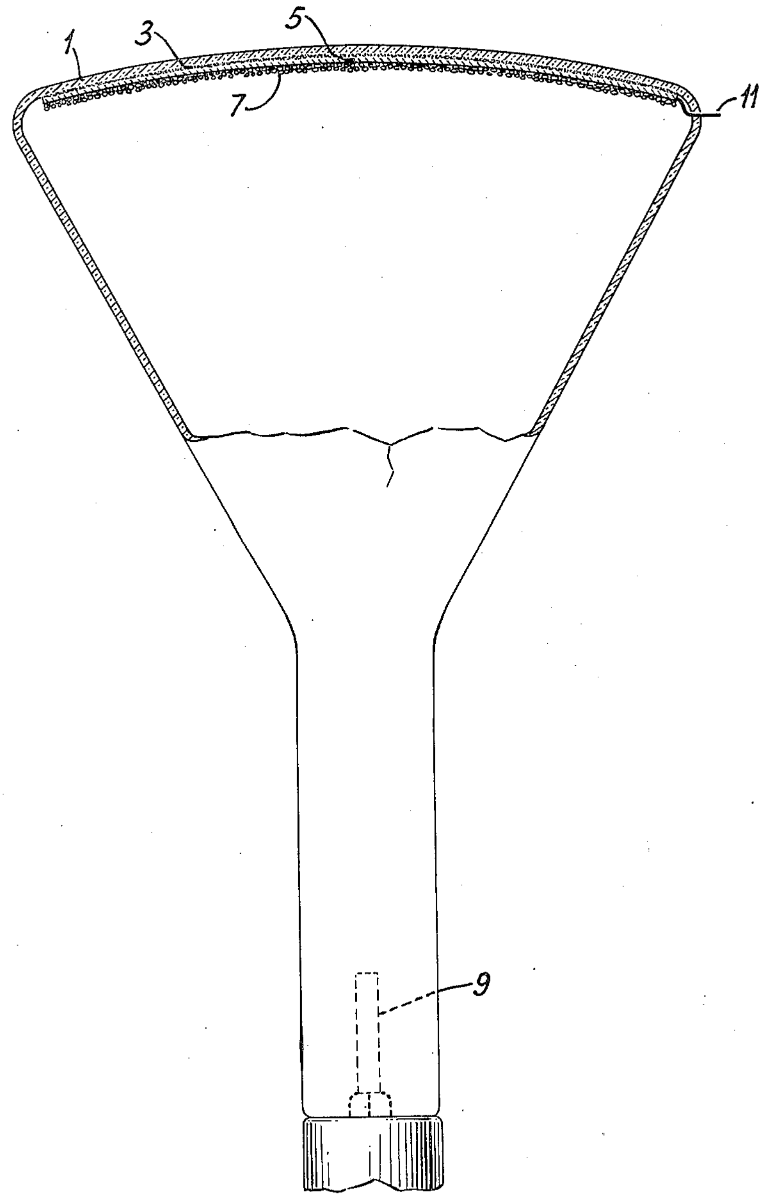
April 16, 1940. M. C. TEVES ET AL 2,197,625

CATHODE RAY TUBE

Filed Aug. 9, 1938



INVENTORS
MARTEN CORNELIS TEVES, HAJO HUBERTUS KRAAK
MENZE BANDRINGA
BY H. S. Grover
ATTORNEY

Patented Apr. 16, 1940

2,197,625

UNITED STATES PATENT OFFICE

2,197,625

CATHODE RAY TUBE

Marten Cornelis Teves, Eindhoven, Hajo Hubertus Kraak, deceased, late of Eindhoven, by Eline Kraak-Cramer, heir, Eindhoven, and Menze Bandringa, Eindhoven, Netherlands, assignors, by mesne assignments, to Radio Corporation of America, New York, N. Y., a corporation of Delaware

Application August 9, 1938, Serial No. 223,818
In the Netherlands June 17, 1937

4 Claims. (Cl. 250—27.5)

In cathode ray tubes, it is known to apply a thin, conducting layer to the surface of the glass before the fluorescent mass is applied to the wall. The purpose of this measure is to carry off electrical charges which would be produced owing to the impinging of the cathode rays upon the screen, and furthermore to give the screen a definite potential. This layer is chosen as thin as possible consistent with providing the necessary conductance, in order that as little as possible of the radiated light will be absorbed in the metal layer. At the customary thickness of the layer the loss in light is not greater than 10%.

The invention relates to a cathode ray tube in which a conducting layer placed between the wall of the fluorescent screen surface and the fluorescent mass has a thickness that is greater than the customary one. Apparently such a tube would be less useful in view of its comparatively great loss in light (approximately 50%). However, it was found that an important advantage goes hand in hand with the said disadvantage, if the wall to which the conducting layer is applied is frosted. The said advantage resides in that the screen efficiently absorbs the light impinging upon it from the outside. This affords the possibility of obtaining sufficient contrasts even if the projection chamber is not completely dark. The luminous images appear on a black or gray background and the visibility will not be jeopardized by an illumination that lacks brightness. But, in the hitherto used screens which reflect diffuse light the richness in contrasts will already be diminished considerably at dusk because the light reflected from the screen reduces the contrasts between bright and dark parts.

