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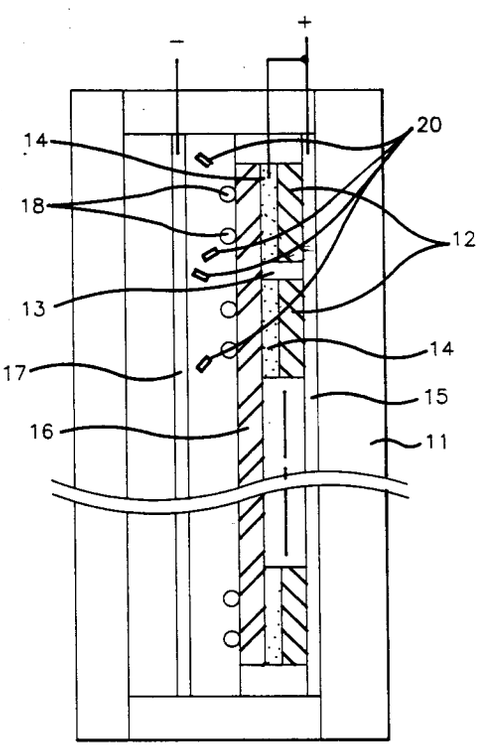
(54) Flat picture tube.

(57) A flat picture tube is disclosed which includes a heater for emitting thermions; a plurality of anodes extending vertically and arranged by a predetermined interval for absorbing the thermions; a plurality of phosphors arranged in a matrix form on the plurality of anodes and becoming luminous by the thermions absorbed to the anodes; and a plurality of grids extending horizontally and arranged by a predetermined interval for controlling the thermions to be absorbed to the anodes, thereby reducing the volume and power consumption.

FIG.2



EP 0 680 068 A1

Background of the Invention

The present invention relates to a picture tube for projecting an image, and more particularly, to a flat picture tube.

Generally, in projecting an image, a cathode ray tube makes a phosphor luminous by using thermions to be emitted.

Fig. 1 illustrates a conventional color cathode ray tube.

Referring to Fig. 1, there are comprised of an electron gun 1, deflection yokes 3 and 4, a shadow mask 6, a phosphorous surface 5, and a high-voltage power supply 7.

Electron gun 1, made up of three red, green and blue electron guns, emits red, green and blue electron beams 8. Deflection yokes 3 and 4 converge red, green and blue electron beams 8 onto one point of shadow mask 6.

Shadow mask 6, formed with a plurality of holes on the inner surface of phosphorous surface 5, passes electron beams 8 emitted from electron gun 1 through one hole, and emits them onto phosphorous surface 5.

Phosphorous surface 5 is made in such a manner that red, green and blue phosphors are coated uniformly on a glass surface 2. Electron beams 8 passing shadow mask 6 make the phosphorous surface luminous.

High-voltage power supply 7 absorbs the electrons used in luminance on phosphorous surface 5, and supplies a high-voltage power to electron gun 1.

When the high-voltage power is fed from high-voltage power supply 7, the red, green and blue electron guns heat a built-in heater (not shown) to emit thermions. The emitted thermions are then controlled by a plurality of grids (not shown), and emitted as electron beams 8.

Red, green and blue electron beams 8 emitted from the red, green and blue electron guns converge onto one hole of shadow mask 6 by deflection yokes 3 and 4, and pass therethrough.

The red, green and blue electron beams 8 passing through one hole of shadow mask 6 collide with the red, green and blue phosphors of phosphorous surface 5 so as to make them luminous.

However, in the conventional color cathode ray tube, electron gun 1 for emitting electron beams 8, and deflection yokes 3 and 4 are essential to increase the volume. In addition, a high-voltage power must be supplied for the emission of electron beams 8, raising power consumption.

Summary of the Invention

Therefore, it is an object of the present invention to provide a flat picture tube in which an electron gun and deflection yoke are removed to reduce the volume and power consumption.

To accomplish the object of the present invention, there is provided a flat picture tube comprising a heater for emitting thermions; a plurality of anodes extending vertically and arranged by a predetermined interval for absorbing the thermions; a plurality of phosphors arranged in a matrix form on the plurality of anodes and becoming luminous by the thermions absorbed to the anodes; and a plurality of grids extending horizontally and arranged by a predetermined interval for controlling the thermions to be absorbed to the anodes

Brief Description of the Attached Drawings

Fig. 1 illustrates a conventional color cathode ray tube;

Fig. 2 is a side sectional view of a flat picture tube of the present invention;

Fig. 3 is a front view of the flat picture tube of the present invention;

Fig. 4 is a diagram of an operation state of the flat picture tube of the present invention;

Fig. 5 is a diagram of input signal waveforms of the grid electrode of the present invention;

Fig. 6 is a diagram of input signal waveforms of the anode electrode of the present invention; and

Fig. 7 illustrates another embodiment of the flat picture tube of the present invention.

