

(19)



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Office européen des brevets



(11) Publication number:

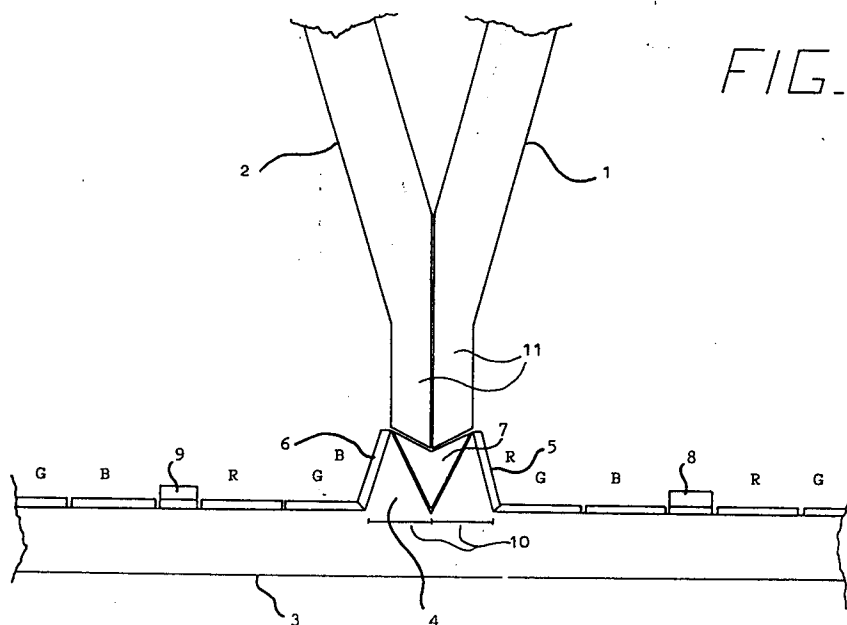
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EUROPEAN PATENT APPLICATION(21) Application number: **91111865.1**(51) Int. Cl.⁵: **H01J 29/18**(22) Date of filing: **16.07.91**(30) Priority: **17.07.90 IT 4815290**(72) Inventor: **Maltese, Paolo**(43) Date of publication of application:
22.01.92 Bulletin 92/04**Via Dandolo, 24****I-00153 Roma (RM)(IT)**(84) Designated Contracting States:
DE ES FR GB NL(74) Representative: **Dini, Roberto**(71) Applicant: **Maltese, Paolo**
Via Dandolo, 24
I-00153 Roma (RM)(IT)**S.I.SV.EL. S.p.A. Società Italiana per lo****Sviluppo dell'Elettronica ViaCastagnole, 59****I-10060 None (Torino)(IT)**(54) **Image viewing device.**

(57) The present invention relates to a viewing device of complex images, for example the television type, particularly for large screens of a reduced depth, of the type comprising a vacuum envelope, a display window whose internal wall is a cathodoluminescent screen, in which phosphors are excited by a multitude of electron beams, controlled in accordance of the image to be displayed, a multitude of close-spaced

sustaining elements (11), the characterising principles of the viewing device of complex images consists in the fact that the contact points of said sustaining elements (11) with said display window (3) are made practically invisible by reflective elements (7) placed in appropriate housings (4) situated insaid display window (3).

*FIG. 1***EP 0 467 304 A2**

DESCRIPTION

The present invention relates to a viewing device of complex images, for example of the television type, particularly for large screens of a reduced depth, of the type comprising an envelope, whose internal wall is a cathodoluminescent screen, in which phosphors are excited by a multitude of electron beams, controlled in accordance of the image to be displayed, a display window, a multitude of close-spaced sustaining elements.

