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(54) MULTI-DOMAIN LIQUID CRYSTAL DISPLAY DEVICE

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Related U.S. Application Data

(60) Division of application No. 09/598,213, filed on Jun. 21, 2000, now Pat. No. 6,791,647, which is a continuation-in-part of application No. 09/256,180, filed on Feb. 24, 1999, now Pat. No. 6,809,787.

(30) **Foreign Application Priority Data**

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Publication Classification

(51) **Int. Cl.**[7] **G02F 1/1337**
(52) **U.S. Cl.** **349/129**

(57) **ABSTRACT**

A multi-domain liquid crystal display device comprises first and second substrates facing each other; a liquid crystal layer between the first and second substrates; a plurality of gate bus lines arranged in a first direction on the first substrate and a plurality of data bus lines arranged in a second direction on the first substrate to define a plurality of pixel region; a thin film transistor positioned at a crossing area of the data bus line and the gate bus line, the thin film transistor comprising a gate electrode, a semiconductor layer, and source/drain electrodes; a common-auxiliary electrode comprising at least one electrode in the each pixel region; a plurality of pixel electrodes electrically charged through the thin film transistor; and an alignment layer on at least one substrate between the first and second substrates.

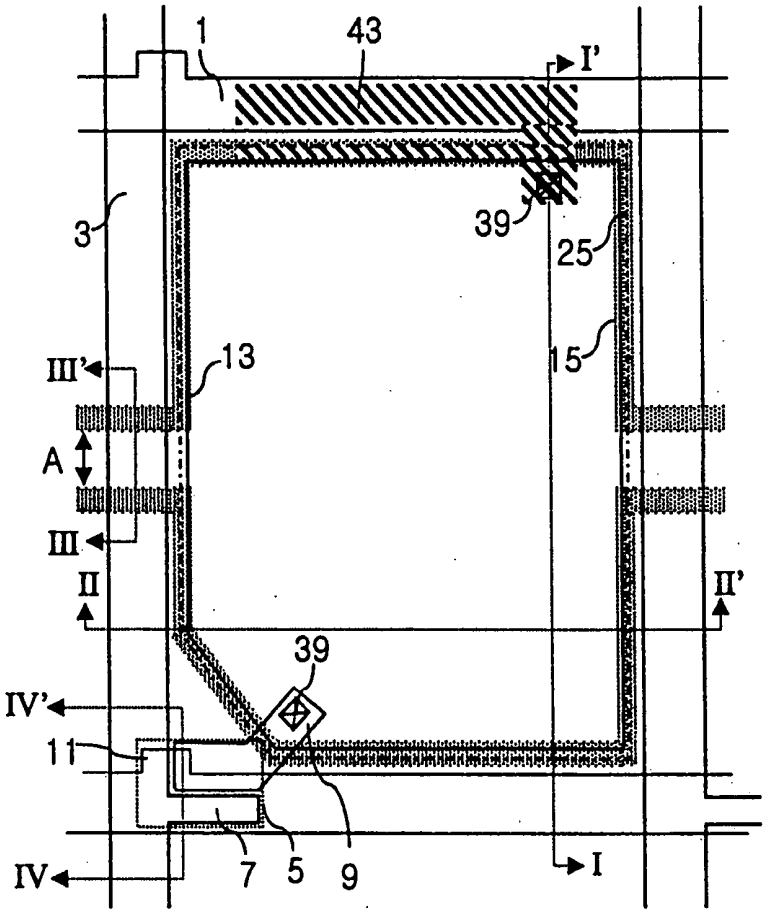

FIG. 1

PRIOR ART

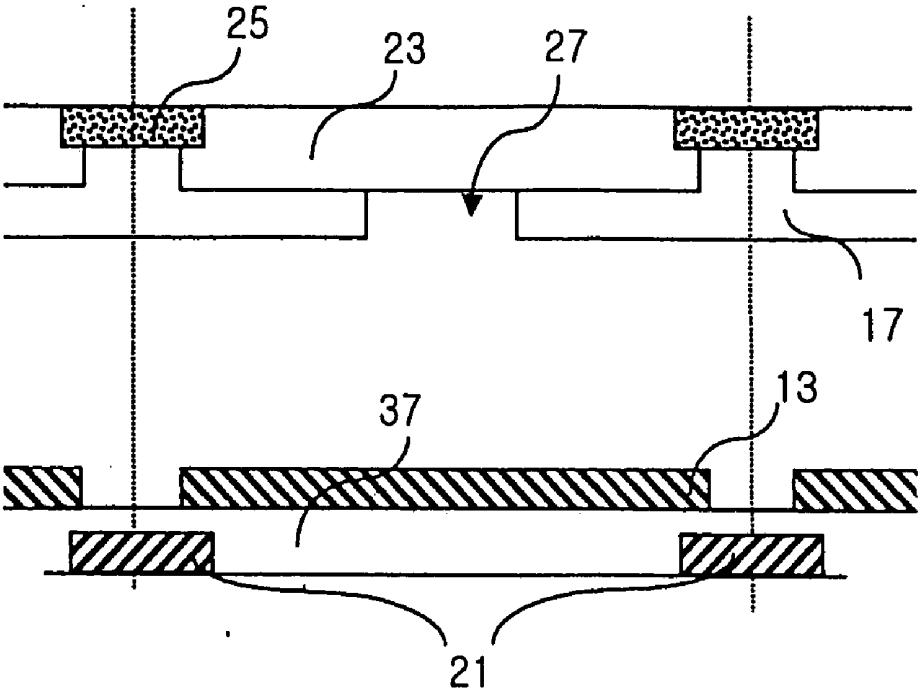

FIG. 2A

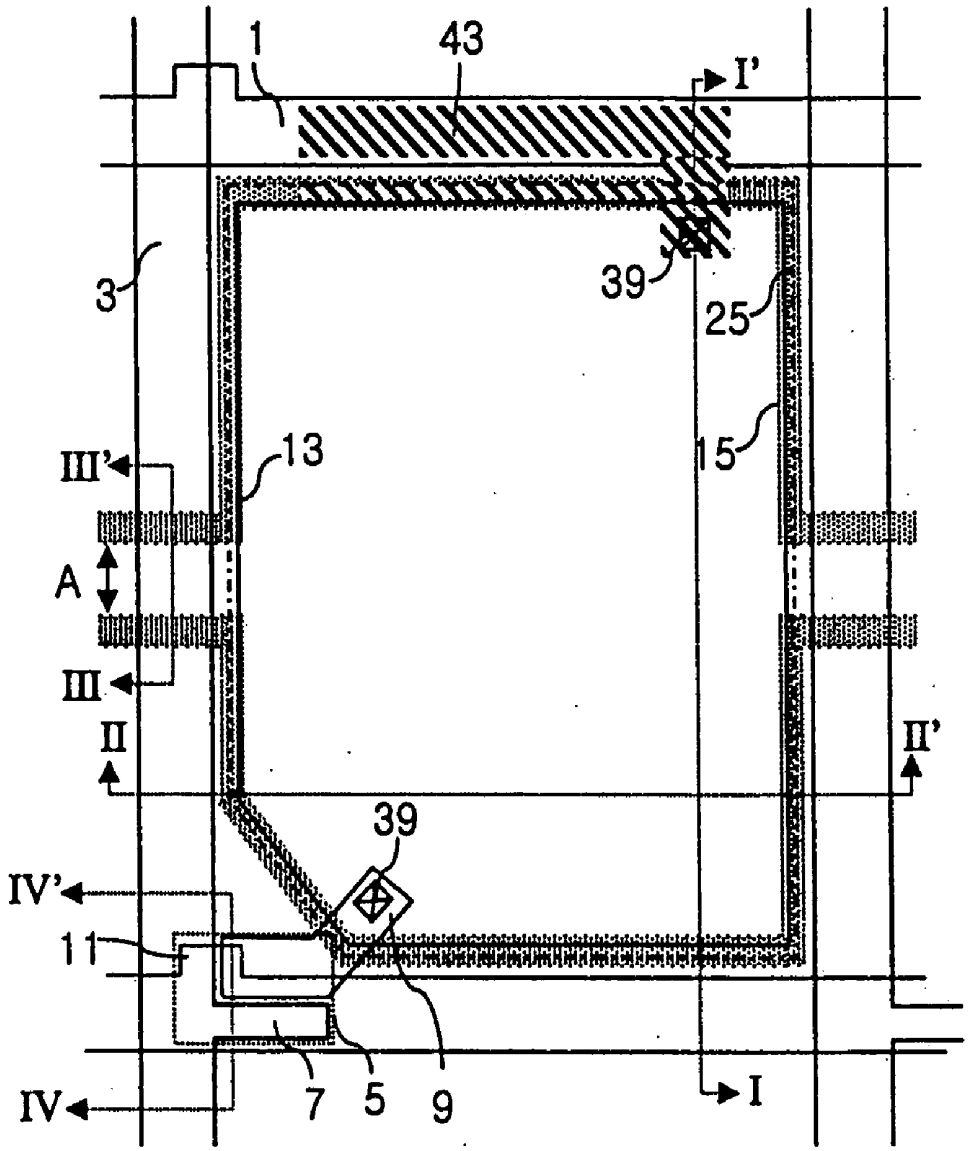

FIG. 2B

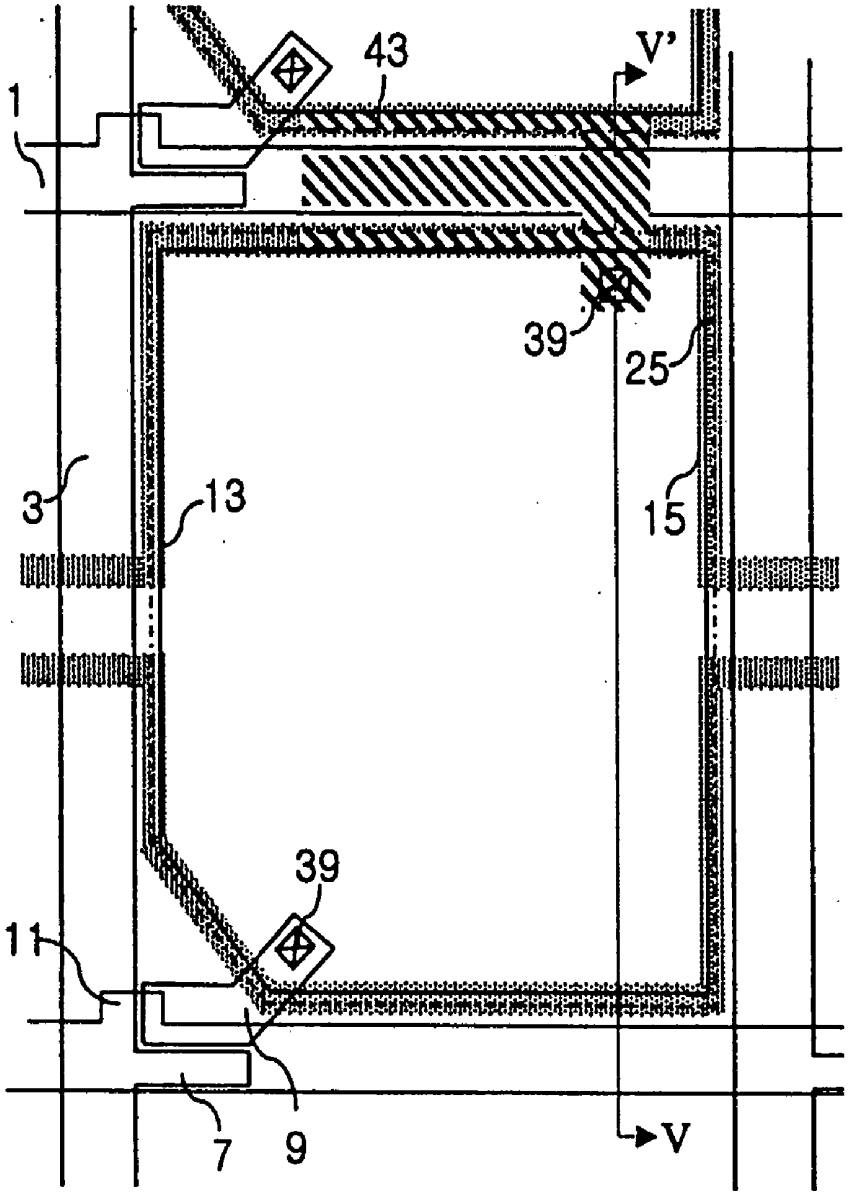

FIG. 2C

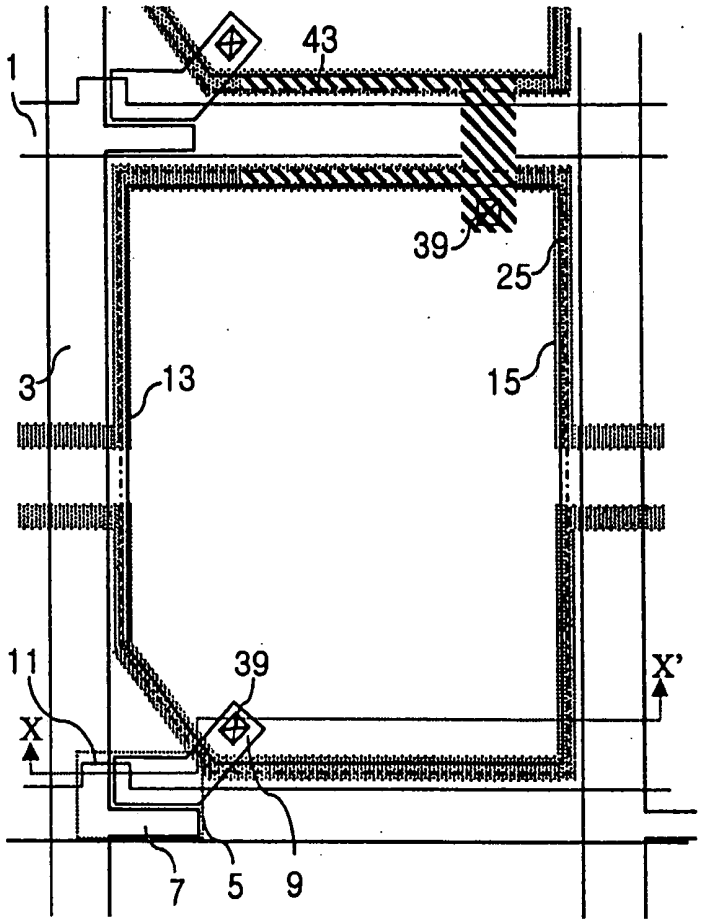

FIG. 3

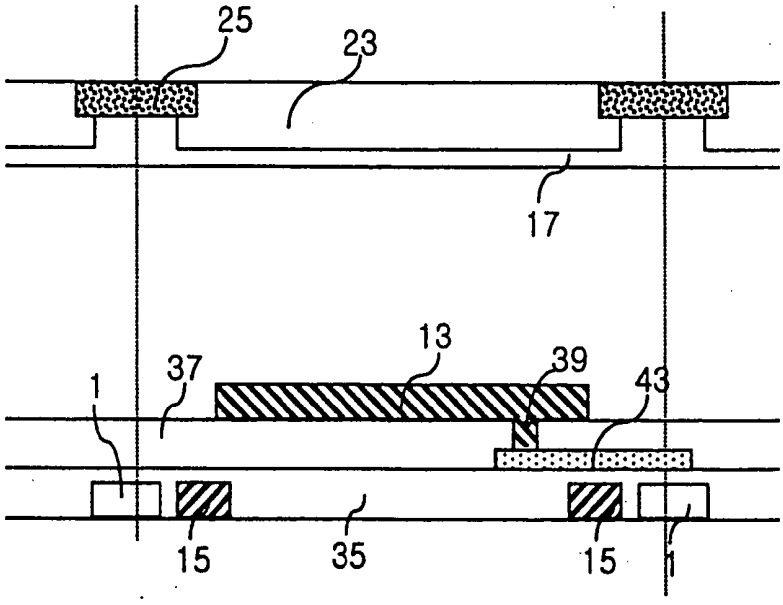

FIG. 4A

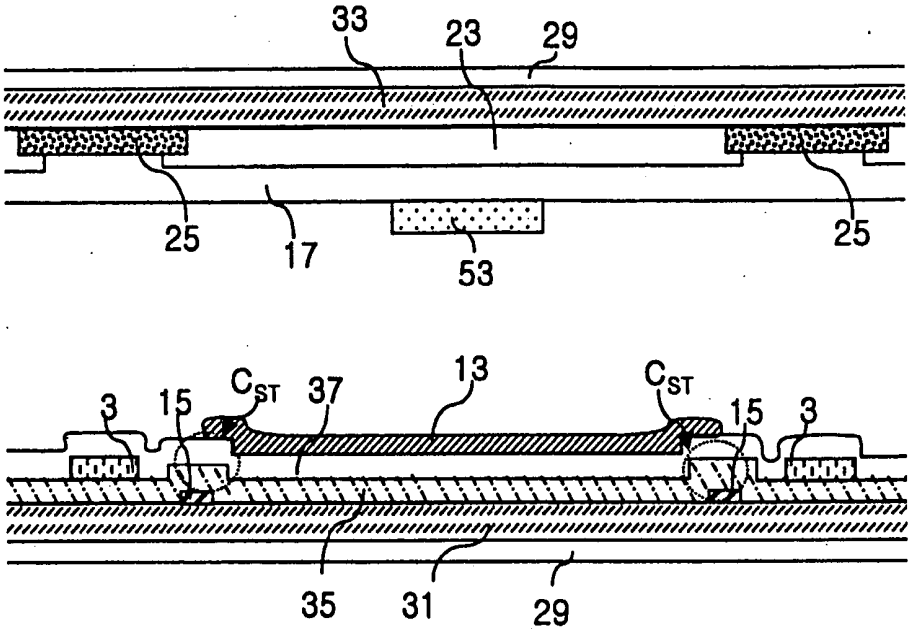
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FIG. 4B

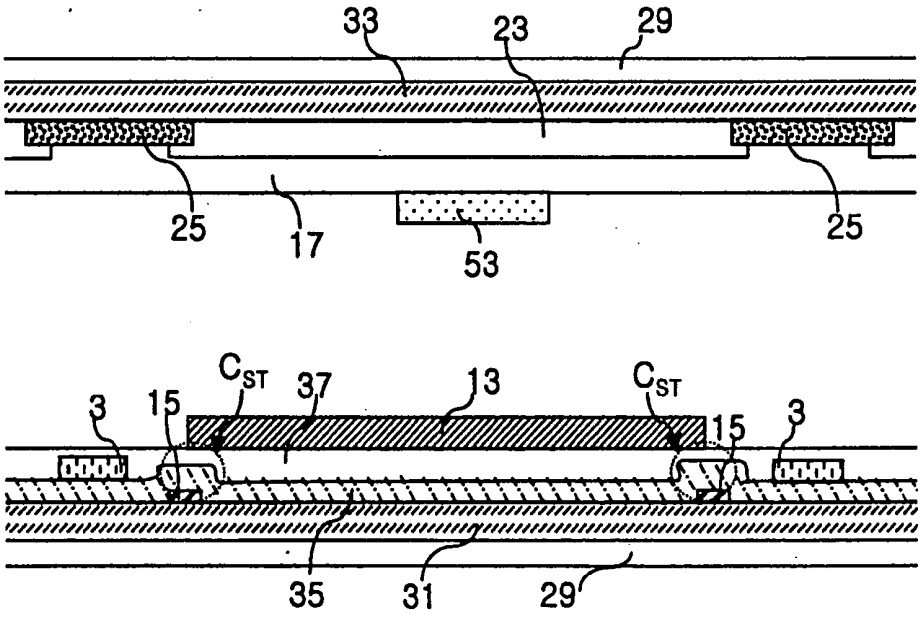
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FIG. 4C

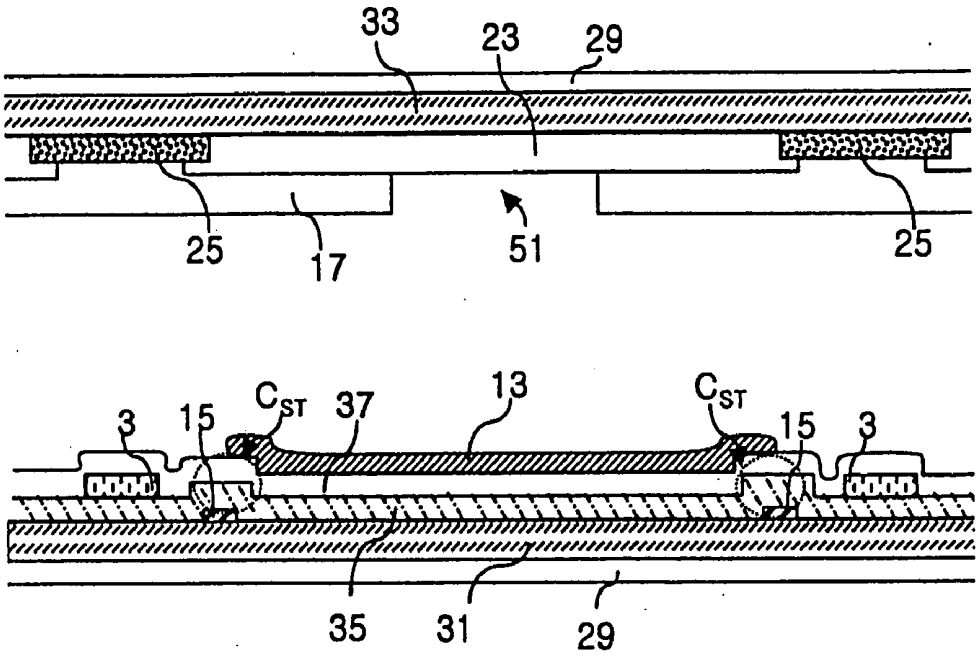
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FIG. 4D

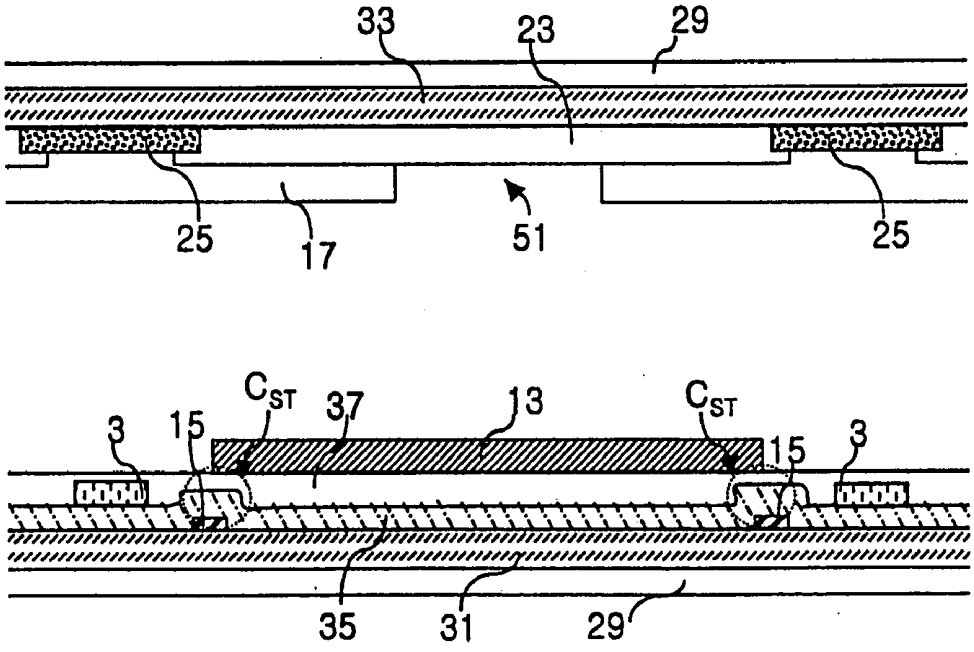
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FIG. 5

