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(54) Cathode ray tube storage device with an electroluminescent display panel.

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Page 30—page 31 right-hand column, paragraph "Memory effects" to page 33; Figures 1, 5 to 7

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Cathode ray tube storage device with an electroluminescent display panel

The invention relates to a cathode ray tube storage device having a display panel for producing a visible image corresponding to a charge pattern written on the panel by an electron gun within the tube. The invention relates in particular to such a storage device in which the display panel includes an electroluminescent layer which, in the presence of an a.c. sustaining field, can be activated to produce said visible image.

The information content required for computer displays is often large, and accordingly, conventional cathode ray tubes require a large store as a refresh buffer, which is costly. For instance, to display 8000 characters of text, a refresh buffer of 5×10^5 bits capacity is required. Thus the use of storage cathode ray tube devices with inherent internal memory provide an attractive alternative computer display.

U.S. Patent No. 3,796,909 to Change et al describes bistable storage CRT device which utilises an a.c. field-sensitive electroluminescent material as the display medium. In this device a charge pattern is written on an electroluminescent target layer by a "writing" electron beam. This charge pattern is maintained or stored by a "flood" electron beam via a secondary electron emission process. An a.c. potential is applied to the electroluminescent target via a transparent electrode on the faceplate. The a.c. potential produces an a.c. field in the electroluminescent target only in the region where its inner surface is maintained at a fixed collector potential by the flood electron beam thereby exciting the material to electroluminescence in these regions. Thus, the electroluminescent image is generated corresponding to a stored charged pattern. Apart from the need for a flood-gun, a major drawback of this device is that much of the flood beam energy is dissipated from the faceplate as heat. Moreover, since the device exhibits bistability only, that is the electroluminescent screen is either on or off, the usefulness of the display is limited. For example, in many display applications such as business graphing matrix displays and text editing displays, it is desirable to have multilevel intensities (brightness) so that images of grey scale and intensity modulation can be displayed.

U.K. Patent No. 1,057,972 to Hughes Aircraft Company describes a storage CRT device incorporating a target structure consisting of a layer of electroluminescent material overlaid by a d.c. biased field sustained conductivity material. The conductivity of this latter material is selectively changed by radiation with the CRT electron beam causing an increased voltage drop across corresponding regions of the electroluminescent material which is stimulated to emit light. The induced conductivity is a function of electron beam current and the

device can be used to display varying shades of grey.

An article entitled "Memory Effect in EL Devices Points to New Usages" by Inoguchi, Suzuki and Mito in Journal of Electronic Engineering No. 118, October 1976 describes a flat display panel incorporating an electroluminescent layer exhibiting hysteresis loop characteristics. Picture elements on the panel are individually addressed by matrix array of orthogonal conductors and the hysteresis loop characteristics of the material are exploited to obtain a memory effect.

The present invention provides a cathode ray tube storage device including a display panel incorporating a layer of insulated electroluminescent material, means for applying an alternating voltage of predetermined magnitude across said electroluminescent layer, an electron gun operable to selectively write a charge pattern on the display panel and means operable to control the intensity of the electron beam radiation during writing of said charge pattern. The invention is characterised in that the electroluminescent material is of the type exhibiting hysteresis loop characteristics such that a plurality of different light emitting stable states exist for the material in the presence of the applied alternating voltage of said predetermined magnitude, each stable state being individually selectable in response to radiation of said material by said electron beam, the intensity of light emission from the material in each said selected state increasing progressively from state to state with increasing intensity of the electron beam radiation, the arrangement being such that visual images having multiple levels of light intensity can be produced in the electroluminescent layer by appropriate modulation of the intensity of said electron beam radiation.

