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# (54) Plasma display panel

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Panneau d'affichage à plasma

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## Description

**[0001]** A plasma display panel is disclosed herein.

**[0002]** Plasma display panels are known. However, they suffer from various disadvantages. US 2004/046504 A1, US 2006/061278 A1, EP-A-1 688 981, US 2006/076888 A1, and EP-A-1 713 109 disclose example of prior art plasma display panels.

**[0003]** Embodiments will be described in detail with reference to the following drawings in which like reference numerals refer to like elements, and wherein:

**[0004]** FIG. 1 illustrates structure of a barrier rib of a plasma display panel according to an embodiment;

**[0005]** FIGs. 2A to 2C are cross-sectional views of structure of an auxiliary barrier rib according to an embodiment;

**[0006]** FIG. 3 is a perspective view of first barrier ribs according to an embodiment;

**[0007]** FIG. 4A illustrates first barrier ribs of a plasma display panel according to another embodiment;

**[0008]** FIG. 4B is a cross-sectional view of a portion of the plasma display panel of FIG. 4A, taken along lines 4B-4B;

**[0009]** FIG. 5 is a plane view explaining a relationship between a sealing portion and barrier ribs of a plasma display panel according to an embodiment;

**[0010]** FIGs. 6A and 6B are cross-sectional views of a sealing portion according to additional embodiments; and

**[0011]** FIG. 7 is a perspective view of first barrier ribs of a plasma display panel according to another embodiment.

**[0012]** Reference will now be made in detail embodiments examples of which are illustrated in the accompanying drawings.

**[0013]** A plasma display panel generally includes a phosphor inside discharge cells partitioned by barrier ribs. When a driver supplies driving signals to electrodes of the plasma display panel, the phosphor is excited to emit light.

**[0014]** The plasma display panel represents a gray scale due to the combination of subfields. In other words, the plasma display panel emits light to the outside during each subfield, and a gray scale is represented due to a sum of the quantity of light emitted to the outside during each subfield.

**[0015]** Each subfield includes a reset period, an address period, and a sustain period. During the reset period, wall charges are uniformly distributed inside all of discharge cells of the plasma display panel. During the address period, discharge cells to emit light are selected. During the sustain period, light is emitted in the selected discharge cells.

**[0016]** There are several factors that cause noise when the plasma display panel is driven. The noise is an obstacle to a driving of the plasma display panel, and also reduces the structural quality of the plasma display panel.

**[0017]** The present application discloses various embodiments. One of ordinary skill in the art will recognize that features of the various embodiments can be combined to produce different plasma display panels. Further, the auxiliary barrier ribs disclosed herein can be utilized with stripe type barrier ribs, or other type barrier ribs, such as lattice type or well type.

**[0018]** FIG. 1 illustrates structure of a barrier rib of a plasma display panel according to an embodiment. As illustrated in FIG. 1, the plasma display panel 1 includes a first substrate 100, a second substrate 200, and a plurality of barrier ribs 150 and 150' positioned between the first substrate 100 and the second substrate 200. The first substrate 100 and the second substrate 200 may be made of a transparent material, and are positioned parallel to each other to be spaced apart from each other with a predetermined distance therebetween. The plasma display panel 1 includes a sealing portion 300 used to seal the first and second substrates 100 and 200. The sealing portion 300 may be formed by coating a frit of a glass material along edges of the substrates 100 and 200. Although not shown, the plasma display panel 1 may include a scan electrode and a sustain electrode positioned on the first substrate 100, an address electrode positioned on the second substrate 200, a dielectric layer covering the electrodes, and a phosphor layer positioned inside a discharge space partitioned by the barrier ribs.

**[0019]** Discharge cells are partitioned by the barrier ribs 150 and 150' between the first and second substrates 100 and 200. The discharge cells may be divided into a discharge area in which an image is displayed and a non-discharge area in which an image is not displayed. Although not shown, the first and second substrates 100 and 200 each may have a substantially rectangular form with long sides and short sides.

**[0020]** In one embodiment, the barrier rib 150 positioned in the discharge area is defined as a first or main barrier rib, and the barrier rib 150' positioned in the non-discharge area is defined as an auxiliary barrier rib 150'. The auxiliary barrier rib 150' may function as a noise prevention barrier rib. The first barrier rib(s) 150 may be positioned between the first and second substrate 200 in a direction of the long side and/or the short side of the first substrate 100 and/or the second substrate 200.

**[0021]** The auxiliary barrier rib(s) 150' extends from the first barrier rib(s) 150, and is positioned to be spaced apart from the sealing portion 300 formed at the edge of the second substrate 200 with a predetermined distance therebetween. The auxiliary barrier rib(s) 150' have a height h2 lower than a height h1 of the first barrier rib(s) 150.

**[0022]** The auxiliary barrier rib(s) 150' may prevent noise generated in the discharge area during a driving of the plasma display panel from being propagated to outside of the plasma display panel, and may improve an exhaust process characteristic when the plasma display panel is fabricated, because the auxiliary barrier rib (s) 150' are spaced apart from the sealing portion 300

with the predetermined distance therebetween. The auxiliary barrier rib(s) 150' may further improve the exhaust process characteristic because the height h2 of the auxiliary barrier rib(s) 150' is lower than the height h1 of the first barrier rib(s) 150.

**[0023]** The auxiliary barrier rib 150' may be extended from any first barrier rib 150 formed in a direction of the long side or the short side of the first and second substrates 100 and 200.

**[0024]** Examples of a formation process of the first barrier rib(s) 150 and the auxiliary barrier rib(s) 150' may include a photolithography process in which ultraviolet rays are irradiated using a photosensitive barrier rib material, a screen printing process in which a barrier rib material is printed on a substrate, and a direct etching process in which a photoresist is positioned on a barrier rib material and then ultraviolet rays are irradiated on the photoresist to perform an etching process. The first barrier rib(s) 150 and the auxiliary barrier rib(s) 150' may be formed using any formation process capable of forming a barrier rib.

**[0025]** The first barrier rib(s) 150 and the auxiliary barrier rib(s) 150' may be formed using different materials depending on their functions. However, the first barrier rib(s) 150 and the auxiliary barrier rib(s) 150' may be formed using the same material for a simple and easy formation process.

**[0026]** FIGs. 2A to 2C are cross-sectional views of structure of an auxiliary barrier rib according to an embodiment. The auxiliary barrier rib 150', which may be extended from the first barrier rib 150, as illustrated in FIG. 2A, may have a gradually decreasing height (i.e., h2>h2'>h2">h2'",...) as it extends toward the sealing portion 300. As illustrated in FIG. 2B, the height of the auxiliary barrier rib 150' may decrease stage by stage as the auxiliary barrier rib 150' extends toward the sealing portion 300. Further, as illustrated in FIG. 2C, the height of the auxiliary barrier rib 150' may linearly decrease and then may sharply decrease at an end of the auxiliary barrier rib 150' as the auxiliary barrier rib 150' extends toward the sealing portion 300.

**[0027]** The auxiliary barrier rib 150' is not limited to the above-described structure. It may have any structure as long as the auxiliary barrier rib 150' is extended from the first barrier rib 150. For instance, although not shown, the number of auxiliary barrier rib(s) 150' extended from one first barrier rib may be two. The auxiliary barrier rib 150' has a portion with the height lower than the height of the first barrier rib.

**[0028]** FIG. 3 is a perspective view of first barrier ribs according to an embodiment. As illustrated in FIG. 3, the first barrier rib(s) 150 positioned in the discharge area may include a plurality of first barrier rib portions 150a formed in a direction of a long side of the first and second substrates 100 and 200, and a plurality of second barrier rib portions 150b formed in a direction of a short side of the first and second substrates 100 and 200. A height h1 of the first barrier rib portions 150a may be lower than a height h3 of the second barrier rib portions 150b. In such a case, the auxiliary barrier ribs 150' may include a portion with the height h2 lower than the height h1 of the first barrier rib portions 150a. As above, when the heights of the first and second barrier ribs 150a and 150b are different from each other, an exhaust characteristic of the plasma display panel is further improved.