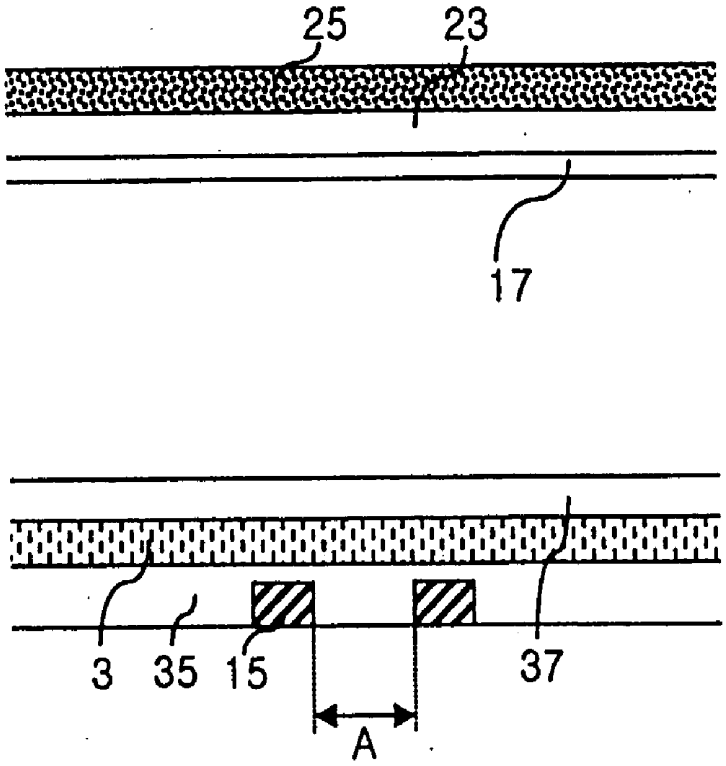


FIG. 6

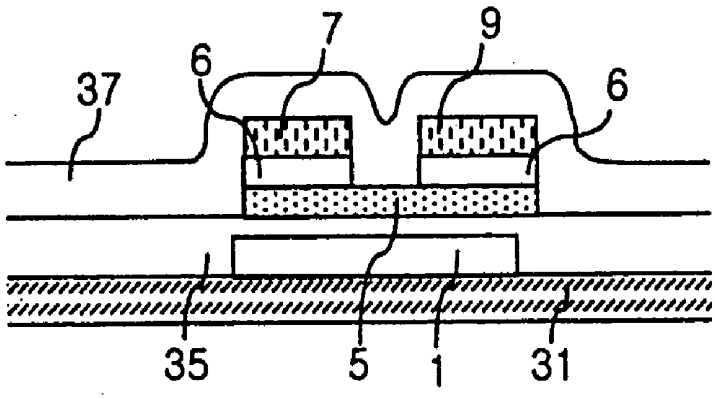


FIG. 7

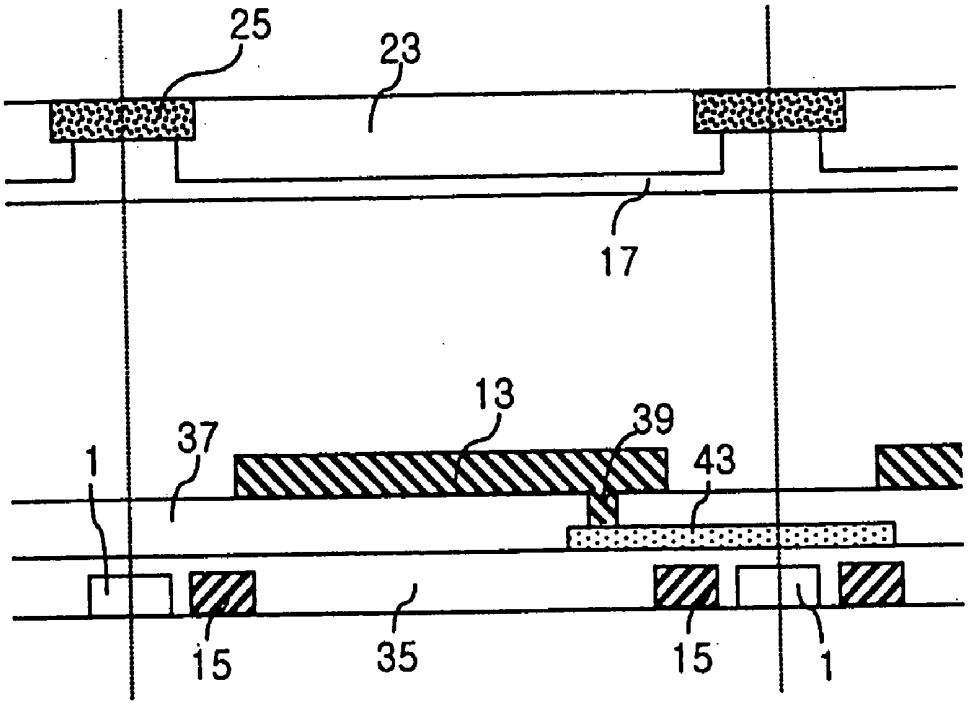


FIG. 8A

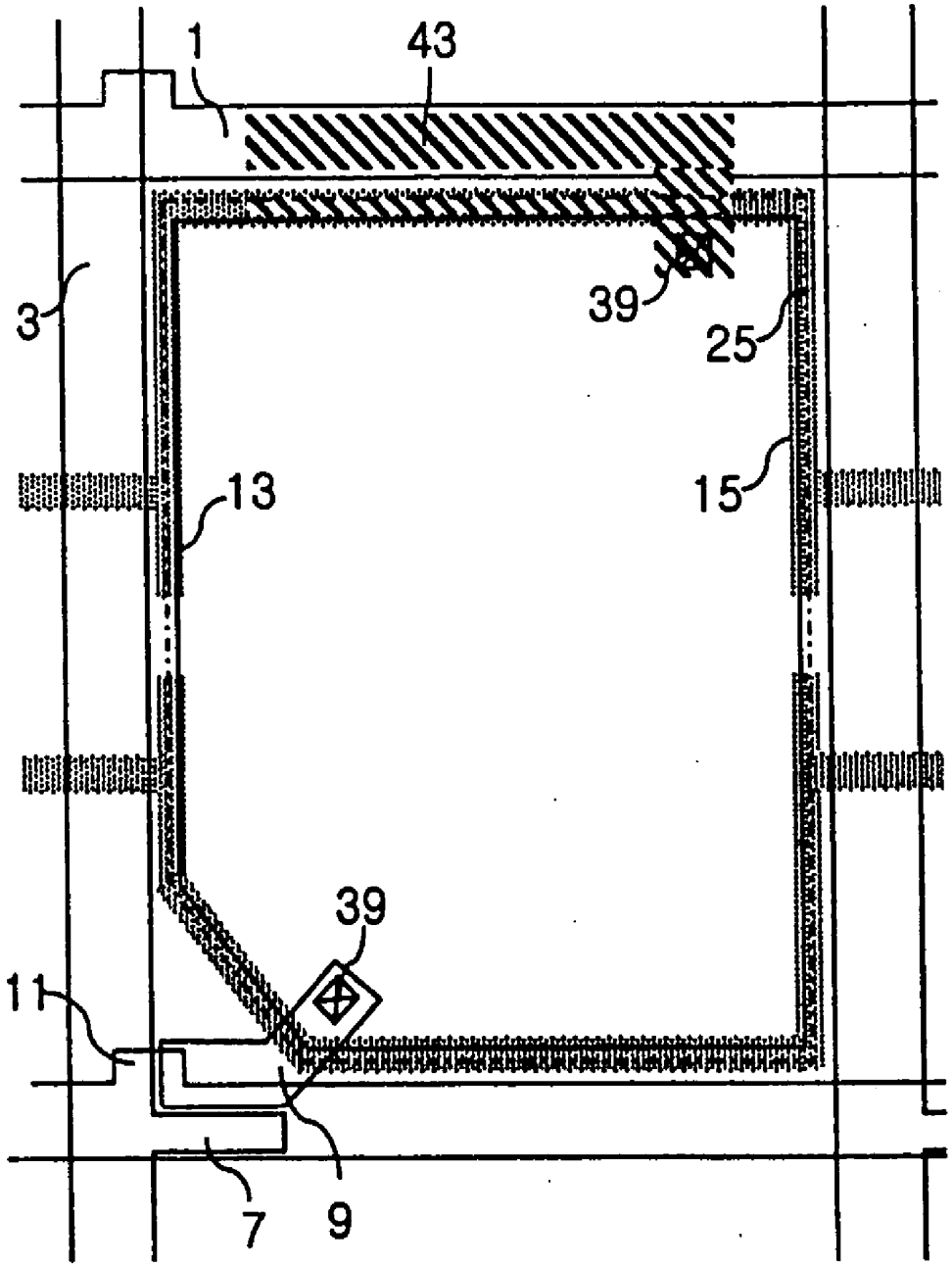


FIG. 8B

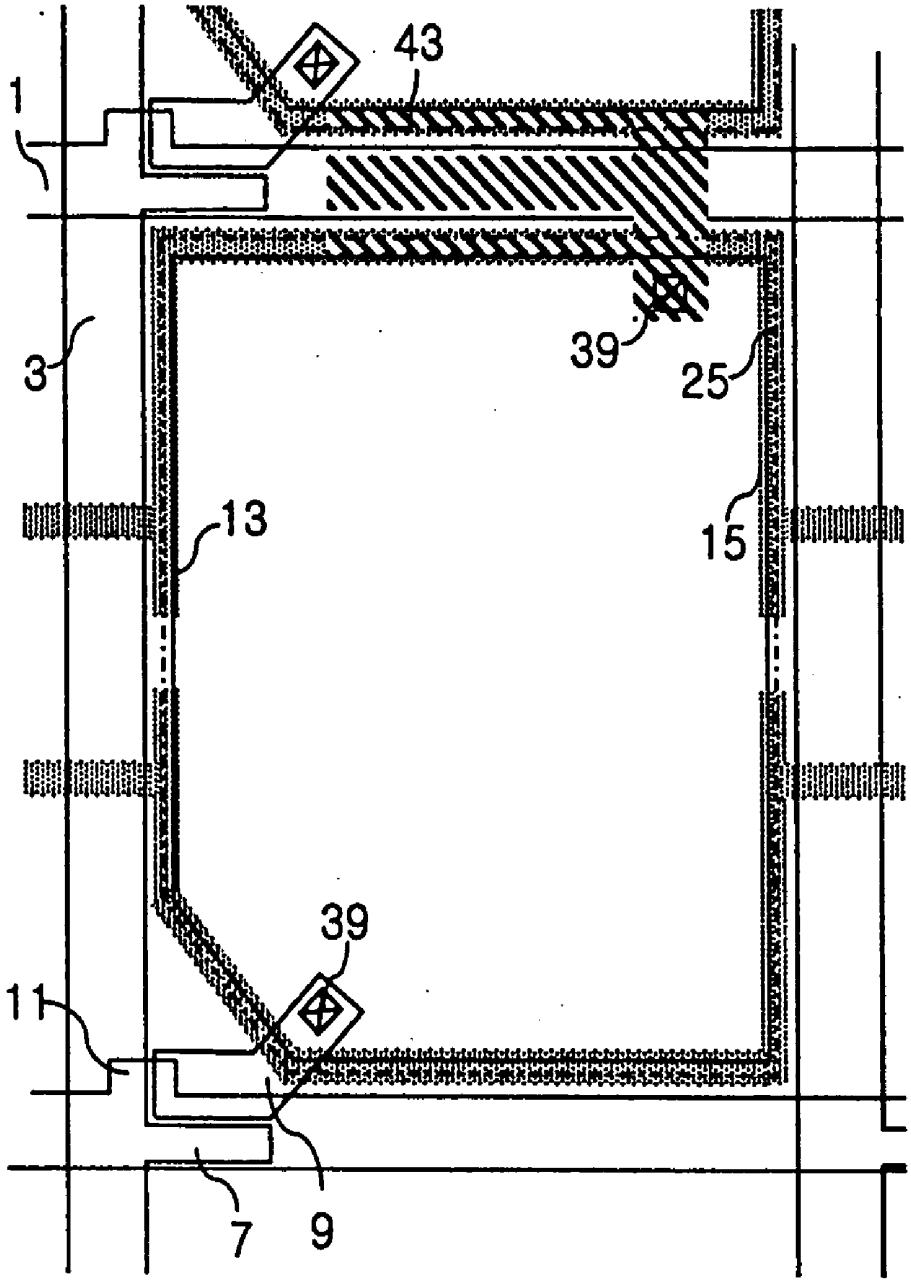


FIG. 8C

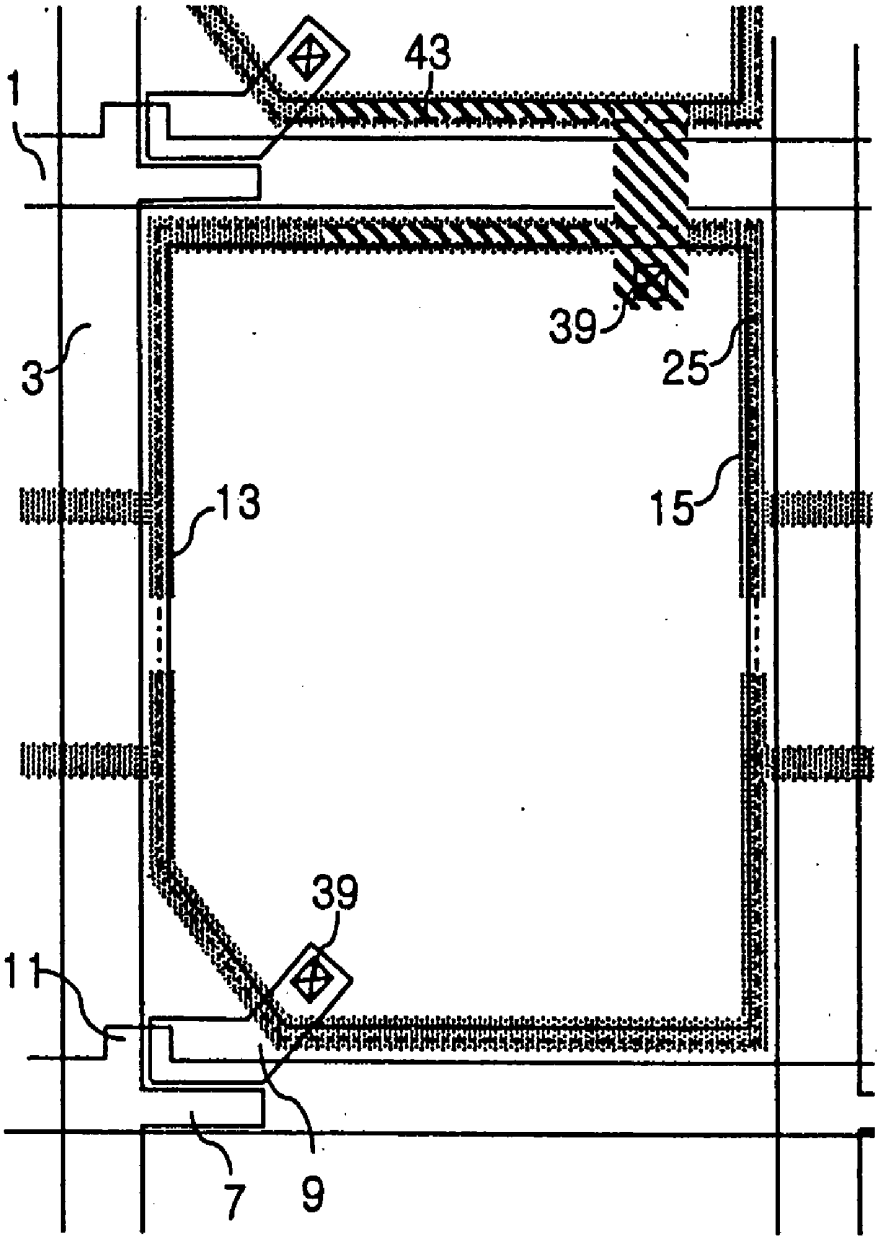


FIG. 9A

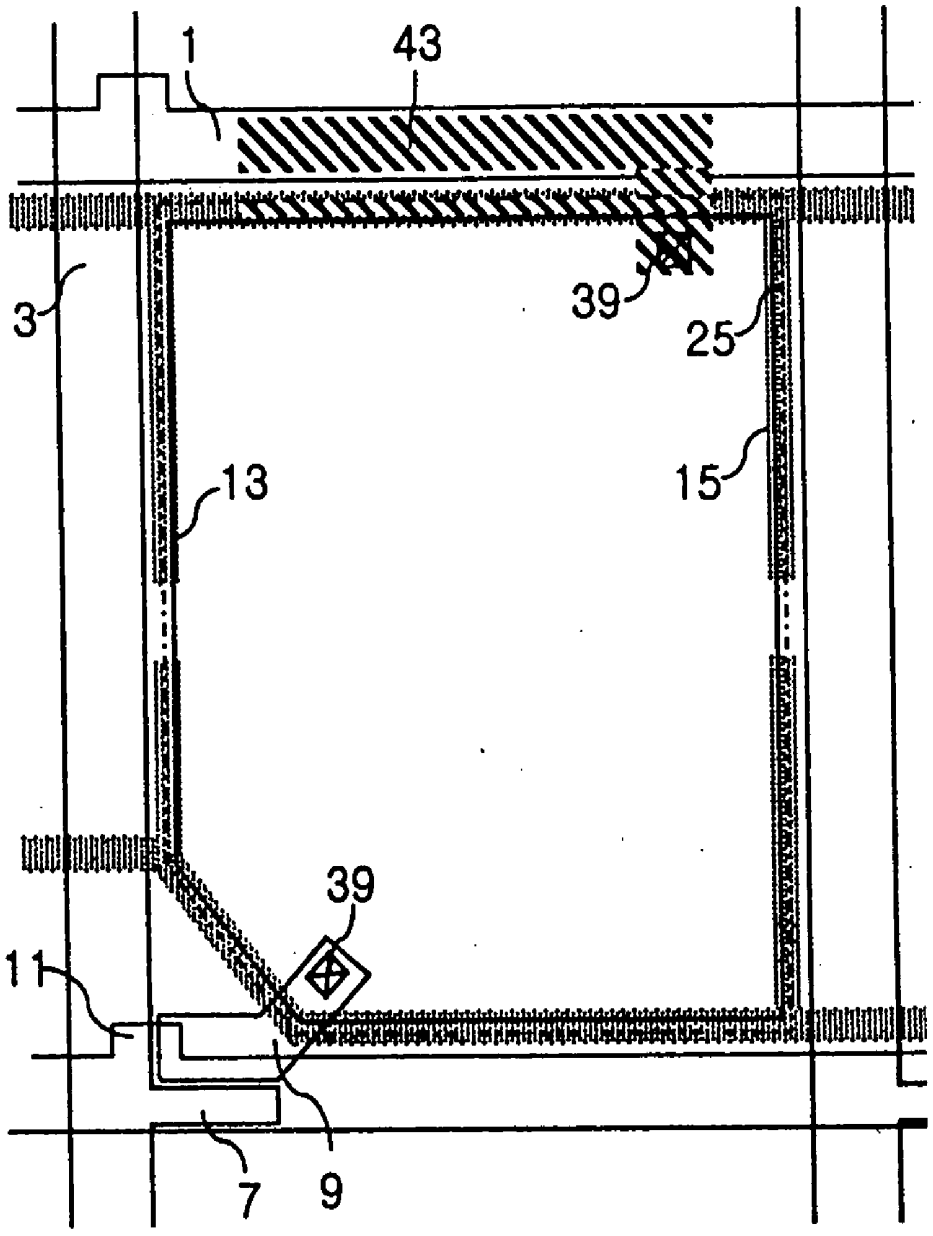


FIG. 9B

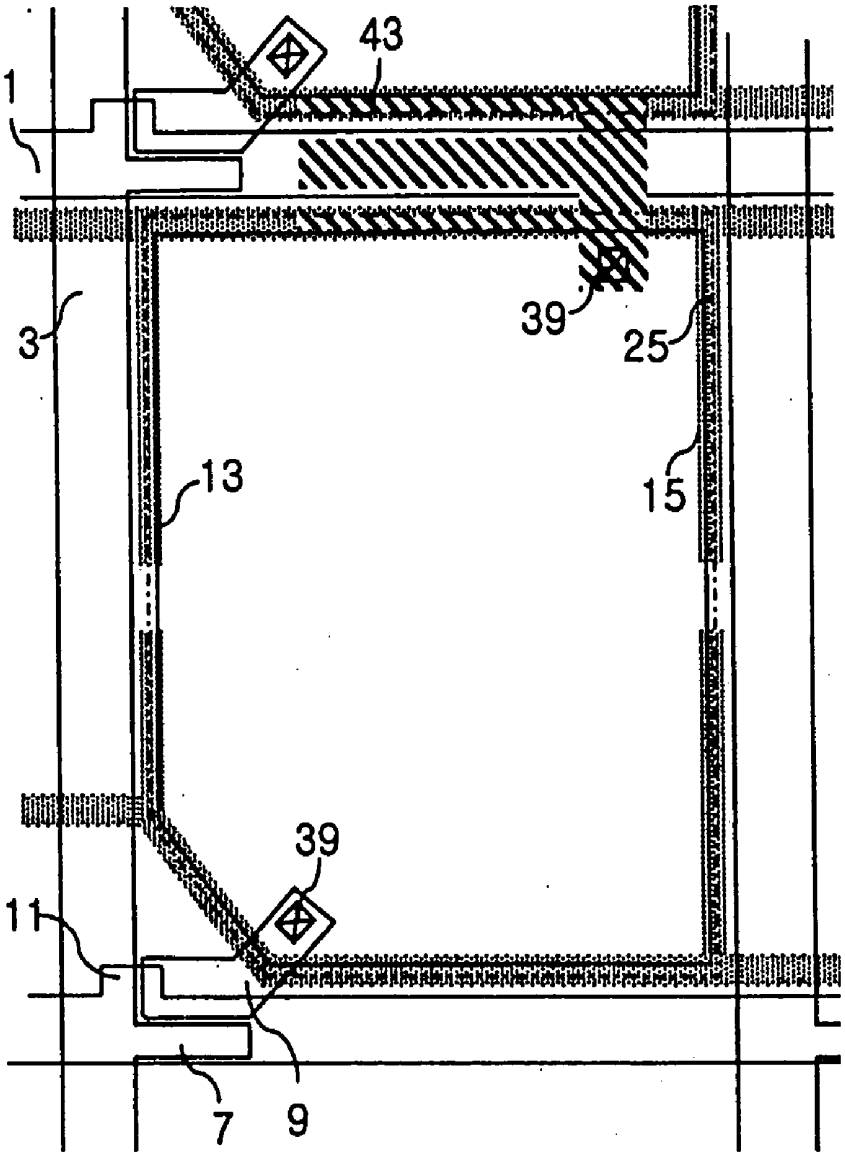


FIG. 9C

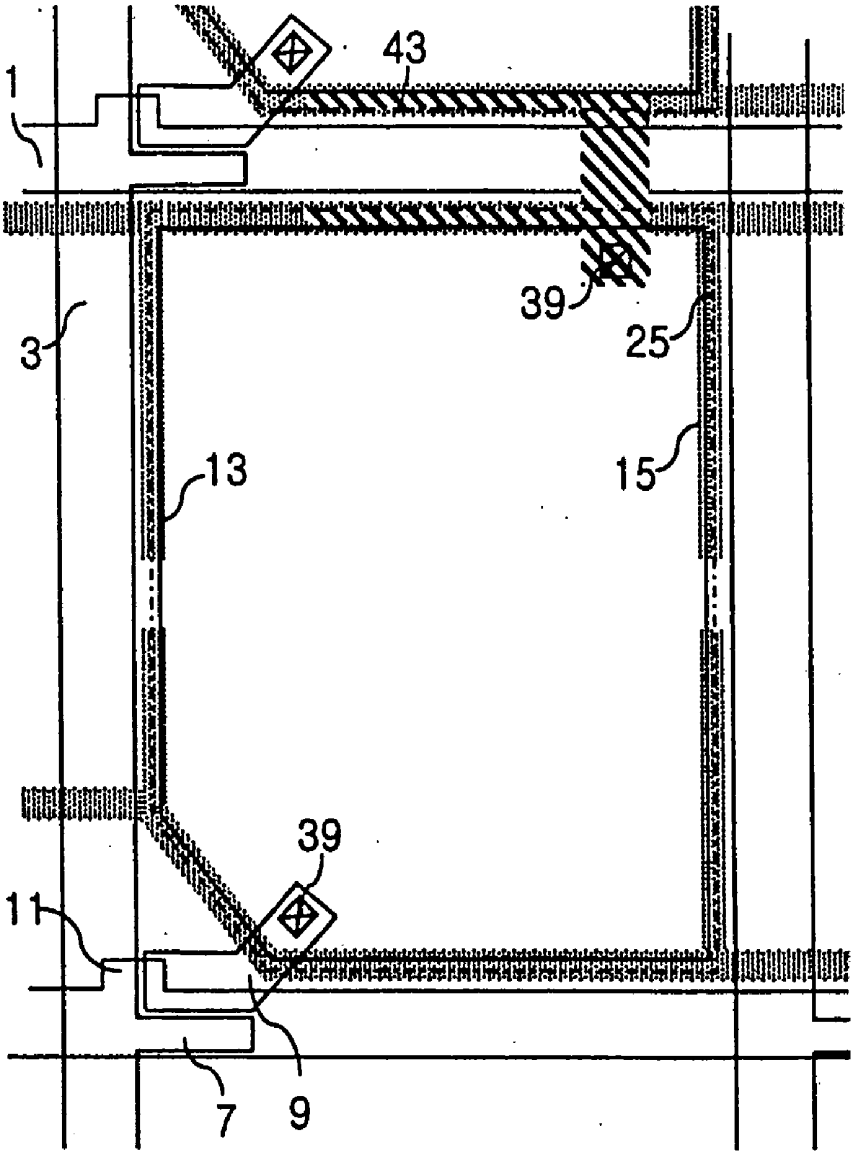


FIG. 10A