Detailed Description of the Invention

Hereinafter, preferred embodiments of the present invention will be described with reference to the attached drawings.

Referring to Figs. 2 and 3, there are provided a heater 17, a plurality of anodes 15, phosphors 12, a plurality of grids 18, and a plurality of targets 20.

Heater 17 is to emit thermions, being composed of 40 vertical heater lines H1-H40 in order to uniformly distribute the thermions. The distance between lines is about 10mm.

The power supplied to heater 17 is available from 3V to 250V for both DC and AC, not requiring a high-voltage power.

Anodes 15 are to absorb the thermions emitted from heater 17 for luminance. Positive power is supplied thereto. The anodes are made so that they extend vertically and are coated with vertical transparent metal lines by predetermined intervals on a plane glass surface 11.

A black dielectric 19 is formed between anodes 15 of vertical transparent metal lines for the purpose of electric dielectric. The width of the vertical transparent metal lines, that is, anodes 15, is 0.11mm. The width of black dielectric 19 between

anodes 15 is 0.08mm.

For instance, for a 19-inch picture tube, anodes 15 are made up of 2100 vertical transparent metal lines, increasing the resolution, as compared with that of a conventional picture tube of 600 lines.

Phosphor 12 is arranged in a matrix form on anodes 15, and becomes luminous by the thermions absorbed by anodes 15. The phosphor is made in a manner that red, green and blue phosphors are alternately printed horizontally by using a silk screen. Here, in order to form phosphor 12 as many as the number of grids 18, that is, the number of vertical scan lines, vertically, black dielectric 13 is arranged by predetermined intervals. The black dielectric is for light insulation.

For instance, for the 19-inch picture tube, phosphor 12 is formed by 0.46mm vertically, with black dielectric 13 being formed by 0.11mm. The number of vertical scan lines is predetermined by a broadcasting station. In the NTSC method, it is 525.

An aluminum layer is deposited on the red, green and blue phosphors to form a metal back 14. An dielectric screen 16 is attached to metal back 14.

Grid 18 is installed on dielectric screen 16 to thereby control the thermions emitted from heater 17 to be absorbed to anodes 15. The grid extends horizontally, and arranged by predetermined intervals.

Grid 18 is arranged as many as the number of the vertical scan lines, for instance, 525 (G1-G525), horizontally. They are arranged vertically by predetermined intervals, and attached to dielectric screen 16.

Targets 20 are installed on upper and lower ends of phosphor 12 between heater 17 and grid 18, that is, on black dielectric 13. Negative power is applied to the targets so that the thermions emitted from heater 17 are absorbed to phosphor 12 of corresponding anode 15, not being emitted to sides. For this reason, phosphor 12 becomes luminous. The number of targets 20 is twice the number of the vertical scan lines, that is, the number of grids 18.

The operation will be described with reference to Figs. 4, 5 and 6.

The red, green and blue phosphors of anode 15 operate as one, according to one anode input signal A1', A2',..., or A700', and grid input signal G1, G2,..., or G525.

For instance, when anode input signal A1' and grid input signal G1 both are positive and synchronized, the first red, green and blue phosphors become luminous. The brightness of the red, green and blue phosphors is controlled by an input image signal. Here, the thermions emitted from heater 17 are converged to the respective phosphors 12 by target 20 to which negative power is applied, and then incident on anode 15 according to synchronized anode 15 and grid 18.

This operation will be explained in the case of the 19-inch flat picture tube.

525 grid input signals G1, G2, G3,..., and G525 stay HIGH for 59μs sequentially for one period of a vertical sync signal VS. Anode input signals A1', A2',... and A700' stay HIGH for 75ns sequentially for one period of a horizontal sync signal HS. Here, red, green and blue phosphors in which the grid input signal and anode input signal both are HIGH, become luminous. According to horizontal sync signal HS and vertical sync signal VS, the red, green and blue phosphors become luminous horizontally and sequentially, and then a next row of red, green and blue phosphors becomes luminous, making all of the phosphors of the flat picture tube luminous for one period of vertical sync signal VS.

