Dec. 12, 1961 R. D. EATON 3,013,178

FOCUSSING MASK FOR CATHODE RAY TUBE

Filed March 23, 1953

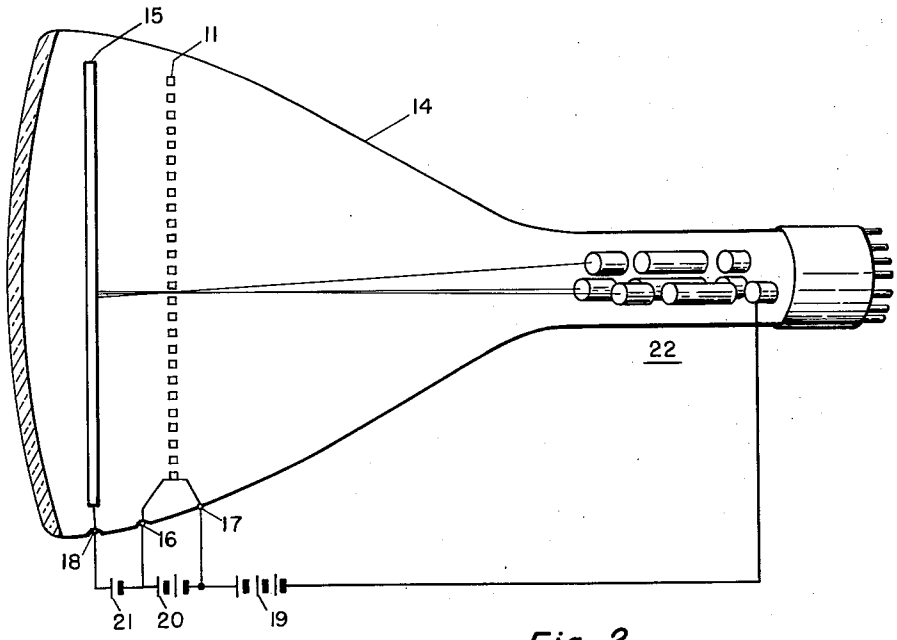


Fig. 2

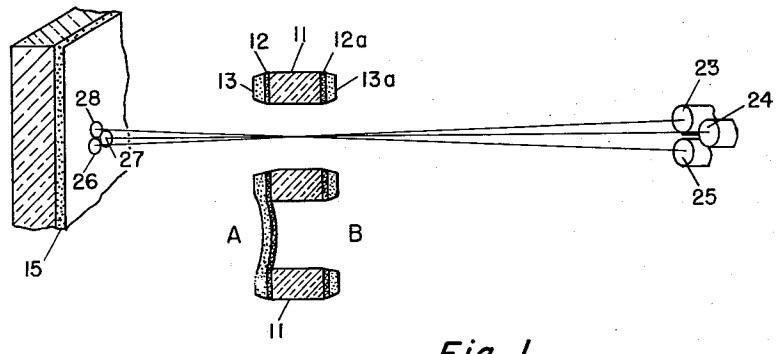


Fig. 1

INVENTOR.
ROLAND D. EATON
BY Daily & Daily
ATTORNEYS

United States Patent Office 3,013,178
Patented Dec. 12, 1961

3,013,178

FOCUSSING MASK FOR CATHODE RAY TUBE

Roland D. Eaton, Radburn, N.J., assignor to Fairchild Camera and Instrument Corporation, a corporation of Delaware

Filed Mar. 23, 1953, Ser. No. 343,988
5 Claims. (Cl. 315—13)

This invention relates to color television and more particularly to a dual-purpose mask for a color television tube.

In reproducing color television pictures prior art practice has been to provide a fluorescent screen with a pattern of dots of fluorescent materials laid down in a geometrical pattern, each material fluorescing in a different color when excited by an electron beam. Three sources of electron beams are provided, and by suitable masking means each beam is caused to impinge on one and only one type of fluorescent material. All dots of the same color emitting property are excited by the beam from the same source.

An object of this invention is to provide a perforated mask for a plurality of electron beams from several electron guns impinging upon a fluorescent screen having a definite dot pattern, each dot of fluorescent material emitting light of a different color when excited by an electron beam, and to increase efficiency by providing holes in the mask considerably larger than the color dots on the screen.

Another object of this invention is to provide means in combination with the aforesaid perforated mask to focus these beams onto the fluorescent dots.

These and other objects of the invention will become apparent from a study of the following specification in connection with the attached drawing in which,

FIGURE 1 is a sectional view, greatly enlarged, through a portion of the mask showing the paths of several beams from the electron guns to the fluorescent screen; and

FIGURE 2 is a somewhat diagrammatic view of the color picture tube in which the invention is practiced, parts being broken away to show the internal construction.