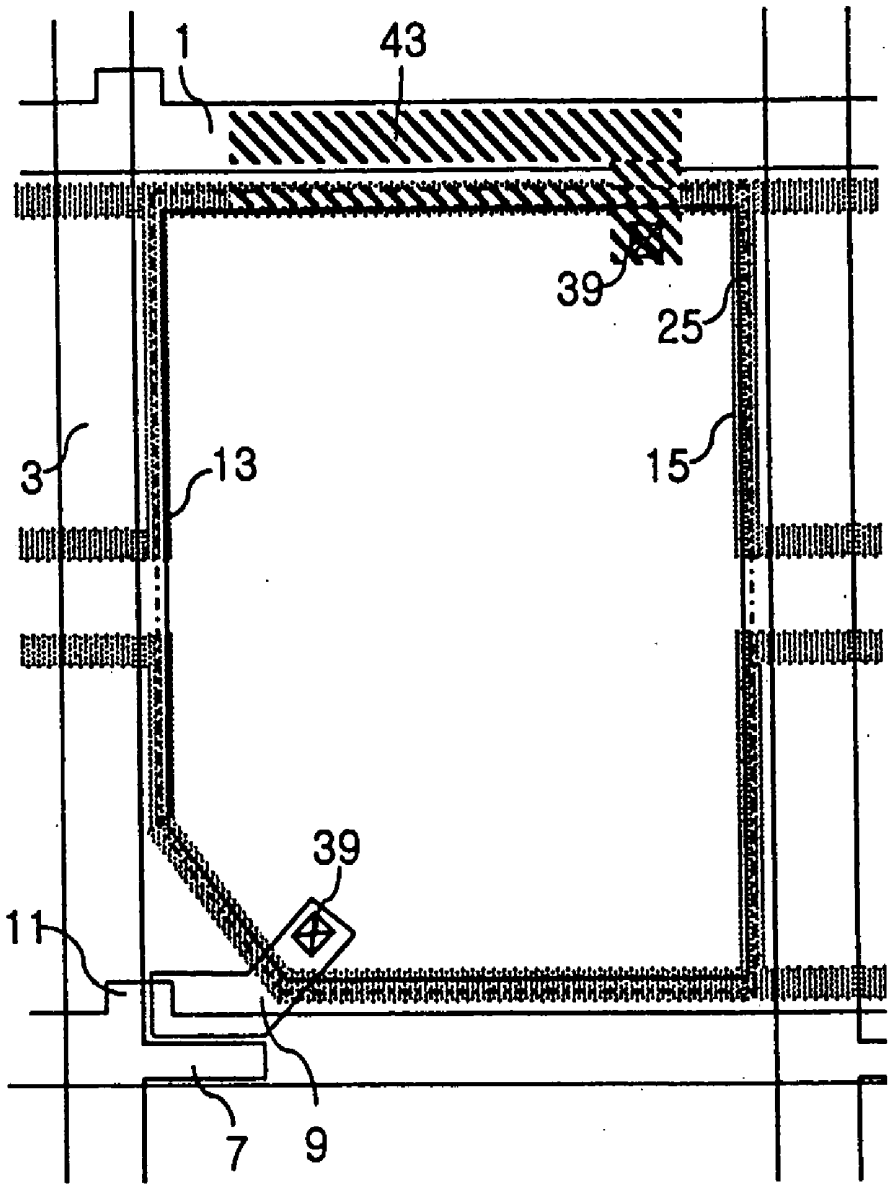


FIG. 10B

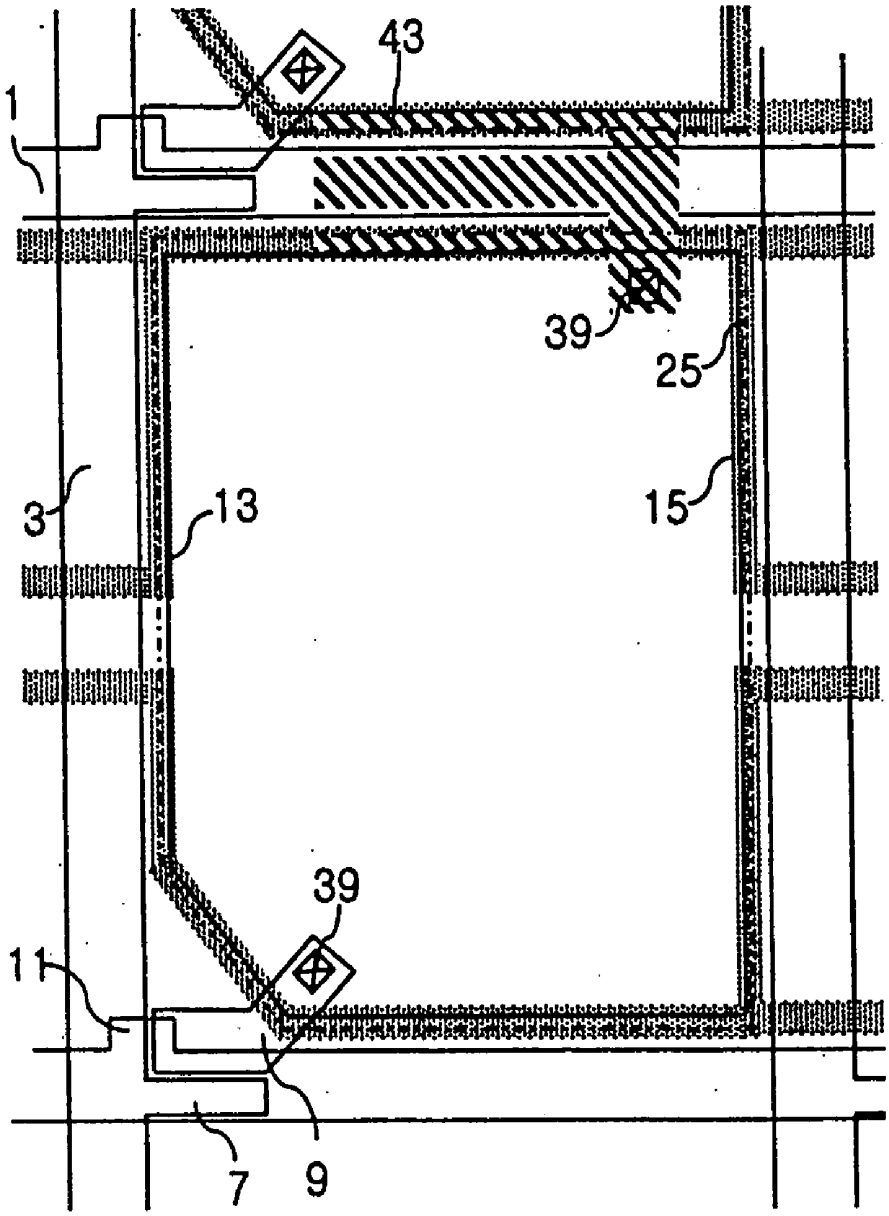


FIG. 10C

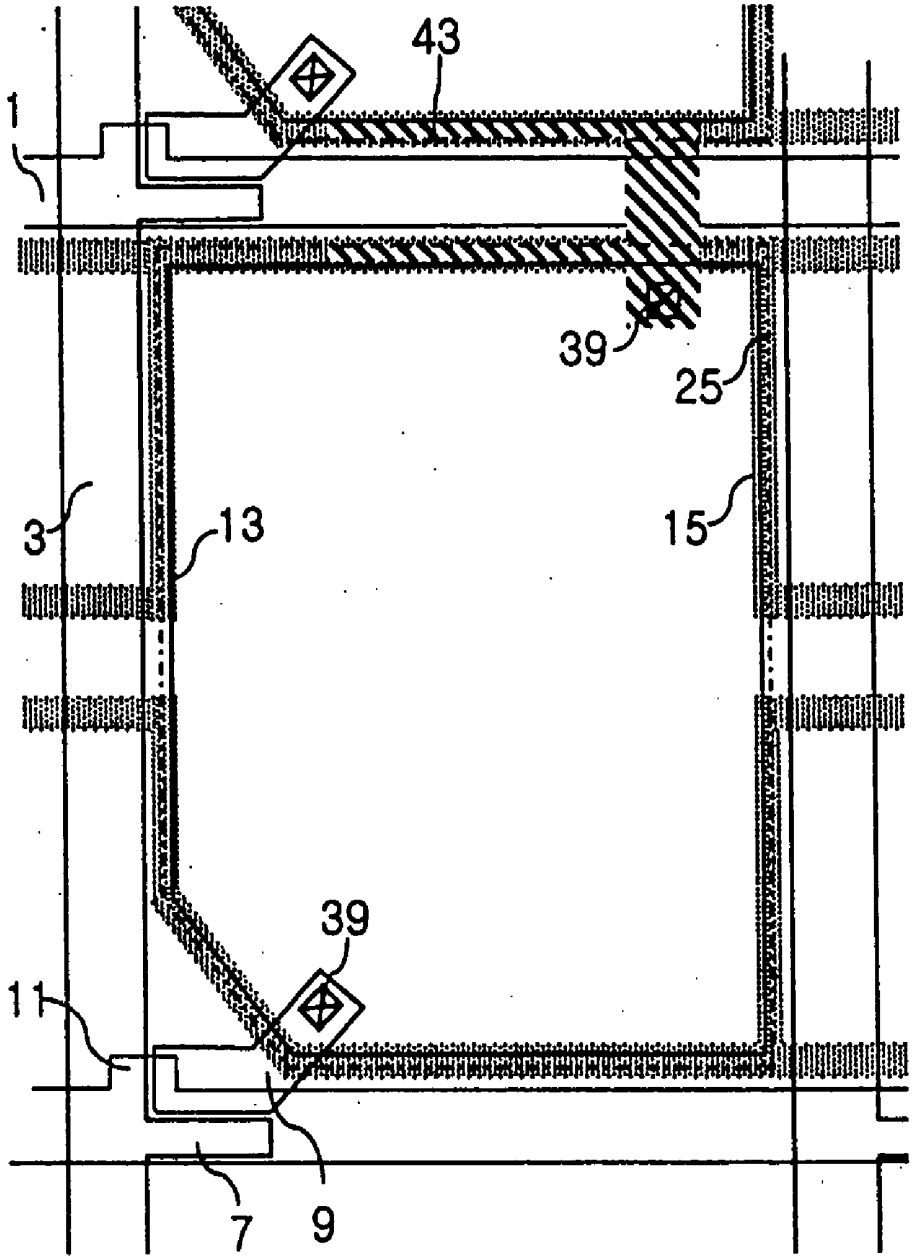


FIG. 11A

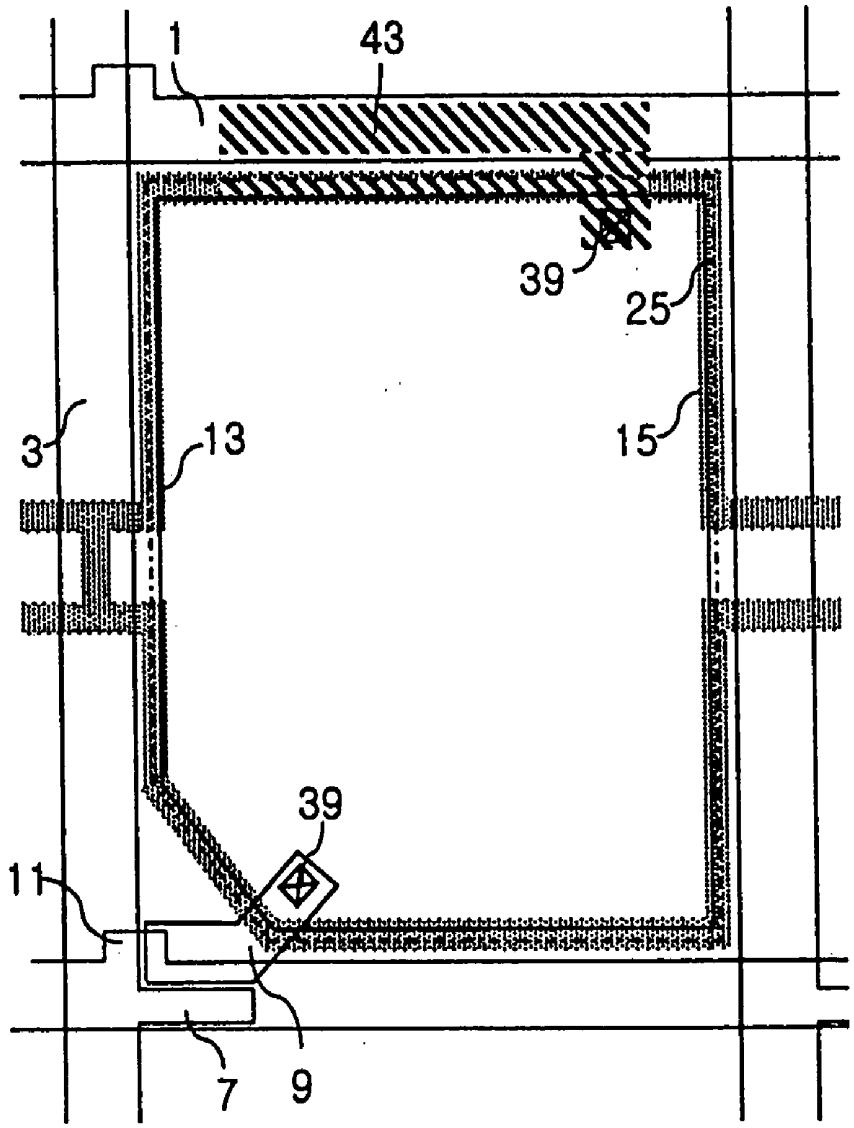


FIG. 11B

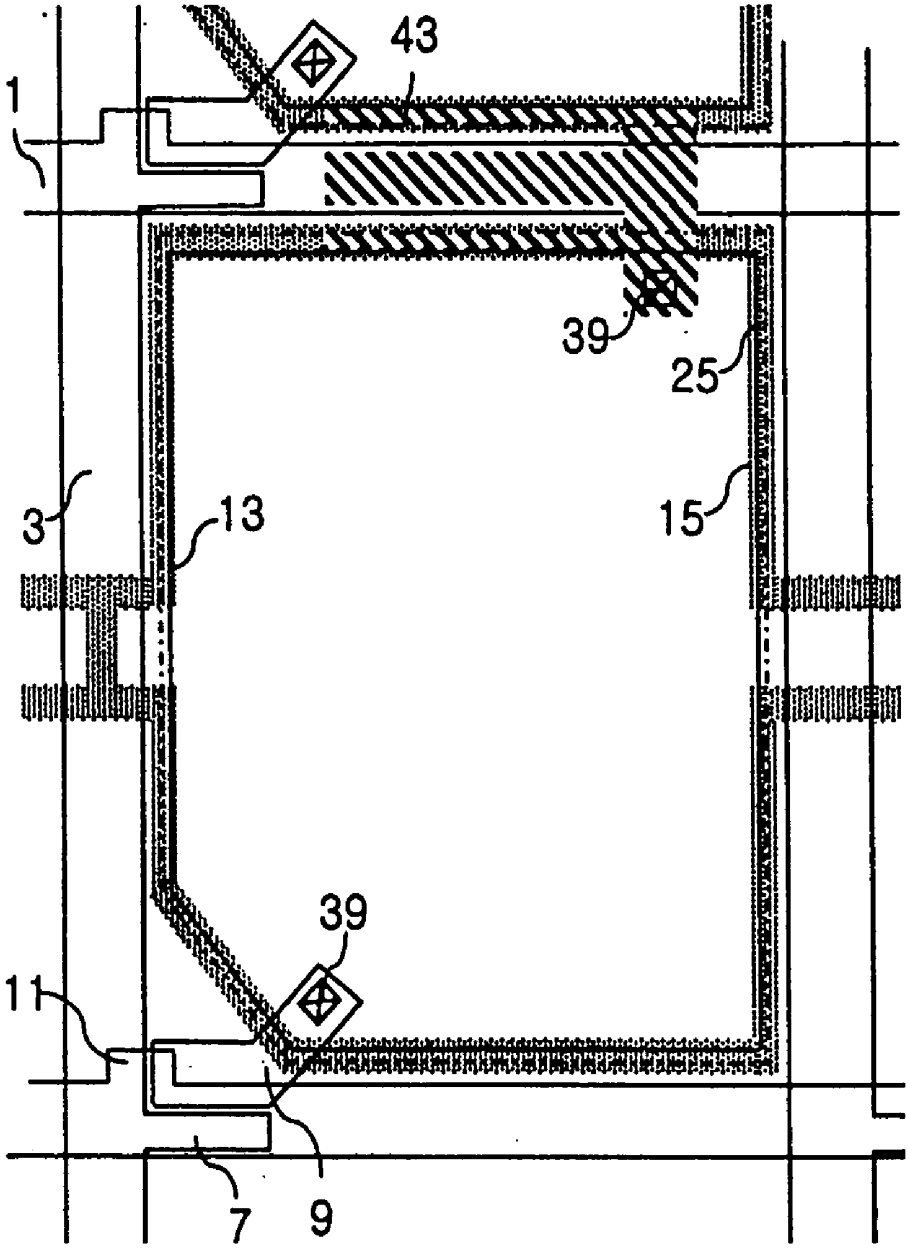


FIG. 11C

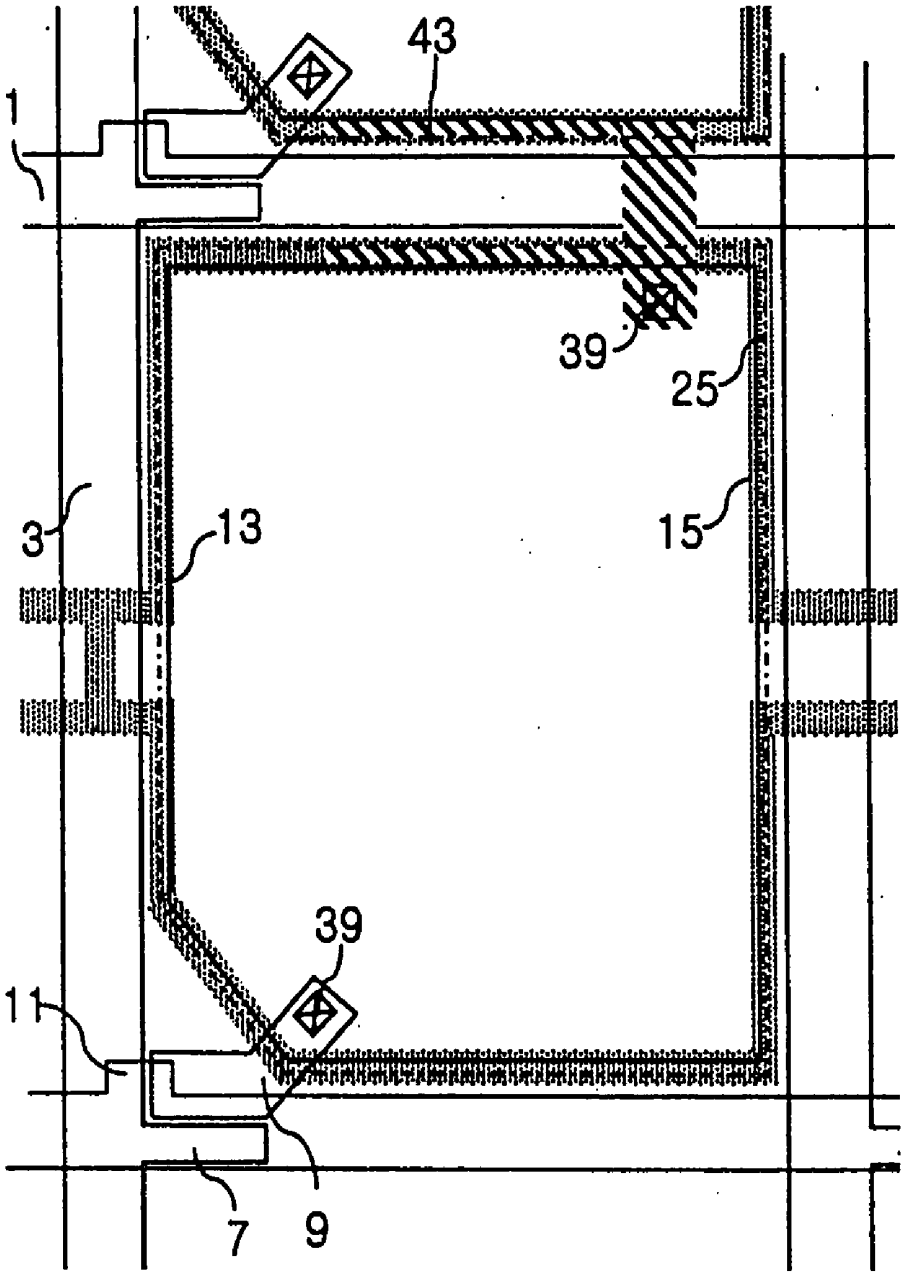


FIG. 12A

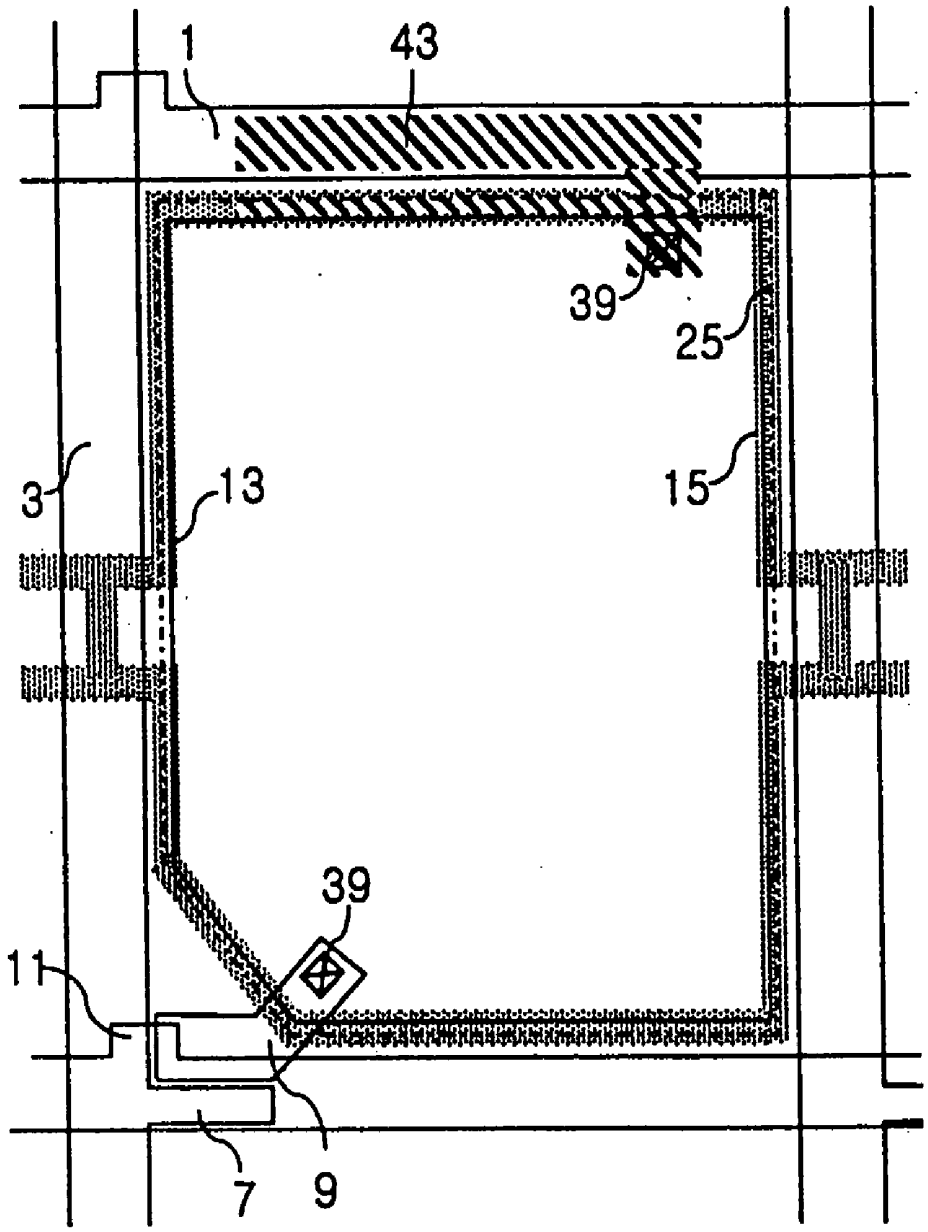


FIG. 12B

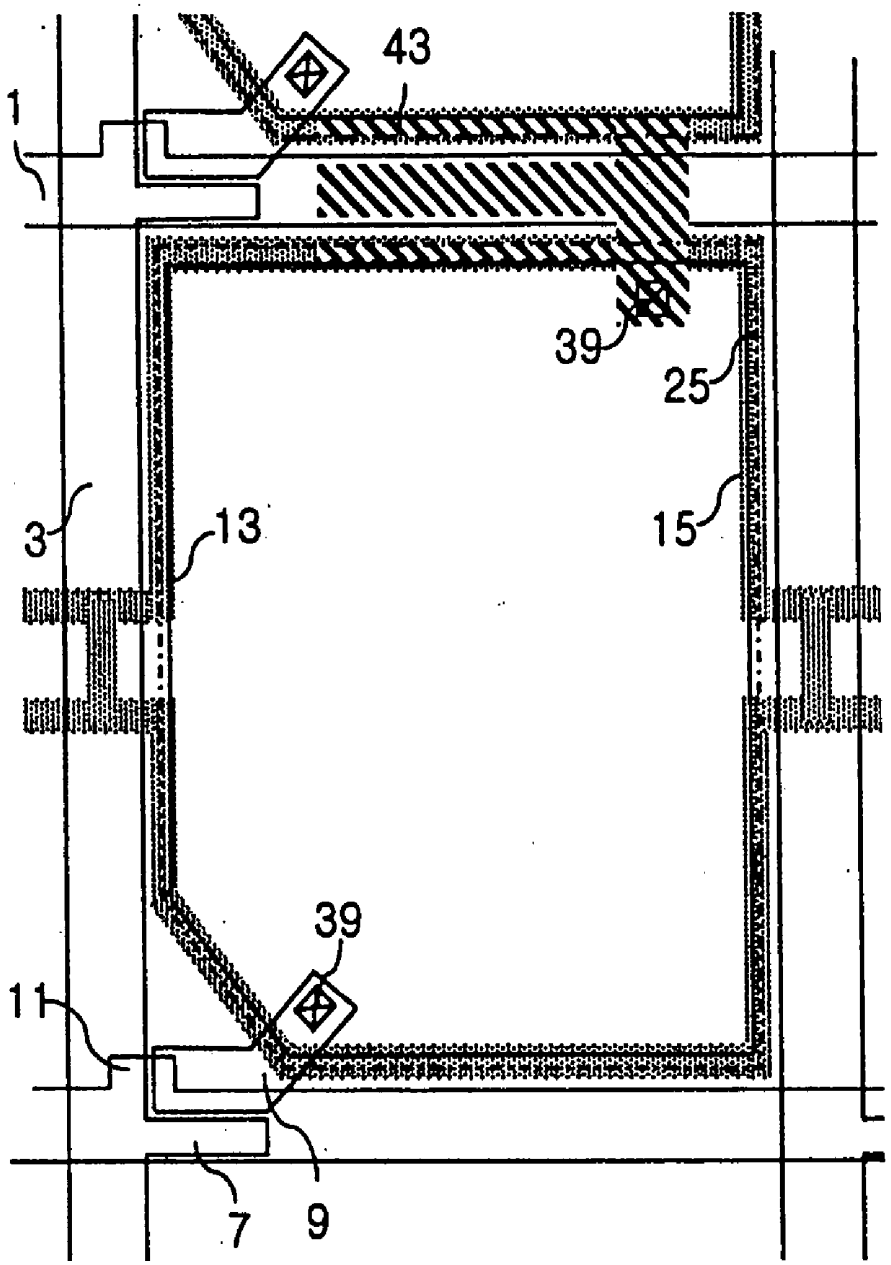


FIG. 12C

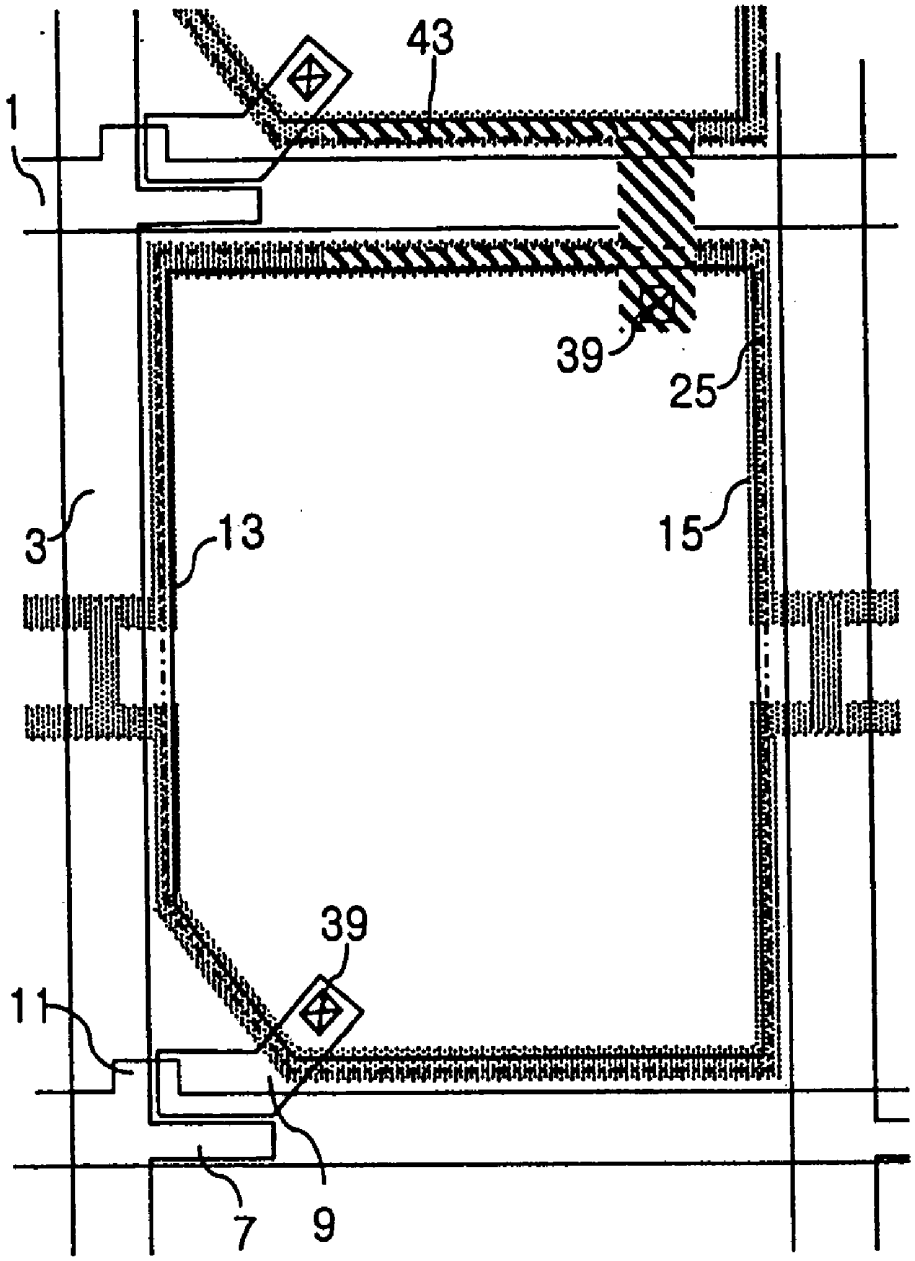


FIG. 13A

