Aug. 12, 1958 B. M. FELBURG 2,847,596

SCREEN STRUCTURE FOR TWO-COLOR CATHODE RAY TUBES OR THE LIKE

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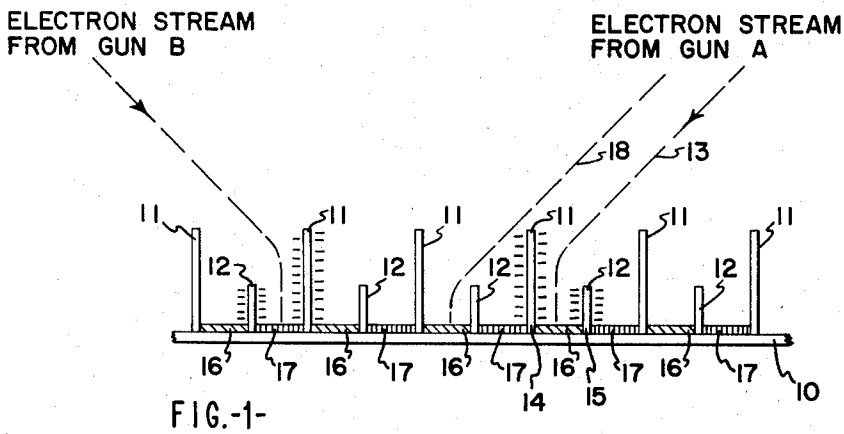



FIG.-1-

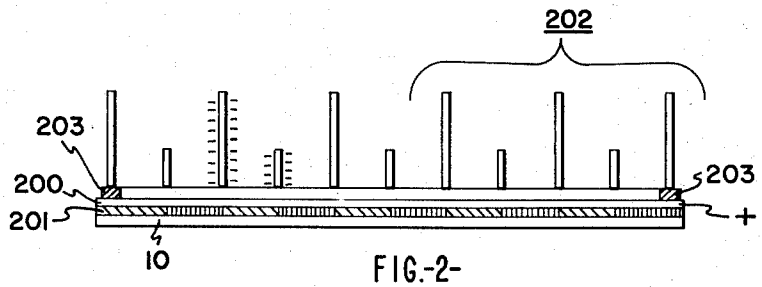



FIG.-2-

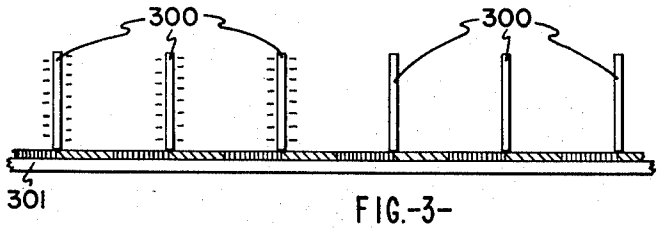



FIG.-3-

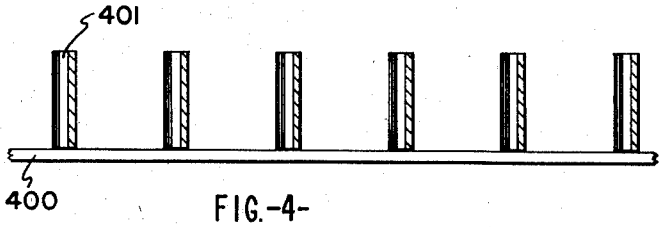



FIG.-4-

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# SCREEN STRUCTURE FOR TWO-COLOR CATHODE RAY TUBES OR THE LIKE

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6 Claims. (Cl. 313—70)

This invention is related to screen structures for two-color cathode ray tubes and, more particularly, to an improved screen structure which will exhibit a minimum of color dilution, simplicity of construction and optimum performance in general. This invention is to be understood to be suitable for employment in two-gun cathode ray tubes having either conventional or aluminized face plates, and having the electron guns either adjacent to each other or spaced apart so long as the paths of the two electron streams each have an inclined angle of incidence relative to the tube face plate.

