United States Patent

Souri

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[45] **July 18, 1972**

[54] MULTI-COLOR PLASMA DISPLAY PANEL

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[30] **Foreign Application Priority Data**

Nov. 29, 1969 Japan.....44/95381

[52] **U.S. Cl.**.....**313/201,** 313/210, 313/217, 313/220, 313/226

[51] **Int. Cl.**.....**H01j 11/02,** H01j 61/30, H01j 65/00

[58] **Field of Search**.....315/167, 169 R, 169 TV, 84.6, 315/260, 235, 240; 340/166 EL, 166 R; 313/201, 210, 217, 220, 226

[56] **References Cited**

UNITED STATES PATENTS

3,013,182	12/1961	Russell	317/169 TV
3,509,407	4/1970	Cullis, Jr.	315/169 TV

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[57] **ABSTRACT**

In a plasma display panel comprising a center glass plate having plurality of openings each containing luminous gas, a pair of outer glass walls on the opposite sides of the center glass plate for sealing the gas and a plurality of electrodes on the outer surfaces of the outer glass walls for exciting the luminous gas, the openings are in the form of blind openings opened on the opposite surfaces of the center glass plates and are sealed with gasses of different discharge colors, thus providing a multi-color display panel.

3 Claims, 5 Drawing Figures

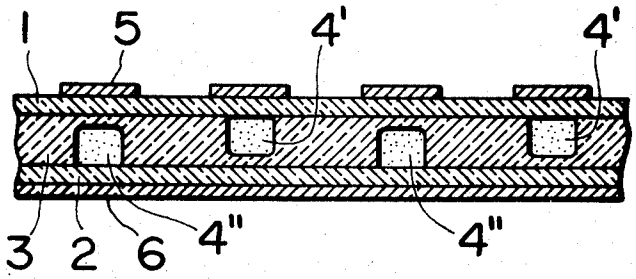


FIG. 1
PRIOR ART

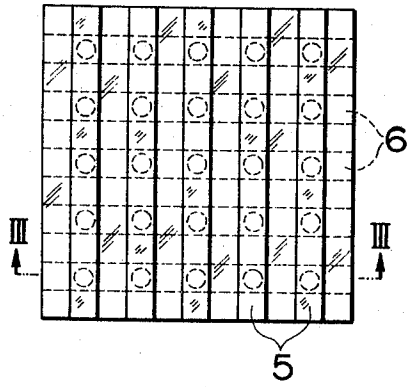


FIG. 2
PRIOR ART

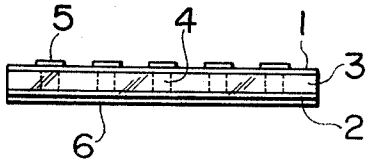


FIG. 3
PRIOR ART

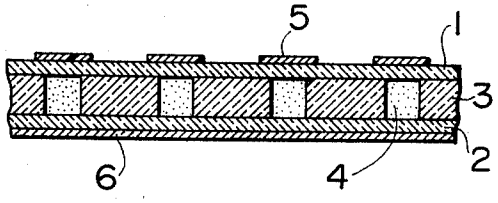


FIG. 4

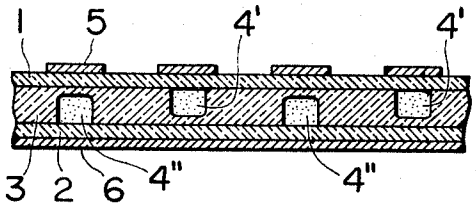
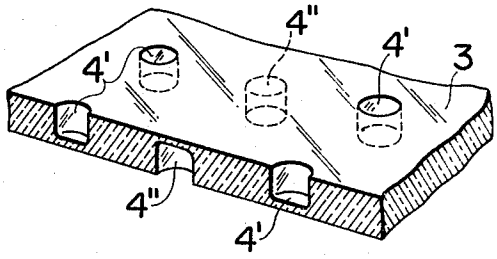


FIG. 5



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MULTI-COLOR PLASMA DISPLAY PANEL

BACKGROUND OF THE INVENTION

This invention relates to a multi-color plasma display panel utilizing two types of gasses of different discharge colors for providing multi-color displays.

