March 21, 1939. E. RUSKA 2,151,530

BRAUN TUBE

Filed Sept. 16, 1936

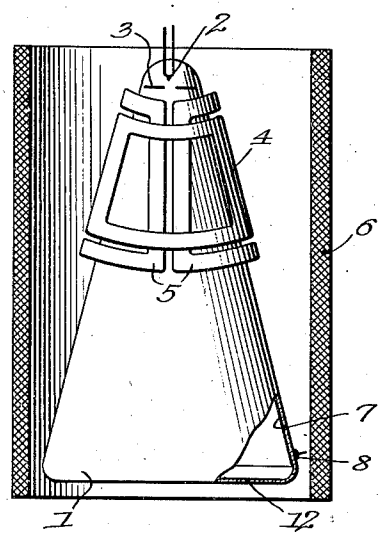


Fig. 1.

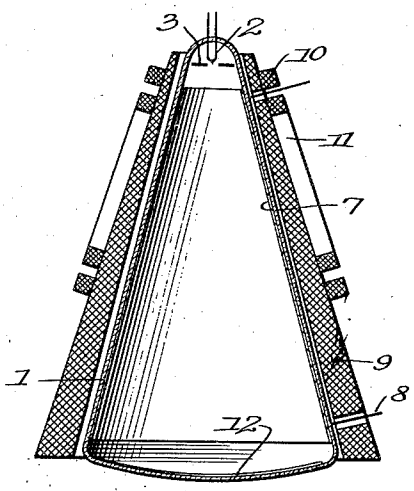


Fig. 2.

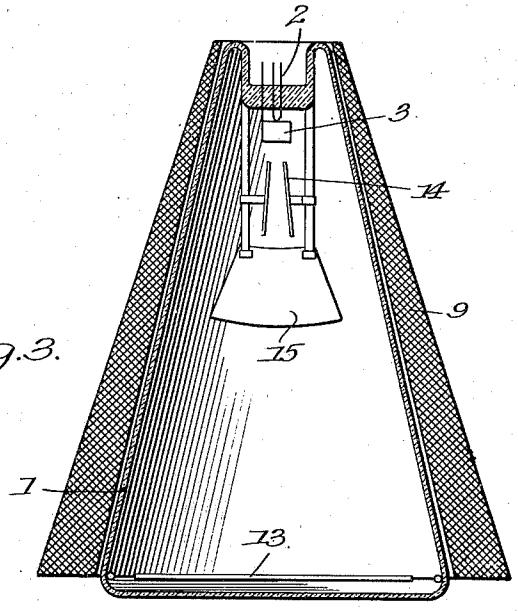


Fig. 3.

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Patented Mar. 21, 1939

2,151,530

UNITED STATES PATENT OFFICE

2,151,530

BRAUN TUBE

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Application September 16, 1936, Serial No. 101,174
In Germany October 15, 1935

3 Claims. (Cl. 250—161)

The invention relates to non-gas filled Braun tubes in which an especially sharp focus is to be produced on a screen.

In the usual types of Braun tubes wherein the ray is cross deflected, the bundling of the rays is secured by non-homogeneous electric or magnetic fields which are disposed coaxial with the ray in front of the cross control fields. The electron focus spot produced by these bundling fields is the smaller the further the cathode or projected radiated diaphragm is removed from the bundling field. In order to produce a projection of the cathode or the diaphragm in a 1:1 proportion the tube must be made double the length of the deflected ray path.

In accordance with the invention the cross deflection of the ray is effected directly behind the cathode or ray-producing system and the entire tube is placed in a magnetic homogeneous field which is parallel to the axis of the tube. In addition to shortening the tube this has the advantage that the deflecting system may be narrower than hitherto, since the ray up to its inlet into the system has not yet spread out, thus producing, particularly when magnetic cross control is employed, sensitive coil systems of reduced inductivity.