As already stated, in view of the thickness of the layer necessary for reaching the said absorption, a higher loss in light is taken into account as compared with a screen having a thinner layer thickness. But, at a favorable layer thickness it is found, against expectation, that the light impinging on the screen is weakened to a much higher degree than the fluorescent light passing through the metal layer.

An embodiment of the invention is shown schematically in the drawing, in which a cathode ray tube is shown schematically having a screen prepared in accordance with the invention. In the drawing, the glass envelope has the inner surface of the end wall frosted as indicated at 3. Deposited upon the frosted surface is a thin metallic layer 5 to which a lead-in 11 is connected. Luminescent material forming a layer 7 is thereafter deposited upon the metal layer 5. Electrons for scanning the luminescent material are provided by the electron gun 9 conventionally.

The frosting of the glass wall prevents the formation of a metal mirror. At the same thickness of the metal layer and without providing a frosted surface the wall becomes a mirror owing to the metal deposit and the light impinging from the outside will be reflected in the ordinary way so that the viewing of the image will thereby be disturbed. The increase in the thickness of the metal layer would then only entail a disadvantage as regards the image surface.

A further advantage arises through frosting of the wall of the fluorescent screen surface since a more favorable adhesion of the fluorescent material can be achieved. In connection with the conducting layer, aside from the dark aspect of the screen, a still further advantage is obtained. The known fluorescent screens reveal a more or less intensive halo effect, i. e. the width of an image lines does not correspond to the width of the cathode ray beam, but the lines are widened owing to reflection phenomena. This causes also a blurring of the sharp limits of the lines. Owing to this halo effect the image will be less sharp and lacks in contrasts. Though in the tube according to the invention this effect is not entirely eliminated, the fact is that its result is two diffuse sidelines on both sides of the image line and at a distance depending on the thickness of the glass. These lines have such a low intensity that they produce substantially no effect. The image line proper will not be widened and the limits thereof remain sharp.

For the conducting base layer of the fluorescent screen, metals will preferably be used which reveal no agglomeration. To this end metals are to be considered which have a high melting point such as tungsten and molybdenum. But for the present purpose still better results are assured by the rare metals of the eighth group of the periodic system, the so-called platinum metals. Layers formed of these metals have a greater durability because they are not subject to oxidation and because they retain in a better way the optical contact with the glass wall.

Rhodium offers a particular advantage. Metals such as platinum for instance are very sensitive to certain binders used for applying the fluorescent mass and if such binders must be used, these metals have no particular usefulness, but in other cases they can be readily employed.

Thus, for instance in case of sulfide screens, there is often used as binder a solution of phosphoric acid in acetone since the sulfide does not withstand the high temperature of the burning of other binders such as Zapon (nitro-cellulose) lacquer. Acetone evaporates at a low temperature and the phosphoric acid remains on the wall. Now, it was found that the metal base of the screen if composed of platinum, for instance, will be somewhat loosened up from the glass wall when coming in contact with the phosphoric acid so at certain places the favorable effect of the metal layer as regards the impinging light may be detrimentally affected. If rhodium is used as metal base, this drawback is not caused. If no binder is used, or if in combination with silicate of zinc as fluorescent mass another binder such as nitrocellulose is used, very satisfactory results will likewise be obtained with a conducting layer of other suitable metals such as platinum.

In order to apply the metal layer there may be employed the known methods of cathode atomizing or evaporation in vacuum whereby in the first mentioned case the metal body connected as cathode will be arranged near the surface of the screen, said metal body carrying a certain quantity of the metal to be deposited.

The conducting layer may be extended across a further part of the wall of the tube where it may serve for absorbing electrons in the manner known as such. This layer has preferably a current lead-in 11 connected thereto.

Having described our invention, what we claim is:

1. A cathode ray tube having a frosted end wall, a layer of metal chosen from the eighth group of the periodic series deposited upon the frosted end wall, and a layer of fluorescent material positioned upon the layer of metal.

2. A cathode ray tube having a frosted end wall, a conductive layer deposited upon the frosted end wall, and a layer of fluorescent material positioned upon the layer of metal.

3. A cathode ray tube having a frosted end wall, a layer of rhodium deposited upon the frosted end wall, and a layer of fluorescent material positioned upon the layer of metal.

4. The method of preparing fluorescent screens in a cathode ray tube, which comprises the steps of frosting a supporting surface within the cathode ray tube, depositing a thin layer of highly refractory metal upon the frosted surface, and depositing the fluorescent material upon the deposited metal layer.

MARTEN CORNELIS TEVES.
ELINE KRAAK-CRAMER,
Heir of Hajo Hubertus Kraak, Deceased.
MENZE BANDRINGA.