**[0029]** The outermost second barrier rib portion 150b among the second barrier rib portions 150b positioned in the discharge area may have a curvature in a direction of the non-discharge area. This may prevent a reduction in strength of the barrier rib, improving the structure of the barrier rib for noise prevention.

**[0030]** At least one auxiliary barrier rib may be formed parallel to the first barrier rib portion 150a and/or the second barrier rib portion 150b in the non-discharge area in which the first barrier rib 150 is not positioned. The auxiliary barrier rib may be formed in a form similar to a connection form of the first barrier rib 150 and the auxiliary barrier rib 150' as illustrated in FIGs. 2A to 2C. Further, the auxiliary barrier rib may be formed in a stripe form having a constant height similar to the first barrier rib 150. The auxiliary barrier rib may further reduce a noise generated when the plasma display panel is driven.

**[0031]** A dummy area may be formed between the discharge area with the first barrier rib 150 and the non-discharge area with the auxiliary barrier rib 150'. In the dummy area, discharge cells partitioned by dummy barrier ribs are positioned, but light is not emitted in the discharge cells positioned in the dummy area. The dummy area prevents noise generated in the discharge area from being propagated to outside of the plasma display panel. The dummy barrier rib may have a cross structure of the first and second barrier rib portions 150a and 150b each having the different height, or a stripe structure using only one barrier rib.

**[0032]** FIG. 4A illustrates structure of first barrier ribs of a plasma display panel according to another embodiment. Figure 4B is a cross-sectional view of a portion of the plasma display panel of Fig. 4A, taken along line 4B-4B.

**[0033]** As illustrated in FIGs. 4A and 4B, the plasma display panel 14 includes a first barrier rib 150 positioned in a discharge area and an auxiliary barrier rib 150' positioned in a non-discharge area. The first barrier rib 150 may be a stripe type barrier rib positioned on a second substrate 200. The embodiment of FIGs. 4A-4B show the auxiliary barrier rib 150' being shorter and narrower that the first barrier rib 150. Further, the spacing between adjacent auxiliary barrier ribs 150' may be different or the same as the spacing between adjacent first barrier ribs 150. Alternatively, the first barrier rib 150 may be a well type barrier rib including first and second barrier rib portions illustrated in FIG. 3. In such a case, a height of the second barrier rib portion may be higher than a height of the first barrier rib portion so as to improve an exhaust characteristic.

**[0034]** The auxiliary barrier rib 150' may be positioned

parallel to the first barrier rib 150 in the non-discharge area, and is spaced apart from a sealing portion 300 with a predetermined distance therebetween, as shown in FIG. 4A. The number of auxiliary barrier ribs 150' positioned in the non-discharge area may be one or more. The embodiment of FIGS. 4A and 4B shows 3 auxiliary barrier ribs 150'. When the first barrier rib 150 includes a first barrier rib portion and a second barrier rib portion having a height higher than a height of the first barrier rib portion, a height of the auxiliary barrier ribs 150' may be substantially equal to the height of the second barrier rib portion. Although not shown, the auxiliary barrier rib 150' may be positioned perpendicular to the first barrier rib 150 in the non-discharge area.

**[0035]** If the disposition structure of the auxiliary barrier rib 150' is explained based on a first substrate and the second substrate 200, the auxiliary barrier rib 150' may be positioned in a direction of a short side or a long side of the second substrate 200 in the non-discharge area. In this case, the auxiliary barrier rib 150' is positioned to be spaced apart from the sealing portion 300 with a predetermined distance therebetween.

**[0036]** A shape and a material of the auxiliary barrier rib 150' may be the same as those of the first barrier rib 150. The auxiliary barrier rib 150' may have a constant height along its entire length.

**[0037]** Alternatively, the embodiment of FIGs. 4A and 4B may be combined with the embodiments of FIG. 1 or FIG. 7, discussed hereinafter, such that the embodiment further includes a first barrier rib 150 having an auxiliary barrier rib 150' that extends or is spaced from one or both ends of the first barrier rib 150 and positioned in the non-discharge area.

**[0038]** FIG. 5 is a plane view for explaining a relationship between a sealing portion and a barrier rib of a plasma display panel according to an embodiment. Referring to FIG. 5, the first barrier rib 150 may be positioned in the discharge area on the second substrate 200, and the sealing portion 300 may be positioned at an edge of the second substrate 200. The sealing portion 300 includes a first sealing portion 300a positioned in a direction of the long side of the second substrate 200, a second sealing portion 300b positioned in a direction of the short side of the second substrate 200, and may include a third corner sealing portion 300c formed at a contact position of the first sealing portion 300a and the second sealing portion 300b.

**[0039]** The sealing portions 300a, 300b, and 300c may prevent noise generated in the discharge area from being propagated to outside of the plasma display panel 15. Only, in the case that the auxiliary barrier rib 150' is positioned in a direction of the short side of the second substrate 200 as in the previous embodiment, the auxiliary barrier rib 150' may prevent noise generated in the direction of the short side of the second substrate 200. However, it may be insufficient for the auxiliary barrier rib 150' to prevent only noise generated in the direction of the long side of the second substrate 200. Accordingly, noises generated in all directions of the second substrate 200 may be prevented by setting a width W2 of the second sealing portion 300b to be larger than a width W1 of the first sealing portion 300a.

**[0040]** A distance d1 ranging from the second sealing portion 300b to the first barrier rib 150 is longer than a distance d2 ranging from the first sealing portion 300a to an end of the first barrier rib 150. More specifically, the distance d1 may be equal to or less than about 2.5 times longer than the distance d2.

**[0041]** Although not shown, the auxiliary barrier rib may be positioned in the non-discharge area and may be extended from the first barrier rib. The distance d2 may be about 2 to 10 times a distance from the first sealing portion 300a to an end of the auxiliary barrier rib extended from the first barrier rib. In this case, a length of the auxiliary barrier rib extended from the first barrier rib 150 may be longer than the distance from the first sealing portion 300a to the end of the auxiliary barrier rib.

**[0042]** When the above-described relationships between the sealing portions 300a, 300b, and 300c and the first barrier rib(s) 150 are satisfied, noise may be prevented in a discharge area of the plasma display panel and, at the same time, the discharge area and the non-discharge area may be efficiently partitioned. Accordingly, an advantage (i.e., a margin) in a structural disposition of the plasma display panel may be improved due to the effective partition of the discharge area and the non-discharge area.

**[0043]** In particular, the third corner sealing portion 300c may have a structural weakness when the first and second substrates are attached. In other words, because the structure of the third corner sealing portion 300c may be weaker than the structure of the first or second sealing portion 300a or 300b, cracks may be generated in the third corner sealing portion 300c. The cracks may greatly affect the generation of noise. Accordingly, the third corner sealing portion 300c may be formed in a round form and may be connected to the first and second sealing portions 300a and 300b, thereby preventing cracks. In this case, a width of the third corner sealing portion 300c may be larger than the width W2 of the second sealing portion 300b.

**[0044]** In FIG. 5, reference numeral "a" indicates a distance from a contact surface of the first sealing portion 300a and the third corner sealing portion 300c to an imaginary line R1 extended from the second sealing portion 300b. Reference numeral "b" indicates a distance from a contact surface of the second sealing portion 300b and the third corner sealing portion 300c to an imaginary line R2 extended from the first sealing portion 300a. A ratio of "a" to "b" may be 5:4 so as to further improve the structural weakness of the third corner sealing portion 300c and to prevent noise.

**[0045]** FIGs. 6A and 6B are cross-sectional views of a sealing portion according to another embodiment. As illustrated in FIG. 6A, the first substrate 100 and the second substrate 200 may be positioned to be spaced apart

from each other with a predetermined distance therebetween. A plurality of scan electrodes 101 and a plurality of sustain electrodes 102 may be positioned parallel to each other on the first substrate 100, and an upper dielectric layer 103 may be positioned on the first substrate 100 to cover the plurality of scan electrodes 101 and the plurality of sustain electrodes 102. In this case, the upper dielectric layer 103 may cover an entire surface of the first substrate 100 on which the plurality of scan electrodes 101 and plurality of sustain electrode 102 are formed. Although not shown, the upper dielectric layer 103 may include a first layer positioned adjacent to the plurality of scan electrode 101 and the plurality of sustain electrode 102, and a second layer positioned on the first layer. The first layer may be formed by a screen printing method so that a dielectric paste covers the plurality of scan electrodes 101 and the plurality of sustain electrodes 102, and the second layer may be formed by a laminating method using a green sheet. A protective layer 104 made of MgO may be formed on the upper dielectric layer 103.

