(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 818 800 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
19.12.2001 Bulletin 2001/51

(51) Int Cl.[7]: **H01J 29/07**

(21) Application number: **97111545.6**

(22) Date of filing: **08.07.1997**

(54) **Color cathode ray tube**

Farbkathodenstrahlröhre

Tube à rayons cathodiques couleur

(84) Designated Contracting States:
DE FR GB

(30) Priority: **12.07.1996 JP 18316096**

(43) Date of publication of application:
14.01.1998 Bulletin 1998/03

(73) Proprietor: **KABUSHIKI KAISHA TOSHIBA**
Kawasaki-shi, Kanagawa-ken 210-8572 (JP)

(72) Inventors:
- **Shimizu, Norio**
  1-1 Shibaura 1-chome Minato-ku Tokyo 105 (JP)
- **Nakagawa, Shinichiro**
  1-1 Shibaura 1-chome Minato-ku Tokyo 105 (JP)
- **Inoue, Masatsugu**
  1-1 Shibaura 1-chome Minato-ku Tokyo 105 (JP)

(74) Representative: **Henkel, Feiler, Hänzel**
Möhlstrasse 37
81675 München (DE)

(56) References cited:
EP-A- 0 004 245 **US-A- 4 949 009**

- **PATENT ABSTRACTS OF JAPAN vol. 017, no. 480 (E-1425), 31 August 1993 & JP 05 121009 A (NEC CORP), 18 May 1993,**

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 0 818 800 B1

Description

[0001] The present invention relates to a shadow mask type color cathode ray tube.

[0002] Generally, a color cathode ray tube comprises an envelope including a substantially rectangular panel in which a skirt portion is provided on a periphery of an effective portion thereof, and a funnel connected to the skirt portion. On the inner surface of the effective portion of the panel is formed a phosphor screen comprising three-color phosphor layers. A shadow mask is disposed inside of the phosphor screen so as to oppose it. An electron gun for emitting three electron beams is disposed in a neck of the funnel. Then, the three electron beams emitted from the electron gun are deflected by a magnetic field generated from a deflection apparatus provided outside of the funnel, and vertically and horizontally scan the phosphor screen through the shadow mask, thereby displaying color image on the phosphor screen.

[0003] The shadow mask is used for selecting three electron beams and comprises a substantially rectangular mask body in which a number of electron beam passage apertures are formed on a region opposing the phosphor screen and a substantially rectangular mask frame having side walls fixed to the periphery of the mask body. As a shadow mask supporting method, according to some type thereof, substantially wedge shaped elastic supports are provided at corners of the mask frame and these elastic supports are engaged with stud pins provided at the skirt portion of the panel, so that the shadow mask is detachably supported thereby.

[0004] Generally, in order to display color picture images having no deviation in color on the phosphor screen of the color cathode ray tube, three electron beams which pass the electron beam passage apertures in the mask body must be landed properly on the corresponding three color phosphor layers. For this purpose, it is necessary to keep the shadow mask at a proper position relative to the panel.

[0005] To meet recent trend of multi-media, there is provided a color cathode ray tubes in which the size of three color phosphor layers and their arrangement pitch are reduced to increase its resolution. In such a color cathode ray tube, allowance to deviation of beam landing relative to the three color phosphor layers has dropped so that more accurate beam landing than ordinary color cathode ray tubes is demanded.

[0006] However, in conventional color cathode ray tubes, the shadow mask is so constructed that almost entire periphery of the mask body is in contact with the side walls of the mask frame. Thus, there sometimes occurs a case in which the shadow mask may be deviated from its proper position because a undesired force is applied to the mask body due to disparity in quality of the mask frame resulting from production. Particularly in recent color cathode ray tubes having aspect ratio of 16:9, the side wall on the long side of the mask frame is much longer than the side wall on the short side as compared to ordinary color cathode ray tubes. Thus, the mask body is likely to be deformed because of insufficient strength and a disparity in distance between the opposing side walls on the long side (distance in the direction of the short axis).

[0007] In manufacturing process for the color cathode ray tubes, fitting and removal of the shadow mask are carried out repeatedly. Due to a force applied to the shadow mask during this fitting and removal operation, a distortion may occur in the mask frame so that the mask body may be deformed. If such a phenomenon occurs, a deviation in beam landing to the three color phosphor layers is produced.

[0008] On the other hand, in color cathode ray tubes for the multi-media, which have a small allowance in beam landing to the three color phosphor layers, it is necessary to reduce a load on the elastic supports by reducing the weight of the mask frame occupying most part of the weight of the shadow mask so as to relax the deviation of the shadow mask due to external shock. However, if the weight of the mask frame is reduced, it is likely that the mask frame is deformed due to an external shock or a force applied when the shadow mask is fitted or removed so that the shadow mask is deviated relative to the panel.

[0009] Further, although such a procedure has been taken as to reduce the thickness of the mask body thereby equalizing the size and shape of the electron beam passage apertures which are a prominent reason for generation of unevenness of the phosphor screen, reducing the thickness of the mask body likely induces a reduction of the strength thereby producing a deformation of the mask body itself.

[0010] There have bee provided a color cathode ray tube employing a low thermal expansion type shadow mask which is made of amber material having a high effect of suppressing a transition of electron beams due to so-called doming that the shadow mask is expanded in a direction of the phosphor screen due to thermal expansion of the shadow mask. As a measure for preventing a deformation of such a low thermal expansion type shadow mask, Jpn. Pat. Appln. KOKAI No. 5-121009 has disclosed a shadow mask in which a plurality of protruding portions which protrude outwardly are provided on side walls of the mask frame. However, even in the case in which such protruding portions are provided, since the mask body and the mask frame are in contact with each other through planes, a deformation of the mask body is generated due to disparity in production of the mask frame or deformation of the mask frame in a manufacturing process of color cathode ray tubes.

[0011] As described above, design of the mask frame is important in order to display picture images having no deviation in color on the phosphor screen. However, conventional shadow masks have such a problem that the mask body or mask frame is deformed and it is dif-

ficult to display high quality images.

[0012] A color cathode ray tube according to the precharacterizing part of claim 1 is disclosed in EP-A-0 004 245.

[0013] US-A-4,949,009, JP-A-05121009 and EP-A-0 886 296 (having a priority of 11.03.1996 and being published on 23.12.1998) disclose further color cathode ray tubes and corresponding connections of the mask body with the mask frame.

[0014] The present invention has been contrived in consideration of the above circumstances and its object is to provide a color cathode ray tube which is capable of suppressing effectively a deformation of the mask body or the mask frame and displaying high quality images.

[0015] According to the present invention the above object is achieved by a color cathode ray tube according to claim 1. The dependent claims are related to further advantageous aspects of the present invention.