As shown in FIGS. 1 to 3, a prior art plasma display panel comprises a pair of outer glass walls 1 and 2 sandwiching a center glass 3 provided with a plurality of regularly arranged through openings 4. Outer walls 1 and 2 are sealed to both surfaces of glass plate 3, and openings 4 are filled with a discharge gas. A plurality of parallel transparent electrodes 5 are secured on the upper surface of glass plate 1 whereas a plurality of parallel transparent electrodes 6 are secured to the lower surface of glass plate 2 at right angles with respect to electrodes 5 to cross therewith at the locations of openings 4. With this construction it is possible to selectively luminesce a particular gas filled opening 4 or gas cell by applying suitable voltage across electrodes 5 and 6 which are arranged in a matrix. Such a plasma display panel is characterized in that it can act as a memory, has high brightness, consumes small power, has long life and can be fabricated to have small weight. However, it has been impossible to obtain a multi-color display panel.

SUMMARY OF THE INVENTION

It is therefore an object of this invention to provide a multi-color plasma display panel of simple construction.

In accordance with this invention there is provided a multi-color plasma display panel comprising a center glass plate having a plurality of blind small openings which are formed from opposite surfaces of the center glass plate, the openings opening on different sides of the center glass plate being sealed with gasses of different discharge colors, outer glass walls on the opposite sides of the center glass plate to seal the openings, and a plurality of electrodes on the outer sides of the outer glass walls for causing the gasses to luminesce. Each group of electrodes on each side are disposed in parallel, and respective groups of electrodes are disposed at right angles to form a matrix. The openings are disposed at respective crossings between respective groups of electrodes.

BRIEF DESCRIPTION OF THE DRAWING

The invention can be more fully understood from the following description taken in conjunction with the accompanying drawing in which:

FIG. 1 shows a plan view of a prior art plasma display panel;

FIG. 2 is a side elevation of the panel shown in FIG. 1;

FIG. 3 is a sectional view of the panel taken along a line III—III in FIG. 1;

FIG. 4 shows a similar sectional view of one embodiment of this invention and

FIG. 5 is a partial perspective view of a center glass plate.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the embodiment of this invention shown in FIGS. 4 and 5 portions corresponding to those shown in FIGS. 1 and 3 are designated by the same reference numerals. According to this

invention blind openings 4' and 4'' are alternately formed in center plates 3 from opposite surfaces and gasses of different discharge colors are sealed in these openings. More particularly after forming openings 4' and 4'' by etching, for example, a gas of one discharge color is admitted in openings on one side, for example 4' which are then sealed by outer glass wall 1. After removing residual gas in the other openings 4'' another gas of different discharge color is admitted therein and sealed by outer glass wall 2. Transparent electrodes 5 and 6 are arranged in a matrix in the same manner as those shown in FIGS. 1 to 3. Minimum diameter of bottomed openings 4' and 4'' is about 0.15 mm, for example. Neon, helium nitrogen and the like may be used as the luminous gasses.

When a transparent electrode 5 and a transparent electrode 6 are energized the gas in the opening at the crossing of these energized electrodes luminesces to emanate monochromatic light. When two or more electrodes 5 and 6 are selectively energized the light emanated from each blind opening is monochromatic so that the viewer sees a resultant color made up of of different monochromatic lights of different colors. Thus it is possible to display three types of multi-colors.

Alternately, a plurality of blind openings 4' or 4'' or 4' and 4'' may be provided at each crossing between transparent electrodes 5 and 6. Further, it is to be understood that the number of openings at respective crossings may not always be equal, and that transparent electrodes on one side may be opague.

Thus, this invention provides a novel multi-color plasma display panel of simple construction. When the electrodes are suitably arranged it is possible to address the bits with an electron beam. Moreover, as blind openings are formed on the opposite sides of the center glass plate, all openings on one side can be sealed with gas at a time thus greatly simplifying the fabrication.

While the invention has been described in terms of a preferred embodiment it will be clear that many changes and modifications may be made without departing from the true spirit and scope of the invention as defined in the appended claims.

What is claimed is:

1. A multi-color plasma display panel comprising a center glass plate having a plurality of blind small openings which are formed from opposite surfaces of said center glass plate, said openings opening on different sides of said center glass plate being sealed with gasses of different discharge colors, outer glass walls on the opposite side of said center glass plate to seal said openings, and transparent electrodes on the outer sides of said outer glass walls for causing said gasses to luminesce.

2. The multi-color plasma display panel according to claim 1 wherein one group of said electrodes on one side are disposed in parallel to each other and the other group of said electrodes on the other side are also disposed in parallel to each other and at right angles with respect to said electrodes on said one side thus forming a matrix and said blind openings are respectively formed at respective crossings between said two groups of electrodes.

3. The multi-color plasma display panel according to claim 1 wherein a plurality of said openings are formed at each one of said crossings.

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