The invention will now be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a cathode ray tube storage device according to the present invention;

Figure 2 shows the construction of one form of display panel suitable for use in the device shown in Figure 1 and which includes an electroluminescent layer which is directly activated by electron beam radiation;

Figure 3 shows the construction of another form of display panel suitable for use in the device shown in Figure 1 and which includes an electroluminescent layer which is activated by electron beam induced light emanating from an insulating cathodoluminescent layer;

Figure 4 shows the construction of yet another form of display panel suitable for use in the device shown in Figure 1 and which includes an electroluminescent layer which is

activated by electron beam induced light emanating from a cathodoluminescent layer;

Figure 5 shows a modified construction of the display panel shown in Figure 4; and

Figure 6 shows a curve of brightness against applied voltage showing a hysteresis characteristic for the electroluminescent material.

In Figure 1, there is shown a CRT storage display tube indicated generally as 10 having a display screen or panel 26 and a high energy electron writing gun shown generally as 14. The gun is of conventional configuration having a high energy electron source 16 which acts to emit high energy electrons through focusing element 18 to the vertical and horizontal fields created by deflection plates shown at 20, 22 and 24. As can be seen, plates 20 and 22 act to vertically deflect the high energy electron beam while plates 24 (only one shown) act to horizontally deflect the electron beam. Alternatively, magnetic deflection and magnetic focus can be used. It should be noted that the flood gun required by the prior art CRT storage device is absent since in this invention continuous electron beams are not used to generate high brightness display nor to maintain a stored charge pattern.

The display screen or panel 26 differs from that of the prior art CRT storage device as will be shown later. An a.c. sustaining drive field is maintained across display panel 26 by means of a.c. voltage source 28 via leads 27 and 29. Typically, the a.c. source 28 is a sinusoidal wave generator or an a.c. pulse generator capable of supplying from 0 volts to at least 300 volts. In order that the electroluminescent panel may be operated at optimum efficiency, a switching arrangement 30 is provided to vary the inductance 25 of resonant circuit 23 according to the capacitive load of the panel 26 in a manner to be described in more detail later. The switch 30 is itself controlled by means of a conventional switching circuit 31 itself controlled from the tube control grid 16. The various alternative construction of display panel 26 will now be described.

The display panel shown in Figure 2 consists of a glass face-plate 12 having deposited, or otherwise formed, thereon a transparent contiguous conductive layer 32 of, for example, SnO_2 or In_2O_3 . A transparent contiguous layer 34 of an insulating material such as BaTiO_3 , SrTiO_3 , Al_2O_3 , Y_2O_3 , Si_3N_4 or AlN is formed on the conductive layer 32. An electroluminescent layer 36 is formed on the insulating layer 34. Although the electroluminescent layer may comprise any of a variety of well known electroluminescent materials, preferably it is in the form of an electroluminescent polycrystalline thin film, for example, Cu or Mn doped ZnS. Alternatively powdered electroluminescent materials may be employed. Examples of electroluminescent materials that may be

employed and methods by which they may be made are described by Blazey et al in U.S. Patent No. 3,313,652. A second insulating layer 38 is formed contiguous with layer 36 and can be of the same or different material as insulating layer 34. A second conductive layer 40 is formed on insulating layer 38. This layer may be either a transparent or non-transparent thin film of SnO_2 , In_2O_3 , Al, Cu, Ag, Au or other thin metal layers. Likewise thin layers of copper iodide or graphite can be employed.

The display panel shown in Figure 3 is similar to that shown in Figure 2 except that the second insulating layer 38 is replaced by a layer 44 of a material which is both insulating and cathodoluminescent. Whereas electroluminescent materials exhibit electroluminescence in response to an applied a.c. field, cathodoluminescent materials exhibit luminescence in response to direct electron beam or ultra violet radiation. The material selected generally emits light in the ultra violet and blue wavelengths of the spectrum in response to electron beam radiation. One example of such material is AlN , which is an efficient ultra-violet light emitter. Many other wide band gap materials such as metal oxides and metal tungstates may also be used. The remaining layers are identical to corresponding layers in the panel shown in Figure 2 and are identified by the same reference numerals.

