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CATHODE RAY TUBE WITH IMPROVED DEFLECTION MAGNIFYING SCREEN

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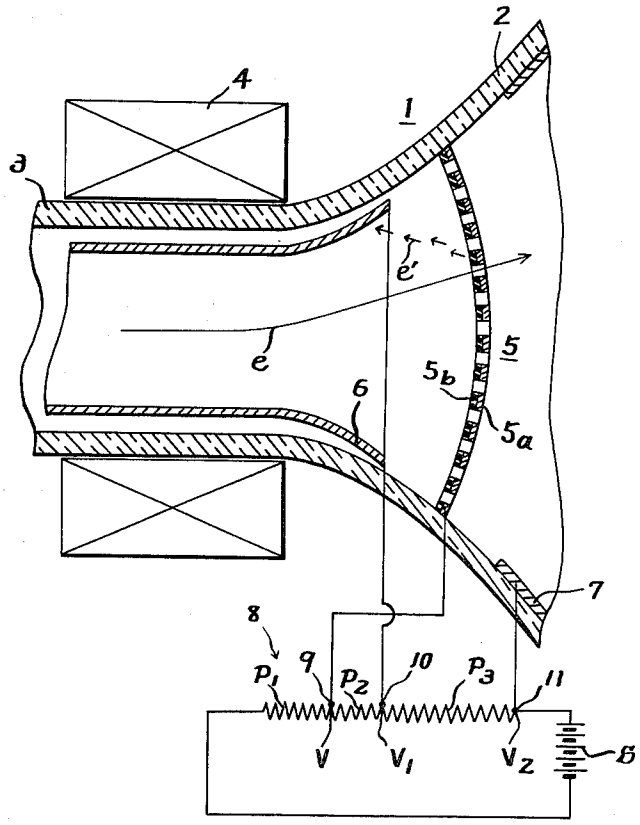

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CATHODE RAY TUBE WITH IMPROVED DEFLECTION MAGNIFYING SCREEN

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This invention relates to a cathode-ray tube and, more particularly, to a cathode-ray tube having substantially no secondary electron emission from its electron beam deflection magnifying mesh screen.

One object of this invention is to provide a cathode-ray tube which has an electron beam deflection magnifying mesh screen from which secondary electrons are seldom emitted.

Another object of this invention is to provide a cathode-ray tube which has an anode, which sets up a particular electric field such that secondary electrons emitted from an electron beam deflection magnifying mesh screen are attracted to an anode.

A further object of this invention is to provide a cathode-ray tube which gives a clear picture on its fluorescent screen without being affected by stray secondary electrons emitted from an electron beam deflection magnifying mesh screen.

In accomplishing these objects an electron beam deflection magnifying mesh screen, in accordance with the invention, is provided for use in a cathode ray tube and comprises a mesh screen of an electrical insulating material having low secondary electron emission ratio. Fastened to the insulating material is a layer of electrically conductive material. The mesh screen is further adapted to be fastened to the inside of a cathode-ray tube at the base of a cone, with the insulating material forming the mesh surface which faces in the direction of the supply of electrons for the cathode-ray tube.

Further, it is contemplated in accordance with another aspect of the invention to provide a curved mesh screen for a cathode-ray tube having first and second anodes having a first layer of electrically insulating material having a low emission ratio and a second layer of an electrically conductive material. The screen is adapted to be disposed in the cathode-ray tube between the first and second anodes with the layer of insulating material forming the mesh screen surface facing the source of electrons and is further adapted to be connected to an electric potential source lower than that of the first and second anodes.

Other objects, features and advantages of this invention will be fully apparent from the following description taken in connection with the accompanying drawing in which:

A single figure is an enlarged schematic diagram, partially in section of a main part of a cathode-ray tube illustrating one embodiment of this invention.

We will hereinafter explain one embodiment of a cathode-ray tube according to this invention with reference to the drawing, wherein **1** illustrates a tube proper and **2** is its cone shaped part and **3** is its neck part. An electron gun assembly (not shown) may be arranged inside the neck and an electron beam deflection device such as a coil **4** is usually disposed outside the neck. An electron beam *e* from the electron gun passes through the center axis of the tube into an electron beam deflection electromagnetic field of the deflection device **4** to be deflected and directed to a fluorescent screen (not shown).