[0016] According to one aspect of the present invention, there is provided a color cathode ray tube comprising: an envelope including a panel having a substantially rectangular effective portion in which a phosphor screen is formed on an inner surface thereof, a skirt portion provided on a periphery of the panel, and a funnel fixed to the skirt portion; a shadow mask arranged in the envelope so as to oppose the phosphor screen; and an elastic support elastically supporting the shadow mask relative to the skirt portion.

[0017] The shadow mask comprises a substantially rectangular mask body in which a number of electron beam passage apertures are formed, and a substantially rectangular mask frame having four side walls supporting the periphery of the mask body. At least two side walls opposing each other include connecting portions which are provided at their central portions in a lengthwise direction and connected to the mask body, and a pair of protruding portions which are provided on both sides of the connecting portion and protrude in a direction apart from the mask body. Each of the protruding portions defines a gap between the side wall and the mask body and the gap includes that portion whose width gradually increases as it goes far from the connecting portion.

[0018] Further, by defining a gap between the side wall of the mask frame and the mask body, a contact area therebetween is reduced so that influence upon the mask body of the disparity in size of the mask frame or deformation of the mask frame can be reduced.

[0019] By optimizing the shape of the mask frame and fixing of the mask body relative to the mask frame as described above, it is possible to reduce deviation of beam landing which may occurs due to deviation of the mask body relative to the mask frame and deformation of the mask body resulting from a deformation of the mask frame.

[0020] The invention can be more fully understood from the following detailed description when taken in conjunction with the accompanying drawings, in which:

FIGS. 1 to 4 show a color cathode ray tube according to a first embodiment of the present invention, in which:

FIG. 1 is a sectional view of the color cathode ray tube,

FIG. 2 is a perspective view schematically showing an electron gun, a shadow mask and a phosphor screen of the color cathode ray tube,

FIG. 3A is a plan view of the shadow mask,

FIG. 3B is a sectional view taken along the lines IIIB-IIIB in FIG. 3A, and

FIG. 4 is an enlarged plan view of a side wall of the shadow mask;

FIG. 5 is a plan view showing a different modification of the side walls of the shadow mask;

FIG. 6A is a plan view of the shadow mask according to a second embodiment of the present invention;

FIG. 6B is a sectional view taken along the lines VIB-VIB in FIG. 6A;

FIG. 7A is a plan view of the shadow mask according to a third embodiment of the present invention;

FIG. 7B is a sectional view taken along the lines VIIB-VIIB in FIG. 7A;

FIG. 8A is a plan view of the shadow mask according to a fourth embodiment of the present invention; and

FIG. 8B is a sectional view taken along the lines VIIIB-VIIIB in FIG. 8A.

[0021] Hereinafter, a color cathode ray tube according to an embodiment of the present invention will be described in detail with reference to the accompanying drawings.

[0022] As shown in FIGS. 1 and 2, the color cathode ray tube comprises a vacuum envelope 10 formed of glass. The vacuum envelope 10 comprises a panel 3 including a substantially rectangular effective portion 1 and a skirt portion 2 provided on the periphery of the effective portion, and a funnel 4 attached to the skirt portion 2. On an inner surface of the effective portion 1 of the panel 3 is formed a phosphor screen 5 including stripe shaped three color phosphor layers 20B, 20G, 20R emitting blue, green and red colors, and stripe shaped light shielding layer 23 formed between the phosphor layers. A shadow mask 21 which will be described later is disposed in the envelope 10 to oppose the phosphor screen 5.

[0023] An electron gun 9 for emitting three electron beams 8 is disposed within a neck 7 of the funnel 4. The three electron beams 8 emitted from the electron gun 9 are deflected by a magnetic field generated from a deflection apparatus 11 provided outside of the funnel 4, and horizontally and vertically scan the phosphor screen 5 through the shadow mask 21, thereby displaying color images on the phosphor screen.

[0024] As shown in FIGS. 1 to 3B, the shadow mask 21 comprises a substantially rectangular mask body 27 and a mask frame 30 supporting the mask body 27. The mask body 27 includes a substantially rectangular effective portion 27a which is opposed to the phosphor screen 5 and has a number of electron beam passage apertures 25, and a skirt portion 26 formed on the periphery of the effective portion 27a. The mask frame 30 is formed in a substantially rectangular and has a pair of side walls 28L on its long side and a pair of side walls 28S on its short side. The mask body 27 is supported by welding the skirt portion 26 thereof to the mask frame 30.

[0025] Among the side walls of the mask frame 30, the pair of the side walls 28L on the long side are fixed to the mask body 27 while only a central portion thereof in the lengthwise direction and its both ends in the lengthwise direction are in contact with the skirt portion 26 of the mask body 27, and each side wall 28L has those portions which are not in contact with the skirt portion 26 of the mask body 27.

[0026] If speaking in detail, as shown in FIGS. 3A, 3B and 4, the respective side walls 28L are bent symmetrically with respect to a short axis V of the mask frame 30 such that a central connecting portion 32a and a pair of end connecting portions 32b which are in contact with the skirt portion 26 of the mask body 27 are formed in the center portion in the lengthwise direction and both ends in the lengthwise direction. On both sides of the central connecting portion 32a are wedge-shaped protruding portions 34 which protrude in a direction to be apart from the mask body 27. A distance d between the pair of the side walls 28L at the positions of the protruding portions 34 is larger than a distance dv between the side walls 28L on the short axis V and a distance ds between the side walls 28L in the vicinity of the side walls 28S on the short side.

[0027] Each long side portion of the skirt portion 26 of the mask body 27 is located inside the mask frame 30 and is in contact with the central connecting portion 32a and the end connecting portions 32b of the corresponding side walls 28L and welded to the central connecting portion 32a and the end connecting portions 32b. A pair of gaps 36 are defined between each of the side walls 28L and the mask body 27 by the protruding portions 34 and located on both sides of the central connecting portions 32a. The respective gaps 36 are formed in a wedge shape whose width gradually expands from the central connecting portion 32a toward the end connecting portion 32b.

[0028] The maximum width w of each gap 36 is set in about 1 to 3 mm and assuming that a distance between the short axis V and the side wall 28S is L, the length L1 of the gap 36 in the longitudinal direction of the side wall 28L is L1 = 0.7 to 0.9L.

[0029] On the other hand, the skirt portion 26 on the short side of the mask body 27 is in contact with the inside of the entire length of the side wall 28S on the short side of the frame 30 and welded to the side wall 28S at several appropriate points.

[0030] As shown in FIG. 1, the shadow mask 21 having the above structure is detachably supported by the panel 3 by engaging wedge shaped elastic supports 15 fixed to corner portions of the mask frame 30 with stud pins 16 protruding from the skirt portion 2 of the panel 3, respectively. In FIG. 1, reference numeral 22 denotes an internal magnetic field shielding body attached to the shadow mask 21.