Here, a grid input signal and anode input signal corresponding to a phosphor not to become luminous stay LOW. This state indicates a standby. The brightness of red, green and blue phosphors is determined by an input image signal.

Referring to Fig. 7, an electrode is connected to metal back 14, and is integrally formed with grid 18. By doing so, metal back 14 deposited on phosphor 14 can be used as grid, without the grid separately.

In other words, the electrode is connected to metal back 14 to control the thermions emitted from heater 17 to be absorbed to phosphor 12 of anode 15.

As described above, the present invention operates in a matrix digital method, not requiring an electron gun and deflection yoke. This reduces the volume. For a 20-inch picture tube, the thickness is 4cm at maximum so that the picture tube can be used as wallmounted TV. In addition, the present invention does not need a high-voltage power supply, reducing power consumption. For a 19-inch color picture tube, the number of horizontal lines is 2100, increasing the resolution, as compared with 600 lines in the conventional color cathode ray tube.

Claims

1. A flat picture tube comprising:

a heater for emitting thermions;

a plurality of anodes extending vertically and arranged by a predetermined interval for absorbing the thermions;

a plurality of phosphors arranged in a matrix form on said plurality of anodes and becoming luminous by the thermions absorbed to said anodes; and

a plurality of grids extending horizontally

and arranged by a predetermined interval for controlling the thermions to be absorbed to said anodes.

2. A flat picture tube as claimed in claim 1, wherein a metal back is formed between said grid and phosphor.

3. A flat picture tube as claimed in claim 1, further comprising a plurality of targets installed on the upper and lower ends of said plurality of phosphors between said heater and grid so as not to emit the thermions emitted from said heater to sides.

4. A flat picture tube as claimed in claim 2, wherein a dielectric screen is attached between said grid and metal back.

5. A flat picture tube as claimed in claim 2, wherein an aluminum layer is deposited to form said metal back.

6. A flat picture tube as claimed in claim 1, wherein said heater is made up of 40 vertical heater lines.

7. A flat picture tube as claimed in claim 1, wherein said anodes are made up of vertical transparent metal lines extending vertically and coated by a predetermined interval on a plane glass surface.

8. A flat picture tube as claimed in claim 1, wherein black dielectrics are arranged vertically by a predetermined interval in order to dispose said phosphors in a matrix form.

9. A flat picture tube as claimed in claim 1, wherein said phosphors are made up of the same number as that of said grids vertically.

10. A flat picture tube as claimed in claim 1, wherein said phosphors are made in a manner that red, green and blue phosphors are sequentially and horizontally printed on said plurality of anodes.

11. A flat picture tube as claimed in claim 1, wherein said grids are made up of the same number as that of vertical scan lines.

12. A flat picture tube as claimed in claim 3, wherein said targets are made up of twice the number of said grids.

13. A flat picture tube as claimed in claims 3 and 8, wherein said targets are installed on said black dielectrics.

14. A flat picture tube as claimed in claim 6, wherein said vertical heater lines are formed by the interval of 10mm.

15. A flat picture tube as claimed in claim 7, wherein a black dielectric is formed between said vertical transparent metal lines.

16. A flat picture tube as claimed in claim 7, wherein said vertical transparent metal line is 0.11mm in width.

17. A flat picture tube as claimed in claim 7, wherein said vertical transparent metal lines are coated by the interval of 0.08mm.

18. A flat picture tube as claimed in claim 8, wherein black dielectrics are arranged by a predetermined interval so that said phosphors are the same number as that of vertical scan lines.