The display panel shown in Figure 4 is again similar to that shown in Figure 2 with the addition of a catholuminescent phosphor layer 44 on the second conductive layer 40. Examples of cathodoluminescent phosphors which may be used in the present invention include lead doped barium zinc magnesium silicate, lead doped strontium hexaborate, copper doped zinc cadmium sulphide, manganese doped zinc silicate, silver doped zinc sulphide, zinc doped zinc oxide and the like. The display panel shown in Figure 5 is similar to that of Figure 4. In this arrangement, the cathodoluminescent layer 44 and the second conductive layer 40 are interchanged.

Whichever form of display panel is used, the a.c. sustained voltage, V_s from the a.c. source 28 is applied across the electroluminescent layer 36 by means of conductive layers 32 and 40 which are connected to conductors 29 and 27 respectively. Figure 6 shows a curve of brightness B against applied voltage V (RMS) showing that the electroluminescent material exhibits hysteresis characteristics. The drive voltage level V_s is therefore selected to lie above the extinction voltage, V_e and below the turn-on threshold voltage, V_t for the material. With this arrangement the intensity of light output from the electroluminescent material can be selected by radiation with an electron beam or ultra-violet of appropriate magnitude. Thus, the application of exciting electrons switches the material from one stable state B, where the light output is substantially zero, to another one of a

plurality of stable states such as indicated at C, where the light output is relatively high. By controlling the intensity of the exciting electrons or indeed ultra-violet light, the electroluminescent output can be selected to lie at any value between zero and saturation for the material. The threshold voltage V_t for electroluminescent materials is typically 50 V to 300 V (RMS) and the extinction voltage V_e is typically 0 to 270 V (RMS) depending on the layer thickness of the electroluminescent device.

The panel shown in Figure 2 operates directly by the penetration of electrons, illustrated by arrow 42, to electroluminescent layer 36. Such penetration activates the storage mechanism. It is thought that the incoming electrons or the secondary electrons and light radiation induced by the electron beam excite the trapping states or charge storage levels in the electroluminescent material. The excited charges are polarised under the sustaining drive field to result in an internal field. The internal field aids the external field in exciting the electroluminescence. With the panel shown in Figure 3, the electron beam (42) penetrates only to insulating cathodoluminescent layer 44 which emits high energy photons. These high energy photons then activate the electroluminescent storage mechanism in layer 36. Similarly, with the panel shown in Figure 4 the electron beam 42 penetrates only to cathodoluminescent layer 44 whereby said layer 44 is caused to emit high energy photons which in turn activate the electroluminescent storage mechanism in layer 36. The interchanged cathodoluminescent and conductive layers in the panel shown in Figure 5 provide a trade-off between low energy electrons and ease of activating the electroluminescent layer 36.

Generally, the drive voltage is not sufficient to cause any appreciable electroluminescence before electron excitations. When excited by electrons (and/or photons or secondary electrons generated by electrons) it is thought that the conductivity of the electroluminescent layer 36 is increased (or viewed as the threshold voltage is decreased) so that more current is flowing through and more light emission occurs. The higher current flow also establishes an internal polarisation which aids the a.c. voltage in phase to generate more electroluminescence. Thus the device is switched to the higher conducting state and through the internal polarisation field (switched in phase with external applied field) the device operates in a stable memory state.

The sustaining a.c. voltage can be supplied by a sinusoidal wave generator or an a.c. pulse generator. Since the electroluminescent device is a capacitive load, it is advantageous as previously mentioned to arrange for the device to be included as part of a resonant circuit 23 (Figure 1) in series with the voltage driver 28. The inductance 25 of the circuit can be varied according to the capacitive load of panel 26, i.e.

proportional to the area of faceplate which is turned on. One method of obtaining this type of resonant tuning is to monitor the CRT grid voltage. When the grid voltage is in an off mode no electrons can be emitted out of the CRT gun 14 thus no faceplate area can be excited or turned on. Conversely when the grid voltage is turned on, the electrons are allowed to reach the faceplate 12. Therefore, by monitoring the grid voltage and the deflection signal one can keep track of how much faceplate area is in the on state thus switch in the proper amount of inductance into the resonance circuit. In the resonant drive mode power dissipation is minimized.