[0031] According to the color cathode ray tube having the above-mentioned arrangement, by forming the protruding portions 34 on the side walls 28L of the mask frame 30, the mechanical strength of the mask frame 30 is improved. Thus, it is possible to prevent the shadow mask 21 from being deformed by an external force applied thereto and effectively reduce a deviation of the shadow mask with respect to the panel 3. Particularly in a color cathode ray tube having an aspect ratio of 16:9, the side walls on the long side of the mask frame is much longer than ordinary cathode ray tubes, and therefore the mask body is likely to be deformed due to a shortage of strength and disparity of the distance between opposing side walls on the long side. However, by forming the shadow mask 21 in the structure described above, it is possible to effectively prevent the shadow mask from being deformed.

[0032] Further, the gap 36 is defined between the mask body 27 and the side wall 28L by forming the protruding portions 34 on the side walls 28L of the mask frame 30. Thus, each side wall 28L is in contact with the mask body 27 only through the central connecting portion 32a and the end connecting portions 32b so that a contacting area between the mask frame 30 and the mask body 27 can be reduced largely as compared to conventional examples. As a result, it is possible to reduce undesired forces applied to the mask body 27 due to disparity of the mask frame 30 upon manufacturing. Particularly, by accurately controlling the distance between the mask frame 30 and the mask body 27, that is, only distances dv and ds, it is possible to reduce deformation of the mask body 27 thereby preventing a deviation of the shadow mask 21 with respect to the panel 3. As a result, it is possible to reduce deviation of beam landing relative to the three color phosphor layers composing the phosphor screen, thereby displaying high quality images.

[0033] Further, because of formation of the protruding portions 34, the mask frame 30 is reinforced. Thus, the weight of the mask frame may be reduced so that burden on the elastic supports can be reduced. Further, even if the thickness of the mask body 27 is reduced, the deformation thereof can be prevented.

[0034] In the embodiment described above, each side wall 28L of the mask frame 30 has the wedge-shaped protruding portions 34 and the gaps 36 defined by these protruding portions 34. If the side wall 28L is so structured as to be in contact with the mask body 27 through

only the central portion and both ends portions in the lengthwise directions, the shapes of the protruding portions 34 and the gaps 36 may be changed in various ways as required.

[0035] For example, according to a modification shown in FIG. 5, the respective protruding portions 34 are formed in substantially rectangular shape and each gap 36 is formed such that only end portion 36a on the central connecting portion 32a side gradually expand in terms of width from the central connecting portion 32a toward the end connecting portion 32b and the remaining parts are formed with a constant width.

[0036] FIGS. 6A and 6B show a shadow mask 21 in the color cathode ray tube according to a second embodiment of the present invention. According to the second embodiment, in the mask frame 30, a pair of protruding portions 40 are formed on the side walls 28S on the short side as well as the side walls 28L on the long side. Each of the side walls 28S is also connected to the mask body 27 such that only its central portion 42a and both end portions 42b in the lengthwise direction are in contact with the skirt portion 26 of the mask body 27 and has some portions which are not in contact with the skirt portion 26 of the mask body 27.

[0037] Namely, each side wall 28S is bent symmetrically with respect to a long axis H of the mask frame 30 such that a central connecting portion 42a and a pair of end connecting portions 42b which are in contact with the skirt portion 26 of the mask body 27 are formed in the center portion in the lengthwise direction and both ends in the lengthwise direction. Further, wedge-shaped protruding portions 40 which protrude in a direction to be apart from the mask body 27 are formed on both sides of the central connecting portions 42a. A distance at the protruding portions 40 between the pair of the side walls 28S is larger than a distance on the long axis H between the side walls 28S and further a distance in the vicinity of the long side between the side walls 28S.

[0038] The skirt portion 26 of the mask body 27 is located within the mask frame 30 such that each short side portion thereof is in contact with the central connecting portion 42a and end connecting portions 42b of the corresponding side wall 28s and welded to the central connecting portions 42a and the end connecting portions 42b. A pair of gaps 44 are defined between the side wall 28s and the mask body 27 by the protruding portions 40 and located on both sides of the central connecting portion 42a. Each gap 44 is formed in wedge shape expanding gradually from the central connecting portion 42a toward the end connecting portions 42b.

[0039] Other constructions of the shadow mask are the same as the first embodiment.

[0040] According to the second embodiment having such a structure, the protruding portions 40 are also provided on the side walls 28s on the short side, so that the mechanical strength of the mask frame 30 is further improved and a contact area between the mask body 27 and the mask frame 30 is further reduced. Thus deformation of the mask body 27 can be further reduced thereby preventing effectively a deviation of the shadow mask 21 with respect to the panel 3.

[0041] FIGS. 7A and 7B show the shadow mask 21 of the color cathode ray tube according to a third embodiment of the present invention. According to the third embodiment, four protruding portions 34 are formed on each of the side walls 28L, 28S of the mask frame 30. That is, two protruding portions 34 are formed each on one side symmetrically with respect to the short axis V on each of the side walls 28L. Each side walls 28L has middle connecting portions 32c located between the connecting portions 32a and 32b in addition to the central connecting portion 32a and the end connecting portions 32b, and the side wall 28L is welded to the skirt portion 26 of the mask body 27 through these five connecting portions. Between the side wall 28L and the skirt portion 26 are defined four gaps 36 by the protruding portions 34 such that each of the gaps 36 is formed in wedge shape gradually expanding from the central connecting portion 32a toward the end connecting portions 32b.

[0042] Likewise two protruding portions 40 are formed on one side symmetrically on the side wall 28S with respect to the long axis H. Each side wall 28S has middle connecting portions 42c located between the connecting portions 42a and 42b in addition to the central and end connecting portions 42a and 42b, and each side wall 28S is welded to the skirt portion 26 of the mask body 27 through these five connecting portions. Between the side wall 28S and the skirt portion 26 are defined four gaps 36 by the protruding portions 40 such that each of the gaps is formed in wedge shape gradually expanding from the central connecting portion 42a toward the end connecting portions 42b.

[0043] According to the third embodiment having such a structure, the mask frame 30 is reinforced by forming the protruding portions 34, 40, so that for example if an external shock is applied to the shadow mask 21, that shock can be dispersed depending on the number of the protruding portions. In addition, the same operation and effect as in the first and second embodiments can be obtained.

[0044] FIGS. 8A and 8B show the shadow mask of the color cathode ray tube according to a fourth embodiment of the present invention. According to the fourth embodiment, one protruding portion 34 is formed on each side wall 28L on the long side of the mask frame 30, symmetrically with respect to the short axis V. Each of the protruding portions 34 is formed in a constant width along the entire length in its lengthwise direction. Thus, a distance d between the pair of the side walls 28L at the position of the protruding portions 34 is the same as a distance dv between the side walls 28L on the short axis V. An inner surface of the protrude portion 34 is of linear shape having infinite curvature.

