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W. HENNEBERG ET AL
ELECTRON DEVICE

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Fig. 1

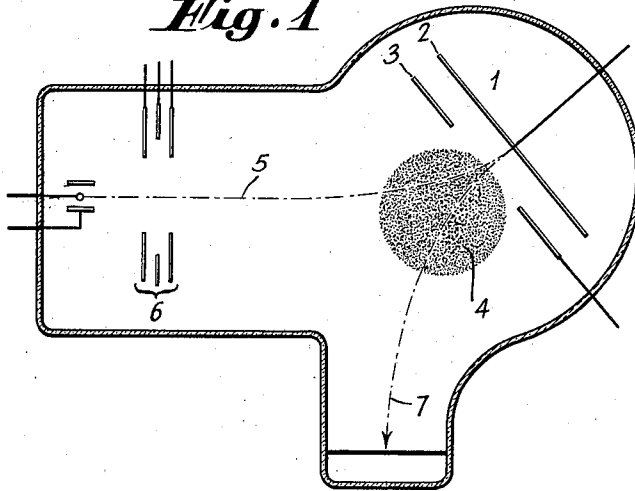
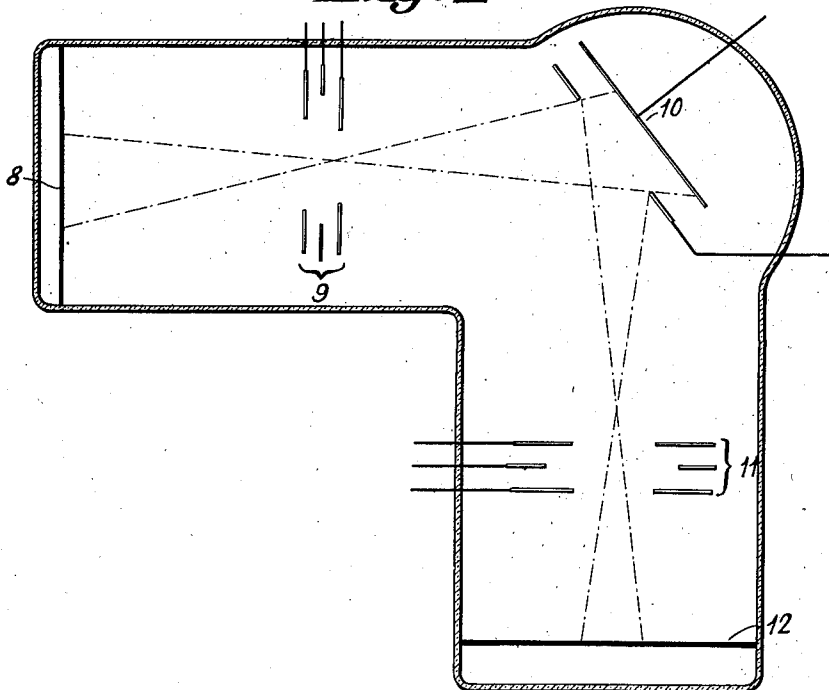


Fig. 2



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ELECTRON DEVICE

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Application April 26, 1937, Serial No. 139,029
In Germany April 25, 1936

6 Claims. (Cl. 250—162)

(Granted under the provisions of sec. 14, act of
March 2, 1927; 357 O. G. 5)

This invention relates to electronic devices, and in particular, to electron optical systems in which a combination of electron mirrors with electron lenses are used for producing signalling currents representative of an optical image.

This application is concerned with improvements of copending application Serial No. 89,507, filed July 8, 1936, and entitled "Electron optics".

One of the objects of the parent application, above identified, is the combination of electron mirrors with electron lenses, whereby the chromatic errors of the individual image reproduction elements compensate each other. The possibility to prepare electron-optical achromats by means of such a combination is based upon the fact that the faster electrons in the reproduction by collecting lenses are deflected later than the slower electrons, but earlier than the slower electrons at the electron mirror.