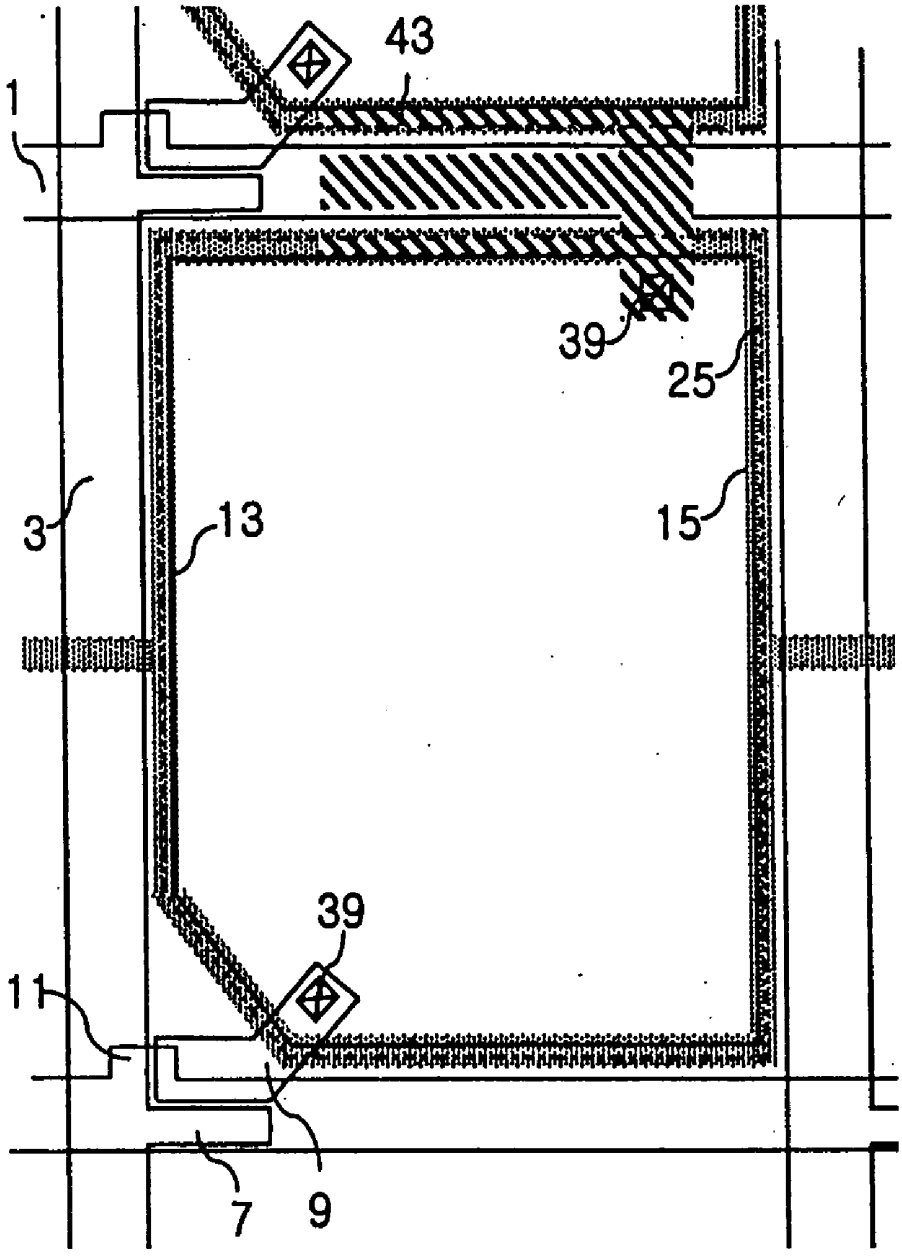


FIG. 13B

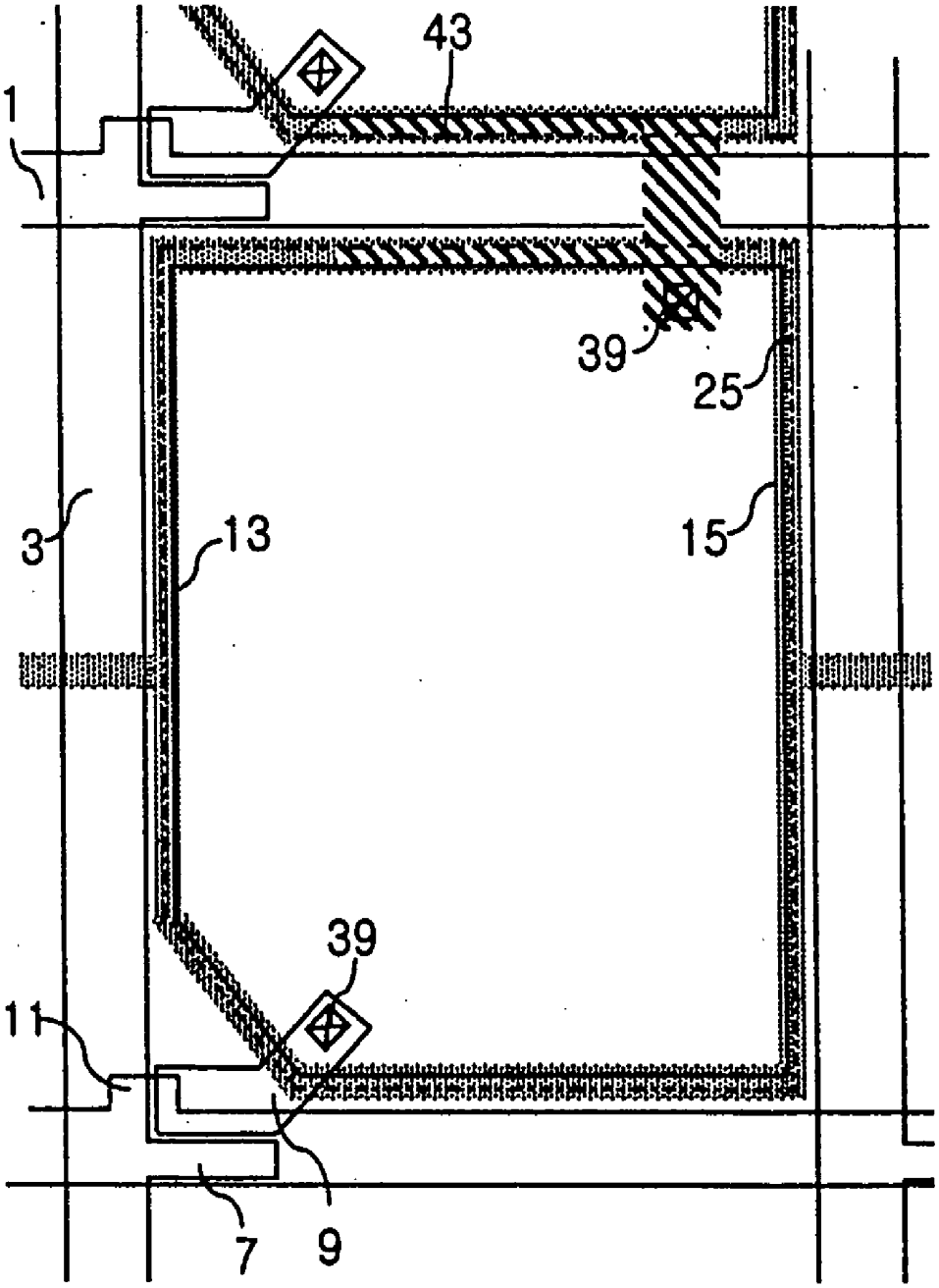


FIG. 14

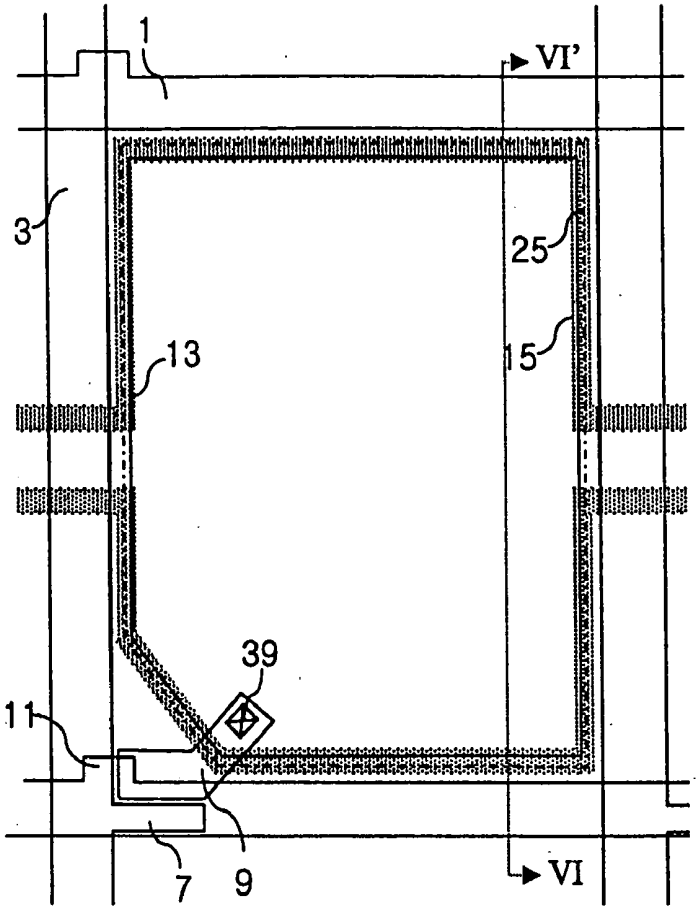


FIG. 15

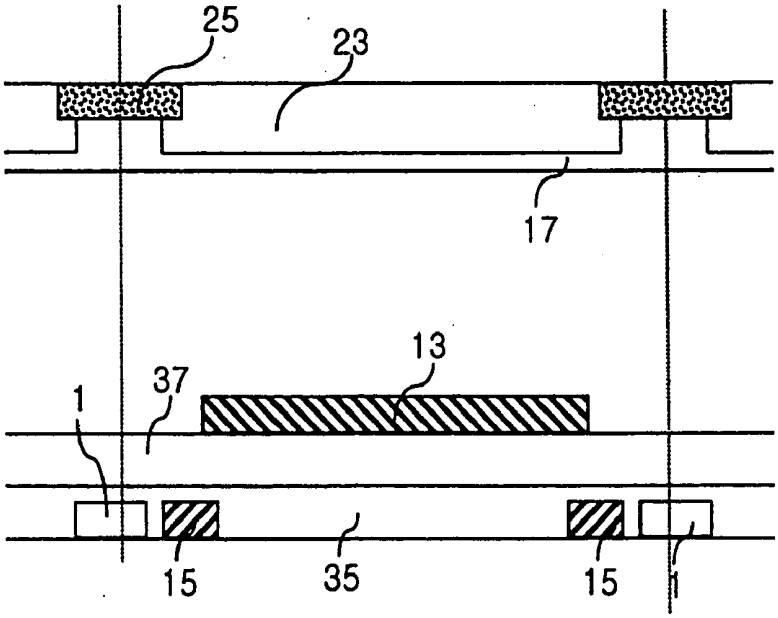


FIG. 16

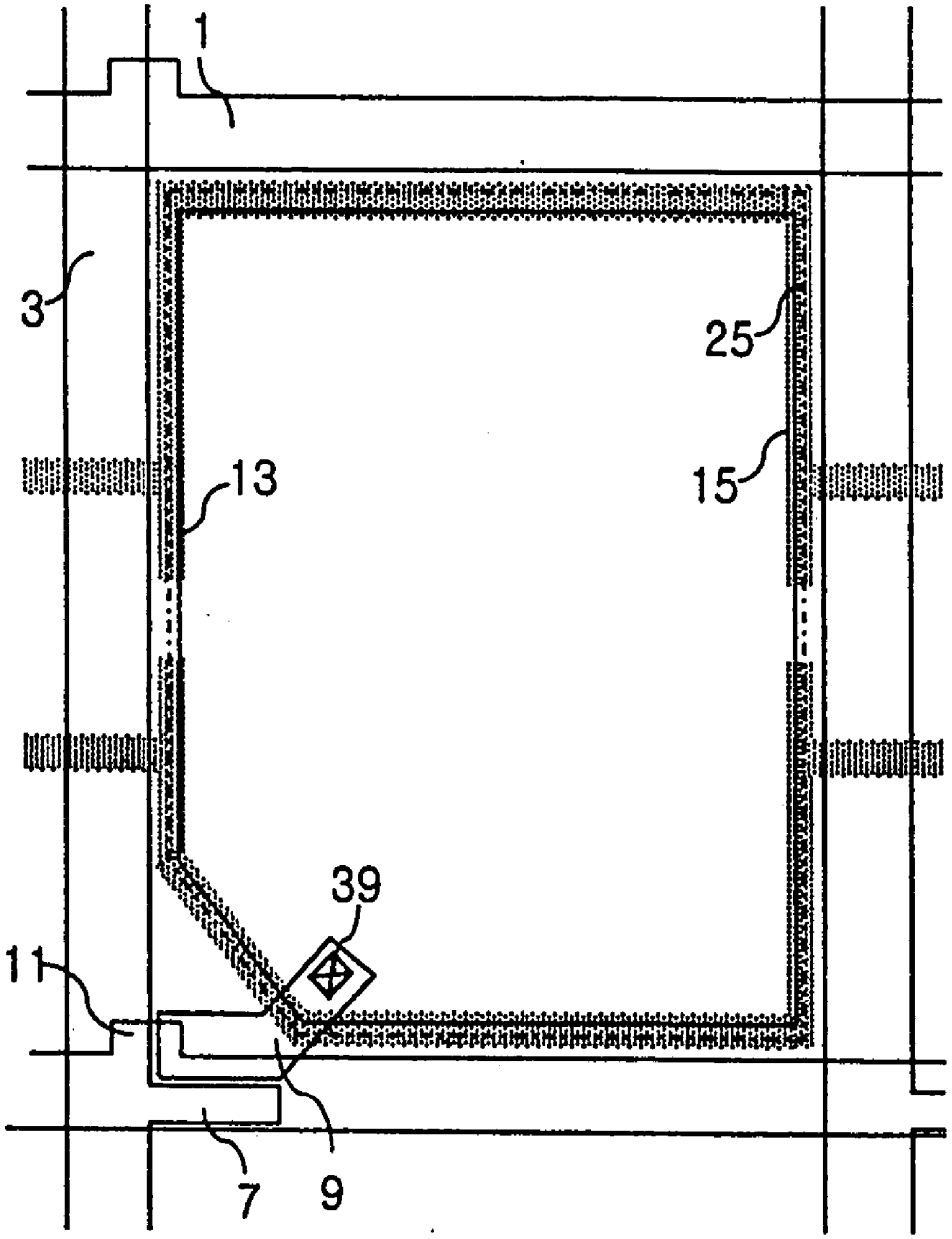


FIG. 17

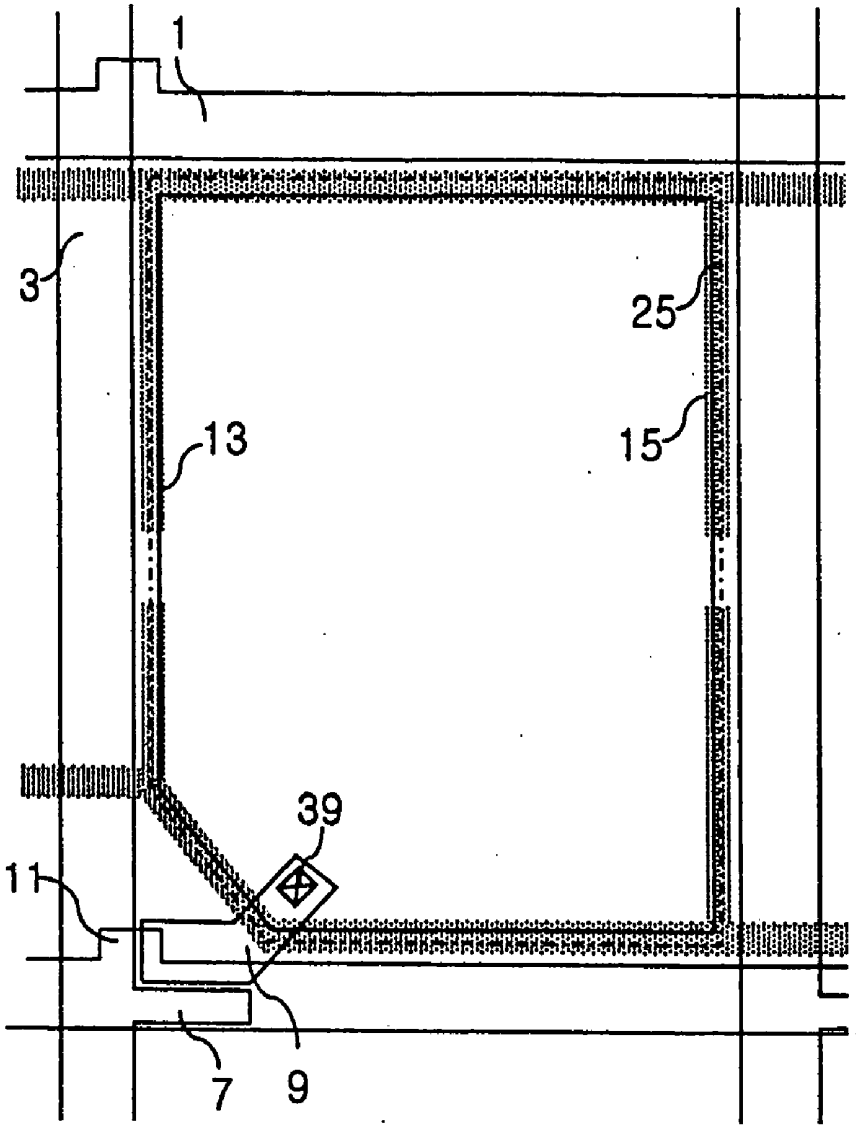


FIG. 18

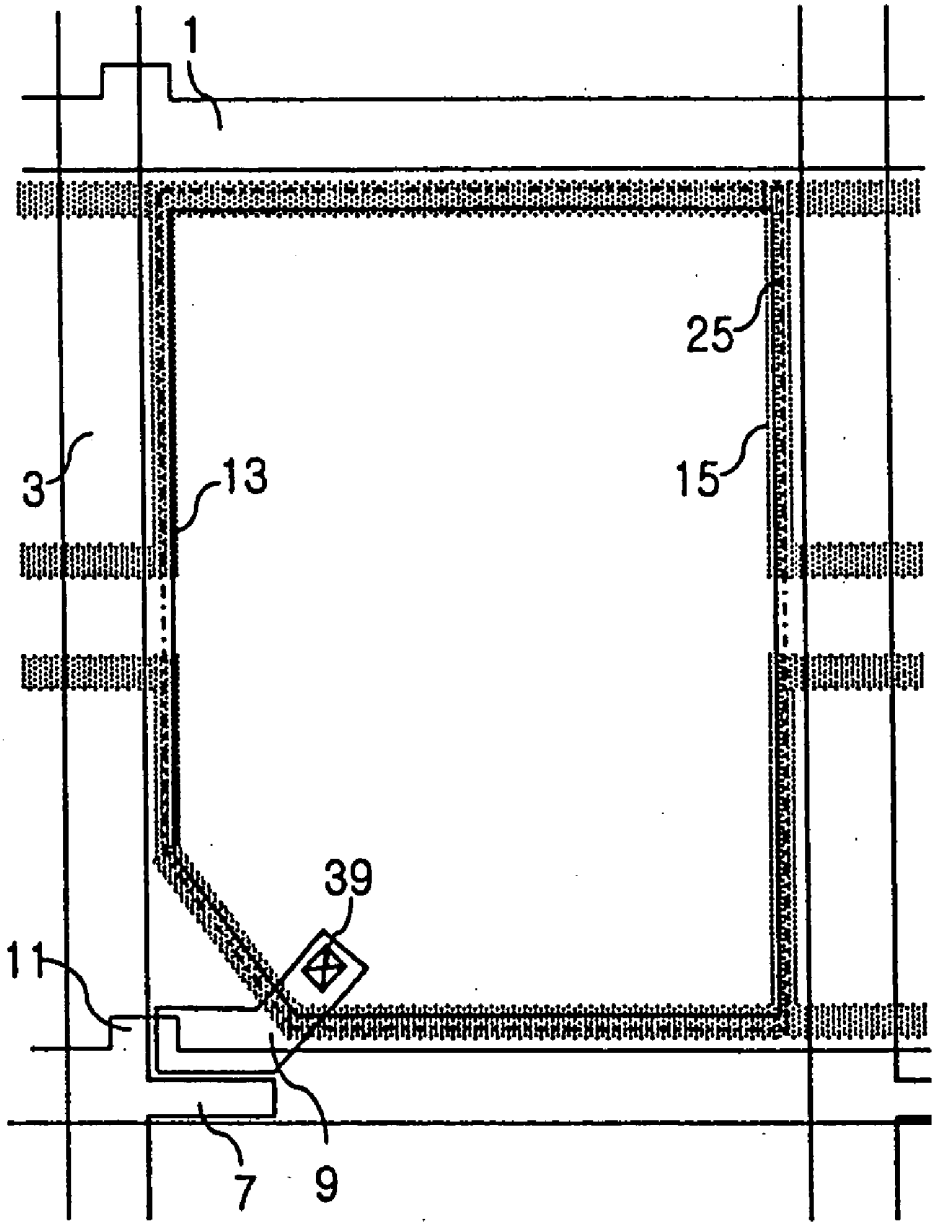


FIG. 19

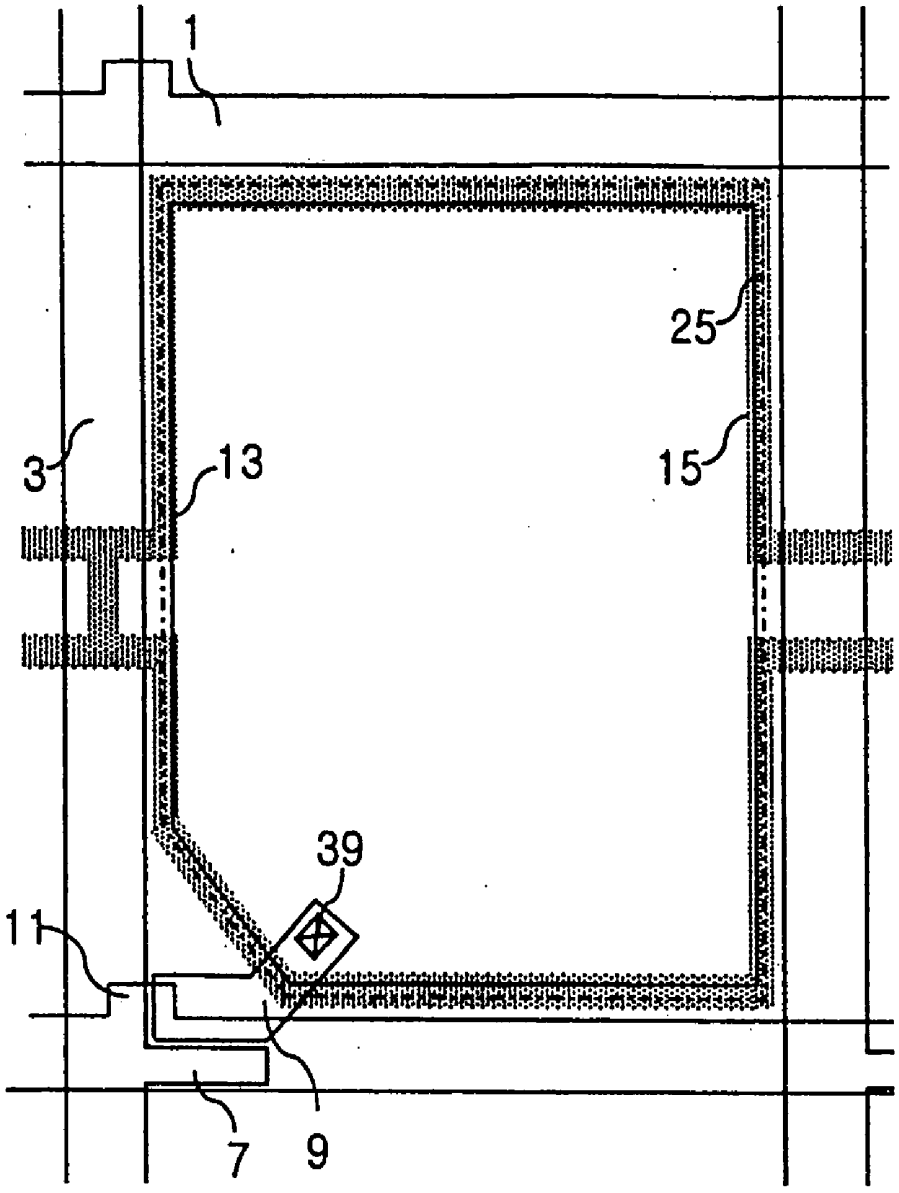


FIG. 20

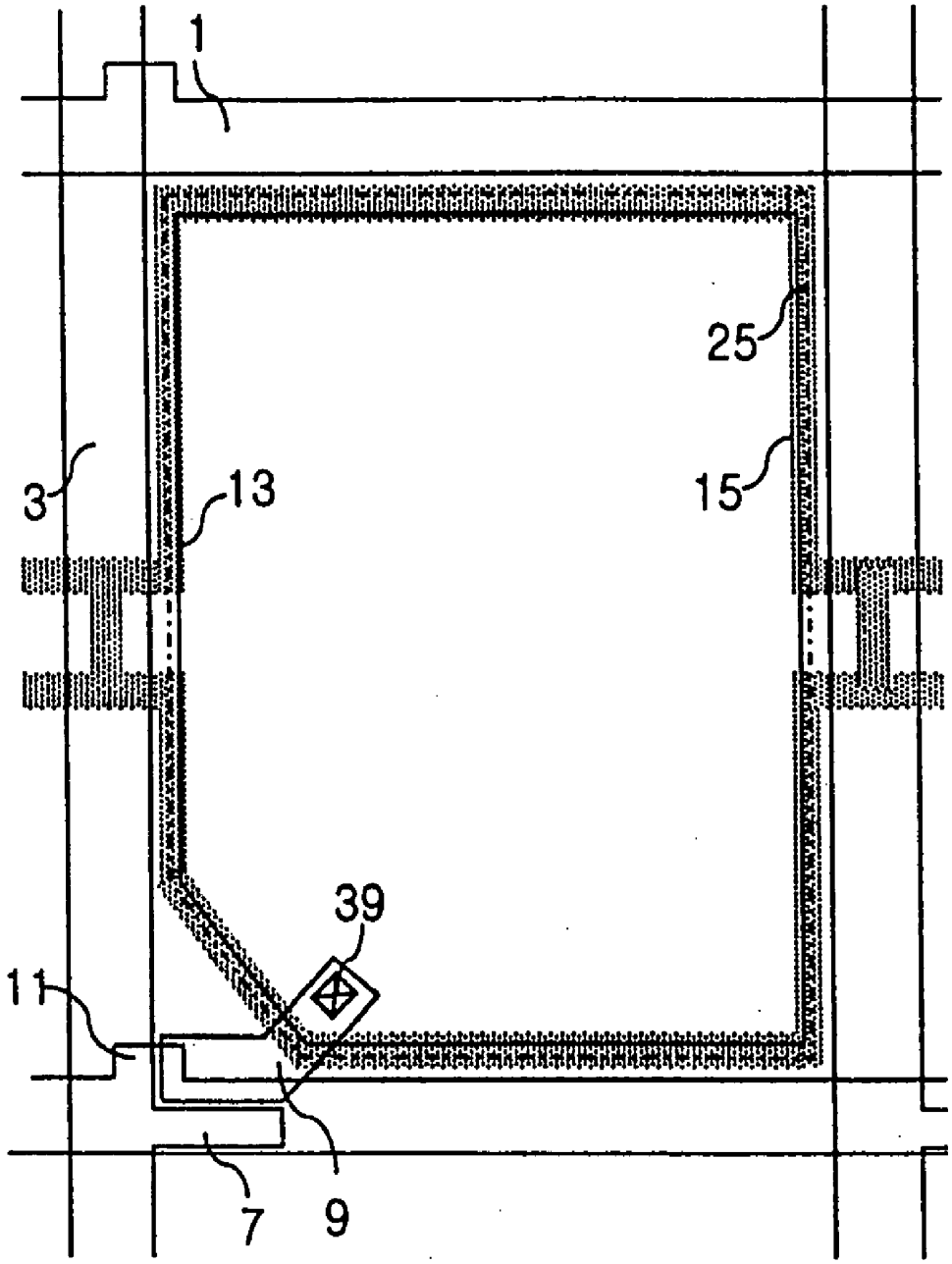


FIG. 21A

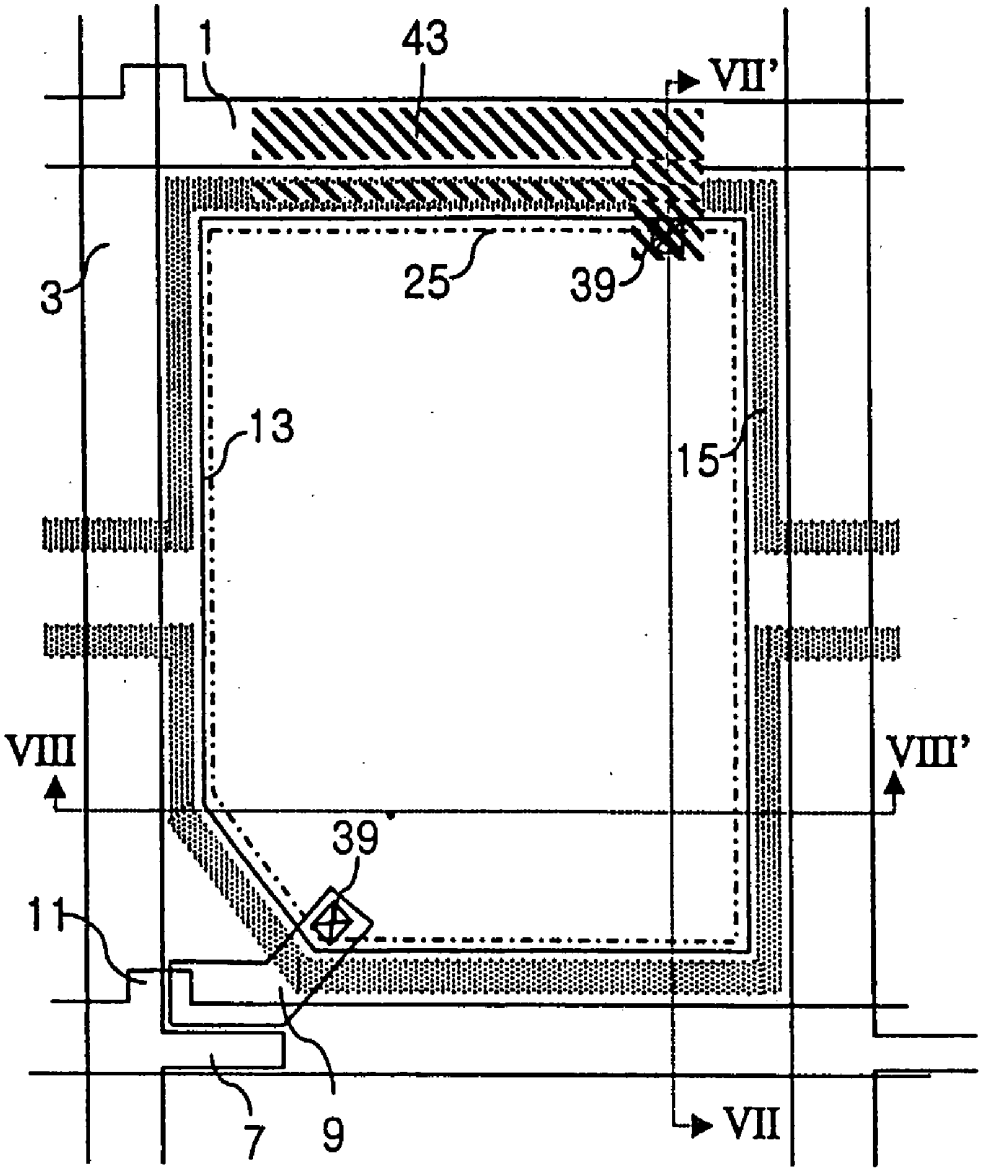