**[0046]** A plurality of address electrodes 201 may be positioned parallel to one another on the second substrate 200, and a lower dielectric layer 203 may be positioned on the second substrate 200 to cover the address electrodes 201. In this case, the lower dielectric layer 203 may cover an entire surface of the second substrate 200 on which the electrodes 201 are formed.

**[0047]** The position structures of the upper dielectric layer 103 and the lower dielectric layer 203 may be applied to the plasma display panel, or one of the position structures of the dielectric layers may be applied to the plasma display panel. Further, the first barrier rib 150 and the auxiliary barrier rib 150' illustrated in FIG. 1 may be positioned between the first substrate 100 and the second substrate 200.

**[0048]** The sealing portion 300 may directly contact each of the upper dielectric layer 103 covering the entire surface of the first substrate 100 and the lower dielectric layer 203 covering the entire surface of the second substrate 200 to attach the first substrate 100 to the second substrate 200. When the upper dielectric layer 103 or the lower dielectric layer 203 does not cover the entire surface of the first substrate 100 or the second substrate 200 (for instance, the upper dielectric layer 103 or the lower dielectric layer 203 is not formed on the first substrate 100 or the second substrate 200), the sealing portion 300 may directly contact the substrate on which the dielectric layer is not formed.

**[0049]** When the sealing portion 300 directly contacts at least one of the upper dielectric layer 103 or the lower dielectric layer 203, noise generated at a contact surface (i.e., an interface) between the sealing portion 300 and the substrate may be prevented. When the sealing portion 300 directly contacts all of the upper dielectric layer 103 and the lower dielectric layer 203, or does not contact all of the upper dielectric layer 103 and the lower dielectric layer 203, the sealing portion 300 may include beads to prevent noise generated at the interface between the sealing portion 300 and the substrates 100 and 200.

**[0050]** As illustrated in FIG. 6B, when the lower dielectric layer 203 covers a portion of the address electrode 201, the sealing portion 300 may directly contact a portion of the address electrode 201 not covered by the lower dielectric layer 203. This may prevent noise and a migration phenomenon generated when the address electrode 201 is exposed to air.

**[0051]** Other details of the plasma display panel can be found in U.S. Patent Nos. 6,838,828 B2, 6,479,935, 6,680,573, 6,630,788, 6,621,230 B2, 6,906,690 B2, 6,791,516 B2, 6,624,587 B2, and 7,187,346.Further, the embodiments disclosed herein can be readily applicable to display panels or plasma display panels made by various manufacturers.

**[0052]** FIG. 7 is a perspective view of first barrier ribs of a plasma display panel according to another embodiment. As illustrated in FIG. 7, since the structure of the plasma display panel 17 according to this embodiment is substantially the same as the structure of the plasma display panel according to previous embodiments, like description thereof will be omitted. In this embodiment, an auxiliary barrier rib(s) 150' may be positioned between a first barrier rib 150 and a sealing portion 300 to be spaced apart from the first barrier rib 150 and the sealing portion 300 with a predetermined distance therebetween. Hence, noise generated when the plasma display panel 17 is driven may be prevented, and an exhaust characteristic improved.

**[0053]** A plasma display panel according to embodiments disclosed herein is capable of preventing noise generated when the plasma display panel is driven.

**[0054]** A plasma display panel according to embodiments disclosed herein is capable of preventing a reduction in an exhaust process characteristic and a reduction in a structural strength characteristic of a barrier rib, which may be generated when the structure of a barrier rib is improved for auxiliary.

**[0055]** A plasma display panel according to an embodiment disclosed herein includes a first substrate and a second substrate that are positioned parallel to each other and spaced apart from each other with a predetermined distance therebetween, a first or main barrier rib that is positioned between the first substrate and the second substrate and partitions a discharge area where an image is displayed, a sealing portion that attaches the first substrate to the second substrate, and an auxiliary barrier rib that is spaced apart from the sealing portion with a predetermined distance therebetween and is extended from the main barrier rib. The auxiliary barrier rib includes a portion with a height lower than a height of the first barrier rib positioned in the discharge area.

**[0056]** Implementations may include one or more of the following features. For example, the auxiliary barrier rib may have a gradually decreasing height as it goes toward the sealing portion. Further, the first barrier rib may include a plurality of first barrier rib portions posi-

tioned in a direction of a long side of the first substrate and the second substrate, and a plurality of second barrier rib portions positioned in a direction perpendicular to the first barrier rib portions. A height of the first barrier rib portion may be lower than a height of the second barrier rib portion, and the auxiliary barrier rib includes a portion with a height lower than the height of the first barrier rib portion. Also, at least one auxiliary barrier rib may be positioned in a non-discharge area in a direction parallel or perpendicular to the first barrier rib. The sealing portion may include beads. The sealing portion includes a first sealing portion positioned in a direction of a long side of the first substrate and the second substrate, and a second sealing portion positioned in a direction of a short side of the first substrate and the second substrate. A width of the first sealing portion is smaller than a width of the second sealing portion.

**[0057]** A plasma display panel according to another embodiment disclosed herein includes a first substrate and a second substrate that are positioned parallel to each other and spaced apart from each other with a predetermined distance therebetween, a first or main barrier rib that is positioned between the first substrate and the second substrate and partitions a discharge area where an image is displayed, a sealing portion that attaches the first substrate to the second substrate, and an auxiliary barrier rib that is positioned parallel to the first barrier rib and is spaced apart from the sealing portion with a predetermined distance therebetween. The auxiliary barrier rib may have a substantially equal height over the entire portion of thereof. The number of auxiliary barrier ribs may be one or more. The auxiliary barrier rib may be positioned in a direction of at least one of a long side and a short side of the first substrate and the second substrate.

**[0058]** A plasma display panel according to another embodiment disclosed herein includes a first substrate and a second substrate that are positioned parallel to each other and spaced apart from each other with a predetermined distance therebetween, a first or main barrier rib that is positioned between the first substrate and the second substrate and partitions a discharge area where an image is displayed, a sealing portion that attaches the first substrate to the second substrate, and an auxiliary barrier rib that is positioned between the first barrier rib and the sealing portion and spaced apart from the first barrier rib and the sealing portion with a predetermined distance therebetween. The auxiliary barrier rib may include a portion with a height lower than a height of the first barrier rib.

**[0059]** The first barrier rib may include a plurality of first barrier rib portions positioned in a direction of a long side of the first substrate and the second substrate, and a plurality of second barrier rib portions positioned in a direction perpendicular to the first barrier rib portions. A height of the first barrier rib portion may be lower than a height of the second barrier rib portion. The auxiliary barrier rib includes a portion with a height lower than the height of the first barrier rib portion.

**[0060]** Any reference in this specification to "one embodiment," "an embodiment," "example embodiment," etc., means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment of the invention. The appearances of such phrases in various places in the specification are not necessarily all referring to the same embodiment. Further, when a particular feature, structure, or characteristic is described in connection with any embodiment, it is submitted that it is within the purview of one skilled in the art to effect such feature, structure, or characteristic in connection with other ones of the embodiments.