In recent years there have been notable developments in the field of electronic viewing systems, with the aim of setting aside, from its pre-eminent position in this field, the traditional cathode ray picture tube or the kinescope tube. In particular, a multitude of innovative viewing systems have been proposed, based on different physical principles. Progress in the realisation of improved Picture tubes has continued however, leading to results above all in the reduction of volume and weight of the picture tube, which in the previous traditional solutions, constituted the major disadvantages. Such disadvantages become considerable when, for the realisation of a large picture tube, a number of tubes placed together are utilised. Instead of the problem of the volume and weight, a problem of the vision of the image arises in the adjacent points between the various tubes, in fact the image results in having interruptions. Interruptions corresponding to the delimitation of each single picture tube. In the case in which a single vacuum envelope is used, divided in various chambers, such interruptions correspond to the strengthening divisions, without which the weight and encumbrance become unacceptable. A known solution, in the case in which a single envelope is used, indentations in the form of a V are created on the internal wall of the screens display window, corresponding to said strengthening dividers of the compartment. Said indentations have rounded edges and furthermore the display window is slightly convex. All of the above serves in creating an optical effect that makes the mentioned dividers partially invisible. See American patent N° 4.622.492.

However, this solution is not satisfactory as the dividers become visible whenever the viewing angle of the screen is not that desired. The aim of the present invention is to realise an image viewing device which does not present the above mentioned disadvantages.

To allow for such aims, the present invention has as its object a viewing device of complex images, for example of the television type, particularly for large screens of a reduced depth, of the type comprising an envelope, whose internal wall is a cathodoluminescent screen, in which phosphors are excited by a multitude of electron beams, con-

trolled in accordance of the image to be displayed, a display window, a multitude of close spaced sustaining elements. The characterising elements of the image viewing device consists in the fact that the contact points of said sustaining elements 11 with said display window 3 are practically made invisible by reflecting elements 7 placed in appropriate housings 4 situated in said display window. Further aims and advantages of the present invention will become clear from the following detailed description, carried out with reference to the annexed drawings, supplied as non-limiting example, wherein 1 and 2 indicate the lateral walls of two of the multitude of chambers, in this case represented by picture tubes, that when assembled make up a viewing screen. With reference number 3 a display window of the device is indicated. 4 indicates a housing, making up part of said display window 3, of a sustaining element 11 constituted, in this case, by two terminal sections of two adjacent picture tubes welded together at the walls 1 and 2. Such housing 4 may be obtained by grinding treatment, or can be constituted by elements located on a flat plate, otherwise it can be constituted by elements located on and applied to an extremity of the sustaining elements. 5 and 6 indicate the collocation of the phosphors deposited on the extremes of a picture tube or in proximity of the housing 4. The reference number 7 indicates a reflecting element constituted by soft metal wedge strips presenting a mirrored surface, which is a functioning part of the housing 4. Such mirrored surfaces of said reflective element 7 and the phosphors 5 and 6, placed in proximity of said housing 4, are inclined and set back with respect to the remainder of the internal wall of the display window 3. Two optical openings are represented with the number 10 that, are obtained by two dihedrons constituted by the inclined surfaces of said reflective element 7 and of said phosphors 5 and 6. Such optical openings constitute the ideal continuation of the regular distribution of the phosphors on the picture tubes. It is worth noting that the surface of the display window 3, in correspondance of the optical openings 10, is made up of optical material diffused with the aim of making the angular arrangement luminous, given out from said optical opening 10, similar to that given out from the remaining phosphor of the screen.

Welding together, in a vacuum tight manner, the window display 3, a plurality of domes, in this case picture tubes comprising one or more means for the generation of electrical or magnetic fields for focusing and deflecting, and the sustaining elements 11, a principle envelope is obtained.

With the letters R, G, B the phosphors corresponding to the three primary colours of colour televisions (red, green and blue) are indicated. The

picture tubes utilised in this example are of the "beam-index" type and the phosphors index are indicated with the numbers 8 and 9.

When we encounter systems incorporating large screens, where a number of picture tubes are used adjacent between themselves, each of the said picture tubes reproduces a portion of the image to be viewed. This type of reproduction is possible by means of a known techniques that consist in the in the division of the sequential video signal in many parts to be addressed, in a parallel manner, to every picture tube of the system.