The invention contemplates the utilization of a masking plate comprising a sheet of glass **11**, preferably of the type known as photo-etched glass, manufactured by the Corning Glass Co., which has been exposed to light through an opaque mask in which a myriad of small holes in a regular geometric pattern have been etched. The action of light on this photosensitive glass is to change its character so that it may be etched away from the rest of the glass by suitable processes.

The etched glass plate **11** is sprayed or coated on each side with a thin layer **12** and **12***a* of a barrier coat such as lacquer which covers the holes as well as the glass as shown at A in FIGURE 1. A layer of aluminum **13** and **13***a* is then evaporated onto the barrier layer on each side of the mask. Thereafter the plate is baked at a temperature of approximately 380° C. to burn out the barrier layer. The aluminum covering of the openings in the plate **11** is then removed. Air may be blown through the holes which blows out the thin unsupported aluminum as shown at B and the plate is then ready for use.

The plate **11** is mounted in the cathode ray tube **14** at a fixed distance from the color dot screen **15** (as shown in FIGURE 2) in accordance with known principles. Leads from each of the deposited aluminum surfaces are brought out to contacts **16** and **17** on the outer surface of the glass envelope. Screen **15** has an aluminized surface and a lead from this surface is brought out to a contact **18** on the envelope.

Suitable sources of potential **19**, **20** and **21** are connected to the tube elements and to the aluminum layers

to provide increasing potential from the electron gun structures, shown diagrammatically at **22**, through the mask **11** to the screen **15**. A difference of potential is applied between the aluminum layers **13** and **13***a* of the mask. This potential difference provides an electron lens or a focussing action which takes place at the mask to focus the beam on the individual dots of the color dot screen.

Referring back to FIGURE 1, the electron beams from the electron guns, shown diagrammatically and identified as sources **23**, **24** and **25** are projected through the apertures in the mask **11** and focussed on the color dots **26**, **27** and **28** respectively of screen **15**. While there is initial focussing at the electron gun sources of the electron beam, post focussing takes place at the mask **11** thereby to insure that the beam is sharply focussed on the dots of the screen **15**.

This post focussing at the mask makes possible greater electron transmission efficiency than heretofore achieved. The individual perforations in the mask may be of a size greater than the individual color dots, the focussing action of the mask concentrating the electron beam and reducing its size to the size of the dots. This action permits passage of more of the beam than that of the prior art masks thus providing greater screen light output. Also it effectively overcomes the heating effect of the electrons striking the mask which causes warping, a difficulty experienced with the prior art masks. Prior art masks permit about 25 to 30% electron transmission. The mask structure in accordance with this invention allows up to 70% electron transmission.

While I have described and illustrated one specific embodiment of the invention, other embodiments are apparent as defined by the following claims.

What is claimed is:

1. In a cathode-ray tube having a fluorescent screen in the form of a plurality of dots of material fluorescing when excited by an electron beam and a plurality of electron guns for generating and directing electron beams onto said screen, the improvement comprising: a perforated mask of electrical insulating material positioned between said fluorescent screen and said electron guns, said perforated mask being provided with an electrical conducting layer on each surface thereof, each said layer being perforated corresponding to the perforations in said mask.

2. The apparatus of claim 1 including a source having a plurality of electrical potentials, each said conducting layer on said mask being connected to said source at different potentials whereby a potential difference may exist between said layers.

3. The apparatus of claim 1, in which said perforations are larger than said dots thereby to provide a high electron transmission efficiency.

4. The apparatus of claim 1 including an electrical conducting layer on said screen and a source of a plurality of potentials, said conducting layer on said screen being connected to said source at one potential and said layers on said mask being connected to said source at other potentials whereby potential differences exist between said layers on said mask and said layer on said screen.

5. In a cathode ray tube having a fluorescent screen in the form of a plurality of dots of material fluorescing when excited by an electron beam, a plurality of sources of electron beams, said beams being directed at said screen, the improvement comprising: a perforated mask located between said screen and said sources to shade said screen so that only beams coming from one of said sources can strike certain of said dots and beams from others of said sources can strike others of said dots,

said perforated mask comprising a sandwich consisting of an electrical insulating material between two electrical conducting layers, said sandwich forming a unitary structure and each perforation in said mask extending entirely through said sandwich, each of said perforations being larger in cross-sectional area than the dots most closely adjacent thereto, a conductive layer on said screen, and a source having a plurality of potentials, one of said potentials being connected to said conducting layer on said screen, a second of said potentials being connected to one conducting layer on said sandwich and a third potential being connected to the other conducting layer on said sandwich, the magnitude relationship between said three potentials being such as to constrict the electron beams passing through said perforations to the area of said dots.

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