FIG.1
PRIOR ART

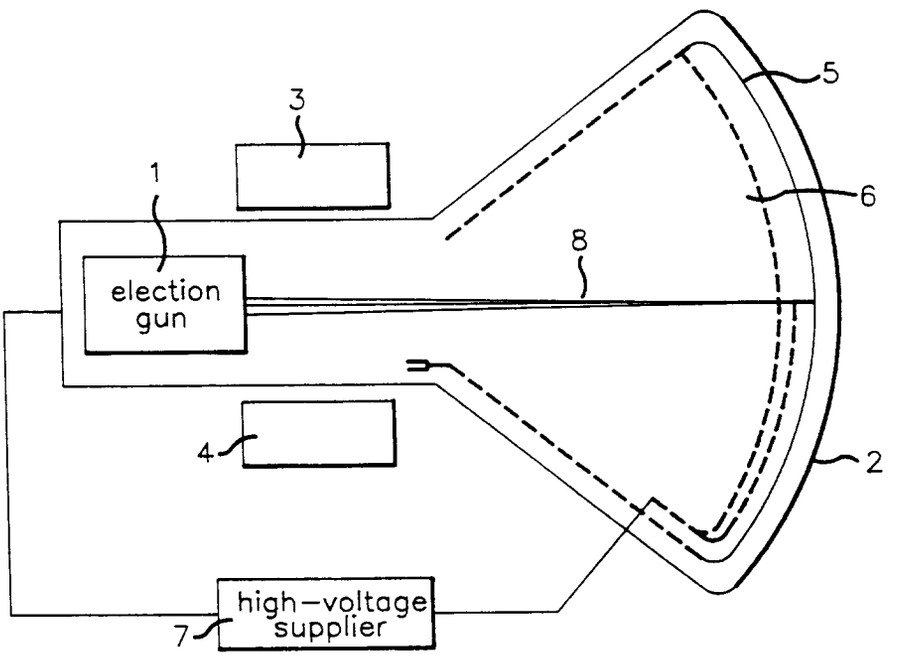


FIG.2

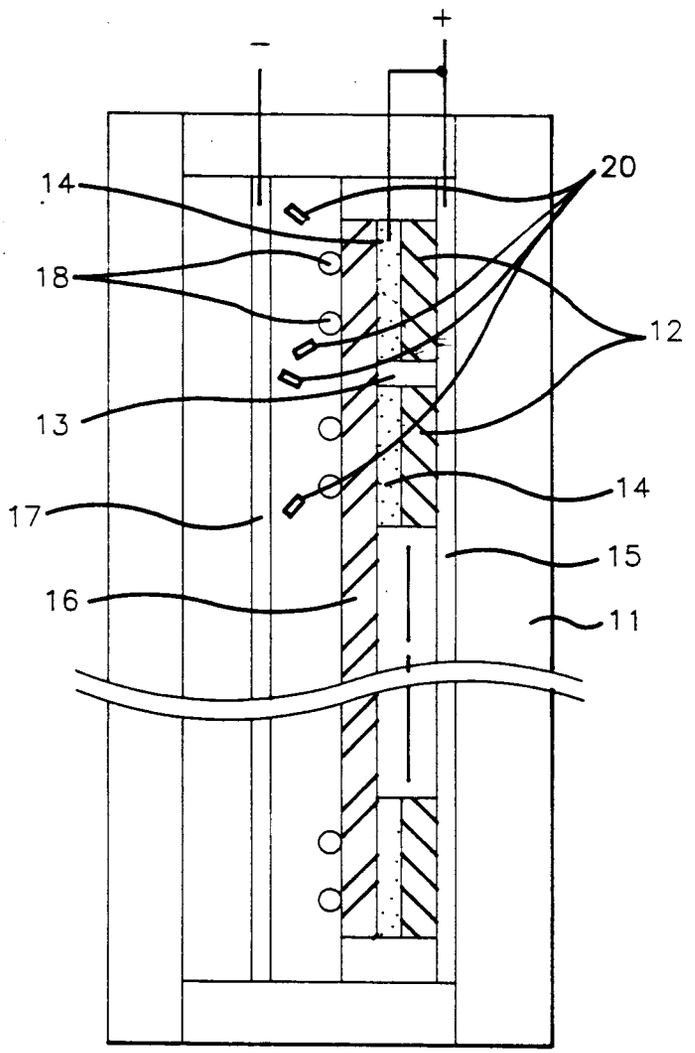


FIG.3

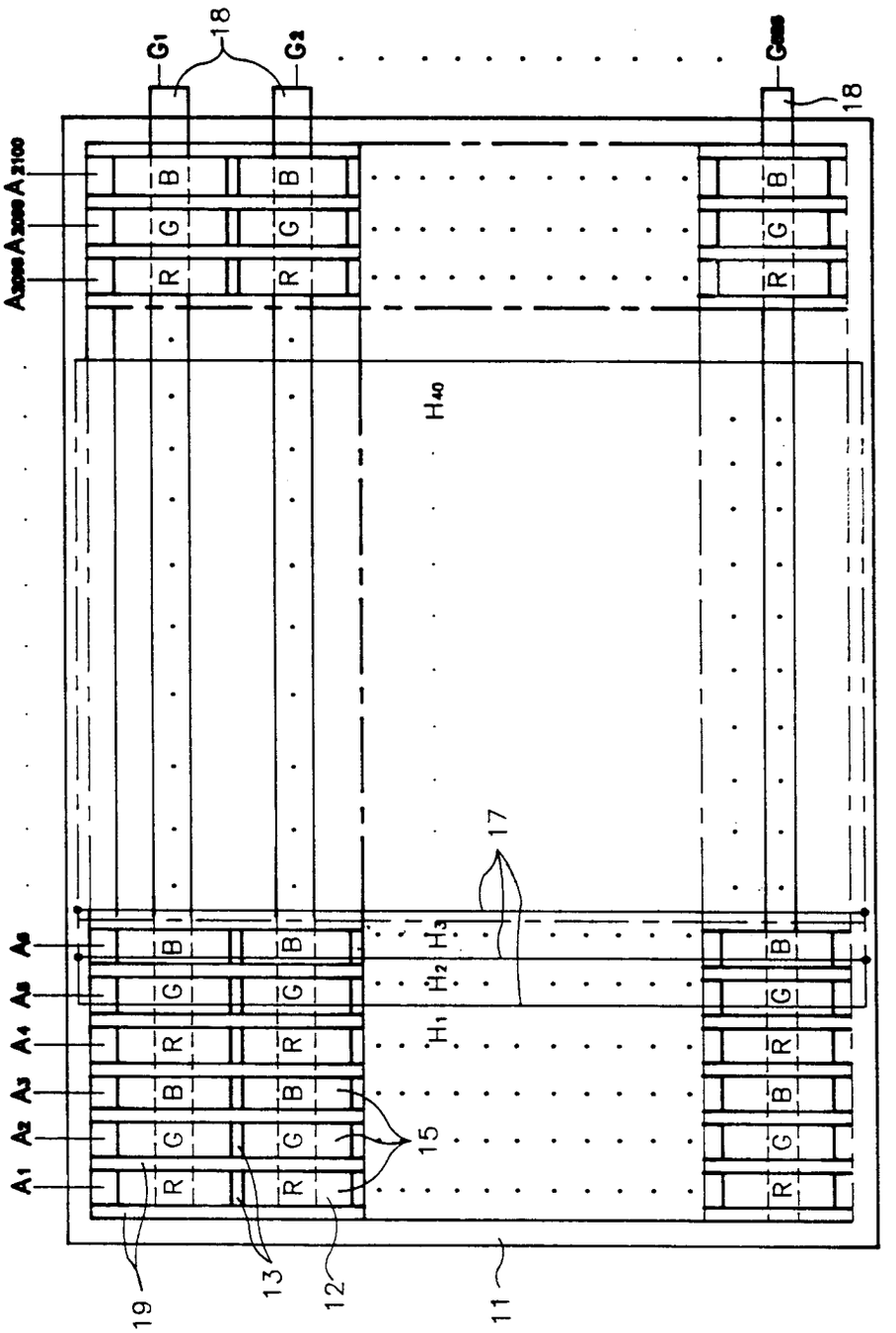


FIG.4

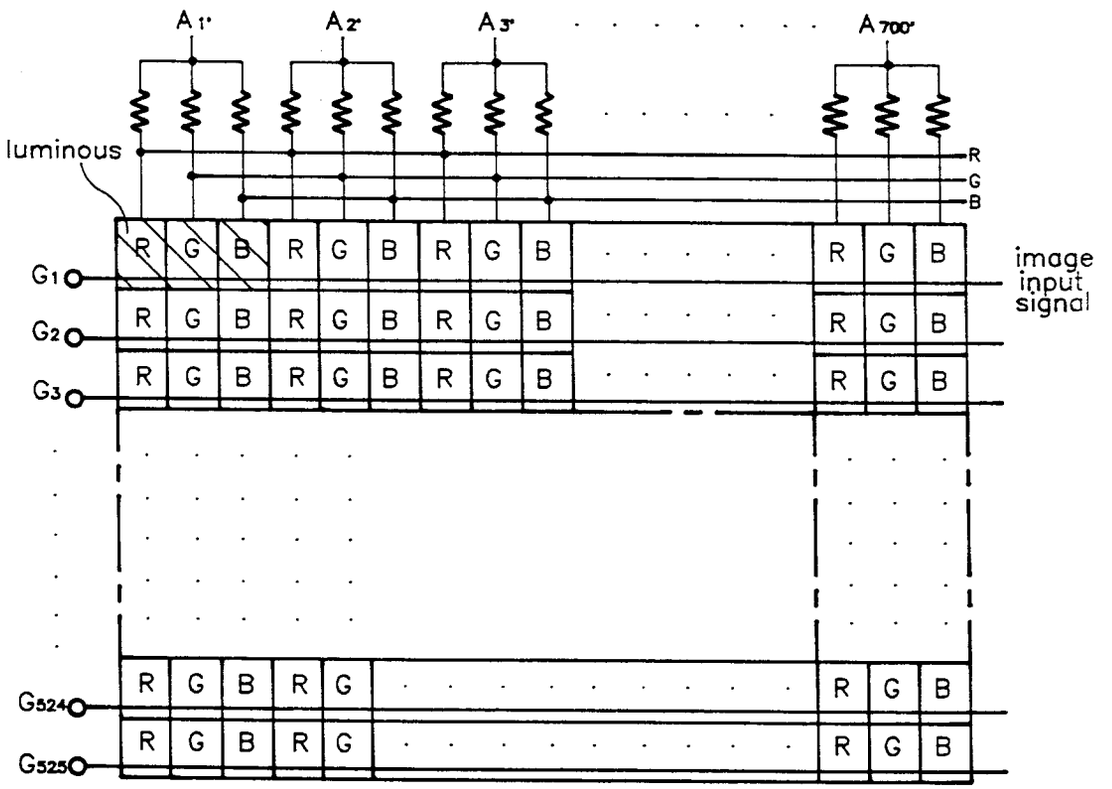

A1'
A2'
A3'
A700'
luminous
R
G
B
G1
G2
G3
G524
G525
image input signal

FIG.5