The picture tubes utilised in this example have the characteristics of using a single beam of electrons and do not present a filtering shadow mask of the beams of electrons. In this case there are no problems of beam convergency, the so called doming effect is not a problem and there are no problems of power dispersion. In the "beam-index" technique the beam of electrons scan, in an orderly fashion, the vertical strips of red, green and blue phosphors and the selection of colour is obtained furnishing the beam the correct current at the right time. In order to obtain this, the piloting circuit must have precise information regarding the position of the beam of electrons in respect to the strips of phosphors. This is carried out with the aid of the phosphors index 8 and 9 emitting ultra violet rays placed on the alluminium sheet blanketing the phosphors of the screen towards the electronic gun. The ultraviolet light, emitted from said strips called index is collected by a photodetector and converted into an electrical signal for the pilot circuit. Another technique is when the coloured phosphor strips are horizontally arranged and the three phosphors become excited subsequently every three line scannings. The device functions in the following way:

The beam of electrons that scans the screen is piloted by the piloting circuit in such a way so as to hit all of the phosphors in function of the image to be reproduced. When the phosphor to be hit is the more extreme with relation to the screen, in this case the phosphor 5 or 6, we have a case in which the beam of light emitted from said phosphor 5 or 6 will exit from the opening 10 after having in part hit the reflective element 7. Said reflective element 7, arranged at an appropriate angle, that can be indicated as an example between 50° and 80° , reflects the beam of light in such a way for it to exit said optical opening 10 with approximately the same angular distribution of the light emitted from the other phosphors. It is to be taken into consideration that the display window 3 is only one plate on which picture tubes are constructed thus creating a multidome type structure. In such a solution, it has been established that the image viewing device completely achieves the set aim in as much the

adjacent points result in being really cancelled by the optical effect created by the mirrored element 7. It is also to be noted that the mirrored element 7 in its posterior section is formed in such a way that the sustaining elements 11 are centered and that the pressure exercised by them be equally placed.

From the outlined description the advantages of the image viewing device, object of the present invention become clear, of which the efficiency of the system and the quality of the reproduced image are cited.

It is clear that numerous variants are possible, by the man of the art, to the image viewing device described as an example, without however departing from the novelty principles inherent in the invention, among which the possibility to provide for each chamber of which the envelope is constituted, one or more matrix structures of crossed electrodes that focus a multitude of beams of electrons, controlling the intensity and eventually deflecting them on small portions of the screen, being such beams obtained starting from a flat source of electrons or from a multitude of linear or punctiform sources.

Claims

1. Viewing device of complex images, for example of the television type, particularly for large screens of a reduced depth, of the type comprising a vacuum envelope, a display window whose internal wall is a cathodoluminescent screen, in which phosphors are excited by a multitude of electron beams, controlled in accordance of the image to be displayed, a multitude of close-spaced sustaining elements (11), characterised by the fact that the contact points of said sustaining elements with said display window (3) are made practically invisible by reflective elements (7) placed in appropriate housings (4) situated insaid display window (3).
2. Viewing device of complex images, according to claim 1, characterised by the fact that said reflective elements (7) have an inclined and withdrawn surface with respects the remainder of the surface of the display window (3).
3. Viewing device of complex images, according to claim 1, characterised by the fact that phosphors (5 and 6) are arranged in proximity of said housings (4).
4. Viewing device of complex images, according to claim 3, characterised by the fact that said phosphors (5 and 6) are inclined and withdrawn with respects the remainder of the inter-

nal part of the display window (3).