## Claims

**1.** A plasma display panel, comprising:

a first substrate (100) and a second substrate (200) spaced apart from each other with a predetermined distance therebetween;

at least one first barrier rib (150) that is positioned between the first substrate (100) and the second substrate (200) and partitions a discharge area;

a sealing portion (300) that attaches the first substrate (100) to the second substrate (200); and

at least one auxiliary barrier rib (150') that is positioned between the at least one first barrier rib (150) and the sealing portion (300) in a non-discharge area, wherein the at least one auxiliary barrier (150') extends from the at least one first barrier rib (150) and includes a portion with a height lower than a height of the at least one first barrier rib (150),

**characterized in that** the at least one auxiliary barrier rib (150') has a width that is narrower than a width of the first barrier rib (150) and the auxiliary rib extends in a direction parallel to the short side direction of the first substrate (100) and the second substrate (200), wherein the sealing portion (300) includes a first sealing portion (300a) that extends substantially in a direction parallel to the long side direction of the first substrate (100) and the second substrate (200), and a second sealing portion (300b) that extends substantially in the short side direction of the first substrate (100) and the second substrate (200), and wherein a width (W1) of the first sealing portion (300a) is smaller than a width (W2) of the second sealing portion (300b), and wherein a distance (d1) , measured in the long side direction of the first substrate and the second substrate, ranging from the second sealing portion (300b) to the first barrier rib (150) is longer than a distance (d2), measured in the short

side direction of the first substrate and the second substrate, ranging from the first sealing portion (300a) to an end of the first barrier rib (150).

**2.** The plasma display panel according to claim 1, wherein the at least one first barrier rib extends substantially in the long side direction or the short direction side of the first substrate and the second substrate.

**3.** The plasma display panel according to either of claims 1 and 2, wherein the at least one first barrier rib includes a plurality of first barrier rib portions that extend substantially in the long side direction of the first substrate and the second substrate, and a plurality of second barrier rib portions that extend in a direction substantially perpendicular to the first barrier rib portions.

**4.** The plasma display panel according to claim 3, wherein a height of the first barrier rib portion is lower than a height of the second barrier rib portion, and wherein the at least one auxiliary barrier rib includes a portion with a height lower than the height of the first barrier rib portions.

**5.** The plasma display panel according to claims 3, wherein an outermost second barrier rib portion of the plurality of second barrier rib portions has a curvature in a direction of a non-discharge area.

**6.** The plasma display panel according to claim 1, wherein at least one auxiliary barrier rib extends in a direction substantially parallel or perpendicular to the at least one first barrier rib.

**7.** The plasma display panel of claim 1, wherein a dummy barrier rib is positioned between the at least one first barrier rib and the at least one auxiliary barrier rib.

**8.** The plasma display panel of claim 1, wherein the sealing portion includes beads.

**9.** The plasma display panel according to claim 1, wherein the sealing portion further includes a third corner sealing portion (300C) formed at a contact position of the first sealing portion and the second sealing portion, and wherein a width of the third corner sealing portion is larger than the width of the second sealing portion.

**10.** The plasma display panel according to claim 1, wherein the distance from the second sealing portion to the at least one first barrier rib is equal to or less than about 2.5 times longer than the distance from the first sealing portion to the end of the at least one first barrier rib.

**11.** The plasma display panel according to any one of claims 1 to 10, further comprising a dummy area, in which a discharge does not occur, outside the discharge area.

**12.** The plasma display panel according to any one of claims 1 to 11, wherein the dummy area extends substantially in least one of the long side or the short side direction of the first substrate and the second substrate.

**13.** The plasma display panel according to any one of claims 1 to 12, further comprising a plurality of address electrodes positioned parallel to one another on the second substrate, and a lower dielectric layer covering the plurality of address electrodes, wherein the sealing portion directly contacts the lower dielectric layer.

**Patentansprüche**

**1.** Plasmabildschirm mit:

einem ersten Substrat (100) und einem zweiten Substrat (200), die in einem vorgegebenen Abstand voneinander angeordnet sind,
mindestens einem ersten Isoliersteg (150), der zwischen dem ersten Substrat (100) und dem zweiten Substrat (200) angeordnet ist und einen Entladungsbereich abtrennt;
einem Versiegelungsabschnitt (300), durch den das erste Substrat (100) am zweiten Substrat (200) befestigt ist; und
mindestens einem Hilfsisoliersteg (150'), der zwischen dem mindestens einen ersten Isoliersteg (150) und dem Versiegelungsabschnitt (300) in einem Nicht-Entladungsbereich angeordnet ist, wobei der mindestens eine Hilfsisoliersteg (150') sich von dem mindestens einen ersten Isoliersteg (150) erstreckt und einen Abschnitt mit einer Höhe aufweist, die kleiner ist als die Höhe des mindestens einen ersten Isolierstegs (150),
**dadurch gekennzeichnet, dass**
die Breite des mindestens einen Hilfsisolierstegs (150') kleiner ist als die Breite des ersten Isolierstegs (150) und der Hilfsisoliersteg sich parallel zur kurzen Seite des ersten Substrats (100) und des zweiten Substrats (200) erstreckt, wobei der Versiegelungsabschnitt (300) einen ersten Versiegelungsabschnitt (300a) aufweist, der sich im Wesentlichen parallel zur langen Seite des ersten Substrats (100) und des zweiten Substrats (200) erstreckt, und einen zweiten Versiegelungsabschnitt (300b), der sich im Wesentlichen in Richtung der kurzen Seite des ersten Substrats (100) und des zweiten Substrats

(200) erstreckt, und wobei die Breite (W1) des ersten Versiegelungsabschnitts (300a) kleiner ist als die Breite (W2) des zweiten Versiegelungsabschnitts (300b), und wobei ein in Richtung der langen Seite des ersten Substrats und des zweiten Substrats gemessener Abstand (d1) vom zweiten Versiegelungsabschnitt (300b) zum ersten Isoliersteg (150) größer ist als ein in Richtung der kurzen Seite des ersten Substrats und des zweiten Substrats gemessener Abstand (d2) vom ersten Versiegelungsabschnitt (300a) zu einem Ende des ersten Isolierstegs (150).

**2.** Plasmabildschirm nach Anspruch 1, wobei der mindestens eine erste Isoliersteg sich im Wesentlichen in Richtung der langen Seite oder in Richtung der kurzen Seite des ersten Substrats und des zweiten Substrates erstreckt.

**3.** Plasmabildschirm nach Anspruch 1 oder 2, wobei der mindestens eine erste Isoliersteg mehrere erste Isolierstegabschnitte aufweist, die sich im Wesentlichen in Richtung der langen Seite des ersten Substrats und des zweiten Substrats erstrecken, und mehrere zweite Isolierstegabschnitte, die sich im Wesentlichen senkrecht zu den ersten Isolierstegabschnitten erstrecken.

**4.** Plasmabildschirm nach Anspruch 3, wobei die Höhe des ersten Isolierstegabschnitts kleiner ist als die Höhe des zweiten Isolierstegabschnitts, und wobei der mindestens eine Hilfsisoliersteg einen Abschnitt mit einer Höhe aufweist, die kleiner ist als die Höhe der ersten Isolierstegabschnitte.

**5.** Plasmabildschirm nach Anspruch 3, wobei ein äußerster zweiter Isolierstegabschnitt der mehreren zweiten Isolierstegabschnitte in Richtung eines Nicht-Entladungsbereichs gekrümmt ist.

**6.** Plasmabildschirm nach Anspruch 1, wobei mindestens ein Hilfsisoliersteg sich im Wesentlichen parallel oder senkrecht zu dem mindestens einen ersten Isoliersteg erstreckt.

**7.** Plasmabildschirm nach Anspruch 1, wobei ein Dummy-Isoliersteg zwischen dem mindestens einen ersten Isoliersteg und dem mindestens einen Hilfsisoliersteg angeordnet ist.

**8.** Plasmabildschirm nach Anspruch 1, wobei der Versiegelungsabschnitt Kügelchen oder Perlen enthält.

**9.** Plasmabildschirm nach Anspruch 1, wobei der Versiegelungsabschnitt ferner einen an einer Kontaktposition zwischen dem ersten Versiegelungsabschnitt und dem zweiten Versiegelungsabschnitt ausgebildeten dritten Eckenversiegelungsabschnitt (300c) aufweist, und wobei die Breite des dritten Ekkenversiegelungsabschnitts größer ist als die Breite des zweiten Versiegelungsabschnitts.

