July 2, 1940. E. BRÜCHE 2,206,387

ELECTRONIC DEVICE

Filed Jan. 23, 1937

Fig. 1

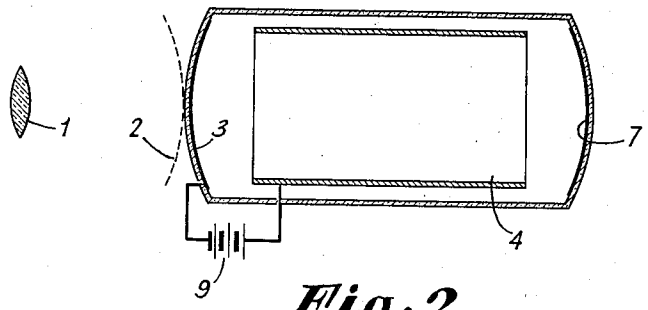



Fig. 2

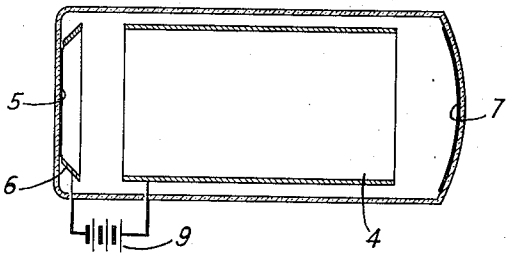



Fig. 3

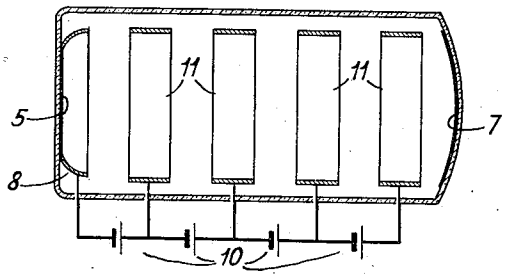
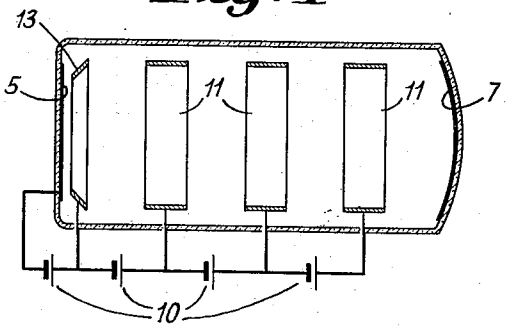



Fig. 4




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Patented July 2, 1940

2,206,387

# UNITED STATES PATENT OFFICE

2,206,387

## ELECTRONIC DEVICE

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Application January 23, 1937, Serial No. 121,923
In Germany January 28, 1936

7 Claims. (Cl. 250—153)

In the production of an image of a cathode of large surface by means of an electron-optical system, such as for instance and in particular in case of an electron-optical image converter, the cathodes are generally developed as curved surfaces of the concave mirror type in order to insure in this manner a faultless image also of points of the object located at remoter distance from axis. On the other hand, a plane cathode surface would be desirable for reasons of a simple structural assembly. In the image converter in particular such a course is to be strived for if only for the reason that the image plane of the image projected from the rear on the cathode is curved in the manner of a concave mirror towards the photo-optic path of the rays and is thus located inversely to the cathode mirror.

In accordance with the invention, there is arranged for insuring a potential distribution suitable for producing an electron-optic image, a globe- or cone-like auxiliary electrode immediately in front of a large-surfaced plane or curved cathode so that the cathode together with the cone or globe section forms approximately a globular surface of suitable curvature.

To facilitate the explanation of my invention, reference will be made to the drawing. In the drawing,

Fig. 1 shows the structure of an image converter known to the prior art;

Fig. 2 shows schematically one embodiment of my invention; and

Figs. 3 and 4 show modified embodiments of my invention.

In the drawing, Fig. 1 shows that the image plane 2 belonging to the light-optical lens 1, wherein the image to be converted is reproduced sharply, has an unfavorable curvature with respect to photo-cathode 3. 4 signifies the anode of an image converter, while 9 is a source of potential connecting the cathode and anode for focusing the electrons released from the cathode under the influence of light upon the fluorescent screen 7.