In accordance with this invention, the deflected electron beam *e* meets with a deflection magnifying mesh **5** in the direction of advance directly after deflection. Namely the mesh **5** is arranged inside the base of the cone shaped part, and this mesh is specifically constructed, as will hereinbelow be described, and to which such an electrical potential is applied so that a secondary electron which is caused by a primary electron impacting the mesh does not run into the fluorescent screen.

It has heretofore been well known that deflection of an electron beam may be magnified by arranging a metal mesh in the base of the cone shaped part. (Refer to Motorola Engineering Digest, vol. 1 No. 2.) In this case, even if the electron pass-factor of the mesh is much increased, some of the electrons from an electron gun strike the metal mesh so that a secondary electron *e'* is emitted. This secondary electron *e'* becomes a free electron in the vicinity of the mesh, which prevents the electron beam *e* from flying towards the fluorescent screen, and this secondary electron strikes the fluorescent screen, which is undesirable.

Accordingly it is inevitable, owing to this defect, that a clear picture cannot be expected.

Considering such a point, in accordance with this invention a special curved mesh **5**, provided with an insulating layer **5***b*, on one side surface of a conductive or metallic mesh **5***a*, is disposed in the base of the cone shaped portion in such a manner that the insulating layer **5***b* is on the side toward the electron gun.

Means are also provided for affording proper potentials to the mesh screen **5**, anode **6** and a second anode **7**. The means illustrated is a voltage divider **8** which has fixed contacts at **9**, **10** and **11** and resistive portions P_1, P_2 and P_3 which are connected across the terminals of a direct current source S. The contacts **9**, **10** and **11** are connected to the mesh **5**, the anode **6** and the anode **7**, respectively. The connections are such that an electric potential V is applied to the mesh **5** which is a little lower than a potential V_1 applied to the first anode **6** disposed at the neck part **3** and considerably lower than the fluorescent screen potential, namely a potential V_2 on the second anode **7**. For instance, if the first anode **6** electric potential is 5 kv. and the second anode **7** potential is 10 kv., an electric potential of about 4.9 kv. is impressed on the mesh.

electrically conducted metal by evaporation.

In order to obtain such a special mesh, an insulation material such as glass is used which may be made in a mesh configuration by a conventional mechanical method such as embossing or the like. The mesh may also be made by an electrical method such, for example, as causing an electron beam to scan a thin glass plate so as to cut it by melting. Subsequently, on one side surface of a mesh thus produced is deposited a proper electrically conducted metal by evaporation.

In accordance with the above described construction, even if some of the electrons of the beam *e* strike against the mesh **5**, the secondary electron emission ratio decreases because of the insulation material layer **5***b* so that the number of free electrons *e'* in the vicinity of the mesh is much reduced.

Thus, one of the main undesirable influences on the picture due to the secondary electron E_2 is eliminated. However, even if the emission of secondary electrons *e'* does occur slightly since an electric field due to the electric potential on the first anode **6** is distributed on the surface of the insulation material layer **5***b*, the secondary electrons *e'* are accelerated by this electric potential and are drawn onto the first anode **6** without being directed to the fluorescent screen.

According to this invention as above described, the emission of the secondary electrons may be avoided and

even if some electrons are emitted a little, they are prevented from striking the fluorescent screen. Therefore, this invention has an advantage that a vivid picture may be produced.

It will be apparent that modifications and variations may be effected without departing from the scope of the novel concepts of this invention.

We claim as our invention:

1. An electron beam deflection magnifying mesh screen for use in a cathode ray tube comprising a mesh screen made of an electrical insulating material having a law secondary emission ratio, a layer of electrically conductive material fastened to said electrical insulating material, said mesh screen being adapted to be fastened to the inside of a cathode-ray tube at the base of a cone with said electrically insulating material forming the mesh screen surface which faces in the direction of the supply of electrons for the cathode ray tube.

2. A screen for use as an electron beam deflection magnifier in a cathode-ray tube having first and second anodes comprising a curved screen having first and second layers, said first layer being made of an electrically insulating material having a law secondary emission ratio and said second layer being made of an electrically conductive material, said screen being adapted to be disposed in the cathode-ray tube between the first and second anodes with the layer of electrically insulating material facing the source of electrons and being adapted

to be connected to an electric potential source that is lower than that applied to the first and second anodes.

3. The electron beam deflection magnifying mesh screen in accordance with claim 2 in which said insulating material having low secondary emission properties is glass.

4. The electron beam deflection magnifying mesh screen in accordance with claim 2 in which the material having low secondary emission properties is glass.

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