A further advantage of the arrangement of the invention is, that owing to the homogeneous magnetic field the projection of the cathode or radiated diaphragm is of natural size (that is, not greatly enlarged as usual) so that relatively large emitting cathode surfaces and hence large ray currents may be used. In the case of cathode surfaces of the usual size only very small focal points and correspondingly small screen surfaces can be obtained.

Embodiments of the subject matter of the invention are shown in the drawing, wherein:

Fig. 1 is a lengthwise section through a tube arrangement using a cylindrical concentration coil.

Figs. 2 and 3 each show longitudinal sections through tubes using conically shaped focusing coils.

The tube 1 of Fig. 1 is of conical shape and contains a cathode 2 and a control diaphragm 3. A deflecting coil system is mounted at the pointed end of the tube directly adjacent the ray producing system, the said coil system being adapted to fit the shape of the tube casing so that it broadens out in the direction of the ray and corresponding to the deflection thereof. The coils 4 serve for deflecting in one coordinate direction and the coils 5 for deflecting in another direction perpendicular thereto. The entire tube together with the coil system is disposed within a cylindrical coil 6 which, in the space traversed by the ray, produces a homogeneous magnetic field. The tube is preferably provided with a black, conducting layer 7, which at 8 is provided with a terminal leading to the outside. The image screen of the tube is disposed on the terminal surface 12. It is preferable so to proportion the deflecting system that it extends from the ray producing system to about the center of the path of the ray.

Fig. 2 also shows a conically shaped tube 1 in which the magnetic homogeneous field is produced by a conically shaped coil 9. The winding of the coil is so arranged that the current layer increases as the diameter of the coil increases, so that inside the hollow space of the coil a homogeneous field is produced. The deflecting coils 10 and 11 are disposed exteriorly upon the conically shaped coil. 7 is the conducting, preferably black, anode coating. It may also be formed as a resistance layer adapted to accelerate the ray (as a homogeneous or a spiral layer) and in that case has two voltage leads, one being near the control electrode and one on the screen.

Fig. 3 shows a tube using electrostatic ray deflection means. The two deflecting plates 14 and 15 are disposed close behind the ray producing system whereas the homogeneous magnetic focusing field is again produced by a conically shaped coil 9 which surrounds the tube. The image screen 13 in this tube is separated from the glass wall. A fluorescent screen as well as a thermally luminous screen may be used or any other type of image screen which under the influence of the cathode ray changes its color, transparency or reflecting power.

Since a very small focal spot and a correspondingly small screen surface may be produced in such tubes, they are especially suited as projection tubes for television reception purposes in which a small very brilliant received image is either optically enlarged upon an image screen for subjective viewing, or recorded on a film for subsequent objective viewing. Such a tube, contrasted with those hitherto known in which the screen is directly observed, is much smaller and shorter, thus practically obviating danger of implosion inasmuch as such tubes can be manufactured with less fear of implosion and the danger inherent in the production of glass splinters in case the tube breaks is less.

I claim:

1. In a cathode ray tube having a conical envelope enclosing an electron beam source and a luminescent screen positioned to intercept said beam, means for producing a homogeneous focusing field between said source and said screen, comprising a conical coil having a varying number of ampere turns per unit of coil length, and proportional to the coil diameter disposed thereabout and extending beyond the electron beam path at each end thereof.

2. A cathode ray tube having an electron beam source and a luminescent screen positioned to intercept said beam, deflecting means disposed immediately adjacent said beam source, and means for producing a uniform focusing field between said source and said screen, said means including a coil having a varying number of turns per unit of length proportional to the diameter thereof at any point.

3. In combination with a cathode ray tube having a beam source and a luminescent screen positioned to intercept a beam from said source, means for producing a homogeneous focusing field between said beam source and said screen comprising a focusing coil having a varying diameter and having a number of turns per unit of length proportional at every point to the diameter thereof, and means for producing deflection of said beam when energized positioned immediately adjacent said beam source.

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