[0045] Relative to the mask frame 30, the long side portion of the mask body 27 is formed in circular shape

protruding toward the side wall side of the mask frame 30. As a result, the side walls 28L are in contact with the long side of the skirt portion 26 of the mask body 27 through only the central connecting portion 32a located in the center in the lengthwise direction of the protruding portion 34 and a pair of the end connecting portions 32b located on boundaries between the protruding portion and the side wall, and welded to the skirt portion through these connecting portions. On both sides of the central connecting portions 32a are defined wedge shaped gaps 36 the width of which is expanded gradually toward the end connecting portions 32b.

[0046] In the shadow mask 21, the short side of the skirt portion 26 of the mask body 27 is in contact with the almost entire length of the inner surface of the side wall 28S on the short side of the mask frame 30 and fixed at several appropriate welding points.

[0047] In the shadow mask according to the fourth embodiment having such a construction, the same operation and effects as in the first embodiment described previously can be obtained.

Claims

1. A color cathode ray tube comprising:

an envelope (10) including a panel (3) having a substantially rectangular effective portion (1) in which a phosphor screen (5) is formed on an inner surface thereof and a skirt portion (2) provided on a periphery of the panel, and a funnel (4) attached to the skirt portion; a shadow mask (21) arranged in the envelope to oppose the phosphor screen; and

an elastic support (15) elastically supporting the shadow mask relative to the skirt portion;

the shadow mask including a substantially rectangular mask body (27) having a number of electron beam passage apertures (25), and a substantially rectangular mask frame (30) having four side walls supporting the periphery of the mask body;

wherein each of at least two side walls (28L) opposing each other of the mask frame (30) has a connecting portion (32a) which is provided at its central portion in a lengthwise direction thereof and fixed to the mask body (27), and a pair of protruding portions (34) which are provided on both sides of the connecting portion with respect to the lengthwise direction of the side wall and protrude in a direction apart from the mask body, and each of the protruding portions defining a gap (36) between the side wall and the mask body,

characterized in that

each gap includes a region whose width gradually increases as it goes far from the connecting portion.

2. A color cathode ray tube according to claim 1, **characterized in that**

each of said at least two side walls (28L) opposing each other includes a central connecting portion (32a) which is located at the central portion of the side wall in its lengthwise direction and fixed to the mask body (27), and a pair of end connecting portions (32b) which are located on both ends of the side wall in its lengthwise direction and fixed to the mask body;

each of the protruding portions (34) is provided between the central connecting portion (32a) and a corresponding end connecting portion (32b) and the gap (36) defined by the protruding portion has a width continuously increasing from the central connecting portion up to the end connecting portion.

3. A color cathode ray tube according to claim 1, **characterized in that**

each of said at least two side walls (28L) opposing each other includes a central connecting portion (32a) which is located at a central portion of the side wall in the lengthwise direction and fixed to the mask body (27);

a pair of end connecting portions (32b) which are located on both ends of the side wall in the lengthwise direction and fixed to the mask body;

a middle connecting portion (32c) which is located between the central connecting portion and each end connecting portion and fixed to the mask body;

a pair of first protruding portions (34) each of which is formed between the central connecting portion and the middle connecting portion and protrudes in a direction apart from the mask body; and

a pair of second protruding portions (34) each of which are formed between the middle connecting portion and the end connecting portion and protrudes in a direction apart from the mask body;

each of the first protruding portions definding a gap (36) whose width continuously increases from the central connecting portion up to the middle connecting portion, and each of the second protruding portions (36) defining a gap whose width continuously increases from the middle connecting portion up to the end connecting portion.

4. A color cathode ray tube according to claim 1, **characterized in that**

a length of the gap (36) defined between the central connecting portion (32a) and the end connecting portion (32b) in the lengthwise direction of the side wall (28L) is set to 0.7-0.9L, if a distance between the central connecting portion and the side wall (28S) on the short side is assumed to be L.

5. A color cathode ray tube according to claim 1, **characterized in that**

a single connecting portion (32a) is provided at each of said at least two side walls (28L) and fixed to the mask body (27) only at its central portion in the lengthwise direction.

6. A color cathode ray tube according to claim 1, **characterized in that**

the long side portion of the mask body (27) is formed in a circular shape protruding toward the side wall side of the mask frame (30).

Patentansprüche

1. Farbkathodenstrahlröhre mit:

einem Kolben (10), der ein Panel (3) mit einem im wesentlichen rechtwinkligen wirksamen Abschnitt (1) aufweist, in dem ein Leuchtstoffbildschirm (5) auf dessen inneren Oberfläche gebildet ist und ein Randabschnitt (2) auf einem Umfang des Panels vorgesehen ist, und ein Trichter (4) an dem Randabschnitt befestigt ist;
wobei eine Lochmaske (21) in dem Kolben angeordnet ist, die dem Leuchtstoffschirm gegenüberliegt; und
einer elastischen Stütze (15), die die Lochmaske bezüglich des Randabschnitts elastisch stützt;
wobei die Lochmaske einen im wesentlichen rechtwinkligen Maskenkörper (27) mit einer Anzahl von Elektronenstrahldurchlauföffnungen (25) und einen im wesentlichen rechtwinkligen Maskenrahmen (30) mit vier Seitenwänden, die den Umfang des Maskenkörpers stützen, aufweist;
wobei jede der mindestens zwei einander gegenüberliegenden Seitenwände (28L) des Maskenrahmens (30) einen Verbindungsabschnitt (32a) aufweist, der am Mittenabschnitt in ihrer longitudinalen Richtung vorgesehen und an dem Maskenkörper (27) befestigt ist, und ein Paar von hervorspringenden Abschnitten (34), die an beiden Seiten des Verbindungsabschnitts bezüglich der longitudinalen Richtung der Seitenwand vorgesehen sind und in einer von dem Maskenkörper hinweggehenden Richtung hervorspringen, und jeder der hervorspringen Abschnitte einen Abstand (36) zwischen der Seitenwand und dem Maskenkörper festlegt,

dadurch gekennzeichnet, daß jeder Abstand einen Bereich aufweist, dessen Breite allmählich ansteigt, wenn er sich von dem Verbindungsabschnitt weg entfernt.

