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2,847,602

VOLTAGE CONTROLLED EMISSION FROM A PHOSPHOR SCREEN

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FIG. 1

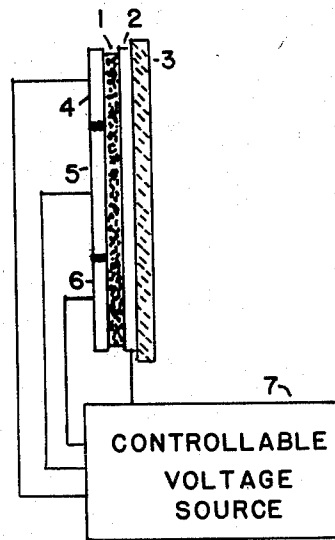


FIG. 2

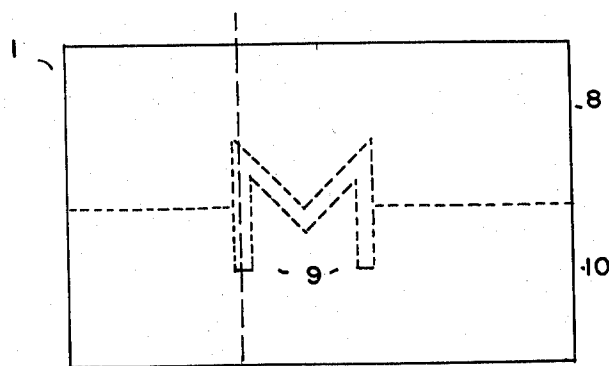


FIG. 1

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VOLTAGE CONTROLLED EMISSION FROM A PHOSPHOR SCREEN

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13 Claims. (Cl. 313-108)

This invention relates to controlling the color emission from a mixture of electroluminescent phosphors. In one of its aspects, the invention relates to effectively producing different luminescent color intensities to be emitted from each different kind of phosphor in intermixture at different potential levels so as to effect resultant color changing, and, in another of its aspects, the use thereof in resultant color emission in patterns and indicia in a luminescent display screen.

One object of my invention is to so control a luminescent screen, such as a phosphor screen, to make said screen luminesce in a selectable resultant color.

Another object of my invention is to selectively control a pattern or indicia of the phosphor screen of the invention so as to effect controllably changing patterns or indicia in changing resultant colors.

Another object of my invention is to provide an electroluminescent phosphor layer having the advantage of ease of arrangement of electroluminescent phosphors so as to effect a better control of resultant color selection.

In accordance with my invention, by way of example, I arrange different kinds of phosphor crystals, each kind emitting in a different color, in minute color spots or, when transparent, one above the other, so as to be effectively blended into a predetermined resultant color on application thereto of a predetermined voltage. Further, each different kind of phosphor crystal having a different rate of change of light output with every change of level of voltage applied thereto; so that in accordance with my invention I vary the resultant color produced in the phosphor layer by varying the voltage applied thereto.

The novel features that I consider characteristic of my invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and its method of operation together with additional objects and advantages thereof, will best be understood from the following description of specific embodiments when read in connection with the accompanying drawing, in which one mode of the invention is schematically illustrated in Figure 1, and a front view thereof in Fig. 2.

The materials and techniques which can be applied to the practice of my invention are disclosed, by way of example, in Patent No. 2,698,915, and, in article entitled "Electroluminescence and related topics" in "Proceedings of the I. R. E.," vol. 43, No. 12, December 1955, pages 1911-1940 and in particular page 1920.

Referring to Figures 1 and 2 to describe an example of a mode of the invention, the layer of phosphors 1 is an intermixture of, preferably, different kinds of transparent electroluminescent phosphors known to the art; one said kind emitting in blue (or green) for example ZnS:Cu, and one kind emitting in yellow for example ZnS:Mn; in which an increase in applied voltage favors the yellow Mn emission at the expense of the blue (or green) Cu emission. In other words, the brightness of ZnS:Mn, the yellow emitting phosphor, increases faster as the voltage is increased than does that of ZnS:Cu, the

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blue (or green) emitting phosphor. The said layer of phosphors 1 can be, for example, constructed to emit luminescence when subjected to between 120 and 600 volts.

The said phosphor layer 1 is sandwiched between transparent conductive layer 2 on glass support 3, and, the conductive layers 4, 5 and 6. Each of said conductive layers 4, 5 and 6 are energized by a different potential from source 7 which when impressed on each of their respective parts of the luminescent phosphor screen 8, 9 and 10, respectively, would cause each said part to luminesce in a different resultant color so as to produce the letter M. Then on changing the voltage applied to each electrode 4, 5 and 7 to one level from source 7, the parts of the luminescent phosphor screen 8, 9 and 10 are caused to emit in one resultant color thereby causing the letter M to be erased.