5. Viewing device of complex images, according to claims 1 and 3, characterised by the fact that said reflective elements (7) reflect the light emitted from the phosphors (5 and 6) located in proximity of said housings (4). 5
6. Viewing device of complex images, according to claims 2,4 and 5, characterised by the fact that the two dihedrals of the inclined surface of said reflective elements (7) and of said phosphors (5 and 6) are such to delimit two optical openings (10) that ideally continue the regular arrangement of the phosphors. 10 15
7. Viewing device of complex images, according to claim 6, characterised by the fact that said inclinisation of the mirrored surfaces of said reflective elements (7) and of said phosphors (5 and 6) is composed of angles arranged from 50° to 80°. 20
8. Viewing device of complex images, according to claim 6, characterised by the fact that the beams of light emitted from the phosphors (5 and 6), arranged in proximity of the elements (4), exit the display window (3) with the same angular distribution of the remaining phosphors (R, G, B). 25 30
9. Viewing device of complex images, according to claim 1 and 6, characterised by the fact that in said display window (3), in correspondence of said optical openings (10), provides a surface of optical material diffused with the aim of making the angular distribution of luminous intensity, emitted from said optical openings (10), similar to that emitted from the remaining phosphors (R; G; B) of the screen. 35 40
10. Viewing device of complex images, according to claim 1, characterised by the fact that said sustaining elements (11) are constituted by two terminal sections arranged between two adjacent chambers in which said envelope is divided. 45
11. Viewing device of complex images, according to claim 1, characterised by the fact that said envelope is realised by welding together, under vacuum, said screen, a plurality of domes and the sustaining elements (11) of the envelope. 50
12. Viewing device of complex images, according to claim 11, characterised by the fact that said envelope is of a multi dome form. 55
13. Viewing device of complex images, according to claim 1, characterised by the fact that said reflective elements (7) are constituted by wedge strips of soft metal.
14. Viewing device of complex images, according to the previous claim, characterised by the fact that said reflective elements (7), in their posterior section, are of such a form so as to center the sustaining elements (11) and regularly distribute the pressure, exercised by the sustaining elements (11).
15. Viewing device of complex images, according to claims 1, 2 and 4, characterised by the fact that the withdrawn surfaces of the display window (3), in correspondence to said housings (4) of the sustaining elements (11) are obtained by pressing.
16. Viewing device of complex images, according to claims 1, 2 and 4, characterised by the fact that said withdrawn surfaces of the display window (3), are obtained by grinding operations.
17. Viewing device of complex images, according to claims 1, 2 and 4, characterised by the fact that said housings (4) of said sustaining elements (11) are constituted by elements being added and attached to a flat plate.
18. Viewing device of complex images, according to claims 1, 2 and 4, characterised by the fact that said housings (4) of said sustaining elements (11) are constituted by elements being added and attached to an extremity of said sustaining elements (11).
19. Viewing device of complex images, according to claim 1, characterised by the fact that said envelope is divided in several chambers.
20. Viewing device of complex images, according to claim 19, characterised by the fact that every chamber in which the envelope is divided corresponds to one or more electronic guns.
21. Viewing device of complex images, according to claim 19, characterised by the fact that every chamber in which the envelope is divided is a television screen.
22. Viewing device of complex images, according to claim 19, characterised by the fact that every chamber, in which the envelope is divided, corresponds to one or more means for

the generating of electrical or magnetic fields for focusing and deflecting.

23. Viewing device of complex images, according to claim 21, characterised by the fact that the television screens utilised are of the single electronic gun type whose beam is focused on phosphors of the three primary colours in subsequent periods. 5
24. Viewing device of complex images, according to claim 21, characterised by the fact that the television screens utilised are of the "beam-index" type. 10
25. Viewing device of complex images, according to claim 19, characterised by the fact that every chamber in which the envelope is divided contains one or more matrix structures of crossed electrodes that focus a multitude of electron beams, they control the intensity there of and deflect them on to small portions of the screen. 15 20
26. Viewing device of complex images, according to claim 25, characterised by the fact that said electron beams are obtained starting from a flat source of electrons or from a multitude of linear or punctiform sources. 25 30

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