FIG. 21B

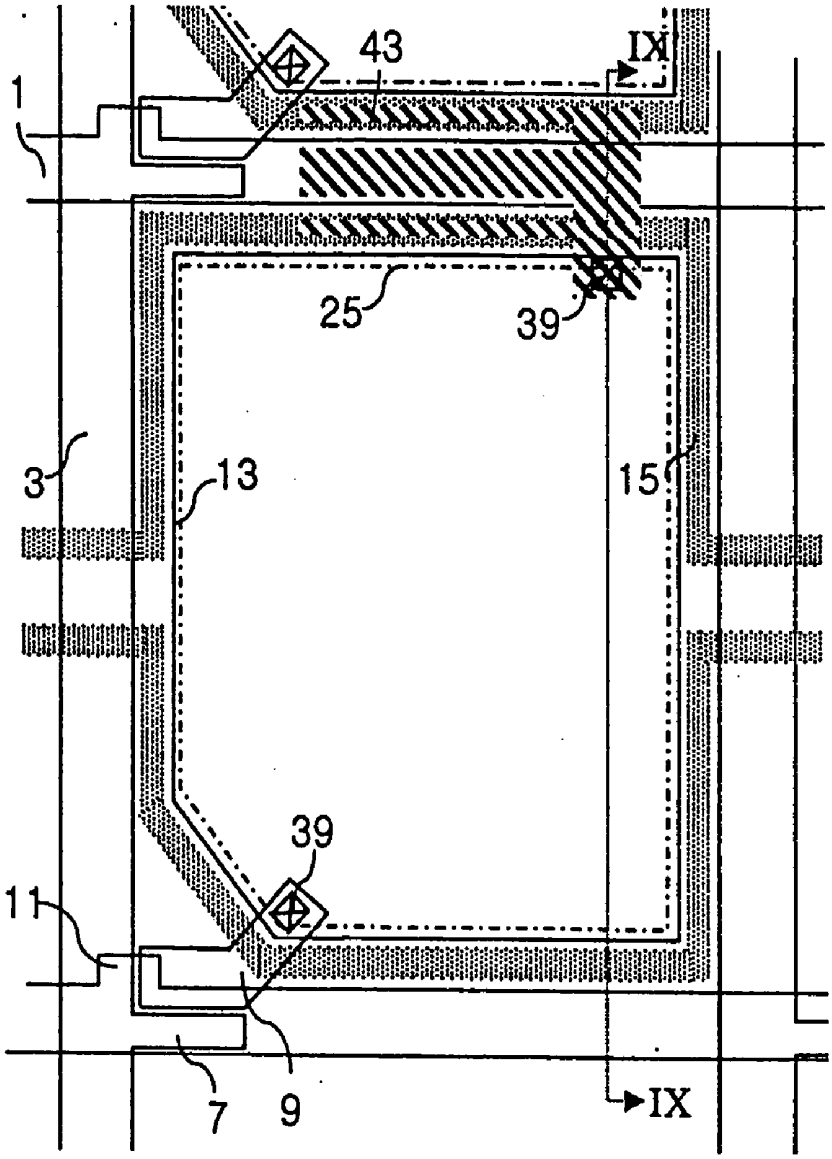


FIG. 21C

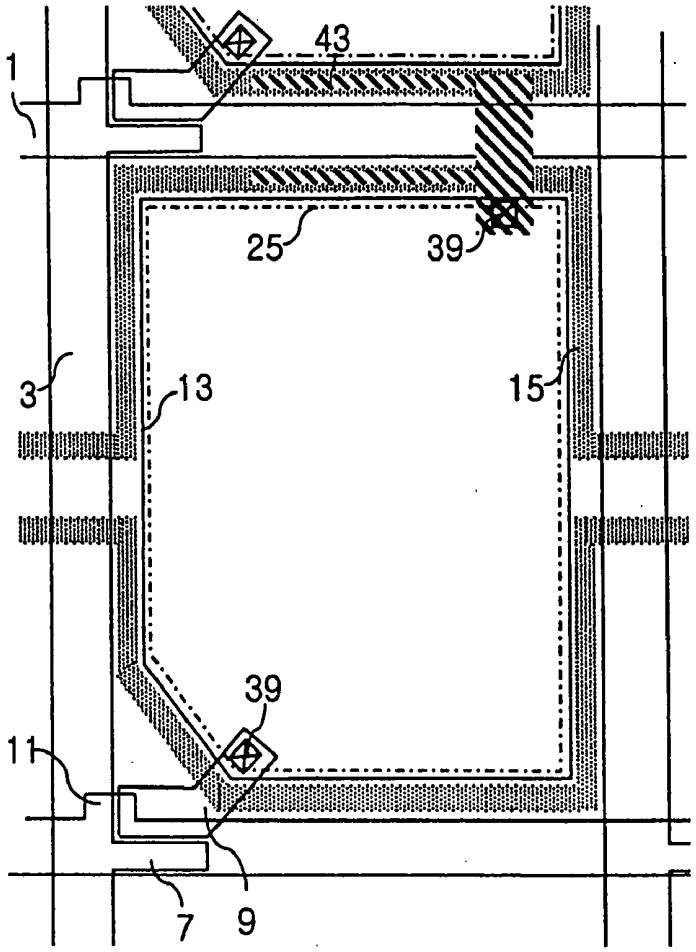


FIG. 22

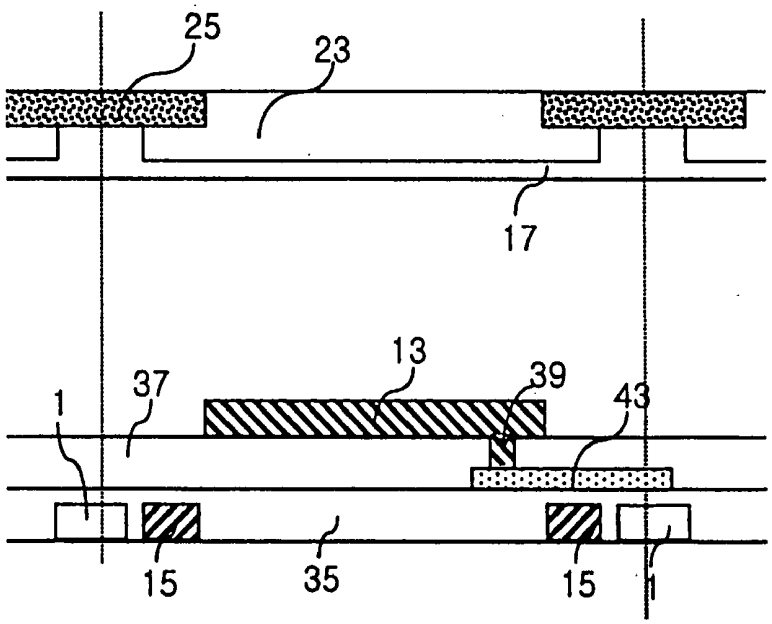


FIG. 23A

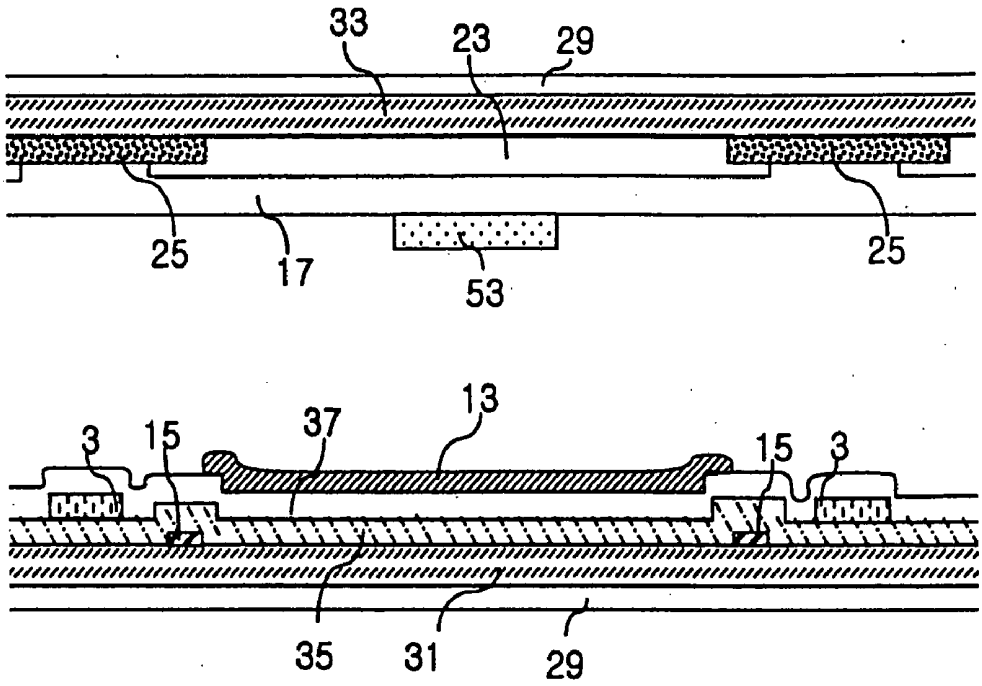


FIG. 23B

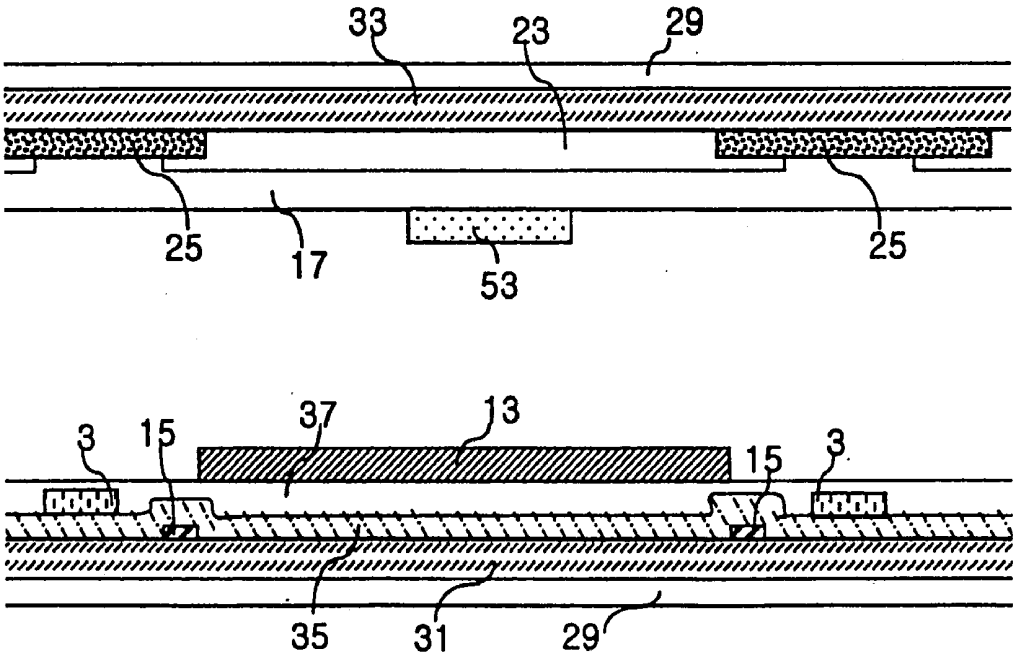


FIG. 23C

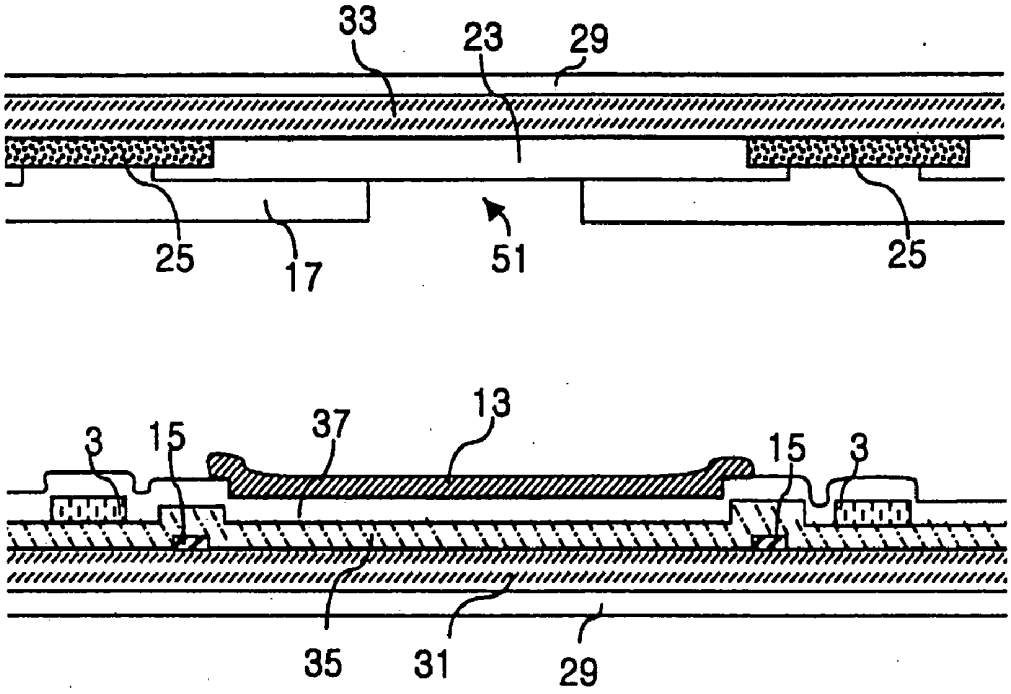


FIG. 23D

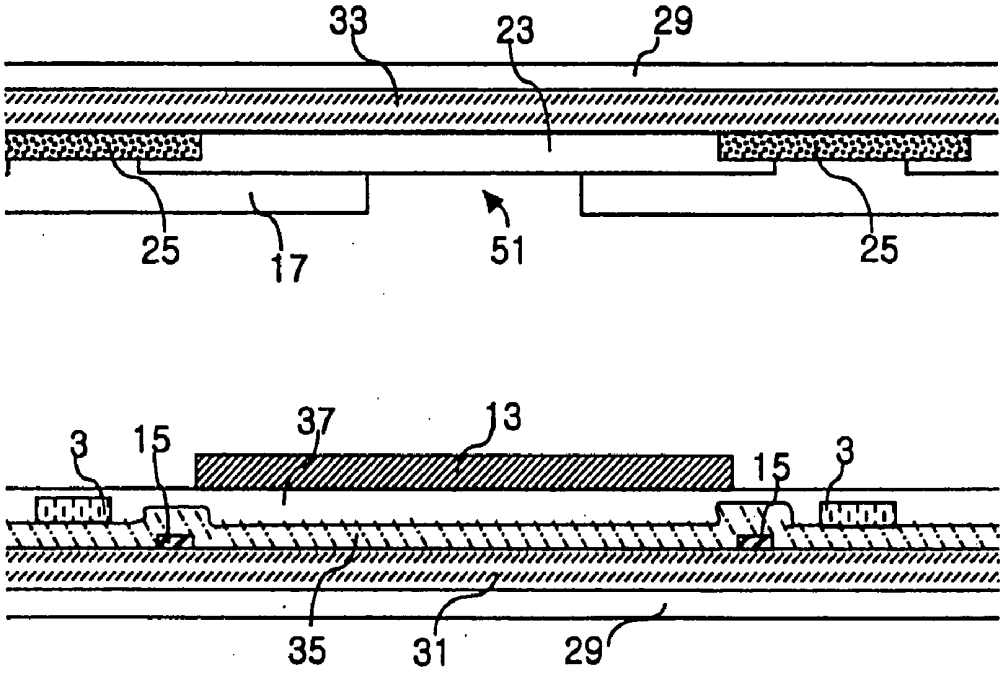


FIG. 24

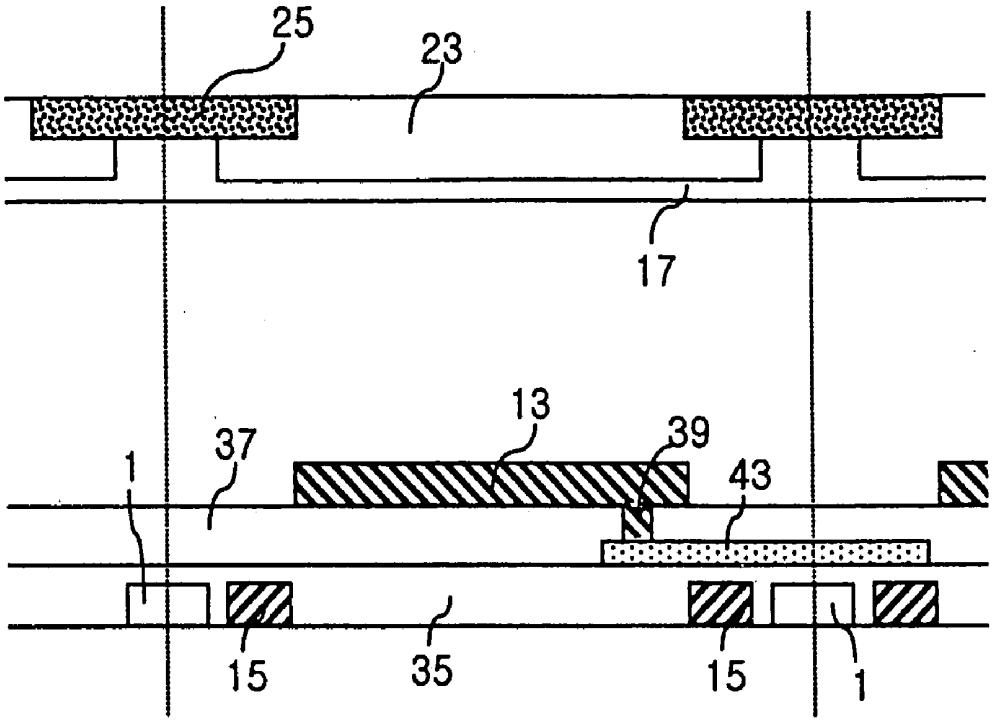


FIG. 25A

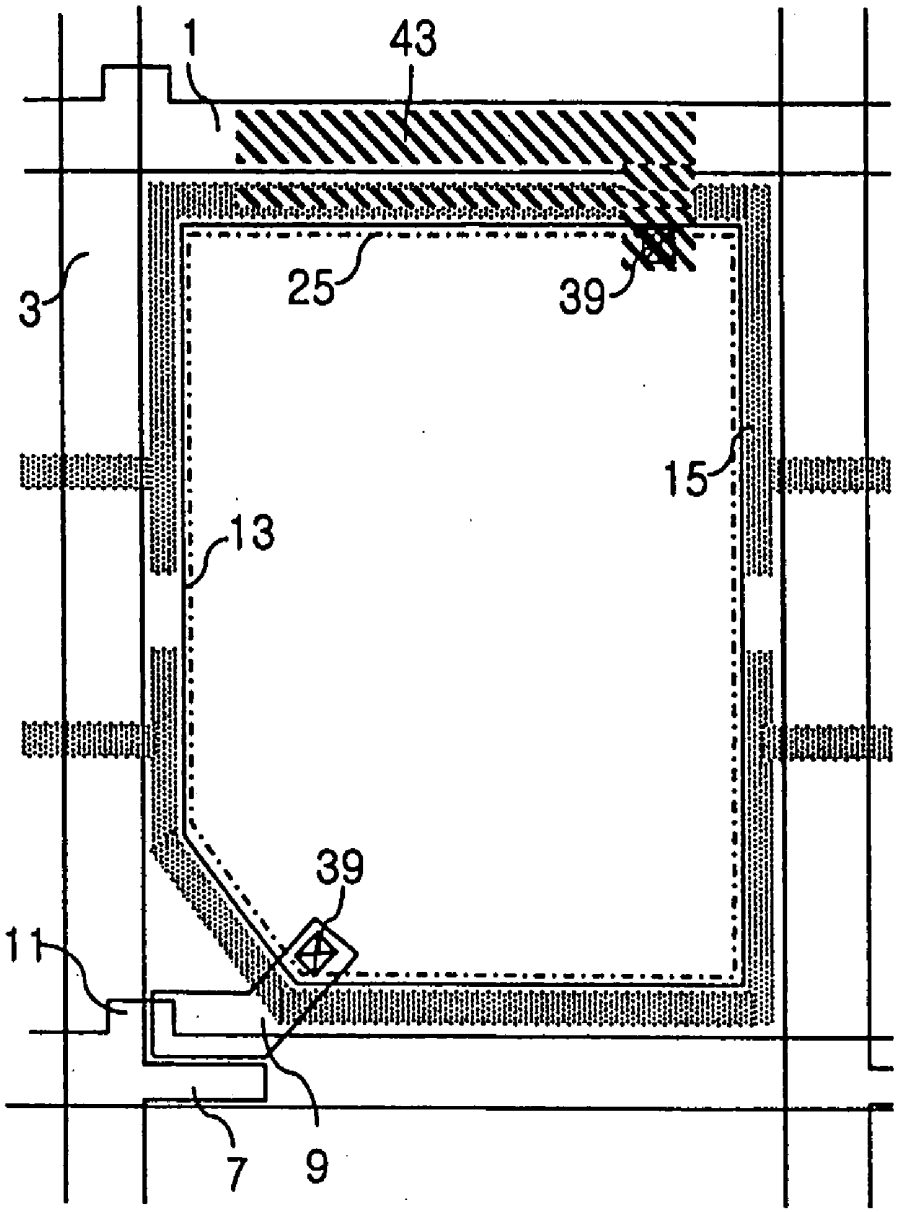