2. Farbkathodenstrahlröhre gemäß Anspruch 1, **dadurch gekennzeichnet, daß** jede der mindestens zwei einander gegenüberliegenden Seitenwände (28L) einen zentralen Verbindungsabschnitt (32a) aufweist, der an dem Mittenabschnitt der Seitenwand in deren longitudinalen Richtung angeordnet und an dem Maskenkörper (27) befestigt ist, und ein Paar von Endverbindungsabschnitten (32b), die an beiden Enden der Seitenwand in deren longitudinalen Richtung angeordnet und an dem Maskenkörper befestigt sind;

wobei jeder der hervorspringenden Abschnitte (34) zwischen dem zentralen Verbindungsabschnitt (32a) und einem entsprechenden Endverbindungsabschnitt (32b) vorgesehen ist, und der durch den hervorspringenden Abschnitt festgelegte Abstand (36) eine Breite aufweist, die sich kontinuierlich von dem zentralen Verbindungsabschnitt bis zu dem Endverbindungsabschnitt erhöht.

3. Farbkathodenstrahlröhre gemäß Anspruch 1, **dadurch gekennzeichnet, daß**

jede der mindestens zwei einander gegenüberliegenden Seitenwände (28L) einen zentralen Verbindungsabschnitt (32a) aufweist, der an einem zentralen Abschnitt der Seitenwand in der longitudinalen Richtung angeordnet und an dem Maskenkörper (27) befestigt ist;
ein Paar von Endverbindungsabschnitten (32b), die an beiden Enden der Seitenwand in der longitudinalen Richtung angeordnet und an dem Maskenkörper befestigt sind;
einen mittleren Verbindungsabschnitt (32c), der zwischen dem zentralen Verbindungsabschnitt und jedem Endverbindungsabschnitt angeordnet und an dem Maskenkörper befestigt ist;
ein Paar von ersten hervorspringenden Abschnitten (34), wobei jeder dieser zwischen dem zentralen Verbindungsabschnitt und dem mittleren Verbindungsabschnitt gebildet ist und in einer von dem Maskenkörper hinweggehenden Richtung hervorspringt; und

ein Paar von zweiten hervorspringenden Abschnitten (34), wobei jeder dieser zwischen dem mittleren Verbindungsabschnitt und dem Endverbindungsabschnitt gebildet ist und in einer von dem Maskenkörper hinweggehenden Richtung hervorspringt;
wobei jeder der ersten hervorspringenden Abschnitte einen Abstand (36) festlegt, dessen Breite kontinuierlich von dem zentralen Verbindungsabschnitt bis zu dem mittleren Verbindungsabschnitt ansteigt, und jeder der zweiten herausragenden Abschnitte (36) einen Abstand festlegt, dessen Breite kontinuierlich von dem mittleren Verbindungsabschnitt bis zu dem Endverbindungsabschnitt ansteigt.

4. Farbkathodenstrahlröhre gemäß Anspruch 1, **dadurch gekennzeichnet, daß**

eine Länge des Abstands (36), der zwischen dem zentralen Verbindungsabschnitt (32a) und dem Endverbindungsabschnitt (32b) in der longitudinalen Richtung der Seitenwand (28L) festgelegt ist, auf 0,7-0,9 L eingestellt ist, wenn ein Abstand zwischen dem zentralen Verbindungsabschnitt und der Seitenwand (28S) auf der kurzen Seite als L angenommen wird.

5. Farbkathodenstrahlröhre gemäß Anspruch 1, **dadurch gekennzeichnet, daß**

ein einzelner Verbindungsabschnitt (32a) an jeder der mindestens zwei Seitenwände (28L) vorgesehen und mit dem Maskenkörper (27) nur an dessen zentralen Abschnitt in der longitudinalen Richtung befestigt ist.

6. Farbkathodenstrahlröhre gemäß Anspruch 1, **dadurch gekennzeichnet, daß**

der lange Seitenabschnitt des Maskenkörpers (27) in einer kreisförmigen Form gebildet ist, der zu der Seitenwandseite des Maskenrahmens (30) hin hervorspringt.

Revendications

1. Tube à rayons cathodiques couleur comprenant :

une enveloppe (10) incluant un panneau (3) ayant une partie effective sensiblement rectangulaire (1) dans laquelle un écran au phosphore (5) est formé sur une surface interne de cette partie et une partie de jupe (2) prévue sur une périphérie du panneau et un entonnoir (4) fixé à la partie de jupe ;
un masque perforé (21) agencé dans l'enveloppe de façon à faire face à l'écran au phosphore ; et
un support élastique (15) supportant de façon élastique le masque perforé par rapport à la partie de jupe ;
le masque perforé incluant un corps de masque sensiblement rectangulaire (27) comprenant un certain nombre d'ouvertures de passage faisceau d'électrons (25) et un cadre de masque sensiblement rectangulaire (30) comprenant quatre parois latérales supportant la périphérie du corps de masque ;
dans lequel chacune d'au moins deux parois latérales (28L) s'opposant l'une l'autre du cadre de masque (30) comprend une partie de connexion (32a) qui est prévue au niveau de sa partie centrale dans une direction de longueur de celle-ci et fixée au corps de masque (27), et une paire de parties en protubérance (34) qui sont prévues sur les deux côtés de la partie de connexion par rapport à la direction de longueur de la paroi latérale et qui font saillie dans une direction d'éloignement par rapport au corps de marque, et chacune des parties en protubérance définissant un espace (36) entre la paroi latérale et le corps de masque,

caractérisé en ce que :

chaque espace inclut une région dont la largeur augmente progressivement à mesure qu'elle s'éloigne de la partie de connexion.

2. Tube à rayons cathodiques couleur selon la revendication 1,
caractérisé en ce que :

chacune desdites au moins deux parois latérales (28L) s'opposant l'une l'autre inclut une partie de connexion centrale (32a) qui est située au niveau de la partie centrale de la paroi latérale dans sa direction de longueur et qui est fixée au corps de masque (27) et une paire de parties de connexion d'extrémité (32b) qui sont situées sur les deux extrémités de la paroi latérale dans sa direction de longueur et qui sont fixées sur le corps de masque ;
chacune des parties en protubérance (34) est prévue entre la partie de connexion centrale (32a) et une partie de connexion d'extrémité correspondante (32b) et l'espace (36) défini par la partie de protubérance présente une largeur qui augmente de façon continue depuis la partie de connexion centrale jusqu'à la partie d'extrémité.

