted therein.

In Figs. 1 and 3, 6 is the actual emissive body, which may be constructed, for example, in the form of a ring or also a pin, and is coated on its surface with the highly emissive substance, such as barium oxide, strontium oxide or the like. The emissive body is mounted on a metallic element 4, which is connected with the cathode lead 11 and 9 and is heated by the conduction of heat from the double-wound filament 14. 8 and 10 are the heating current leads, and 12 is a metallic holder, which is secured on the one hand to the current lead 9 and on the other hand to the metallic holding ring 13. In this manner there is ensured a simple and reliable mounting and centering of the cathode. 1 is the insulating member of the cathode. The same may consist of insulating material of a desired kind, for example steatite.

The holder for the emissive body 4 is preferably made of a good heat-conductive material, such as nickel chromium, and is joined, for example by means of clips, with the current connection 11, which either consists of a poor heat-conducting material or possesses the smallest possible cross-section, in order to prevent appreciable discharge of heat from the body 4. The filament itself may be composed wholly or partially of tungsten, whereby it is desirable to fill out the gaps between the single windings with a poor heat-conducting and insulating oxide, such as zirconium oxide. The bifilar filament is wound as closely as possible in the vicinity of the emissive body and wider apart at a greater distance from the same.

In Fig. 2, 4 is the filament, and 6 the emissive body, which is connected with the filament in direct fashion, for example by welding or the like, and is furnished on its surface with a highly emissive substance.

It is possible in accordance with the invention to first connect the emissive body with the filament, or with the holder 4 respectively, and possibly mount the same firmly on the system, and not until after effected attachment, or completion of the mounting operation, to furnish the body with the emissive coating, for example by spraying the same on or by immersing the body in a suspension of the emissive substance. In this manner mechanical damage to the emissive coating, which would be difficult to avoid upon the mounting, is safely precluded.

The indirectly heated cathode according to the invention may be treated as structural unit, produced in simple fashion, and readily mounted and centered. The cathode ensures an entirely steady function on the part of the tube, even if alternating current is employed for heating the cathode. Owing to the large thermal capacity of the entire cathode small fluctuations in heat will be fully compensated without further trouble.

I claim:

1. A thermionic cathode for space discharge tubes comprising an electron-emitting body hav-

ing a concentrated and restricted surface area which emits electrons upon being heated, and a heating filament external to and outside of said body, said heating filament being non-inductively wound to eliminate substantially all external magnetic fields due to heating current in said filament in a space immediately adjacent said filament, said filament being connected to said body adjacent one end of said body and said body being located with its electron-emitting surface substantially entirely outside the turns of said filament in said magnetic field free space.

2. A thermionic cathode for space discharge tubes comprising an electron-emitting body having a concentrated and restricted surface area which emits electrons upon being heated, and a heating filament external to and outside of said body, said filament being substantially in the form of a figure eight, whereby substantially all external magnetic fields due to heating current in said filament are eliminated in a space immediately adjacent the end of one loop of said figure eight, said body being connected to and supported by said filament at the end of said loop, said body being located with its electron-emitting surface substantially entirely outside the turns of said filament in said magnetic field free space.

3. In a cathode-ray tube, a thermionic cathode comprising an electron-emitting body having a concentrated and restricted surface area which emits electrons upon being heated, a heating filament external to said body, said heating filament being non-inductively wound to eliminate substantially all external magnetic fields due to heating current in said filament in a space immediately adjacent said filament, said filament being connected to said body adjacent one end of said body and said body being located with its electron-emitting surface substantially entirely outside the turns of said filament in said magnetic field free space means for constricting the electrons emitting from said cathode into a narrow pencil, and means for controllably deflecting said pencil.

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