In the past, several approaches have been made in designing two gun cathode ray tubes. In the case of cathode ray tubes having face plates provided with two interlaced sets of phosphor strips, each set having a different wave length or color of luminescence, one type of screen structure heretofore used has employed a shadow mask interposed between the electron guns and the co-planar phosphor strips. Registration difficulties in the case of this type of screen structure have been severe and detract from the utility of this type of tube. Another screen structure which has been proposed is that of a face plate having an inner target area comprising a plurality of parallel, wedge shaped, two-faced portions each face having a phosphor exhibiting a color of luminescence differing from that of the phosphor of the remaining face of each portion. The principal difficulties associated with this latter type of screen structure appear to be slight tendencies toward color dilution and rather high cost of manufacture of the face plate, and in particular of, the face plate target area and the unique non-planar, alternating phosphor coatings laden thereupon.

Therefore, it is an object of the present invention to provide a new and improved screen structure for two-color cathode ray tubes.

It is a further object of the present invention to provide a new and useful screen structure for two-color cathode ray tubes which will exhibit a minimum of color dilution, high efficiency, and simplicity of construction.

According to the present invention, electron beam constraining elements are positioned normal to the tube face plate and with the edge portions thereof resting upon at least every other line of demarcation between adjacent phosphor strips. By electrical means or otherwise the aforementioned elements constrain the electrons from each gun so that they fall on respective ones of the phosphor sets.

The features of the present invention which are believed to be novel are set forth with particularity in the appended claims. The present invention, both as to its organization and manner of operation, together with further objects and advantages thereof, may best be understood by reference to the following desecription, taken in connection with the accompanying drawings, in which:

Figure 1 is a representative cross-sectional view of a face plate and screen structure of a two gun cathode ray tube, according to the present invention.



Figure 2 is a representative cross-sectional view of the face plate and screen structure in Figure 1 in which the face plate is aluminized.

Figures 3 and 4 are representative cross-sectional views of a face plate and screen structure of a two gun cathode ray tube constituting additional embodiments of the present invention.

In Figure 1, face plate **10** has upon its inner surface a plurality of phosphor strips having alternating colors of luminescence, **16** and **17**. The phosphor strips may be deposited upon the face plate **10** by means of silk screening, by settling processes, or by other means. A plurality of primary deflecting elements **11** forms the boundaries between alternating phosphor strip pairs A—B. Interposed between adjacent primary deflection elements **11** is a secondary deflection element **12** which defines the boundary between phosphor strips A and B within the area defined by adjacent primary deflection elements **11**. It has been found in practice that the height of the primary deflection elements **11** should be in the neighborhood of .020 of an inch whereas the height of the several secondary deflection elements **12** will be of the order of .007 of an inch. A spacing of .020 of an inch between adjacent primary deflection elements **11**, and also between secondary deflection elements **12**, has been found to be desirable. It is to be noted that during the horizontal scan by both electron beams the electron paths from gun A and gun B will be inclined, oppositely, relative to face plate **10**.

The cathode ray tube screen structure shown in Figure 1 operates as follows. The electron stream from gun A following path **13** will, by reason of a negative voltage previously applied to primary and secondary deflection elements **11** and **12**, be repelled slightly by primary deflection element **14**, and will be repelled slightly by secondary deflection element **15** toward the end of travel so that the electron stream will impinge normally upon phosphor **16**. It is to be noted that there is no danger of electrons from gun A impinging upon phosphor **17**, by reason of the disposition and height of primary deflection element **14**. In this regard note the configuration of path **18** from electron gun A. It is easily seen that during the entire horizontal scan the electron stream from electron gun A will impinge only upon phosphors **16**. Similarly, the electron stream from electron gun B will impinge only upon phosphors **17**. It is to be noted that the function of the several secondary deflection elements **12** is to assist in preventing electron impingement upon the wrong phosphor strip and also to aid electron impingement in a normal direction upon correct phosphor strips.

Since both the primary deflection elements and the secondary deflection elements are maintained at the same negative potential, they may be joined at one or both ends. From a practical point of view, electroforming seems to be the best method of manufacturing the entire deflection element structure. Perhaps the best way of fabricating the screen structure would be, first, to deposit the phosphor strips on face plate **10** by silk screening or otherwise and, second, to electroform the deflection element structure and, finally, to affix the deflection element structure to the face plate by any conventional means.