In order to display grey scale images or multi-level intensity displays, one simply modulates the electron beam intensity by modulating the control grid voltage as the conventional T.V. CRT. In addition one has the freedom to modulate the amplitude and frequency of the sustaining drive a.c. field in accordance with the video or data signal.

Claims

1. A cathode ray tube storage device including a display panel (26) incorporating a layer (36) of insulated electroluminescent material, means (28) for applying an alternating voltage of predetermined magnitude across said electroluminescent layer (36), an electron gun (14) operable to selectively write a charge pattern on said display panel (26) and means (16) operable to control the intensity of the electron beam radiation during writing of said charge pattern, characterised in that the electroluminescent material (36) is of a type exhibiting hysteresis loop characteristics such that a plurality of different light emitting stable states exist for the material in the presence of the applied alternating voltage of said predetermined magnitude, each stable state being individually selectable in response to radiation of said material by said electron beam, the intensity of light emission from the material in each said selected stable state increasing progressively from state to state with increasing intensity of the electron beam radiation, the arrangement being such that visual images having multiple levels of light intensity can be produced in the electroluminescent layer by appropriate modulation of the intensity of said electron beam radiation.

2. A cathode ray tube storage device as claimed in claim 2, in which said stable states are individually selectable by direct radiation of said electroluminescent material (27) with said electron beam of predetermined selected intensity.

3. A cathode ray tube storage device as claimed in claim 1, or claim 2, in which said electroluminescent material (36) is sandwiched between two co-extensive layers of conductive material (32, 40) separated from said electro-

luminescent material (36) by intermediate layers of insulating material (34, 38), said layers of conductive material (32, 40), the layers of insulating material (34, 38), and the electroluminescent material (36) together with a tube face plate (12) forming the display panel (26), the alternating voltage of predetermined magnitude being applied across said conductive layers (32, 40) and at least the layer of conductive material (40) and layer of insulating material (38) towards said electron gun (14) being of a nature to permit direct electron beam radiation of said electroluminescent material (38) therethrough by said electron gun (14).

4. A cathode ray tube storage device as claimed in claim 1, in which said stable states are individually selectable by light radiation of said electroluminescent material (36) induced in an adjacent intermediate layer of cathodoluminescent material (44) in response to direct radiation of said cathodoluminescent material (44) by said electron beam of predetermined selected intensity.

5. A cathode ray tube storage device as claimed in claim 4, in which said display panel comprises a tube face plate (12), a first layer of conductive material (32) on said face plate (12), a layer of insulating material (34) on said first layer of conductive material (32), said electroluminescent layer (36) on said layer of insulating material (34) a layer of insulating cathodoluminescent material (44) on said electroluminescent material and a second layer of conductive material (40) on said layer of insulating cathodoluminescent material (44) said panel (26) being incorporated in said device with the second layer of conductive material (40) facing towards the electron gun (14) and being of a nature to permit direct electron beam radiation of said insulating cathodoluminescent material (44) therethrough by said electron gun (14), and said alternating voltage of predetermined magnitude being applied across said first and second conductive layers (32, 40).

6. A cathode ray tube storage device as claimed in claim 4, in which a second layer of insulation material (38) is interposed between said electroluminescent material (32) and said cathodoluminescent material (44).

7. A cathode ray tube storage device as claimed in claim 4, in which the disposition of the layers of cathodoluminescent material (44) and second layer of conductive material (40) are interchanged.

8. A cathode ray tube storage device as claimed in any one of the preceding claims, in which said means (26) for applying an alternating voltage of predetermined magnitude forms part of a resonant circuit having a variable inductive load (25) and means (30) for selecting the value of the inductive load (25) in accordance with the value of the capacitive load of the face plate (26).