**10.** Plasmabildschirm nach Anspruch 1, wobei der Abstand vom zweiten Versiegelungsabschnitt zu dem mindestens einen ersten Isoliersteg gleich oder weniger als etwa 2,5-mal größer ist als der Abstand vom ersten Versiegelungsabschnitt zum Ende des mindestens einen ersten Isolierstegs.

**11.** Plasmabildschirm nach einem der Ansprüche 1 bis 10, ferner mit einem außerhalb des Entladungsbereichs angeordneten Dummy-Bereich, in dem keine Entladung stattfindet.

**12.** Plasmabildschirm nach einem der Ansprüche 1 bis 11, wobei der Dummy-Bereich sich im Wesentlichen in Richtung der langen Seite und/oder der kurzen Seite des ersten Substrats und des zweiten Substrats erstreckt.

**13.** Plasmabildschirm nach einem der Ansprüche 1 bis 12, ferner mit mehreren Adressenelektroden, die auf dem zweiten Substrat parallel zueinander angeordnet sind, und mit einer die mehreren Adressenelektroden bedekkenden unteren dielektrischen Schicht, wobei der Versiegelungsabschnitt mit der unteren dielektrischen Schicht direkt in Kontakt steht.

**Revendications**

**1.** Écran à plasma, comprenant :

un premier substrat (100) et un second substrat (200) espacés l'un de l'autre avec une distance prédéterminée entre ceux-ci ;
au moins une première nervure barrière (150) qui est positionnée entre le premier substrat (100) et le second substrat (200) et divise une zone de décharge ;
une partie d'étanchéité (300) qui fixe le premier substrat (100) au second substrat (200) ; et
au moins une nervure barrière auxiliaire (150') qui est positionnée entre l'au moins une première nervure barrière (150) et la partie d'étanchéité (300) dans une zone de non-décharge, dans lequel l'au moins une barrière auxiliaire (150') s'étend à partir de l'au moins une première nervure barrière (150) et comprend une partie avec une hauteur inférieure à une hauteur de l'au moins une première nervure barrière (150),
**caractérisé en ce que** l'au moins une nervure barrière auxiliaire (150') possède une largeur qui est plus étroite qu'une largeur de la première nervure barrière (150) et la nervure auxiliaire se

termine dans une direction parallèle à la direction de côté court du premier substrat (100) et du second substrat (200), dans lequel la partie d'étanchéité (300) comprend une première partie d'étanchéité (300a) qui s'étend sensiblement dans une direction parallèle à la direction de côté long du premier substrat (100) et du second substrat (200), et une deuxième partie d'étanchéité (300b) qui s'étend sensiblement dans la direction de côté court du premier substrat (100) et
du second substrat (200), et dans lequel une largeur (W1) de la première partie d'étanchéité (300a) est inférieure à une largeur (W2) de la deuxième partie d'étanchéité (300b), et dans lequel une distance (d1), mesurée dans la direction de côté long du premier substrat et du second substrat, allant de la deuxième partie d'étanchéité (300b) à la première nervure barrière (150), est plus longue qu'une distance (d2), mesurée dans la direction de côté court du premier substrat et du second substrat, allant de la première partie d'étanchéité (300a) à une extrémité de la première nervure barrière (150).

**2.** Écran à plasma selon la revendication 1, dans lequel l'au moins une première nervure barrière s'étend sensiblement dans la direction de côté long ou la direction de côté court du premier substrat et du second substrat.

**3.** Écran à plasma selon une quelconque des revendications 1 et 2, dans lequel l'au moins une première nervure barrière comprend une pluralité de premières parties de nervure barrière qui s'étendent sensiblement dans la direction de côté long du premier substrat et du second substrat, et une pluralité de secondes parties de nervure barrière qui s'étendent dans une direction sensiblement perpendiculaire aux premières parties de nervure barrière.

**4.** Écran à plasma selon la revendication 3, dans lequel une hauteur de la première partie de nervure barrière est inférieure à une hauteur de la seconde partie de nervure barrière, et dans lequel l'au moins une nervure barrière auxiliaire comprend une partie avec une hauteur inférieure à la hauteur des première parties de nervure barrière.

**5.** Écran à plasma selon la revendication 3, dans lequel une seconde partie de nervure barrière la plus extérieure de la pluralité de secondes parties de nervure barrière possède une courbure dans une direction d'une zone de non-décharge.

**6.** Écran à plasma selon la revendication 1, dans lequel au moins une nervure barrière auxiliaire s'étend dans une direction sensiblement parallèle ou perpendiculaire à l'au moins une première nervure barrière.

**7.** Écran à plasma de la revendication 1, dans lequel une nervure barrière factice est positionnée entre l'au moins une première nervure barrière et l'au moins une nervure barrière auxiliaire.

**8.** Écran à plasma de la revendication 1, dans lequel la partie d'étanchéité comprend des perles.

**9.** Écran à plasma selon la revendication 1, dans lequel la partie d'étanchéité comprend en outre une troisième partie d'étanchéité d'angle (300C) formée dans une position de contact de la première partie d'étanchéité et la deuxième partie d'étanchéité, et dans lequel une largeur de la troisième partie d'étanchéité d'angle est supérieure à la largeur de la deuxième partie d'étanchéité.

**10.** Écran à plasma selon la revendication 1, dans lequel la distance de la deuxième partie d'étanchéité à l'au moins une première nervure barrière est 2,5 fois plus longue ou moins que la distance de la première partie d'étanchéité à l'extrémité de l'au moins une première nervure barrière.

**11.** Écran à plasma selon une quelconque des revendications précédentes 1 à 10, comprenant en outre une zone factice, dans laquelle une décharge ne se produit pas, à l'extérieur de la zone de décharge.

**12.** Écran à plasma selon une quelconque des revendications précédentes 1 à 11, dans lequel la zone factice s'étend sensiblement dans au moins une de la direction de côté long ou de la direction de côté court du premier substrat et du second substrat.

**13.** Écran à plasma selon une quelconque des revendications précédentes 1 à 12, comprenant en outre une pluralité d'électrode d'adresse positionnées parallèlement les unes aux autres sur le second substrat, et une couche diélectrique inférieure recouvrant la pluralité d'électrodes d'adresse, dans lequel la partie d'étanchéité entre directement en contact avec la couche diélectrique inférieure.