FIG. 25B

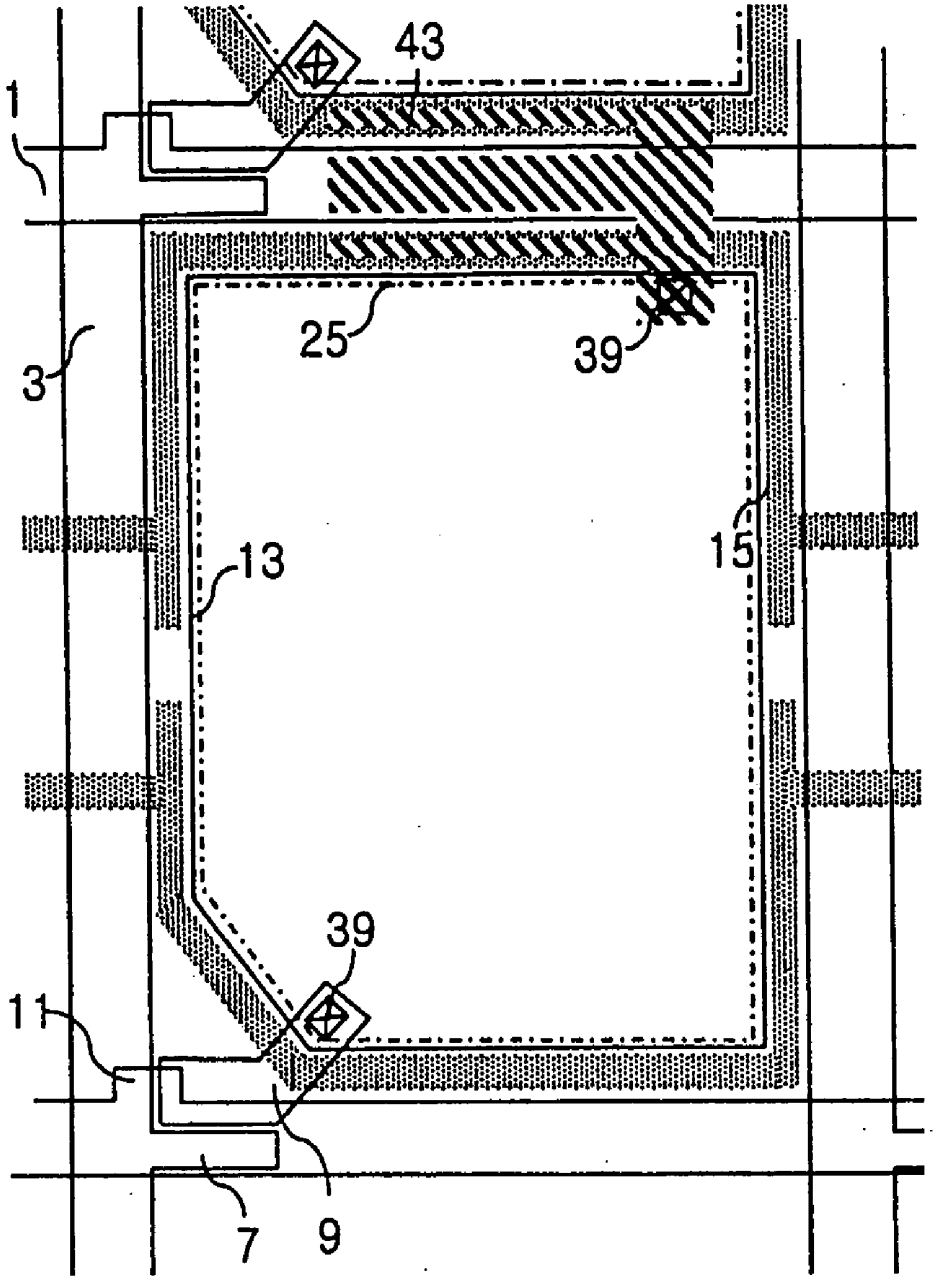


FIG. 25C

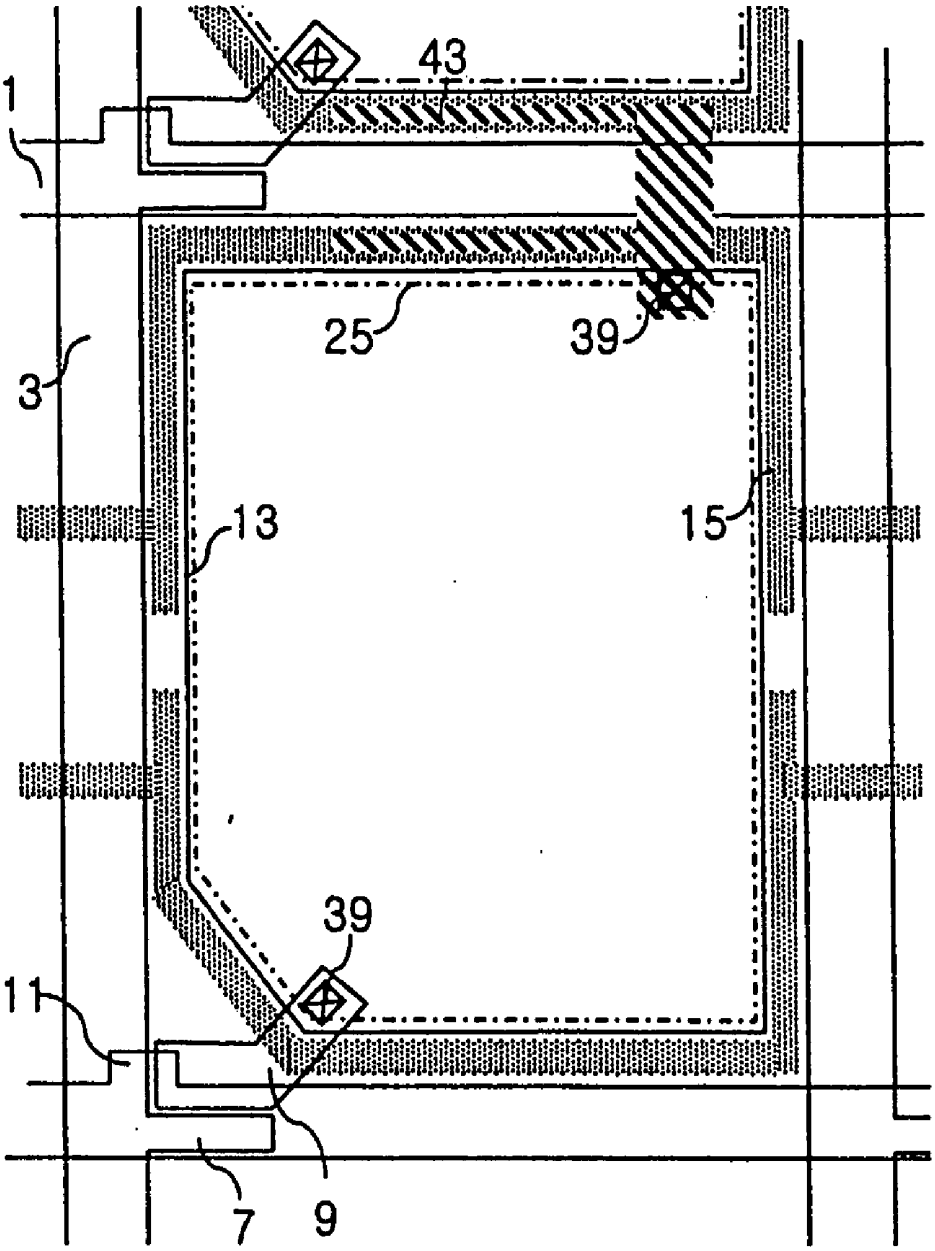


FIG. 26A

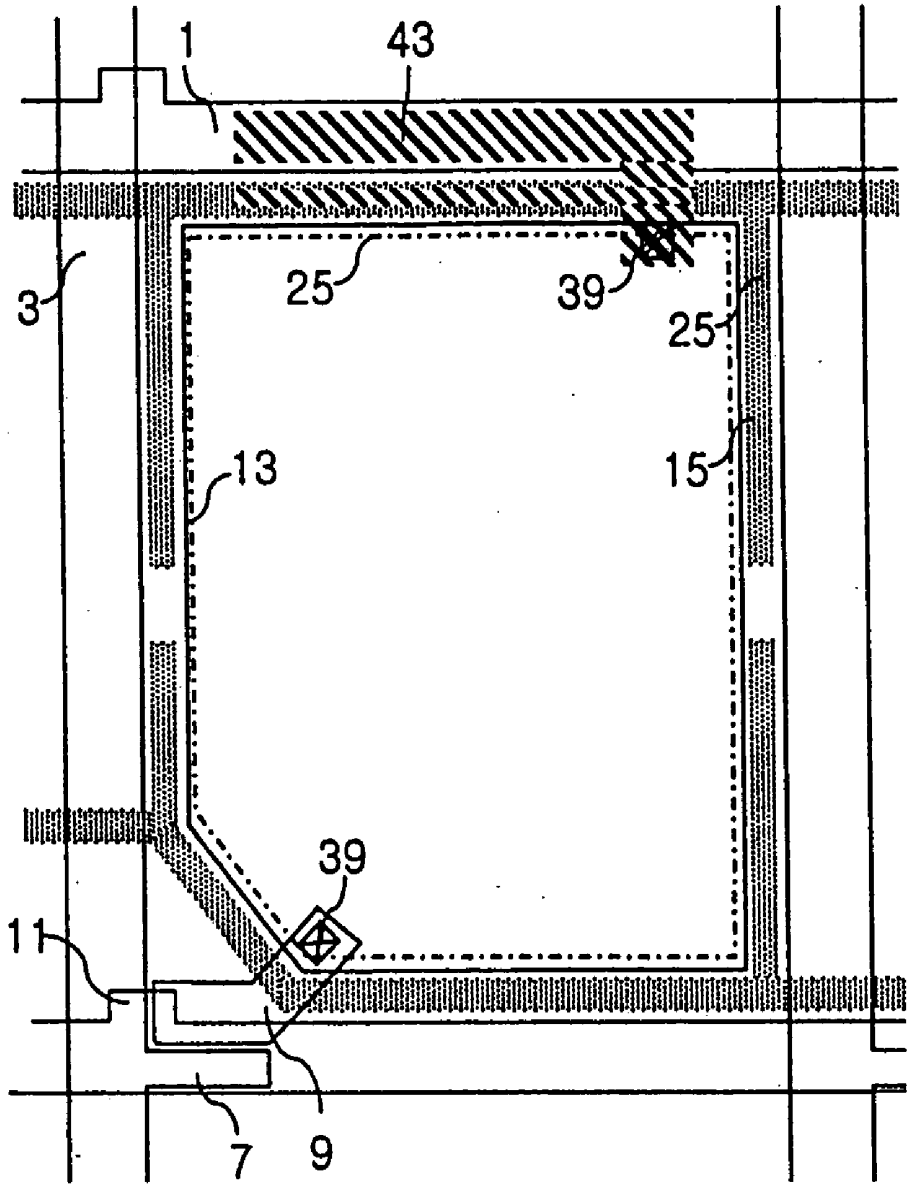


FIG. 26B

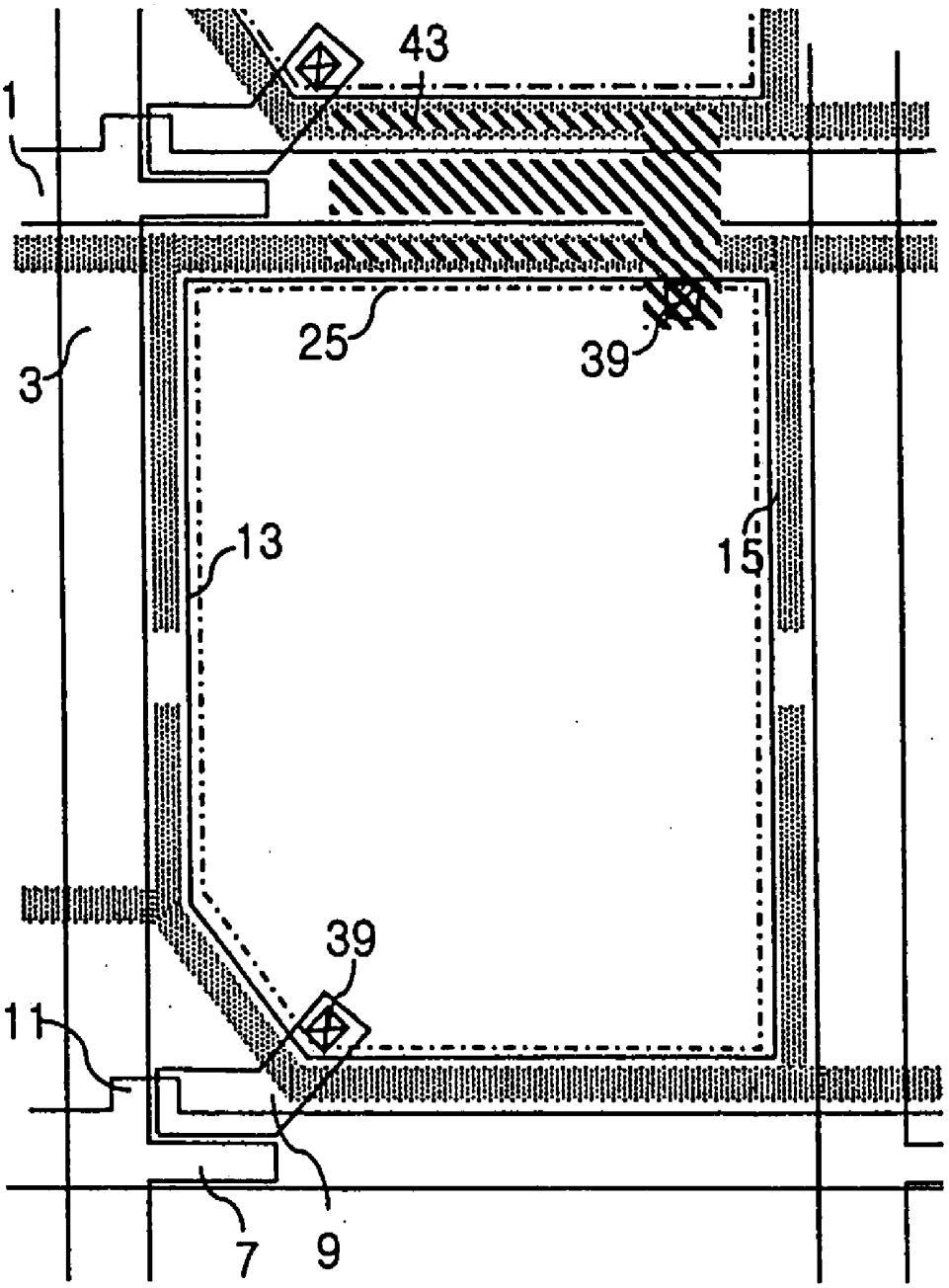


FIG. 26C

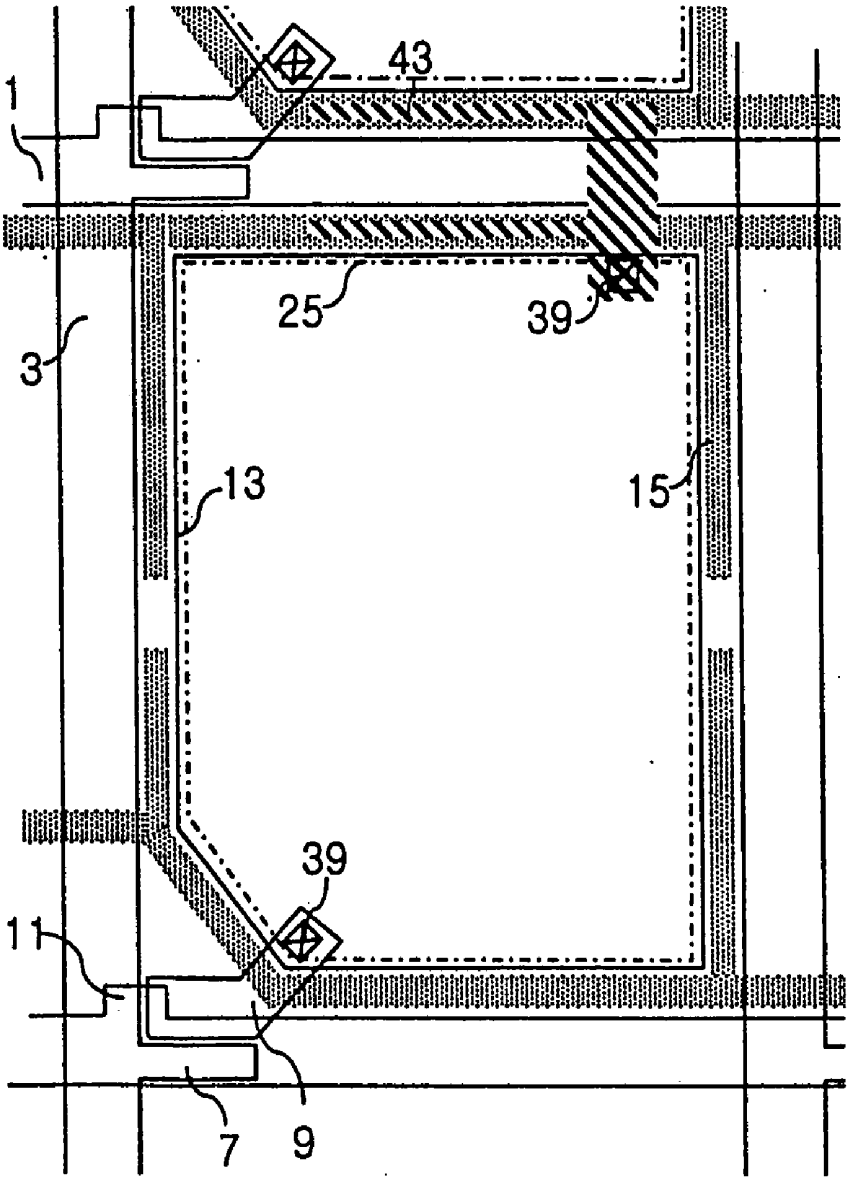


FIG. 27A

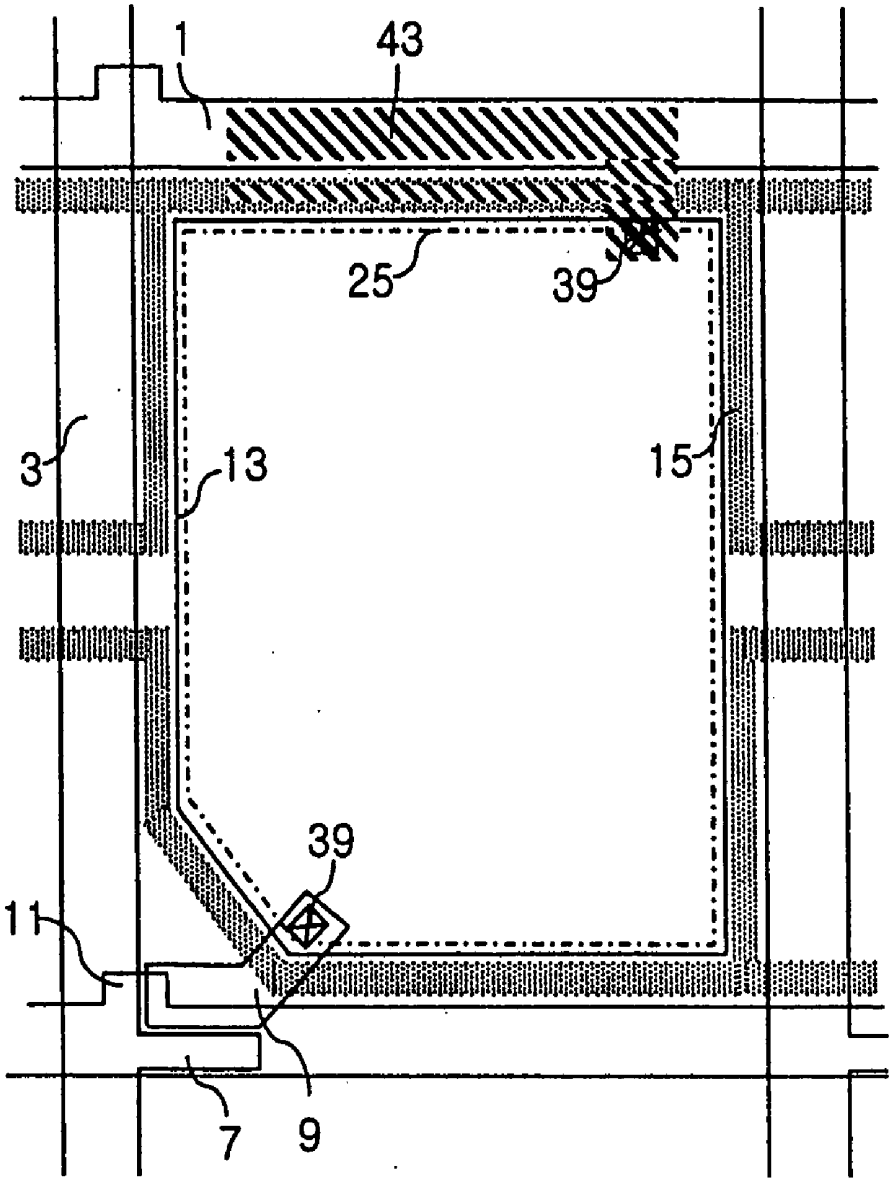


FIG. 27B

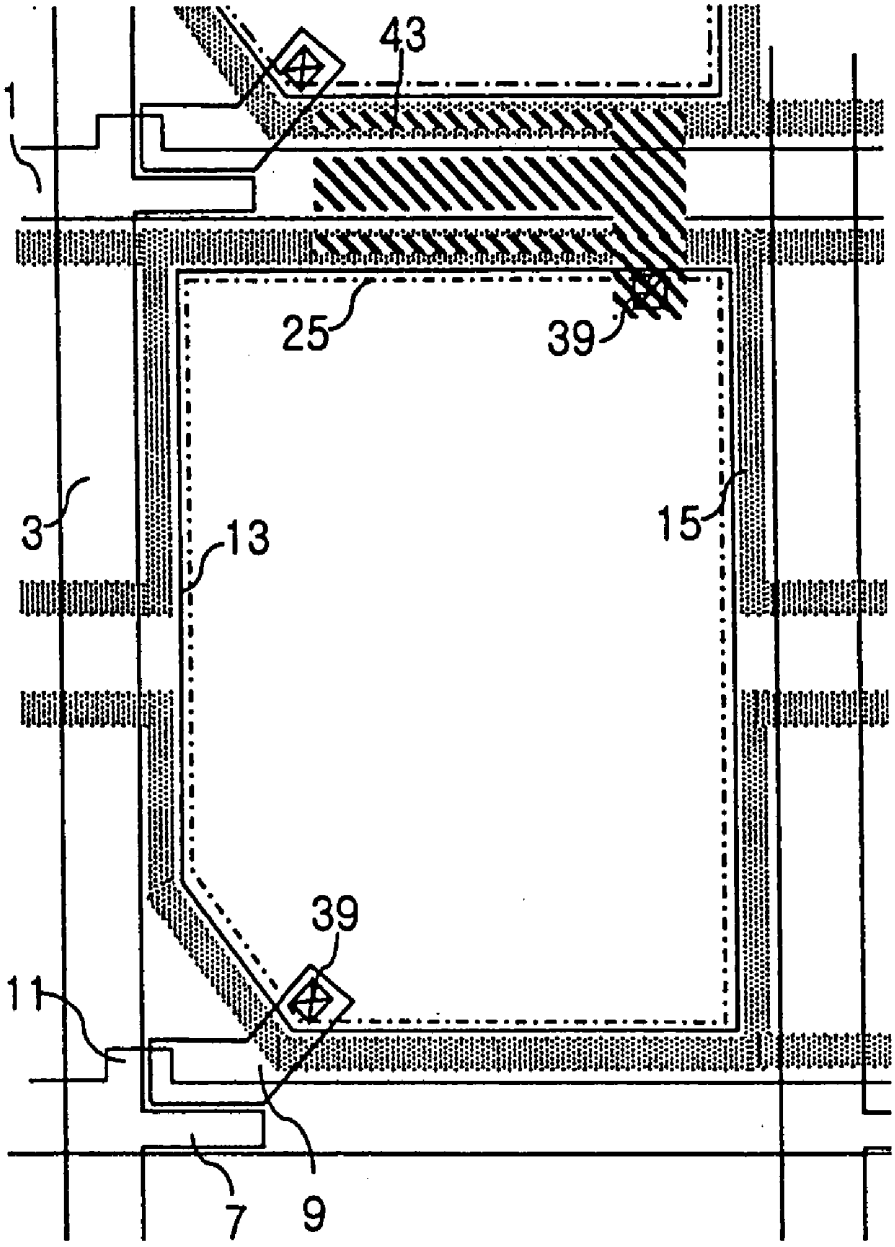


FIG. 27C

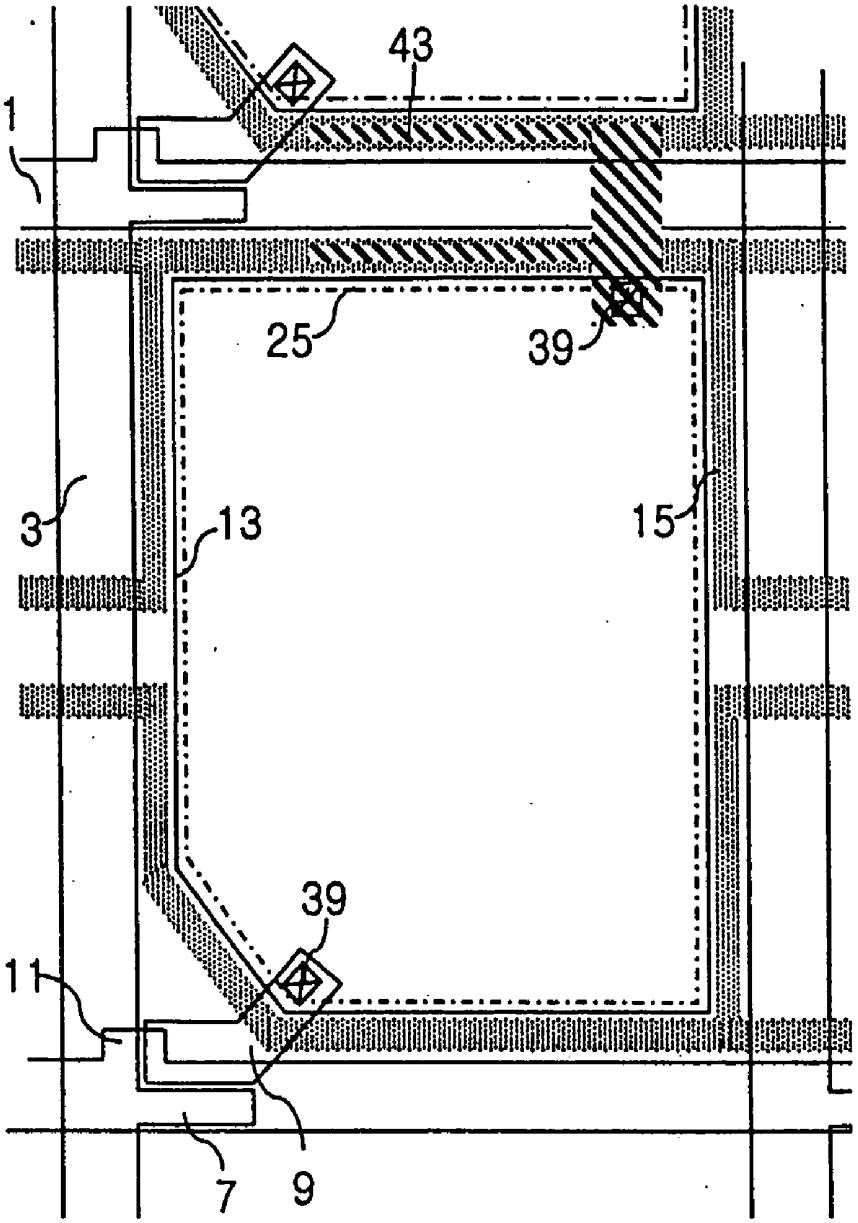


FIG. 28A

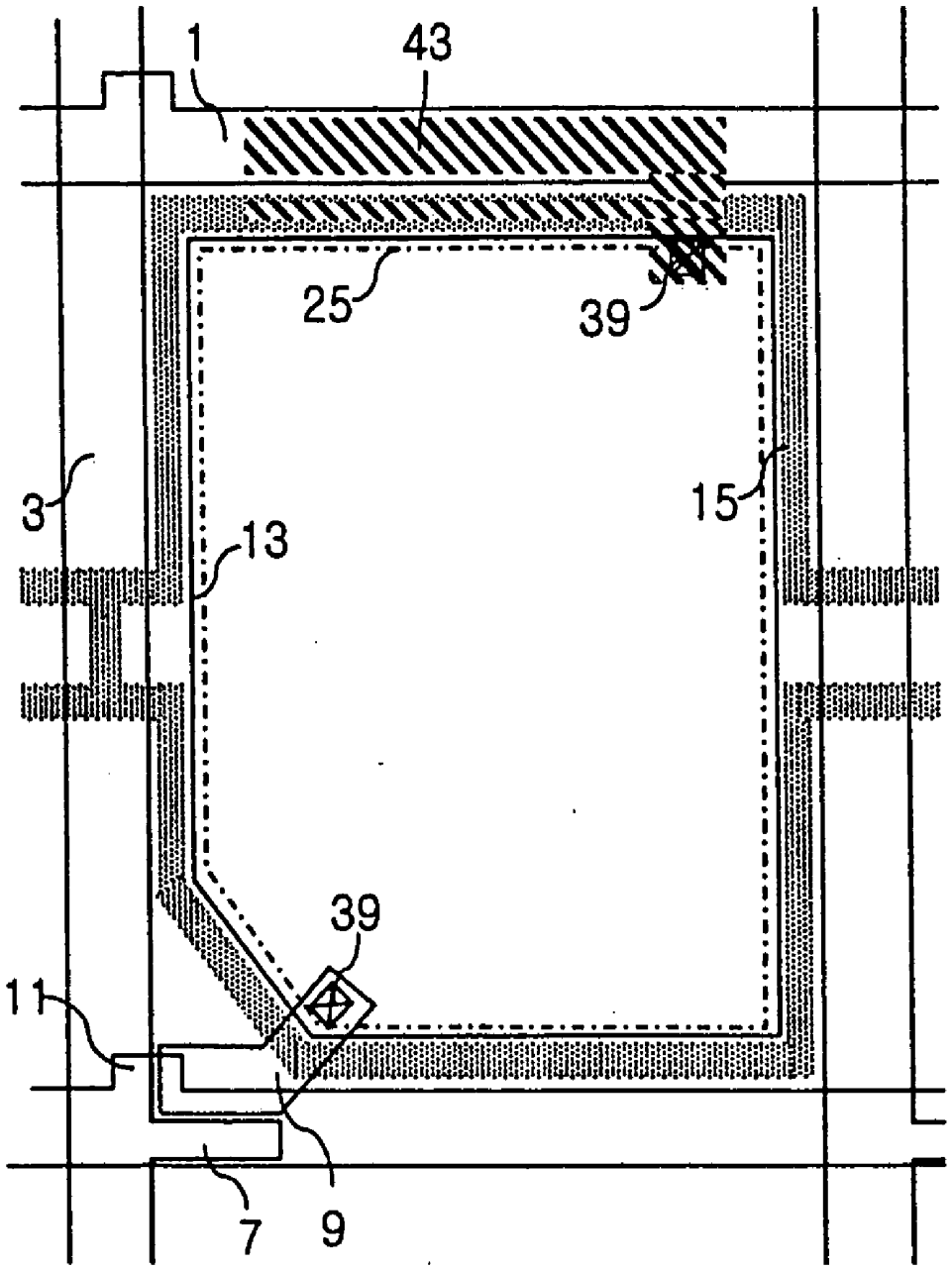