9. A cathode ray tube storage device as claimed in claim 8, in which said means (30) for

selecting the inductive load is operated by a switching circuit (31) controlled by the grid voltage of the electron gun (14).

Patentansprüche

1. Kathodenstrahlröhren - Speicheranordnung, enthaltend eine Schicht (36) aus isolierendem elektroluminescentem Material aufweisenden Bildschirm (26), Maßnahmen (28) zum Anlegen einer Wechselspannung vorgegebener Höhe über besagte elektrolumineszente Schicht (36), ein zum wahlweisen Einschreiben eines Ladungsmusters auf besagtem Bildschirm (26) zu betreibendes Kathodenstrahlerzeugungs-System (14) und Vorkehrungen (16), die zur Betätigung der Intensitätssteuerung des Elektronenstrahls während des Einschreibens besagten Ladungsmusters eingerichtet sind, dadurch gekennzeichnet, daß das elektrolumineszente Material (36) von einer Art ist, die Hystereseschleifen-Eigenschaften aufweist, so daß eine Anzahl unterschiedlicher lichtemittierender, stabiler Zustände für das Material bei Auftreten der angelegten Wechselspannung mit besagter vorgegebener Höhe existiert, indem jeder stabile Zustand durch Ansprechen besagten Materials auf besagten Elektronenstrahl einzeln anwählbar ist, wobei die Intensität der Lichtemission aus dem Material beim jeweils gewählten stabilen Zustand progressiv mit wachsender Elektronenstrahlintensität von Zustand zu Zustand ansteigt und daß die Anordnung so getroffen ist, daß die sichtbaren, eine Anzahl von Intensitätsstufen aufweisenden Bilder in der elektrolumineszenten Schicht durch geeignete Intensitätsmodulation besagten Elektronenstrahls hervorgerufen sind.

2. Kathodenstrahlröhren - Speicheranordnung nach Anspruch 1, dadurch gekennzeichnet, daß die stabilen Zustände durch unmittelbare Bestrahlung besagten elektrolumineszenten Materials (27) mittels besagten Elektronenstrahls vorgebar gewählter Strahlstärke einzeln anwählbar sind.

3. Kathodenstrahlröhren - Speicheranordnung wie in Anspruch 1 oder Anspruch 2 beansprucht, bei welcher besagtes elektrolumineszentes Material (36) zwischen zwei Schichten leitenden Materials (32, 40) bei gleichen Abmessungen, Jedoch unter Abstand von besagtem elektroluminescentem Material (36) durch Zwischenschichten isolierenden Materials (34, 38), eingebettet ist, wobei besagte Schichten leitenden Materials (32, 40), die Schichten isolierenden Materials (34, 38) und das elektrolumineszente Material (36) zusammen mit einem Röhren-Schirmträger (12) den Bildschirm (26) bilden, die Wechselspannung vorgegebener Höhe über besagte leitende Schichten (32, 40) anlegbar ist und zumindest die besagten Kathodenstrahlerzeugungs-System (14) zugewandten Schichten leitenden Materials (40) bzw. isolierenden Materials (38)

von der Art sind, die hierdurch unmittelbare Einstrahlung des Elektronenstrahls von besagtem Kathodenstrahlerzeugungs-System (14) auf besagtes elektrolumineszentes Material (36) gestattet.

4. Kathodenstrahlröhren - Speicheranordnung nach Anspruch 1, dadurch gekennzeichnet, daß besagte stabile Zustände mittels Lichteinstrahlung, die in einer benachbarten Zwischenschicht kathodolumineszenten Materials (44) im Ansprechen auf durch besagten Elektronenstrahl vorgegeben ausgewählter Intensität erfolgender Direkteinstrahlung auf besagtes kathodolumineszentes Material (44) induziert wird, jeweils für sich auswählbar sind.