In accordance with the invention, in the arrangement as described in the copending application above identified, the primary electrons as well as the electrons dispersed with or without velocity loss in the reflection or through-radiation are to be used for the reproduction. By the use of this method, which is only possible by the use of achromatic electron-optical systems, the optimum yield and thus the maximum degree of brightness may be insured in the electron-optical reproduction.

The drawing in which Figs. 1 and 2 show the electrode systems of embodiments of our invention for insuring an achromatic electron-optical reproduction of maximum yield according to the invention.

In Fig. 1 signifies an electron mirror which may be formed for instance, by a fixed back plate 2 and diaphragm 3 provided with a bias potential. In front of the mirror is disposed a homogeneous magnetic field 4 whose lines of force run at right angle to plane of drawing and thus at right angles to the optical axis of the mirror. If now an electron beam 5, passing through an electron lens 6, falls on mirror 1, the reflected electron beam 7 will form with electron ray 5 the angle α . This arrangement, which is not possible in light optics, increases still more the efficiency of the electron yield since the mirror surface can be fully utilized without that a distortion of the image occurs.

Fig. 2 illustrates an arrangement where the greatest possible symmetry has been preserved analogous to the conditions in light optics. Electron rays 21, 22 reach from an object 8 through the lens 9 an electron mirror 10 and are de-

flected by the latter to a further electron lens 11 and finally reproduced on a pick-up 12. In accordance with the invention, all electrons are here used for the reproduction of the image, regardless whether the latter is a foil emitting itself electrons or radiated through or a surface reflecting electrons and whereby the primary and secondary electrons may have decidedly different speeds.

Having described our invention, what we claim as new and desire to secure by Letters Patent is:

1. A cathode ray tube comprising an electron emitting cathode, a control electrode surrounding the cathode, an electron lens in register with the cathode, said lens having chromatic aberration, an electron mirror inclined to the axis of the electron lens, said mirror having chromatic aberration complementary to the aberration of said lens and an impact surface having its axis at right angles to the axis of the electron lens.

2. A cathode ray tube comprising means to produce a focused beam of electrons having a predetermined amount of chromatic aberration, an electron mirror to receive the focused beam of electrons, said mirror having chromatic aberration complementary to the predetermined aberration of the beam of electrons, an impact surface adapted to receive electrons reflected from the electron mirror, and means to produce a magnetic field whose lines of force are at right angles to the axis of the electron mirror.

3. A cathode ray tube comprising means to produce a focused beam of electrons having a predetermined amount of chromatic aberration, an electron mirror to receive the focused beam of electrons, said mirror having chromatic aberration complementary to the predetermined aberration of the beam of electrons, an impact surface adapted to receive electrons reflected from the electron mirror, and means to produce an electromagnetic field positioned between the electron mirror and the means to produce the focused beam of electrons.

4. A cathode ray tube comprising means to produce a focused beam of electrons having a predetermined amount of chromatic aberration, an electron mirror to receive the focused beam of electrons, said mirror having chromatic aberration complementary to the predetermined aberration of the beam of electrons, an impact surface adapted to receive electrons reflected from the electron mirror, and means to produce a homogeneous electromagnetic field positioned between the electron mirror and the means to produce the focused beam of electrons.

5 5. A cathode ray tube comprising means to
produce a focused beam of electrons having a
predetermined amount of chromatic aberration,
an electron mirror to receive the focused beam
of electrons, said mirror having chromatic ab-
erration complementary to the predetermined
10 a homogeneous electromagnetic field positioned
between the beam focusing means and the elec-
tron mirror and at right angles to the axis of the
electron mirror.

6. A cathode ray tube comprising means to
produce a focused beam of electrons having a
predetermined amount of chromatic aberration,
an electron mirror to receive the focused beam
of electrons, said mirror having chromatic ab- 5
erration complementary to the predetermined
aberration of the beam of electrons, an impact
surface adapted to receive electrons reflected
from the electron mirror, and an electron lens
intermediate the electron mirror and the im- 10
pact surface.

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