FIG. 28B

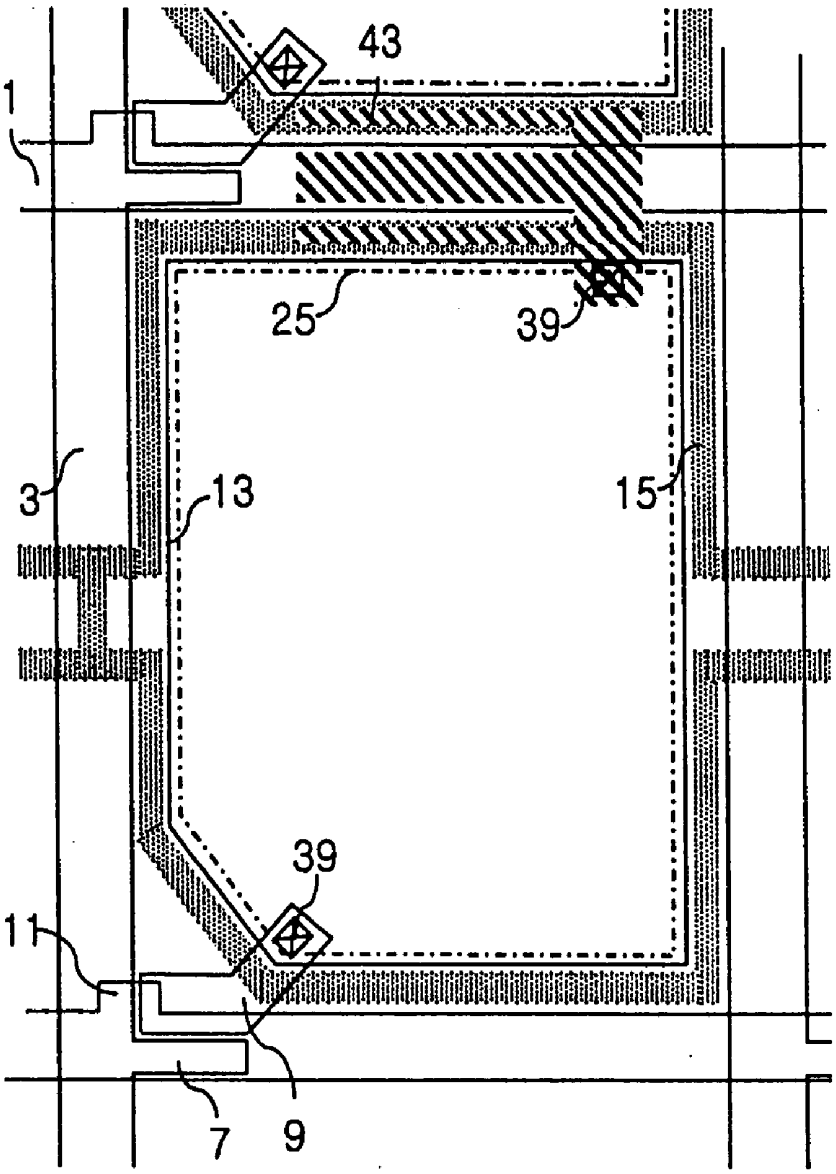


FIG. 28C

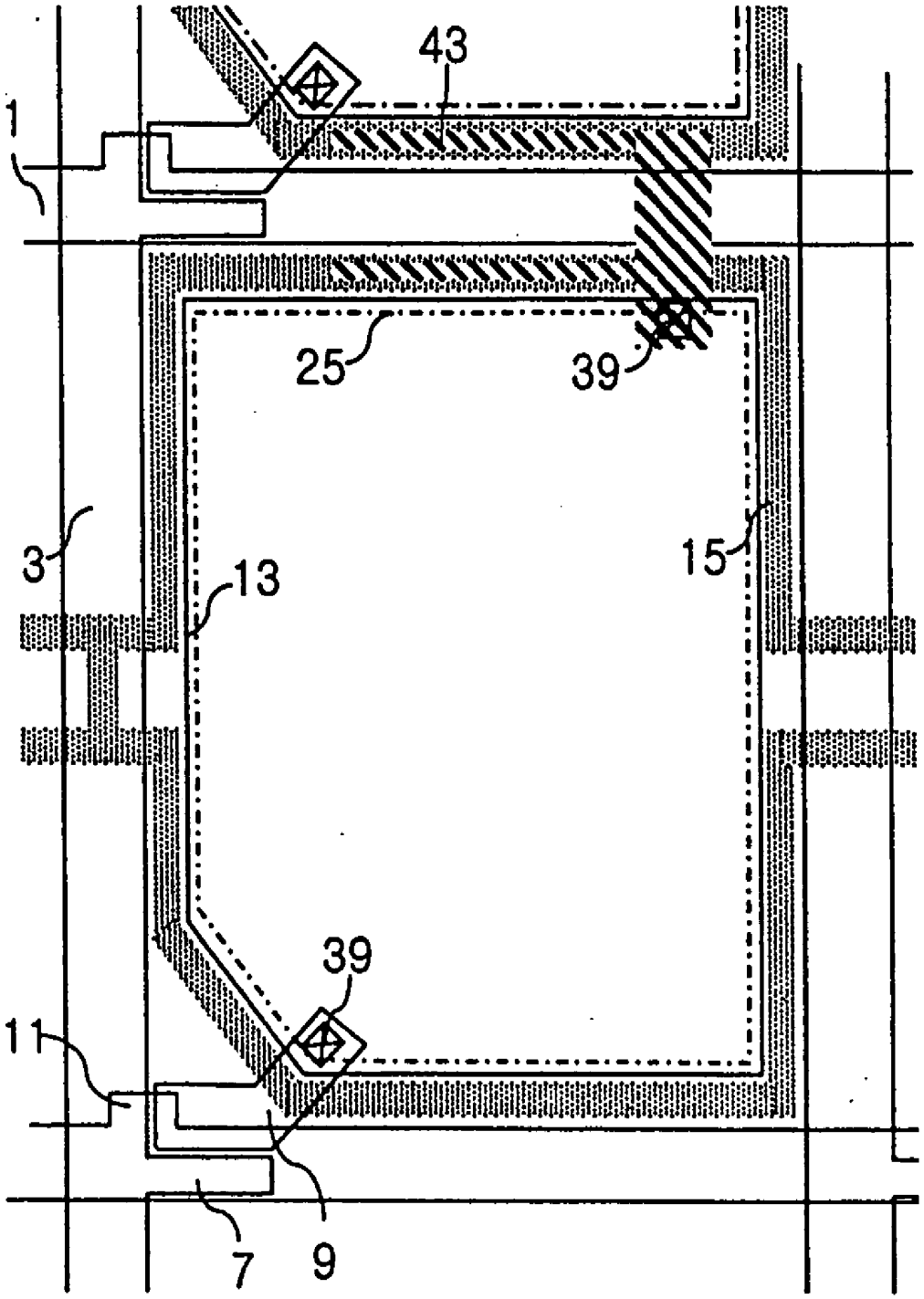


FIG. 29A

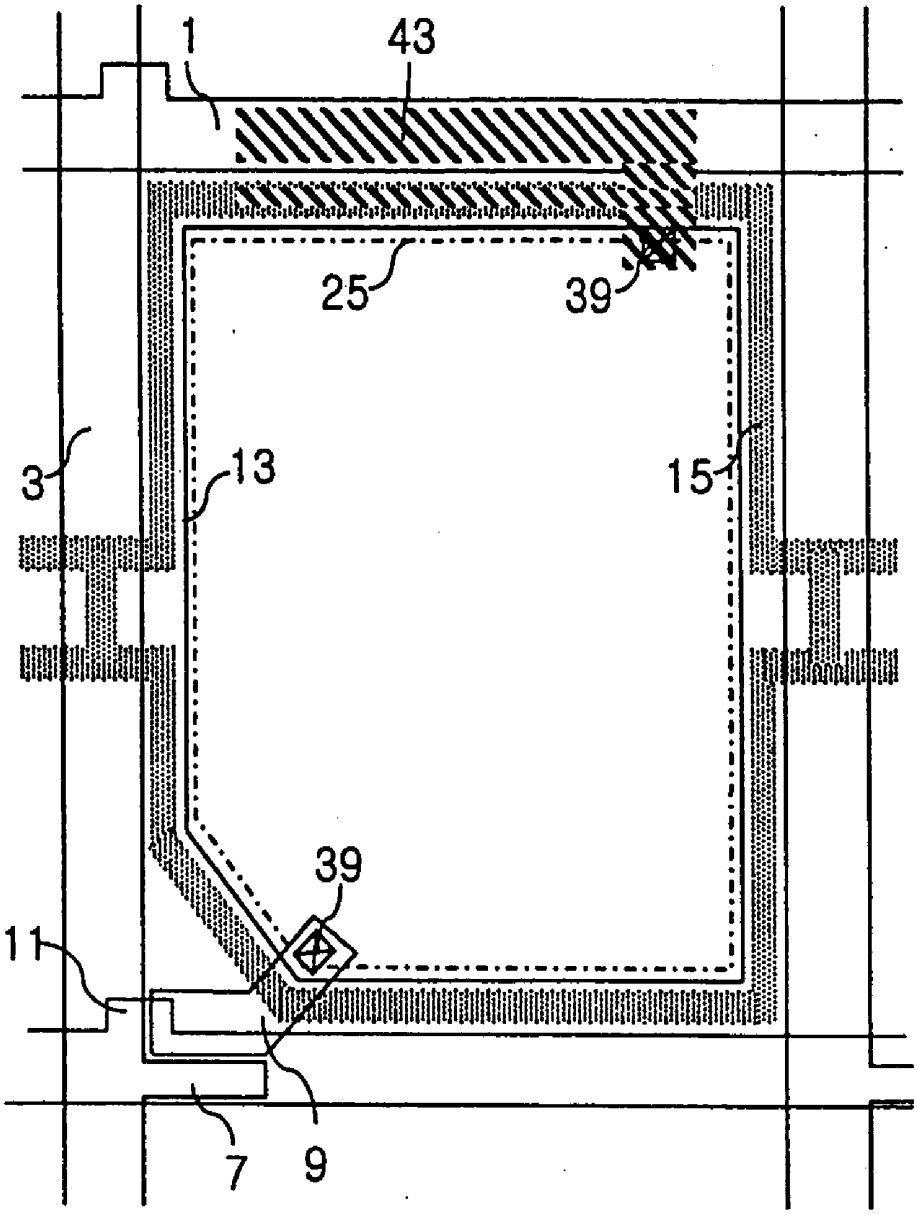


FIG. 29B

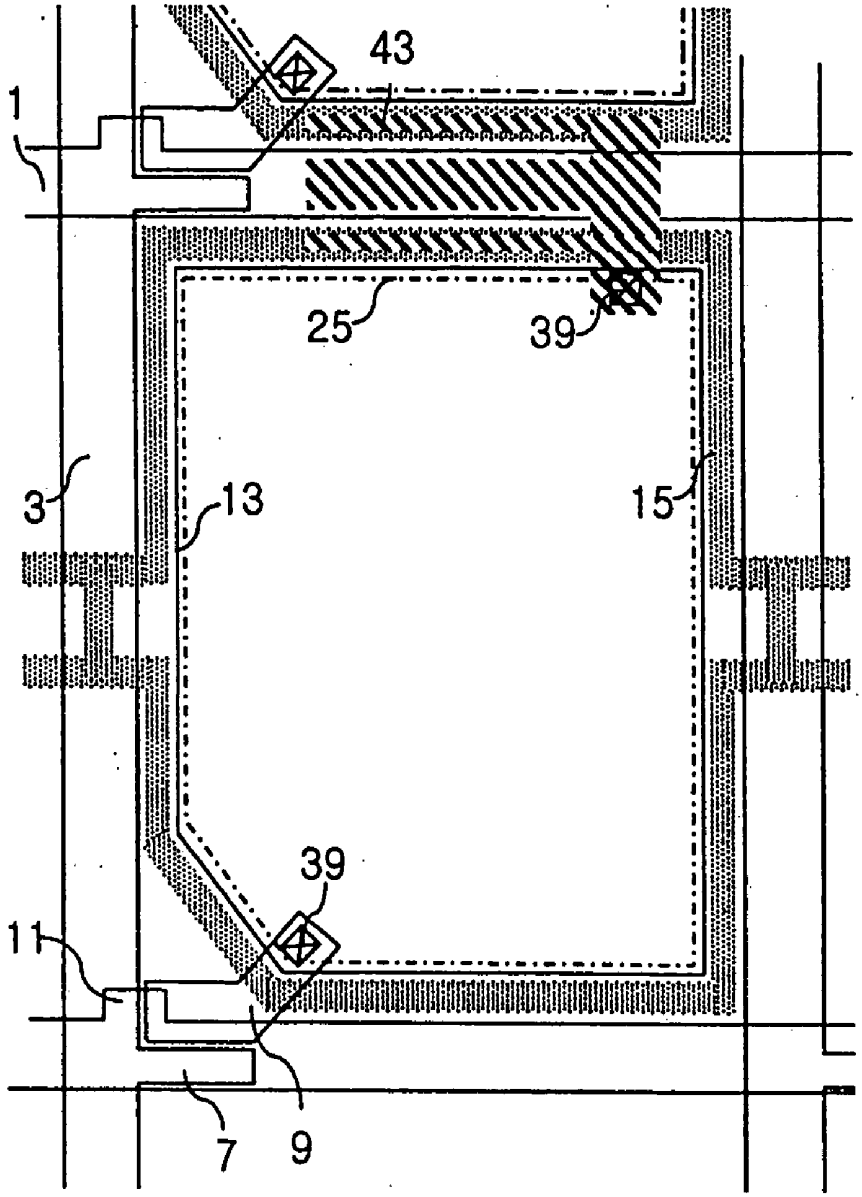


FIG. 29C

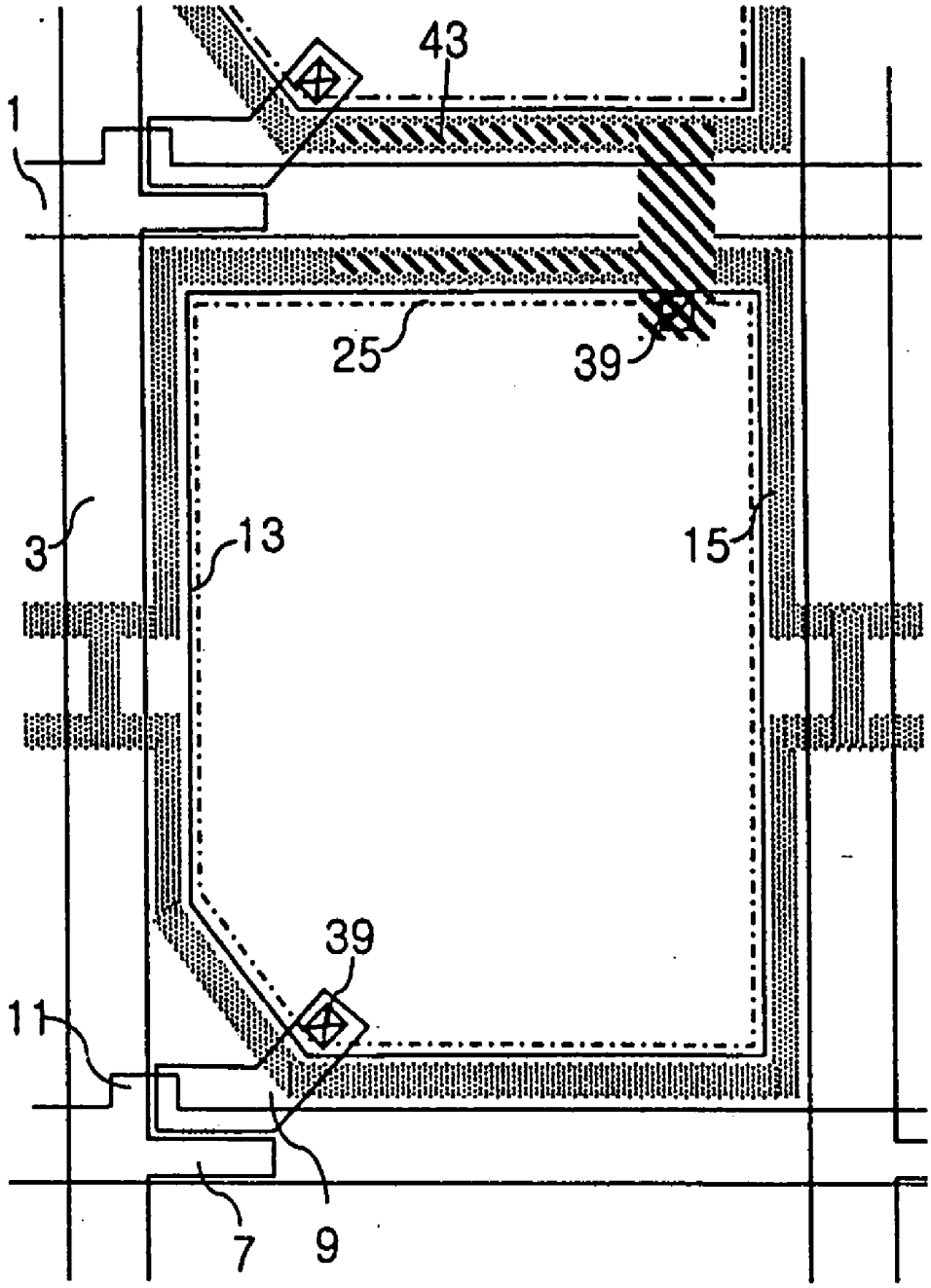


FIG. 30A

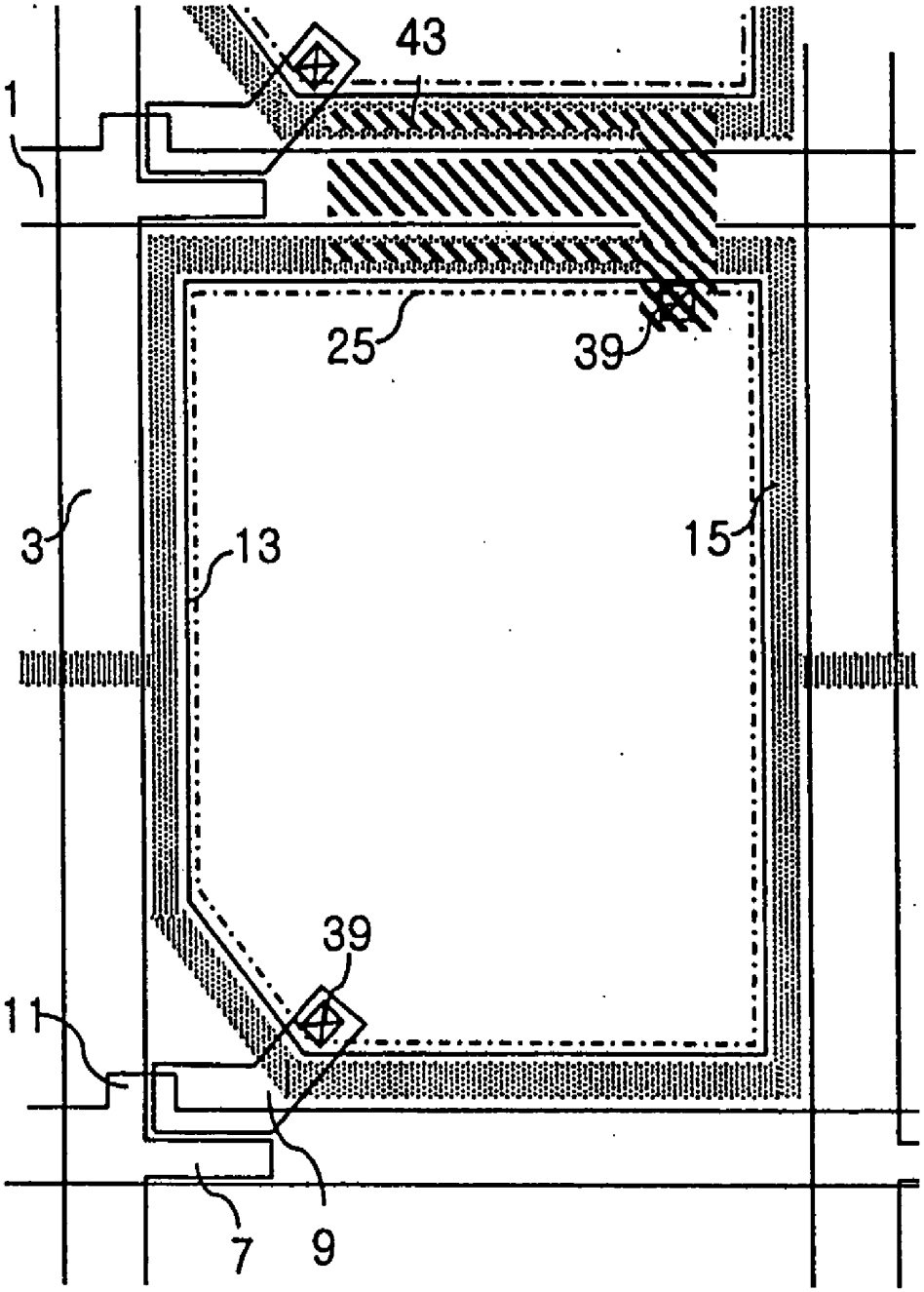


FIG. 30B

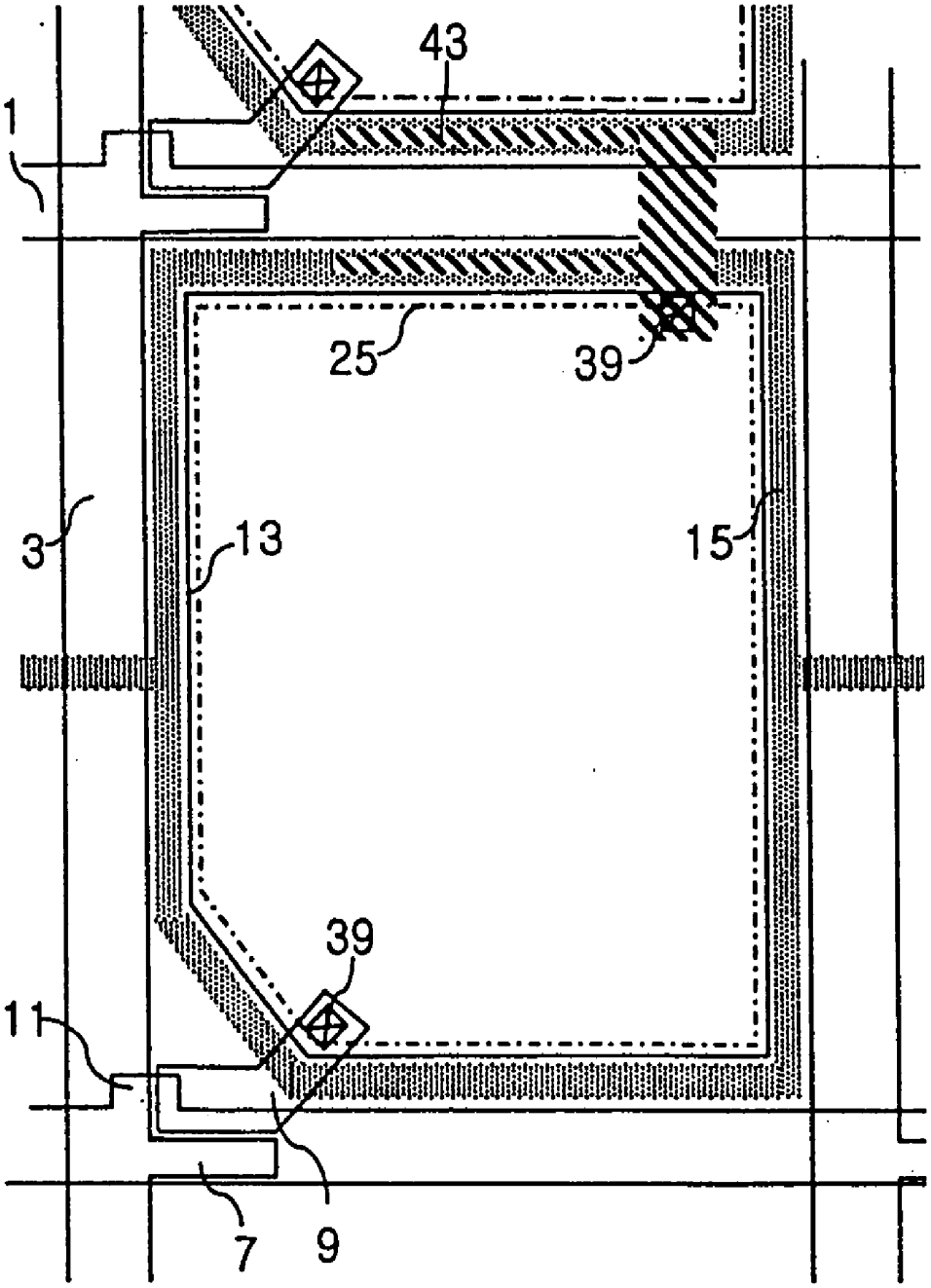


FIG. 31A

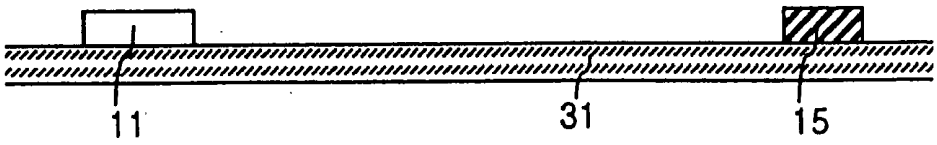


FIG. 31B

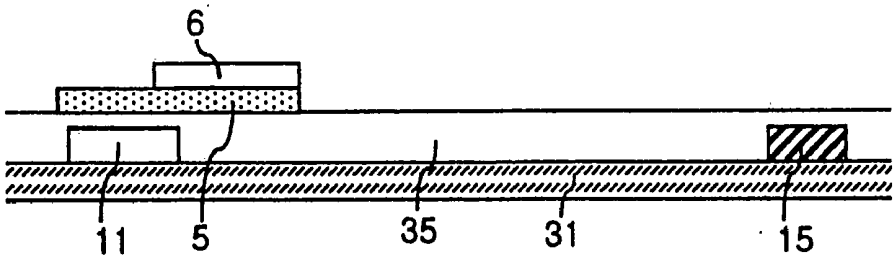


FIG. 31C

