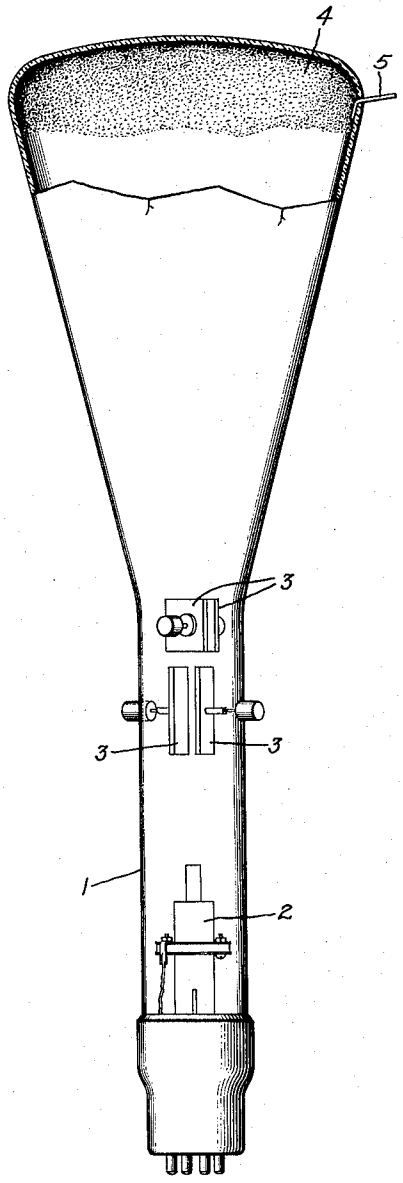
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CATHODE RAY TUBE

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CATHODE RAY TUBE

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2 Claims. (Cl. 250—27.5)

The present invention relates to cathode ray tubes of the type in which a surface collects electrons, the velocity of the electrons and the nature of the surface being such that the impinging electrons cause visible rays to be emitted from the surface. Such devices, owing to the known properties of the electrons, such as, for example, their low mass and the charge they carry, are particularly suitable for providing a light source, that can respond in some desired manner to the frequency or magnitude of an applied electrical or magnetic force.

The use of fluorescent materials, such as zinc sulphide, is well known as a means for rendering the location of impinging electrons visible, but all such materials suffer from the disadvantage that the light emitted is of poor quality and of low intensity. As a rule the light rays emitted by a material fluorescing under the action of electron impacts are colored, a typical color being bluish green.

In the present invention, a surface is provided that gives white light and glows brightly when bombarded by electrons. This is done by coating a suitable material which may be metal, with a deposit of carbon. This carbon is applied in such a manner that although the underlayers in contact with the foundation material are held firmly to the latter, the upper layers are loosely knit in somewhat the manner of a sponge and present to the oncoming electrons a series of points. Now since carbon is a conductor of electricity the electrons will flow in at these points, but owing to the spongy nature of the carbon the points will not be in good thermal contact with the body of the collector. Consequently, the energy liberated by the impinging electrons in the form of heat will not be communicated by thermal conduction to the whole of the collecting surface and dissipated therefrom at a low temperature, but will raise the temperature of the points to incandescence, and will be dissipated therefrom as light as well as heat. This light is of a desirable quality; it has the "whiteness" characteristic of a high temperature source and is of a brilliancy much greater than that associated with fluorescent materials.

Owing to the spongy nature of the carbon, the size and mass of the incandescent points are low and so are, therefore, their thermal capacity, consequently, if rapid fluctuations of electrical or magnetic forces are allowed to affect the magnitude or position of the electron stream flowing to the collecting surface, these fluctuations will be accurately reproduced by the light emitted by the carbon particles. This feature makes a device utilizing a collecting surface coated with carbon in the manner described particularly adapted for rendering visible, impulses from a television transmission. In this application a device is constructed, preferably with an oxide coated or other low temperature electron-emitting cathode and an anode coated with carbon. The electrons are directed by suitably placed potential shields to fall on, and therefore illuminate, a portion of the anode. The current density of the electron stream is then caused to fluctuate in sympathy with the voltage impulses received from the television transmission. This may be done either by applying them after suitable amplification directly to the anode, or preferably by applying them to a control electrode placed adjacent to the anode and cathode and applying to the anode a potential of 300 to 500 volts. In either method the anode current, and consequently the brightness of the glowing particles on the anode, varies with the received impulses. The manner of reception and amplification of the television impulses is well known and need not be discussed here.

There are other methods in which a carbon coated screen so described may be used for the purpose of rendering visible either television or other impulses. It may, for example be used in the device known as the cathode ray oscillograph.

In preparing the electron collecting surface, it is necessary to deposit the carbon in the proper degree of sponginess, otherwise the effect desired is not obtained. This may be done by "smoking" the carbon by a suitable flame, but a preferred method is to use as a base material some metal such as nickel. This, after cleaning, is placed in a furnace heated to approximately 800° C., through which a stream of coal gas is flowing. Instead of coal gas, hydrogen saturated with benzine vapor may be used. It is sometimes advantageous to oxidize the nickel slightly before placing in the furnace.

We have illustratively exemplified the invention in connection with a cathode ray tube which may be used for oscillograph or television purposes. In the drawing, numeral 1 designates the envelope of a highly evacuated or gas-filled tube containing a combined electron-emitting and projecting arrangement 2 ordinarily termed an "electron gun". The beam of electrons is electrostatically deflected in any controlled manner by means of plates 3.

As shown, the tube has a section of uniform diameter which is terminated by a conical por-

tion. At the larger end of the tube, there is a coating 4 improved in accordance with our invention which may conveniently serve as an anode. For this purpose, there is provided a flush seal conductor 5. It will be understood that the coating 4 need not be an electrode but may constitute simply a surface on which the electrons emanated by the electron gun 2 impinge.

As stated hereinbefore, the coating may comprise a thin layer of carbon, in finely divided form and sintered directly to the glass. However, if desired, a thin layer of nickel or other metal may be provided in any suitable and well known manner, as for example, by a plating or distillation process and a carbon-containing material or carbon directly and in finely divided form, applied and fused to the base metal.

What we claim as new and desire to secure by Letters Patent of the United States, is:

1. A cathode ray tube comprising an envelope containing a source of electrons, means for deflecting the electrons and a layer of material on the envelope remote from said electron source, said layer comprising carbon in finely divided form, and electrodal means for causing the electrons to strike said layer with a velocity sufficient to produce fluorescence of the carbon.

2. A cathode ray tube comprising an envelope containing a source of electrons, an electron-deflecting electrode and an anode, the anode being coated with a finely divided deposit of carbon which fluoresces when electrons from said source impinge thereon.

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