Figure 2 describes the employment of the present invention in connection with cathode ray tubes having aluminized face plates. In the case of aluminized tubes, the aluminum coating is disposed immediately over the phosphor strips. Thus, in Figure 2, aluminum coating **200** is disposed over phosphor strip plane **201**. Since the aluminum coating is normally maintained at a positive voltage of approximately 15,000 volts, the deflection element structure must be suitably insulated from aluminum coating **200**. One means of electrically insulating deflec-

tion element structure **202** from aluminum coating **200** would be to provide insulation mounts **203** at either side of deflection element structure **202**. There may of course be other means for otherwise separating deflection element structure **202** from aluminum facing **200**.

The operation of the screen structure of Figure 2 is identical with that of Figure 1.

In Figure 3, primary deflection elements **300** separate alternate pairs of phosphor strips as in Figure 1; however, the secondary deflection elements are omitted. While in the case of Figure 3 the electron impingement will not be normal to tube face **301**, yet operation may be made to be relatively satisfactory even though some color contamination may occur. As before, the primary deflection elements are charged negatively to provide for the desired bending of the electron streams from their associated electron guns to an approximately normal incidence with face plate **301**.

In Figure 4, face plate **400** is transparent or translucent, not having any phosphor strip backing associated therewith. Instead, different color-producing phosphors are deposited on either side of primary deflection elements **401**. In the case of the embodiment shown in Figure 4, no potential need be applied to the several primary deflection elements **401**. It is to be noted in the case of Figure 4 that the adjacent primary deflection elements may be spaced very closely together and that, although normal incidence of the electron stream is prevented from occurring, yet color purity and maximum resolution are enjoyed. By virtue of simplicity of construction, the embodiment shown in Figure 4 may well lend itself to the least costly manufacture of the entire number of embodiments presented.

It will of course be understood that the embodiments shown and described in Figure 3 and the discussion relating thereto are equally suitable for employment in aluminized tubes, so long as the primary deflection element structure is insulated from the aluminized facing.

Since polished nickel and certain crystalline substances possess electron reflective properties, primary deflection elements **300** of Figure 3 may be composed of one of such substances in lieu of a negative voltage otherwise being applied thereto.

While particular embodiments of the present invention have been shown and described, it will be obvious to those skilled in the art that changes and modifications may be made without departing from this invention in its broader aspects, and, therefore, the aim in the appended claims is to cover all such changes and modifications as fall within the true spirit and scope of this invention.

I claim:

1. In combination, a screen structure and a face plate associated therewith for employment in a two-color cathode ray tube provided with two electron guns the electron paths from which approach said face plate at oppositely inclined angles substantially removed from normal incidence; said screen structure comprising at least one set of parallel, equally spaced, strip elements, each being longitudinally positioned with a first edge thereof disposed normal to and in proximate relation with said face plate within said tube; first and second, differently colored, interlaced sets of parallel phosphor coating strips disposed upon said face plate so that each of at least half of the boundaries of adjacent, differently colored phosphor strips are disposed in proximate relationship with a corresponding strip element; and said strip elements each having a second edge vertically projecting a substantial height above said phosphor strips, said height being related to the surface dimensions of said phosphor strips such that said strip elements simultaneously provide a physical barrier to the impingement of electrons from each of said guns upon the phosphor strip set corresponding to the other of said guns and, further, aid in the impingement of electrons from each of said guns upon the phosphor strip set corresponding thereto.

2. Apparatus according to claim 1 in which said screen structure is negatively charged.

3. Apparatus according to claim 1 in which said strip elements are composed of an electron reflective substance.

4. Apparatus according to claim 2 in which a metallic coating is deposited over said phosphor strips and said screen structure is electrically insulated from said metallic coating.

5. Apparatus according to claim 2 in which said screen structure includes a second set of strip elements each being disposed half-way between adjacent strip elements of said one set, said second set of strips being longitudinally positioned with a first edge thereof disposed normal to and in proximate relation with said face plate, said second set of strip elements also being proximately disposed with respect to the remaining and corresponding boundaries between adjacent, differently colored, phosphor strips, and said second set of strip elements having a second edge vertically projecting a substantial height above said phosphor strips, said height of said second set being of the order of one-third of said height of said one set of strip elements.

6. Apparatus according to claim 5 in which metallic coating is deposited over said phosphor strips and said screen structure is electrically insulated from said metallic coating.

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