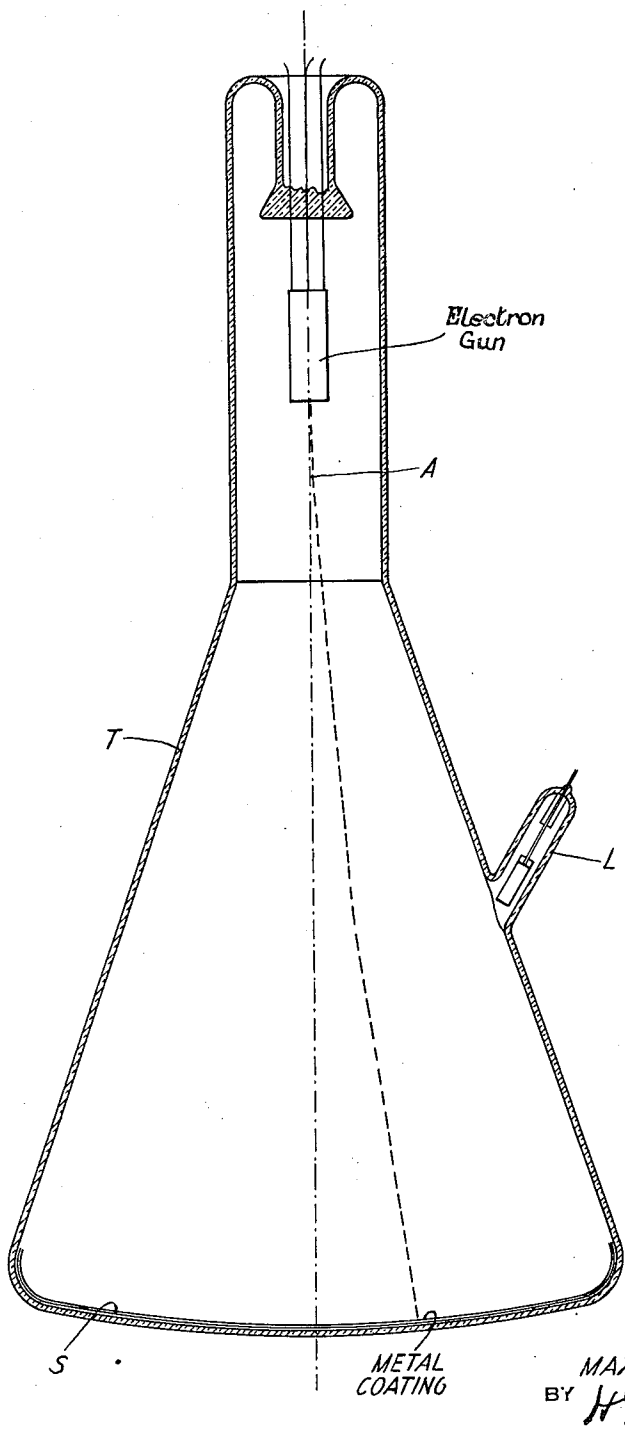
June 21, 1938. M. KNOLL 2,121,356

ELECTRON TUBE

Filed Feb. 21, 1935



INVENTOR
MAX KNOLL
BY H. S. Grover
ATTORNEY

Patented June 21, 1938 2,121,356

UNITED STATES PATENT OFFICE

2,121,356

ELECTRON TUBE

Max Knoll, Berlin, Germany, assignor to Telefunken Gesellschaft für Drahtlose Telegraphie m. b. H., Berlin, Germany, a corporation of Germany

Application February 21, 1935, Serial No. 7,469
In Germany February 2, 1934

3 Claims. (Cl. 250—27.5)

The present invention relates to electron tubes and particularly those of the type known in the art as the cathode ray or Braun tube.

In cathode ray tubes, and more particularly in those which are brought to a high vacuum, it has been found that the electrical charges reaching the luminous screen through the electron current often cause distortions of the electrical field in the vicinity of the fluorescent screen and consequently distortions in the trace of the ray to be recorded on the luminous screen, that is, the oscillogram, picture or the like is distorted.

It already has been proposed to cover the side of the fluorescent screen situated next to the glass wall of the tube by means of a metallic, conducting and transparent layer. This method has the disadvantage that yet an absorption of the light emanating from the fluorescent screen will be caused. Moreover the purpose is thereby only partially accomplished since the carrying away of the charge is not fully obtained due to the intermedially disposed insulating fluorescent substance. It furthermore has been proposed to impart conductivity to the layer of the fluorescent substance proper by admixing a metal powder. This method involves the inconvenience that even small amounts of admixed metals are extremely detrimental to the fluorescent intensity, as well as to the duration of the after glow of the fluorescent substance.

In accordance with the present invention it is proposed to cover the side of the fluorescent screen next to the cathode with a conducting layer. The charge of the electrons will then be directly laterally deviated after impinging on the fluorescent screen. Obviously substances chosen for the purpose of providing such covering must have only small thickness, in order to prevent an appreciable absorption of the electrons in the conducting layer. Since, however, for the carrying away of the extremely low ray currents (of the order of 10^{-6} A.°) a very thin layer is sufficient an appreciable absorption of the electrons does not occur when the thickness of the layer is suitably dimensioned.

For such layers, metals having a low density and electron emitting energy, for instance, barium, potassium, caesium, magnesium, have been found to be suitable, whereby besides the low density and the simple manner of application to be described in the following, perhaps the condition plays an important part according to which due to the strong emission of secondary electrons and the space charges thereby produced in front of the screen, compensate the detrimental influence of static charges of the fluorescent screen which may eventually still exist. My invention will best be understood by reference to the single figure of the drawing, which shows one embodiment thereof.

Referring to the drawing, there is shown a cathode ray tube having the conventional cathode ray developing means identified on the drawing as an electron gun. For purposes of simplicity, the further electrodes have been omitted from the tube.

Such layer can be produced in such manner that the layer material is heated in vacuum in a lateral extension L of the cathode ray tube T whose axis A is directed towards the fluorescent screen as indicated by the single figure of the accompanying drawing. This figure of the drawing omits the electrode systems both with respect to accelerating and deflecting the electrons within the tube. The material within the lateral extension L is then evaporated upon the fluorescent screen S. In accordance with the invention the thin metal covering serves at the same time to also continuously maintain a sufficiently high vacuum after sealing of the tube (getting effect).

Having thus described the invention, what is claimed is:

1. A cathode ray tube comprising an envelope, an electron source at one end thereof, a coating of material adapted to fluoresce under electron impact upon the opposite end thereof, and a layer of electron permeable photo-electric conducting material coating the surface of the fluorescent material adjacent the electron source, said electron permeable photoelectric conducting material comprising an alkaline earth metal capable of secondary emission.

2. The cathode ray tube claimed in claim 1 characterized in that the electron permeable conducting coating is formed of a material having low density and high electron emitting properties, said electron permeable conducting coating comprising an alkaline earth metal.

3. A cathode ray tube comprising an evacuated envelope, an electron source at one end thereof, a coating of material adapted to fluoresce under electron impact upon the opposite end thereof, and a thin layer of an alkali earth metal coating the surface of the fluorescent material adjacent the electron source, said metal having the property of acting as a getter material.

MAX KNOLL.