5. Kathodenstrahlröhren - Speicheranordnung nach Anspruch 4, gekennzeichnet durch einen Bildschirm, bestehend aus: einem Röhrenschirmträger (12), einer ersten Schicht leitenden Materials (32) auf besagtem Röhrenschirmträger (12), einer Schicht isolierenden Materials (34), auf besagter erster Schicht leitenden Materials (32), besagter elektrolumineszenter Schicht (36) auf besagter Schicht isolierenden Materials (34), einer Schicht isolierenden kathodolumineszenten Materials (44) auf besagtem elektrolumineszentem Material und einer zweiten Schicht leitenden Materials (40) auf besagter Schicht isolierendem kathodolumineszenten Materials (44), wobei dieser Bildschirm (26) mit auf das Kathodenstrahlerzeugungs-System (14) gerichteter zweiter Schicht leitenden Materials (40) in der Anordnung eingebaut und von der Art ist, die hierdurch unmittelbare Einstrahlung des Elektronenstrahls vom Kathodenstrahl-Erzeugungssystem (14) auf das isolierende kathodolumineszente Material (44) gestattet, und bei welchem besagte Wechselspannung vorgegebener Höhe zwischen besagten ersten und zweiten leitenden Schichten (32, 40) anlegbar ist.

6. Kathodenstrahl-Speicheranordnung nach Anspruch 4, in welcher eine zweite Schicht isolierenden Materials (38) zwischen besagtem elektrolumineszenten Material (32) und besagtem kathodolumineszentem Material (44) eingelegt ist.

7. Kathodenstrahl-Speicheranordnung nach Anspruch 4, bei welcher die Gruppierung der Schichten kathodolumineszenten Materials (44) und zweiter Schicht leitenden Materials (40) miteinander vertauscht sind.

8. Kathodenstrahlröhren - Speicheranordnung, wie in einem der vorstehenden Ansprüchen beansprucht, dadurch gekennzeichnet, daß besagte Maßnahmen (28) zum Anlegen einer Wechselspannung vorgegebener Höhe einen Teil eines Resonanzkreises mit einstellbarer induktiver Last (25) und mit Mitteln (30) bilden, die zum Wählen des Wertes der induktiven Last (25) in Abstimmung mit dem Wert der kapazitiven Last des Schirmträgers (12) dienen.

9. Kathodenstrahlröhren - Speicheranordnung nach Anspruch 8, bei welcher besagte Mittel (30) zum Wählen der induktiven Last durch einen Schaltsteuerkreis (31) betätigbar sind, der durch die Gitterspannung des Kathodenstrahlerzeugungs-Systems (14) steuerbar ist.

Revendications

1. Dispositif d'emmagasinage à tube cathodique comprenant un panneau d'affichage (26) incorporant une couche (36) de matériau électroluminescent isolé, des moyens (28) pour appliquer une tension alternative d'amplitude prédéterminée à ladite couche électroluminescente (36), un canon à électrons (14) pour écrire sélectivement une configuration de charges sur ledit panneau d'affichage (26) et des moyens (16) pour commander l'intensité du faisceau d'électrons durant l'écriture de ladite configuration de charges, caractérisé en ce que le matériau électroluminescent (36) présente des caractéristiques du cycle d'hystérésis telles qu'il existe pour le matériau plusieurs états stables différents d'émission de lumière lorsque, est appliquée la tension alternative d'amplitude prédéterminée, chaque état stable pouvant être sélectionné séparément en réponse à l'irradiation dudit matériau par ledit faisceau d'électrons, l'intensité de la lumière émise à partir du matériau dans chacun desdits états stables sélectionnés augmentant progressivement d'un état à un autre au fur et à mesure qu'augmente l'intensité du faisceau d'électrons, l'agencement étant tel que puissent être produites dans la couche électroluminescente des images visuelles ayant de multiples niveaux d'intensité de lumière et ce, par une modulation appropriée de l'intensité dudit faisceau d'électrons.