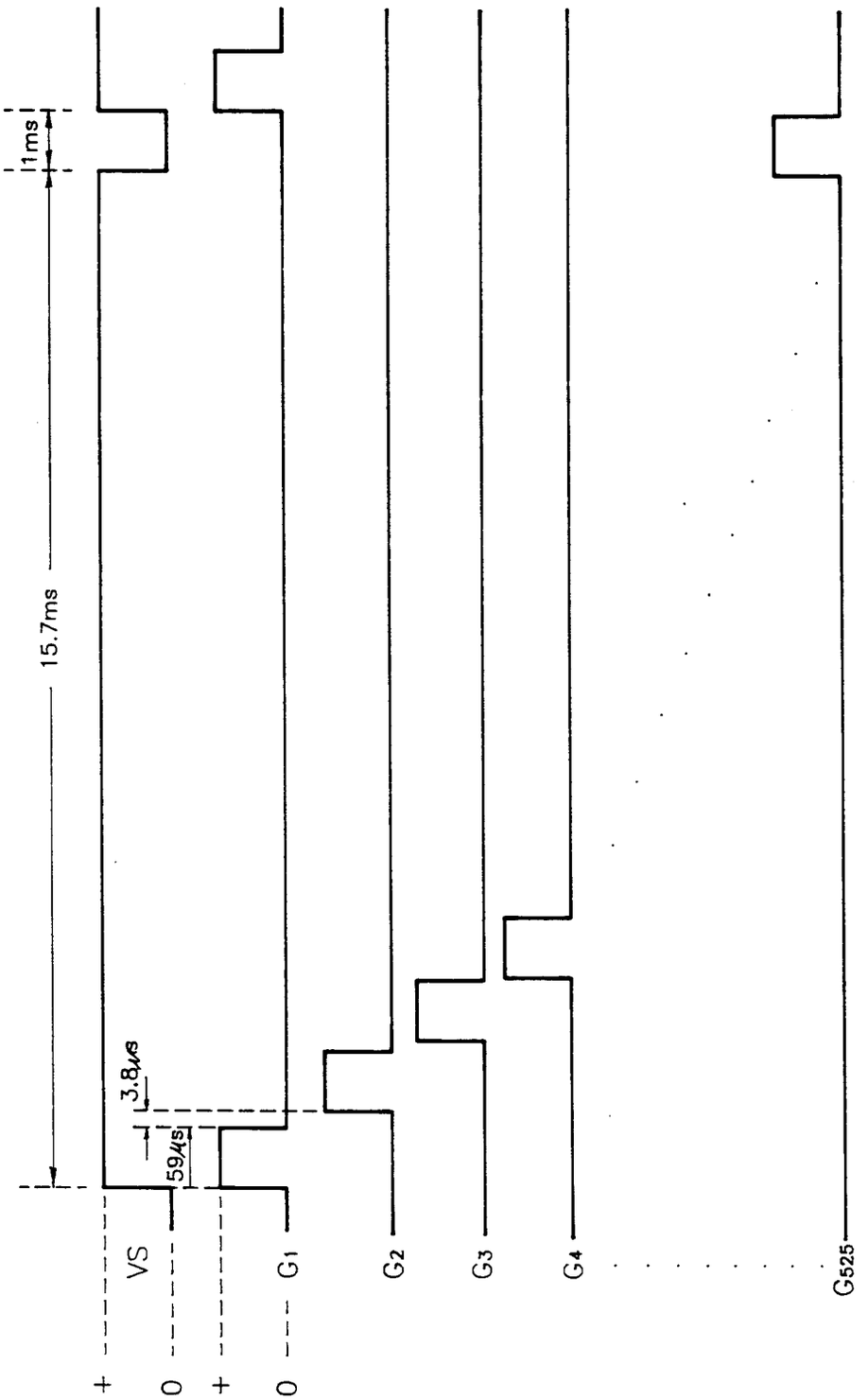


FIG.6

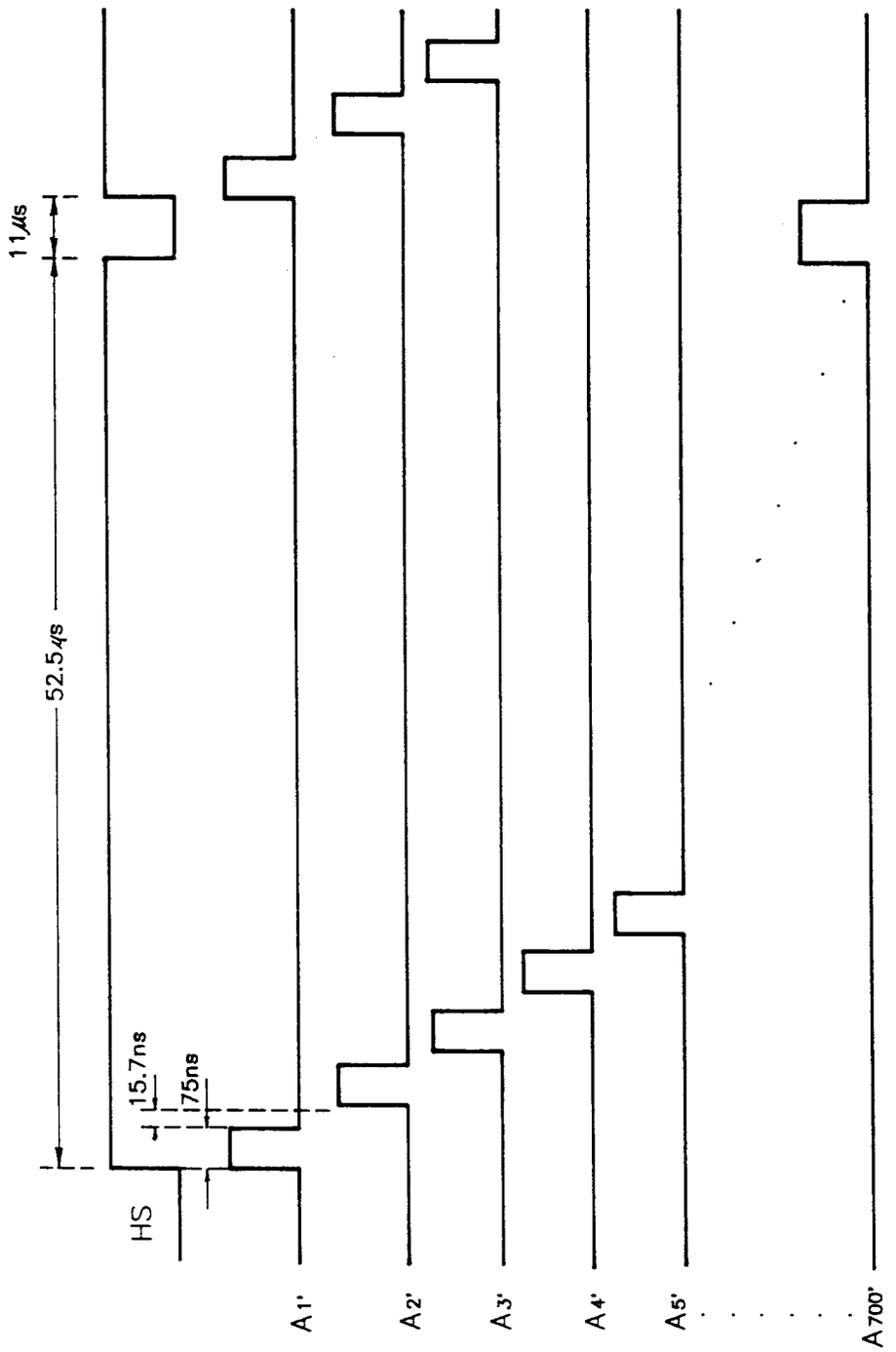
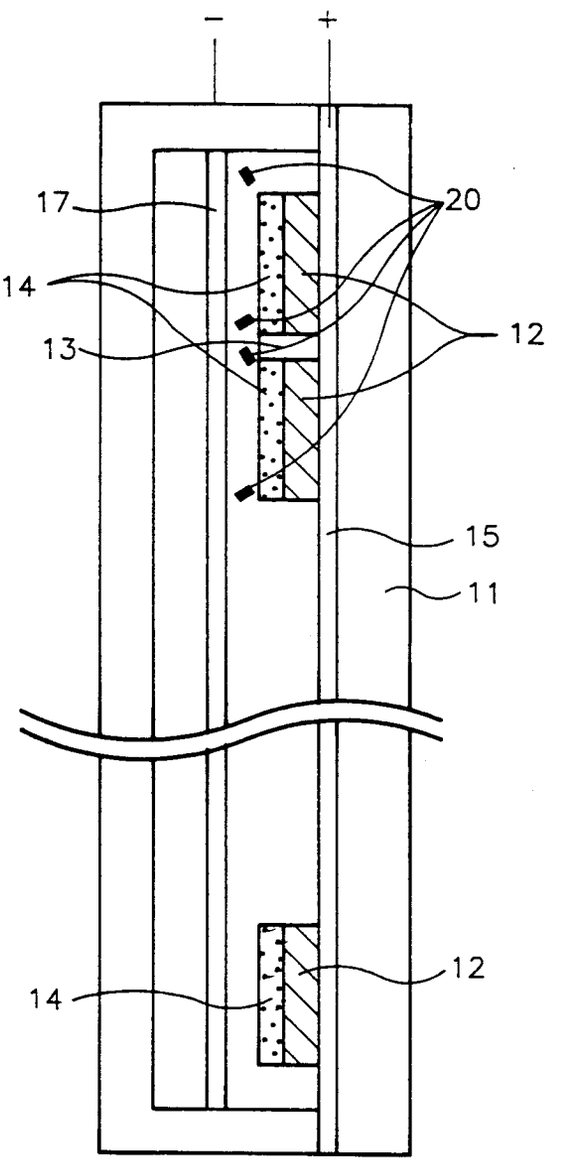


FIG.7



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EUROPEAN SEARCH REPORT

Application Number
EP 95 10 4749

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	DE-A-36 13 716 (FUTABA DENSHI KOGYO KK) 30 October 1986 * claim 1; figures 1,5 * * page 12, line 7 - line 8 * * page 12, line 19 - line 23 * * page 13, line 6 - line 9 *	1,8	H01J31/15 H01J31/12
Y		3,6,7, 9-12, 14-17	

Y	US-A-3 176 184 (HOPKINS ET AL.) * figures *	3,6,7, 9-12, 14-17	

X	GB-A-2 110 466 (FUTABA DENSHI KOGYO KK) 15 June 1983 * figures * * page 1, line 17 - line 29 *	1	

A	PATENT ABSTRACTS OF JAPAN vol. 010 no. 376 (E-464) ,13 December 1986 & JP-A-61 168844 (MATSUSHITA ELECTRIC IND CO LTD) 30 July 1986, * abstract *	8	TECHNICAL FIELDS SEARCHED (Int.Cl.6) H01J

A	PATENT ABSTRACTS OF JAPAN vol. 009 no. 159 (E-326) ,4 July 1985 & JP-A-60 037636 (ISE DENSHI KOGYO KK) 27 February 1985, * abstract *	2	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	18 July 1995	Colvin, G

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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