3. Tube à rayons cathodiques couleur selon la revendication 1,

caractérisé en ce que chacune desdites au moins deux parois latérales (28L) s'opposant l'une l'autre inclut une partie de connexion centrale (32a) qui est située au niveau de la partie centrale de la paroi latérale dans sa direction de longueur et qui est fixée au corps de masque (27) et une paire de parties de connexion d'extrémité (32b) qui sont situées sur les deux extrémités de la paroi latérale dans sa direction de longueur et qui sont fixées sur le corps de masque ;

une partie de connexion intermédiaire (32c) qui est située entre la partie de connexion centrale et chaque partie de connexion d'extrémité et fixée au corps de masque ;
une paire de premières parties en protubérance (34) dont chacune est formée entre la partie de connexion centrale et la partie de connexion intermédiaire et faisant saillie suivant une direction d'éloignement par rapport au corps de masque ; et
une paire de secondes parties en protubérance (34) dont chacune est formée entre la partie de connexion intermédiaire et la partie de connexion d'extrémité et faisant saillie suivant une direction d'éloignement par rapport au corps de masque,
chacune des premières parties en protubérance définissant un espace (36) dont la largeur augmente de façon continue depuis la partie de connexion centrale jusqu'à la partie de connexion intermédiaire, et chacune des secondes parties en protubérance (36) définissant un espace dont la largeur augmente de façon continue depuis la partie de connexion intermédiaire jusqu'à la partie de connexion d'extrémité.

4. Tube à rayons cathodiques couleur selon la revendication 1,
caractérisé en ce que:

une longueur de l'espace (36) défini entre la partie de connexion centrale (32a) et la partie de connexion d'extrémité (32b) suivant la direction de longueur de la paroi latérale (28L) est établie entre 0,7 et 0,9 L, si une distance entre la partie connexion centrale et la paroi latérale (28S) sur le côté court est considérée comme valant L.

5. Tube à rayons cathodiques couleur selon la revendication 1, **caractérisé en ce qu'**une partie de connexion unique (32a) est prévue au niveau de chacune desdites au moins deux parois latérales (28L) et est fixée au corps de masque (27) seulement au niveau de sa partie centrale suivant la direction de longueur.

6. Tube à rayons cathodiques couleur selon la revendication 1, **caractérisé en ce que** la partie latérale longue du corps de masque (27) est formée selon une forme circulaire faisant saillie en direction du côté de paroi latérale du cadre de masque (30).