# FIG. 1

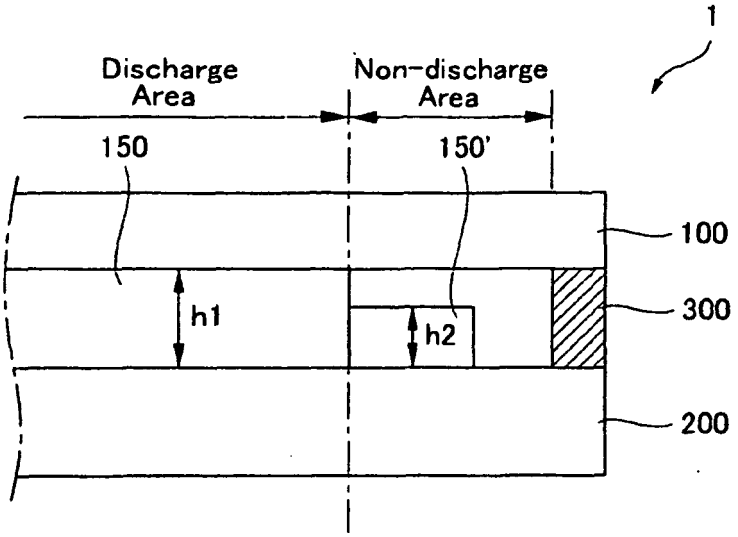


FIG. 2A

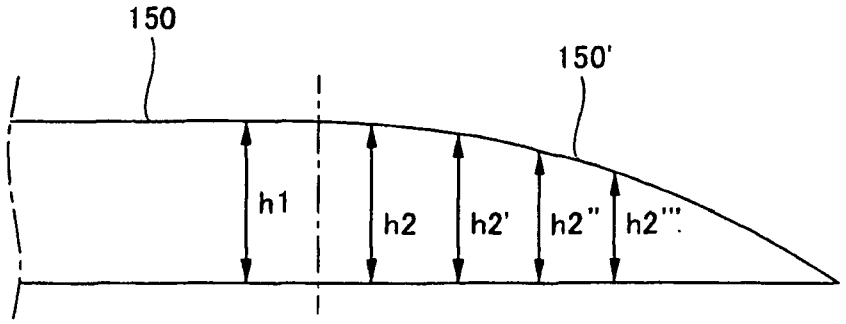



FIG. 2B

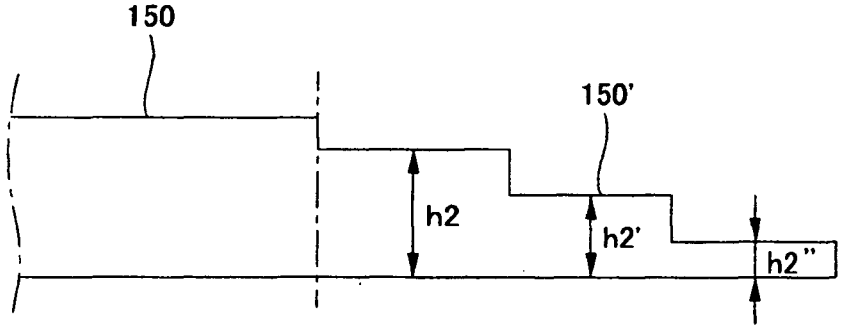
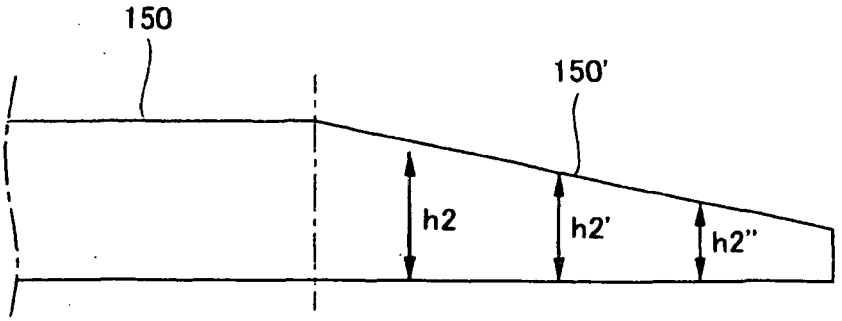
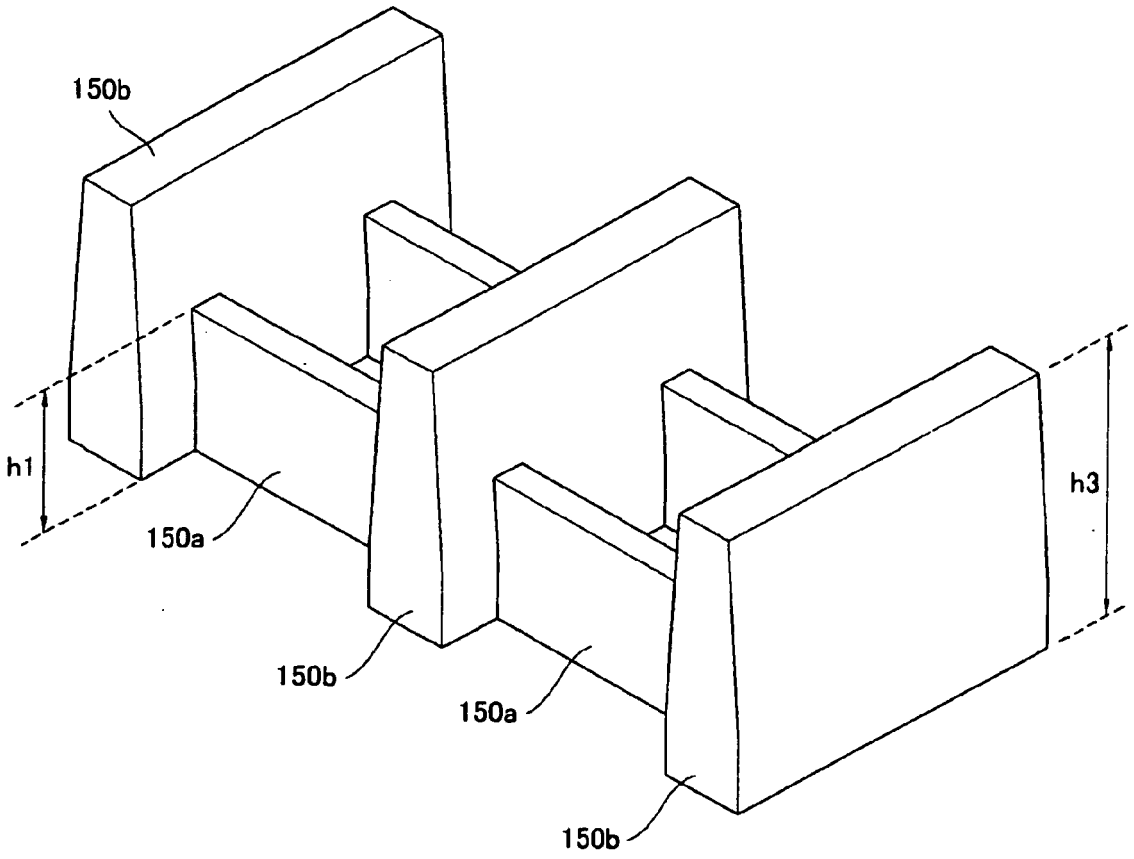