In operation, the different levels of voltage are transmitted from source 7 to be applied to each conductive layer 4, 5 and 6 separately, and, voltage in another level is transmitted from source 7 to be applied to the transparent conductive layer 2 so as to effect potential differences between the transparent conductive layer 2 and the conductive layers 4, 5 and 6 sufficient to cause the electroluminescent phosphor layer 1 to luminesce so as to cause the letter M to be produced in one resultant color, and, each of the parts of the phosphor layer 8 and 10 to be produced in other and different resultant colors. Whereby on equalizing the level of each of the voltages applied to the conductive layers 4, 5 and 6 the electroluminescent phosphor screen is caused to emit in one resultant color whereby erasing the letter M.

While I have shown and described a certain specific embodiment of my invention, many modifications thereof are possible. My invention, therefore, is not to be restricted except as necessitated by the prior art.

I claim:

1. Electroluminescent display device for producing changing resultant colors comprising electroluminescent phosphor layer having arranged therein different kinds of phosphors, each said kind emitting in a different luminosity for each change of potential difference applied thereto, each said kind emitting in a different color, and each said kind arranged in the layer so that on being subjected to a potential difference the emitted different colors therefrom are capable of being combined in the additive process; said layer of phosphors having an electrode at each side thereof at least one electrode being transparent; and a source of controllable voltage arranged to apply different potentials to said electrodes.

2. The electroluminescent display device of claim 1 in which at least one kind of the different kinds of phosphors is transparent.

3. The electroluminescent display device of claim 1 in which the different kinds of phosphors are arranged in minute spots in accordance with the additive process.

4. Electroluminescent display device for producing a resultant color pattern or indicia comprising electroluminescent phosphor layer having arranged therein different kinds of phosphors, each said kind emitting in a different luminosity for each change of potential difference applied thereto, each said kind emitting in a different color, and each said kind arranged in the layer so that on being subjected to a potential difference the emitted different colors therefrom are capable of being combined in the additive process; said layer of phosphors having at least one electrode on one side thereof and a series of electrodes on the other side thereof; each electrode of said series of electrodes being insulated from at least one of the other electrodes in said series of electrodes and shaped to a predetermined pattern; and means

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for controllably and selectively applying different potentials to at least two electrodes simultaneously, each different potential to at least one of the said series of electrodes.

5. The apparatus of claim 4 in which the electroluminescent phosphor layer has at least one kind of phosphors transparent to light rays.

6. The electroluminescent display device of claim 4 for producing changing patterns of resultant colors and means for selectively changing the potential differences between each of the said series of electrodes and each of the said at least one electrode.

7. Electroluminescent display device for producing a resultant color pattern or indicia comprising electroluminescent phosphor layer having arranged therein different kinds of phosphors, each said kind emitting in a different luminosity for each change of potential difference applied thereto, each said kind emitting in a different color, and each said kind arranged in the layer so that on being subjected to a potential difference the emitted different colors therefrom are capable of being combined in the additive process; at least one electrode on one side of said layer, and at least two electrodes on the other side of said layer electrically insulated from each other and each of the layers being in a predetermined shape; and a means for separately and simultaneously applying a different potential to each of two of said at least two electrodes.

8. The electroluminescent display device of claim 7 for producing changing patterns of resultant colors and means for selectively changing the potential differences between each of the said at least two electrodes and each of the said at least one electrode.

9. The electroluminescent display device of claim 7 in which the electroluminescent phosphor layer has at least one kind of phosphors transparent to light rays.

10. The electroluminescent device of claim 7 in which

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the different kinds of phosphors in the electroluminescent phosphor layer are arranged in minute spots in accordance with the additive process.

11. Electroluminescent display device for producing a resultant color pattern or indicia comprising different kinds of phosphors in a layer, each said kind emitting in a different luminosity for each change of potential difference applied thereto, each said kind emitting in a different color, and each said kind arranged in the layer so as to be capable of being additively combined in the additive process on emitting different colors on being subjected to a potential difference; means for applying and controllably varying the potential difference to the phosphor layer so as to produce changing resultant colors.

12. The electroluminescent display device of claim 11 in which the means for applying and controllably varying the potential difference applies potential differences to selected parts of the phosphor layer whereby forming a pattern of changing resultant colors.

13. The electroluminescent display device of claim 11 in which the means for applying and controllably varying the potential difference applies controlled varying potential differences to selected parts of the phosphor layer whereby producing changing patterns of resultant colors.

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