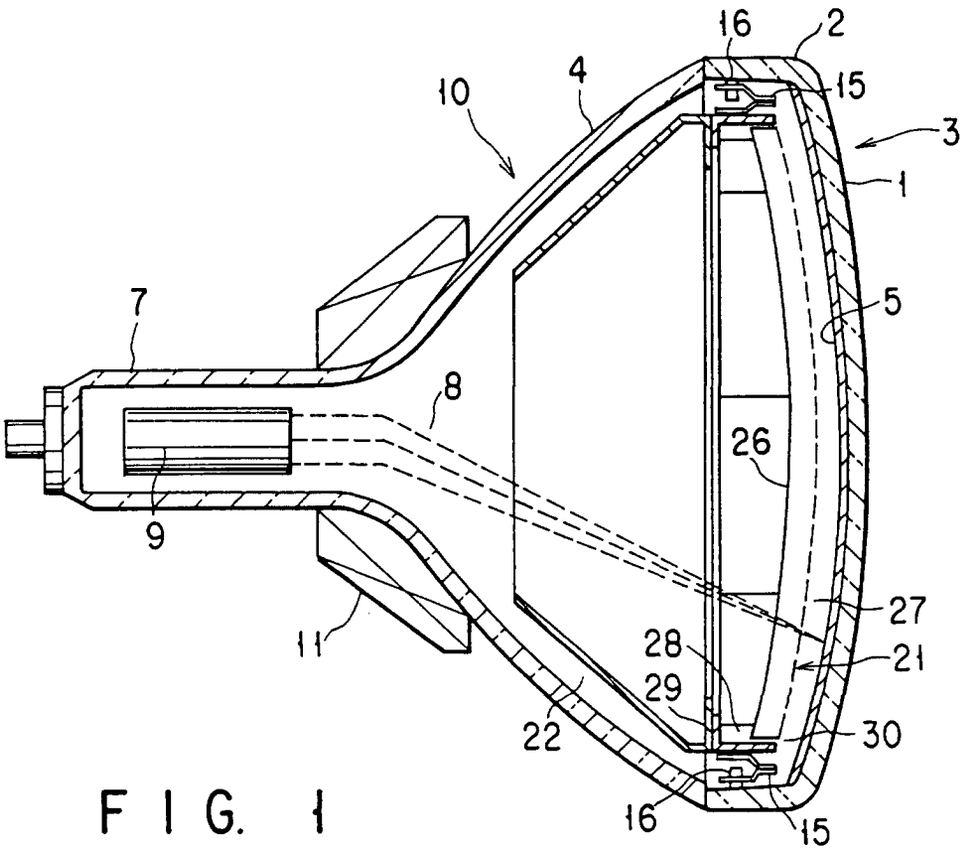

16
2
10
4
15
3
1
7
5
8
26
9
27
11
28
21
29
22
30
16
15

FIG. 1

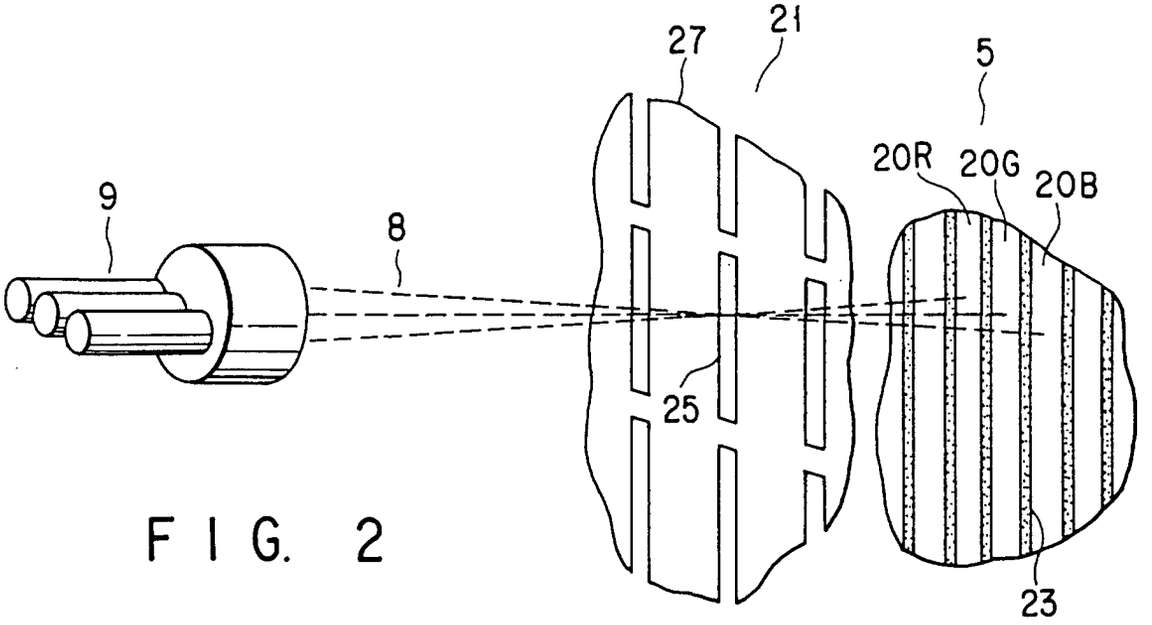

27
21
5
20R
20G
20B
9
8
25
23

FIG. 2

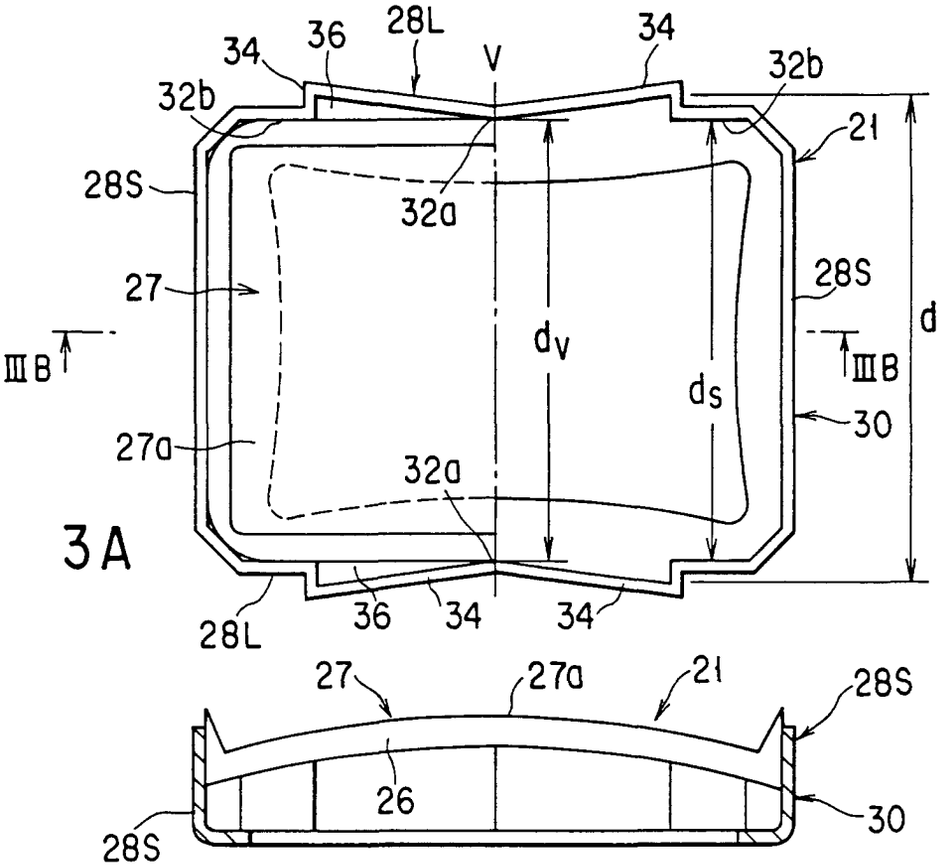


FIG. 3A

FIG. 3B

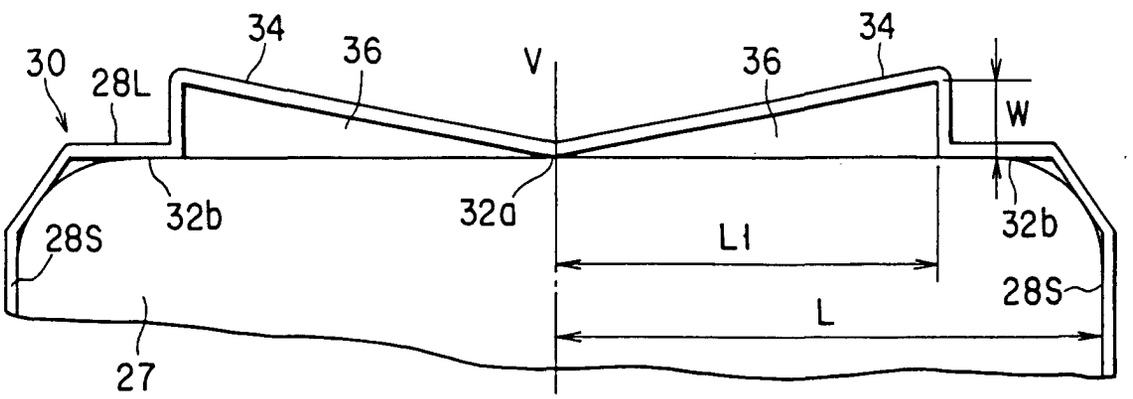


FIG. 4

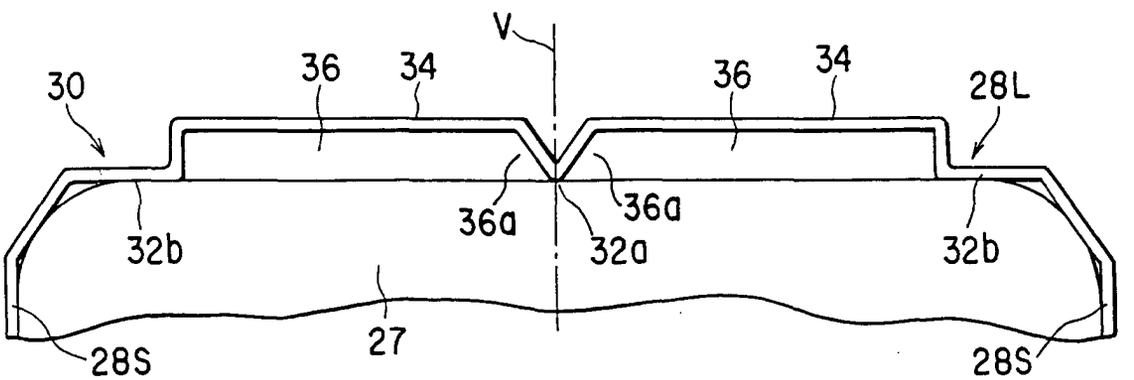


FIG. 5