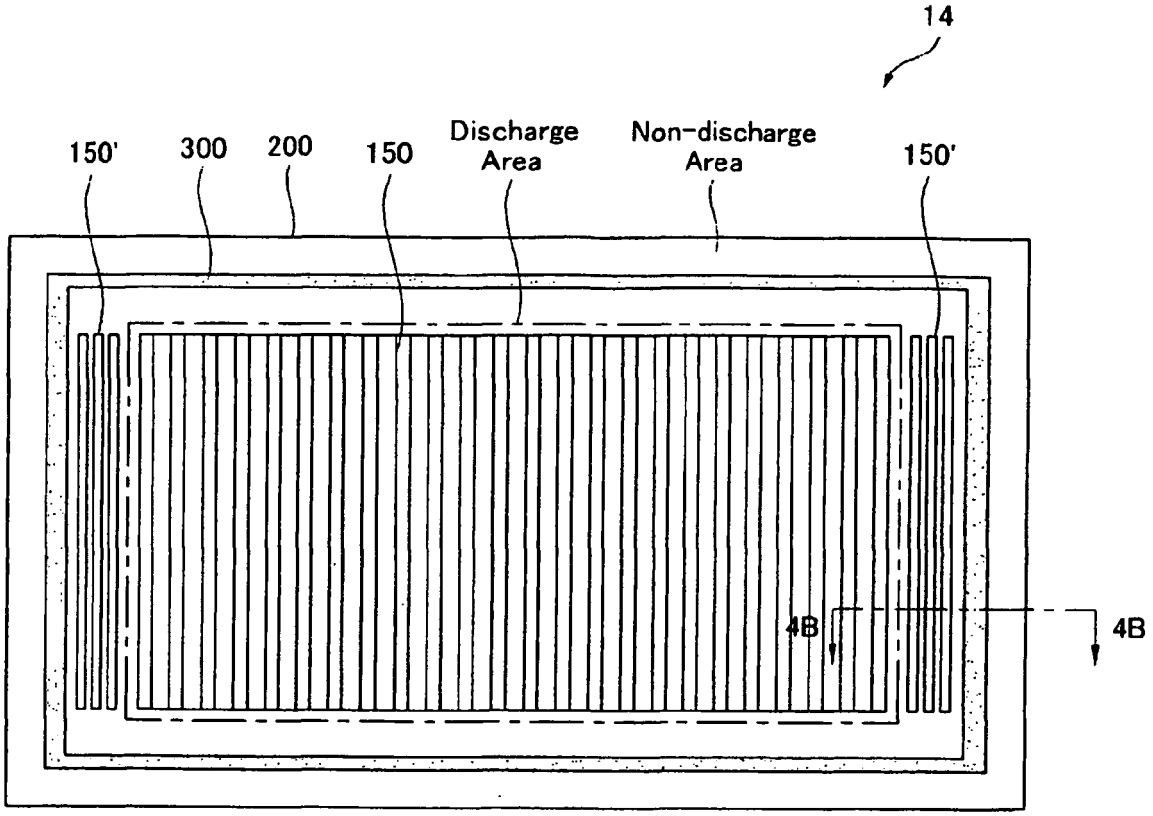

FIG. 2C



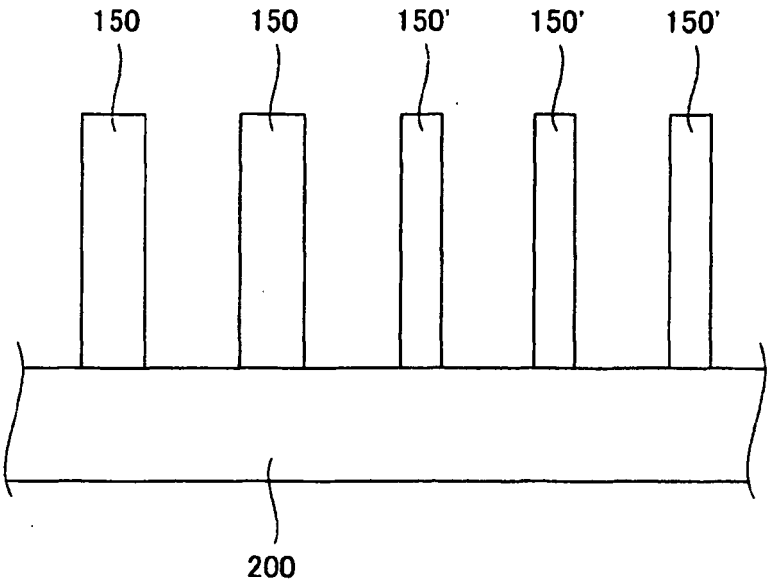
# FIG. 3



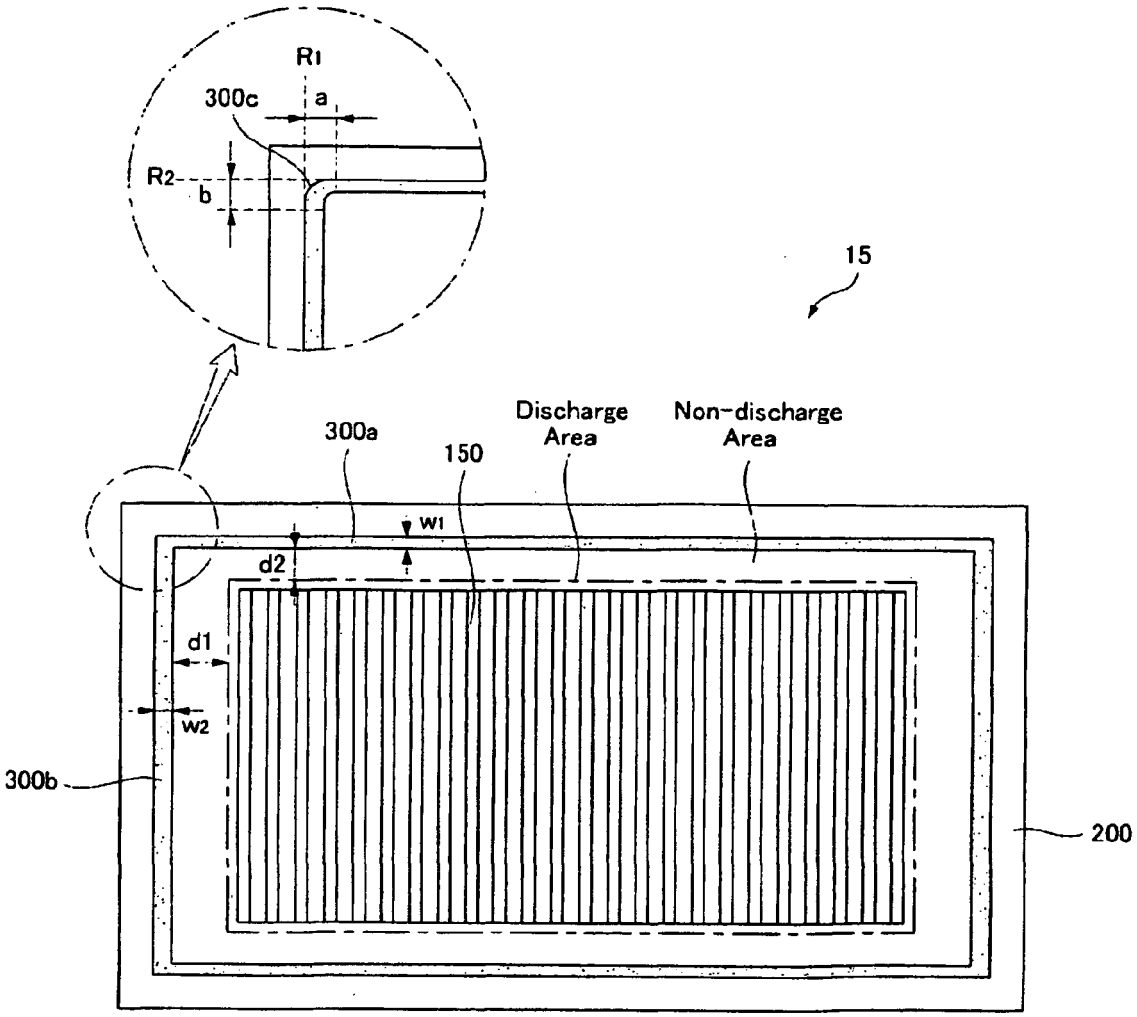
# FIG. 4A


14
150'
300
200
150
Discharge Area
Non-discharge Area
150'
4B
4B

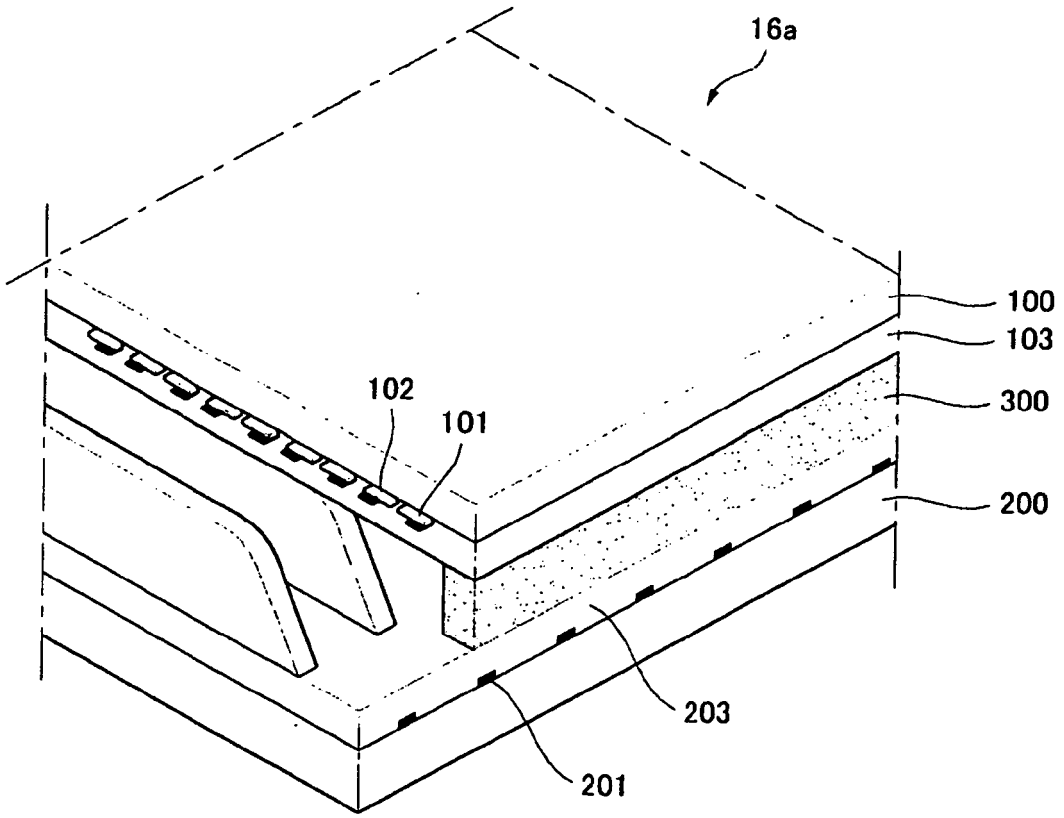