2. Dispositif d'emmagasinage à tube cathodique selon la revendication 1, dans lequel lesdits états stables peuvent être séparément sélectionnés par irradiation directe dudit matériau électroluminescent (36) à l'aide dudit faisceau d'électrons dont l'intensité a été sélectionnée de façon prédéterminée.

3. Dispositif d'emmagasinage à tube cathodique selon la revendication 1 ou la revendication 2, dans lequel ledit matériau électroluminescent (36) est intercalé entre deux couches parallèles (32, 40) faites dans un matériau conducteur, et séparées dudit matériau électroluminescent (36) par des couches intermédiaires (34, 38) faites dans un matériau isolant, lesdites couches de matériau conducteur (32, 40), lesdites couches de matériau isolant (34, 38) et ledit matériau électroluminescent (36) formant avec une plaque frontale (12) du tube, le panneau d'affichage (26), la tension alternative d'amplitude prédéterminée étant appliquée auxdites couches conductrices (32, 40), et au moins la couche de matériau conducteur (40) et la

couche de matériau isolant (38) situées du côté du canon à électrons (14) étant de nature à permettre à travers elles l'irradiation directe dudit matériau électroluminescent (36) par ledit canon à électrons (14).

4. Dispositif d'emmagasinement à tube cathodique selon la revendication 1, dans lequel lesdits états stables peuvent être sélectionnés individuellement par l'irradiation dudit matériau électroluminescent (36) par de la lumière induite dans une couche adjacente intermédiaire de matériau cathodoluminescent (44) en réponse à l'irradiation directe dudit matériau cathodoluminescent (44) par ledit faisceau d'électrons dont l'intensité a été sélectionnée de façon prédéterminée.

5. Dispositif d'emmagasinement à tube cathodique selon la revendication 4, dans lequel ledit panneau d'affichage comprend une plaque frontale (12) du tube, une première couche de matériau conducteur (32) sur ladite plaque frontale (12), une couche de matériau isolant (34) sur ladite première couche de matériau conducteur (32), ladite couche électroluminescente (36) sur ladite couche de matériau isolant (34), une couche de matériau cathodoluminescent isolant (44) sur ledit matériau électroluminescent, et une seconde couche de matériau conducteur (40) sur ladite couche de matériau cathodoluminescent isolant (44), ledit panneau (26) étant incorporé dans ledit dispositif de sorte que la seconde couche de matériau conducteur (40) faisant face au canon à électrons et étant de nature à permettre à

travers elle l'irradiation directe dudit matériau cathodoluminescent isolant (44) à l'aide du faisceau d'électrons (14), et ladite tension alternative d'amplitude prédéterminée étant appliquée sur lesdites première et seconde couches conductrices (32, 40).

6. Dispositif d'emmagasinement à tube cathodique selon la revendication 4, dans lequel une seconde couche de matériau isolant (38) est intercalée entre ledit matériau électroluminescent (36) et ledit matériau cathodoluminescent (44).

7. Dispositif d'emmagasinement à tube cathodique selon la revendication 4, dans lequel la disposition de la couche de matériau cathodoluminescent (44) et de la seconde couche de matériau conducteur (40), est inversée.

8. Dispositif d'emmagasinement à tube cathodique selon l'une quelconque des revendications précédentes, dans lequel lesdits moyens (28) pour appliquer une tension alternative d'amplitude prédéterminée fait partie d'un circuit résonant ayant une charge inductive variable (25) et des moyens (30) pour sélectionner la valeur de la charge inductive (25) conformément à la valeur de la charge capacitive de la plaque frontale (12).

9. Dispositif d'emmagasinement à tube cathodique selon la revendication 8, dans lequel lesdits moyens (30) pour sélectionner la charge inductive sont actionnés par un circuit de commutation (31) commandé par la tension de grille du canon à électrons (14).

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