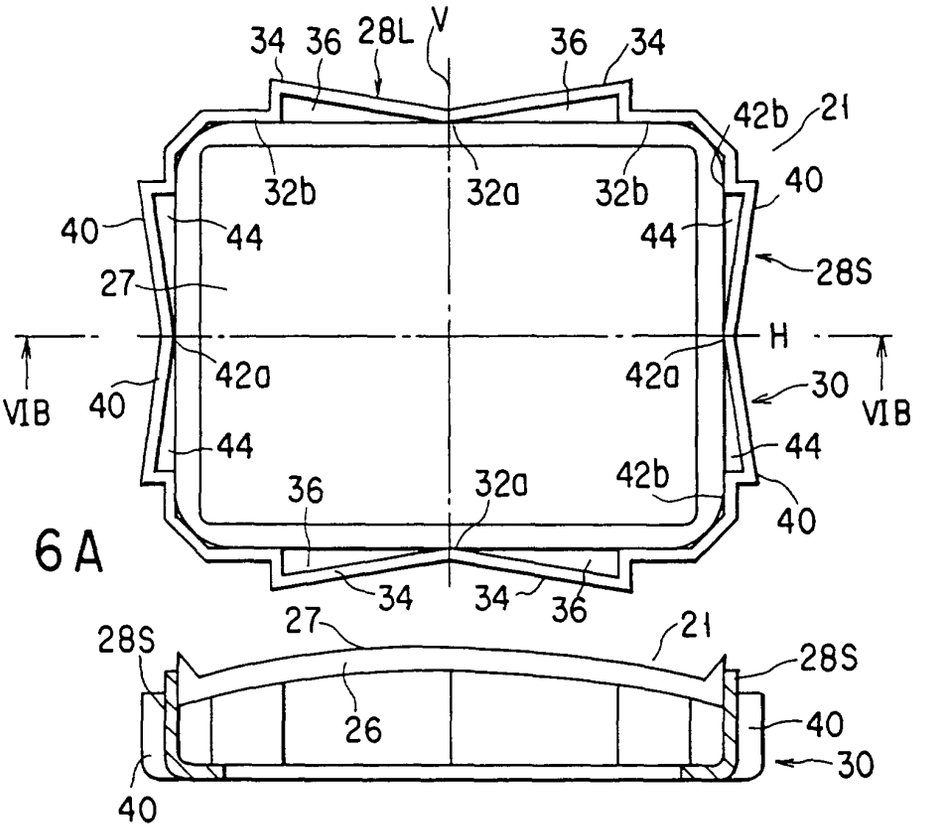


FIG. 6A

FIG. 6B

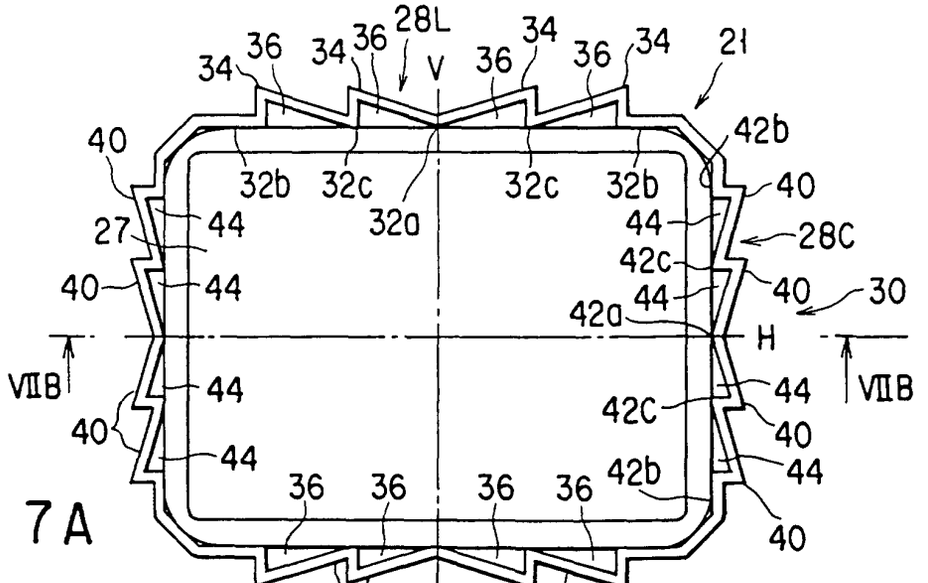


FIG. 7A

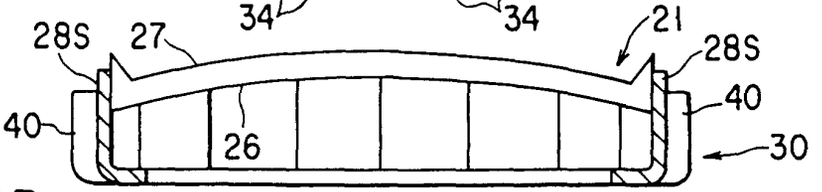


FIG. 7B

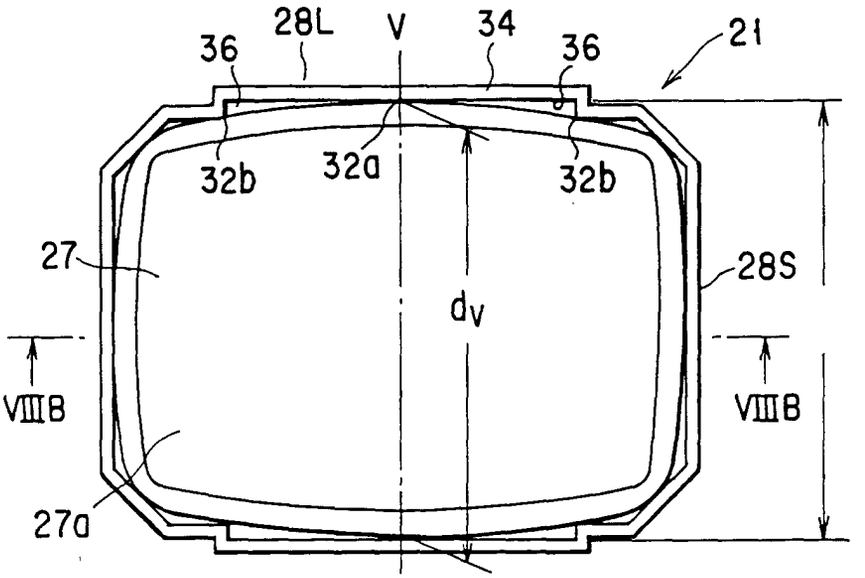

28L
V
34
36
36
21
32b
32a
32b
27
28S
dV
VIIIB
VIIIB
27a

FIG. 8A

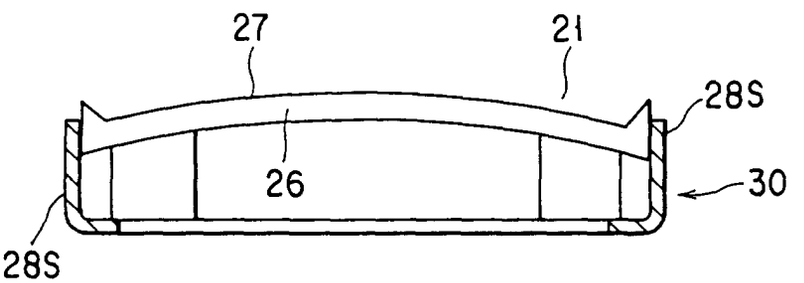

27
21
28S
26
30
28S

FIG. 8B