# FIG. 4B



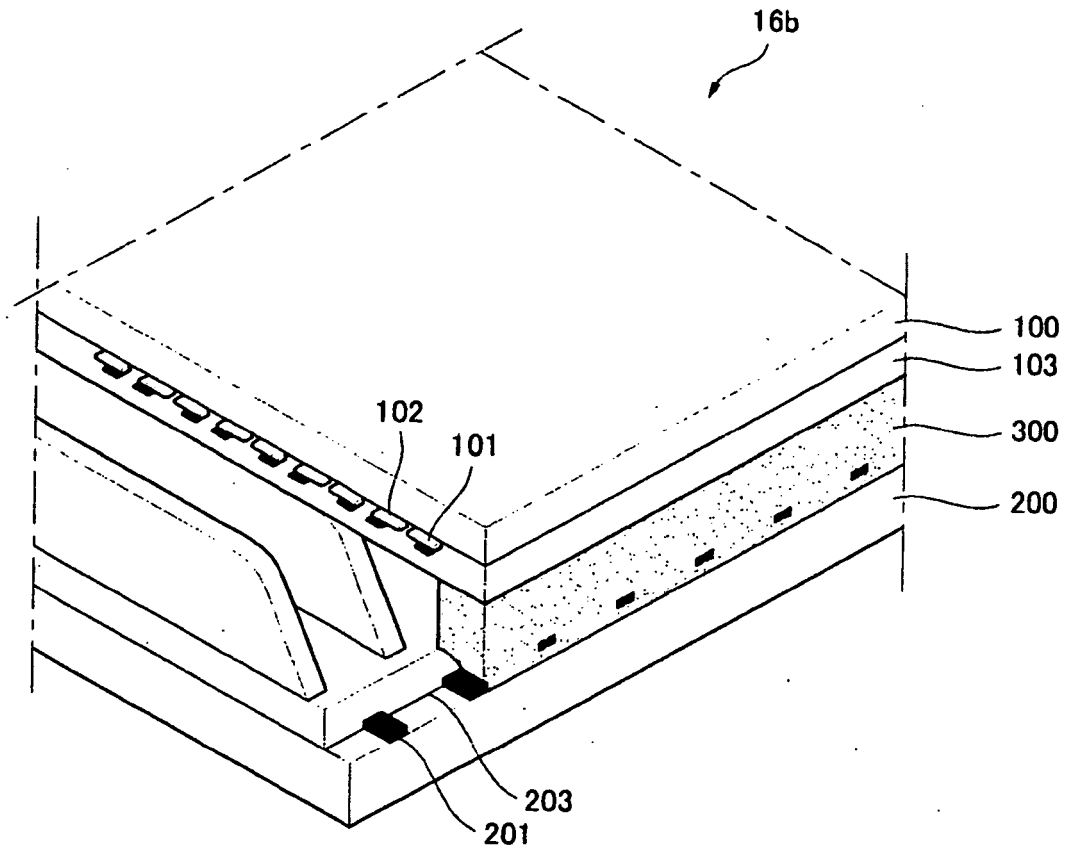
# FIG. 5


R1
300c
a
R2
b
15
300a
150
Discharge Area
Non-discharge Area
w1
d2
d1
w2
300b
200

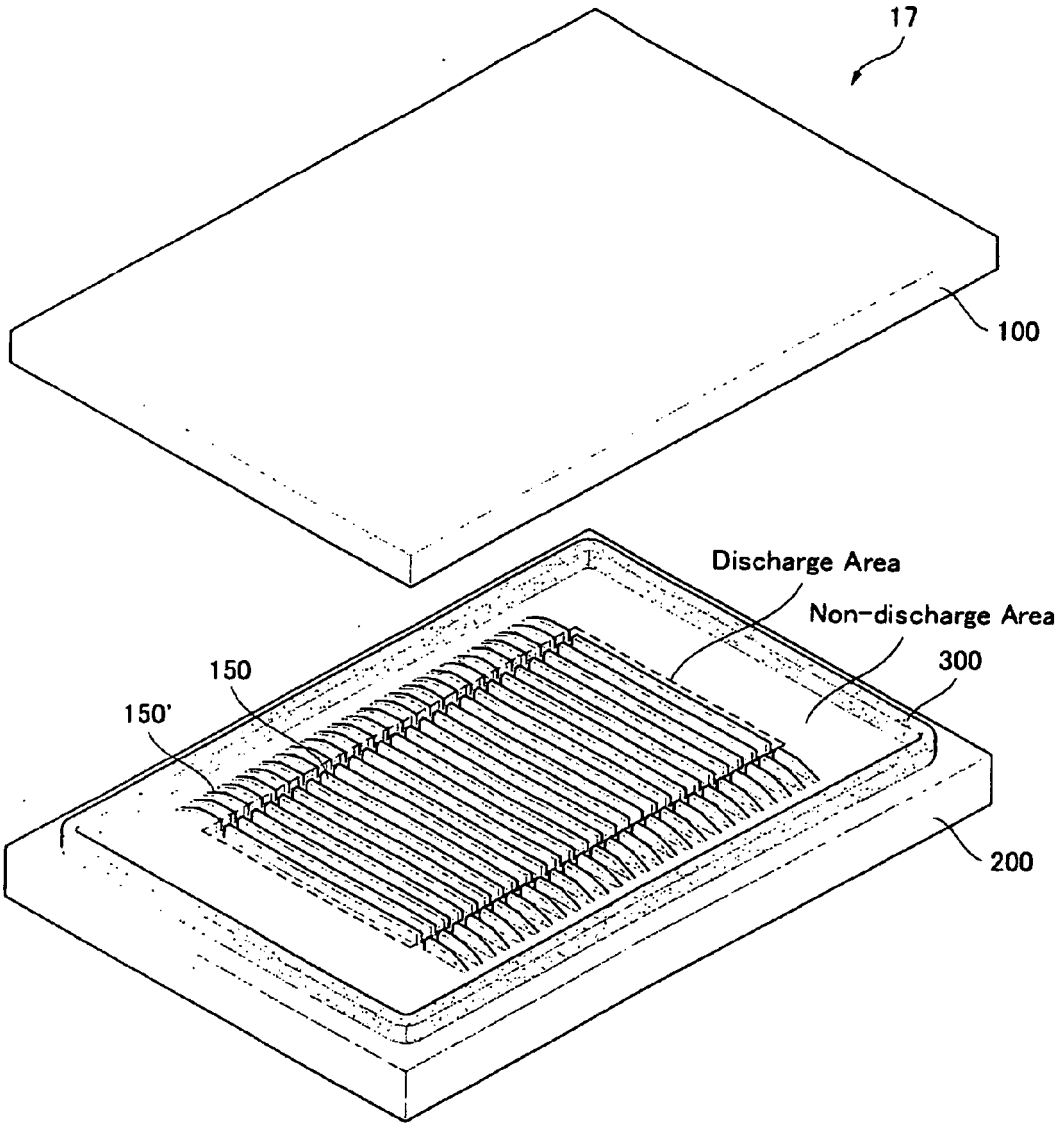
# FIG. 6A



# FIG. 6B



# FIG. 7



## REFERENCES CITED IN THE DESCRIPTION

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