Fig. 2 illustrates an exemplified embodiment of the photo-cathode according to the invention, the plane photo-cathode 5 being provided with a cone-like extension 6 causing a curvature of the equipotential surfaces. The funnel-like auxiliary electrode 6 may either be given the shape of a truncated cone, as shown in Fig. 2, or for instance, that of a spherical sector and the auxiliary electrode may further be arranged in direct conducting relationship with the photo-cathode as shown in the Fig. 2 or then separated therefrom and may besides be impressed with a supplementary potential.

A source of potential 9 is connected to the cathode and the auxiliary electrode and the anode 4 to constitute an electron lens for focusing released electrons upon the fluorescent screen 7. Fig. 3 shows a modification where the auxiliary electrode instead of being a portion of a truncated cone takes the form of a sector of a sphere 8 and a plurality of ring-like anodes 11 are substituted for the single anode. A potential source 10 is provided with leads running from the individual anodes to variable taps of the source for focusing the electrons upon the luminescent screen 7. Fig. 4 shows a further modification in which the auxiliary electrode 13 instead of being in direct contact with the cathode 5 is separated therefrom by a small distance and has potential applied between the cathode and the electrode. It is to be appreciated that the potential between the cathode 5 and the auxiliary electrode 13 may be omitted and the electrode 13 directly connected although in spaced relation to the cathode 5.

Having described my invention, what I claim is:

1. A cathode ray tube comprising a planar photo-emissive electrode of extended predetermined area, an auxiliary apertured truncated conical electrode directly connected to the photo-emissive electrode, a luminescent screen, the area of the aperture of said conical electrode and the area of said screen being substantially that of the predetermined area of said photo-emissive electrode, and focusing means intermediate the auxiliary electrode and luminescent screen.

2. A cathode ray tube comprising a planar photo-emissive electrode of extended predetermined area, an auxiliary apertured spherical sector electrode directly connected to the photo-emissive electrode, a luminescent screen, the area of the aperture of said conical electrode and the area of said screen being substantially that of the predetermined area of said photo-emissive electrode, and focusing means intermediate the auxiliary electrode and luminescent screen.

3. A cathode ray tube comprising a planar photo-emissive electrode of extended predetermined area, an auxiliary apertured spherical sector electrode directly connected to the photo-emissive electrode, a luminescent screen, the area of the aperture of said conical electrode and the area of said screen being substantially that of the predetermined area of said photo-emissive electrode, focusing means intermediate the auxiliary electrode and luminescent screen, and a

cylindrical anode intermediate the auxiliary electrode and luminescent screen.

4. A cathode ray tube comprising a planar photo-emissive electrode, an auxiliary spherical sector electrode directly connected to the photo-emissive electrode, a luminescent screen, focusing means intermediate the auxiliary electrode and luminescent screen, and a plurality of anodes intermediate the auxiliary electrode and luminescent screen.

5. A cathode ray tube comprising an envelope, a planar photo-emissive electrode, an auxiliary surface of revolution electrode having its axis of revolution normal to the photo-emissive electrode and the surface of revolution at an acute angle throughout its length to the photo-emissive electrode electro-conductively connected to the photo-emissive cathode, said auxiliary electrode being longitudinally displaced from said photo-emissive cathode, a luminescent screen in register with the photo-emissive cathode, and auxiliary electrode and focusing means intermediate the auxiliary electrode and luminescent screen and in register therewith.

6. A cathode ray tube comprising an envelope, a planar photo-emissive electrode, an auxiliary surface of revolution electrode having its axis of revolution normal to the photo-emissive electrode and the surface of revolution at an acute angle throughout its length to the photo-emissive electrode, said auxiliary electrode being longitudinally displaced from said photo-emissive cathode, electro-conductive means connected to the photo-emissive electrode and auxiliary electrode and projecting through the envelope, a luminescent screen in register with the photo-emissive cathode and auxiliary electrode, and focusing means intermediate the auxiliary electrode and luminescent screen and in register therewith.

7. A cathode ray tube comprising a planar photo-emissive electrode, an auxiliary surface of revolution electrode having its axis of revolution normal to the photo-emissive electrode and the surface of revolution at an acute angle throughout its length to the photo-emissive electrode in contact with said cathode and surrounding the same to provide a spherical electrostatic field distribution in the immediate vicinity of the planar cathode, a luminescent screen in register with said cathode and auxiliary electrode, and an electron lens intermediate the auxiliary electrode and luminescent screen.

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