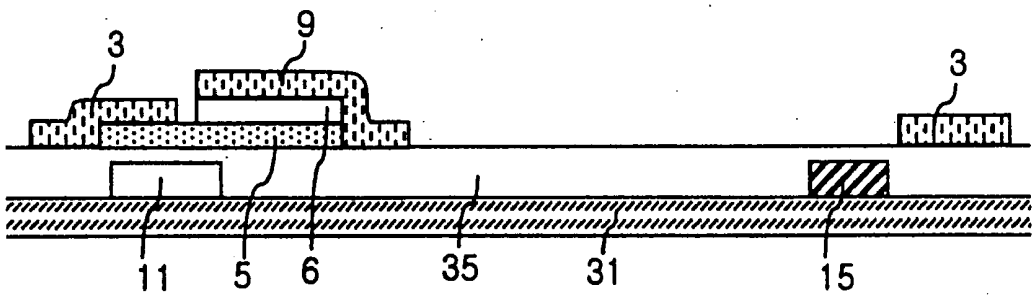


FIG. 31D

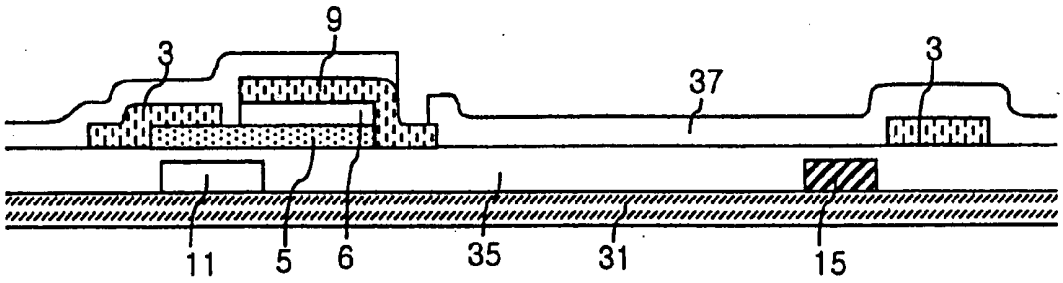


FIG. 31E

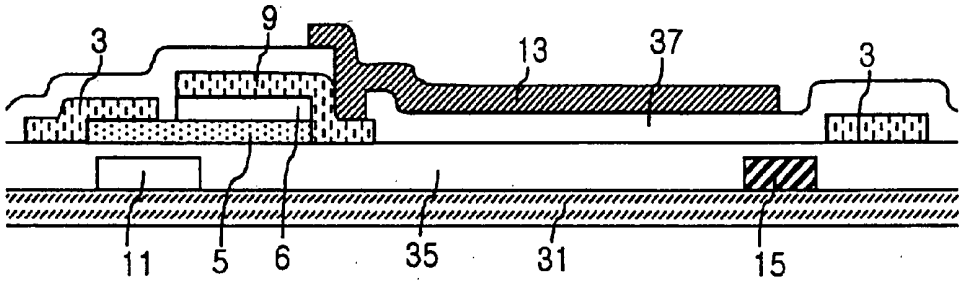


FIG. 32A

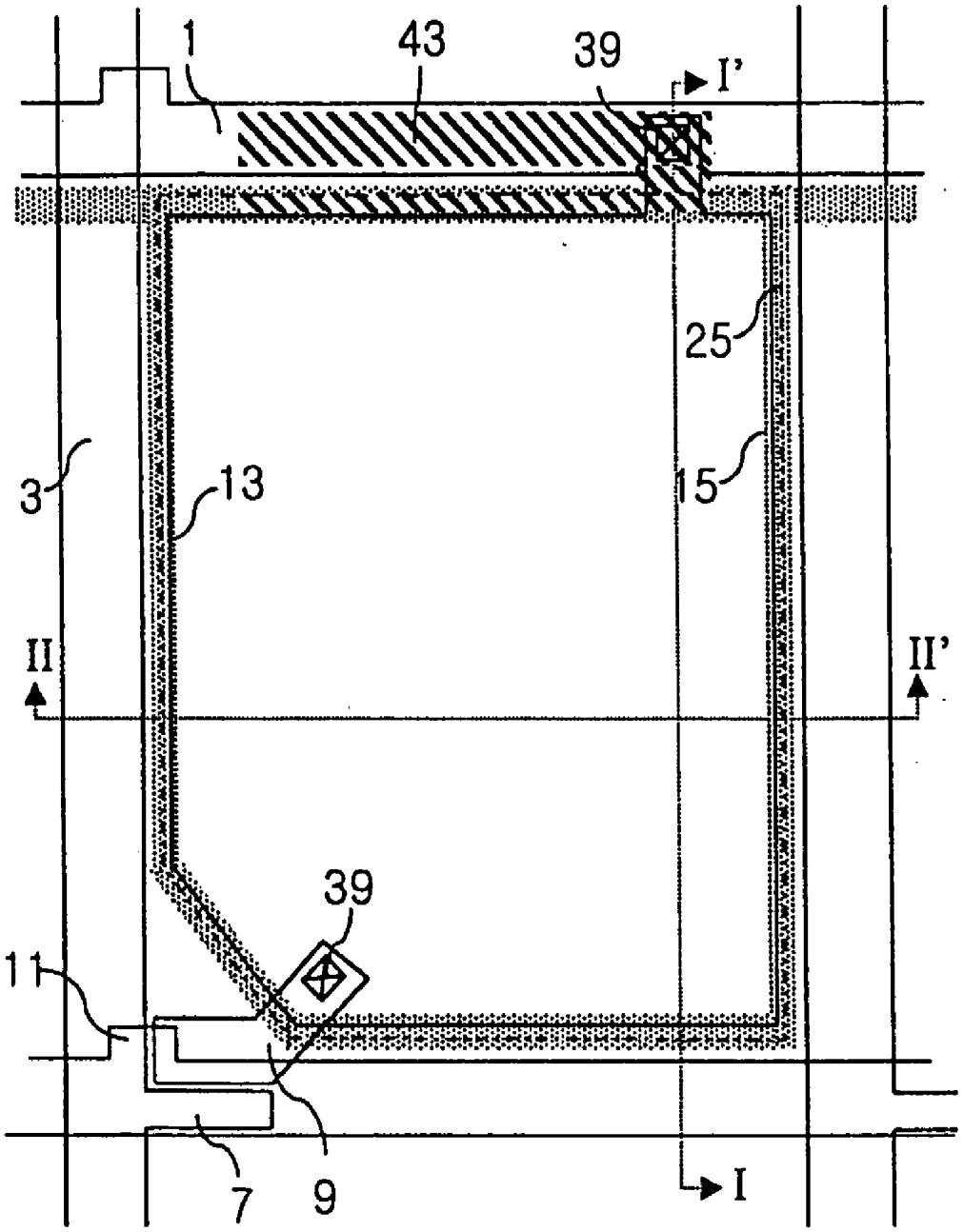


FIG. 32B

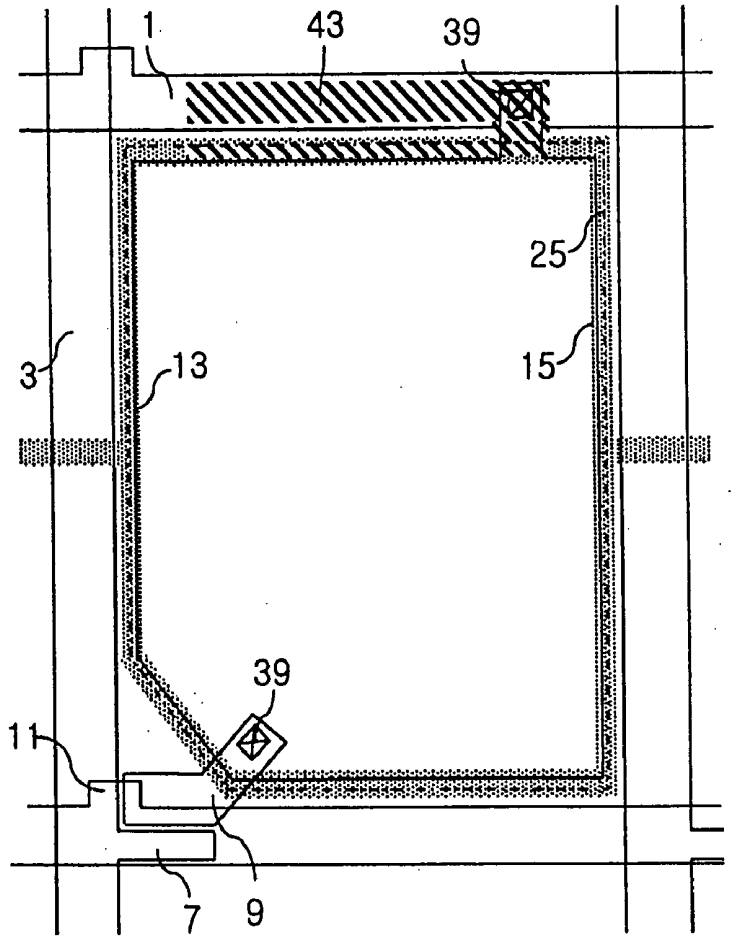


FIG. 32C

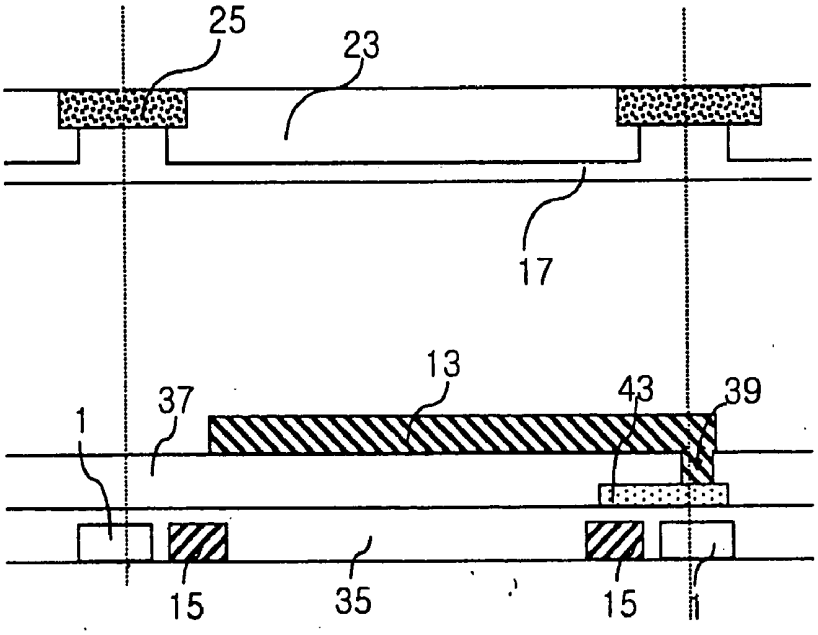


FIG. 32D

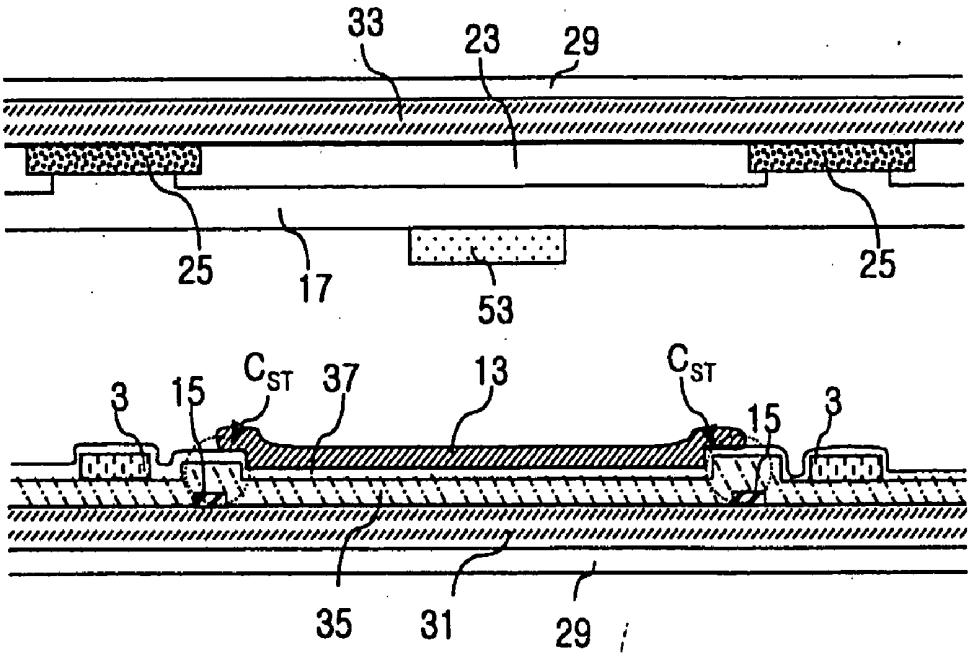


FIG. 32E

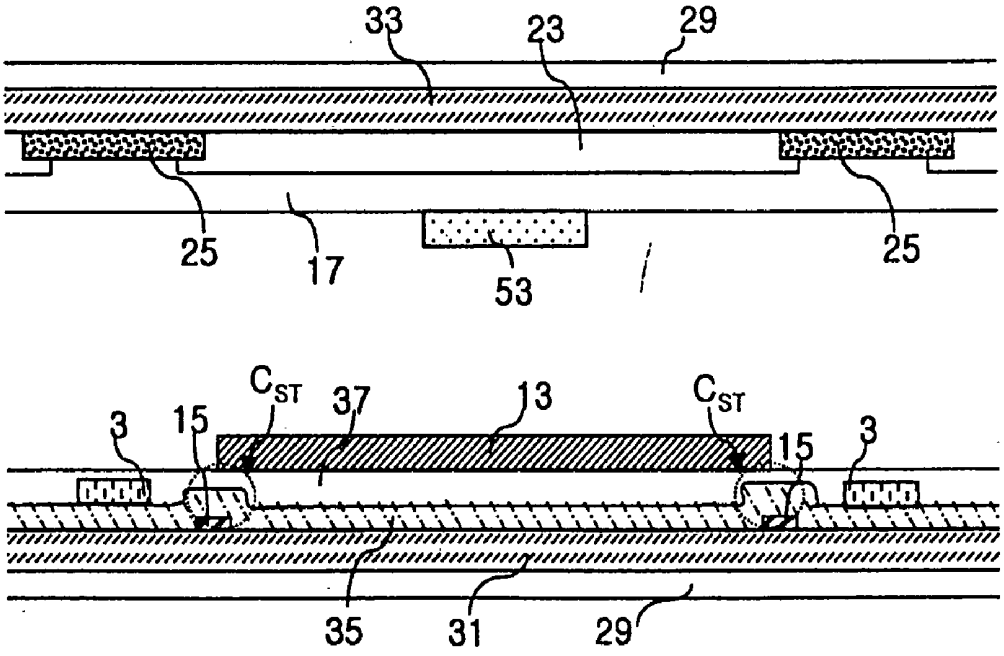


FIG. 32F

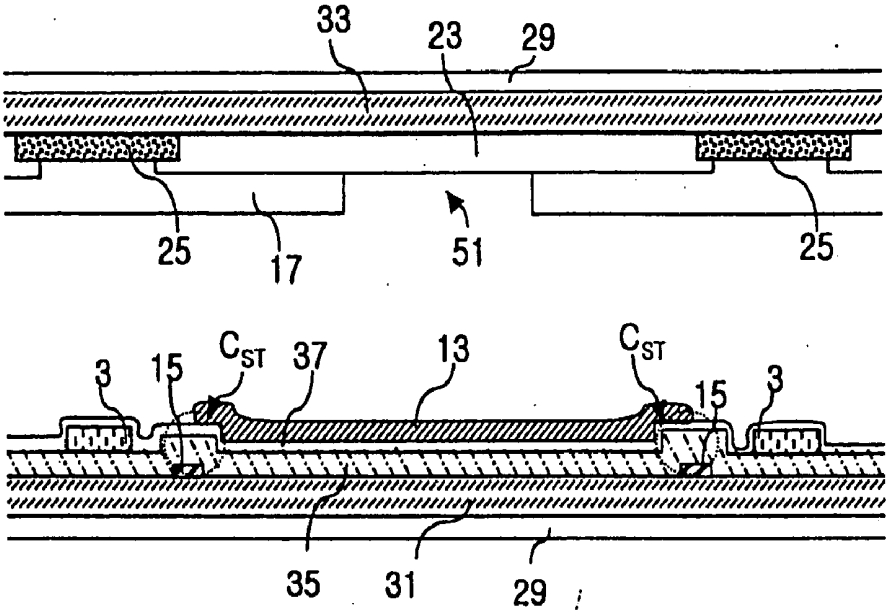


FIG. 32G

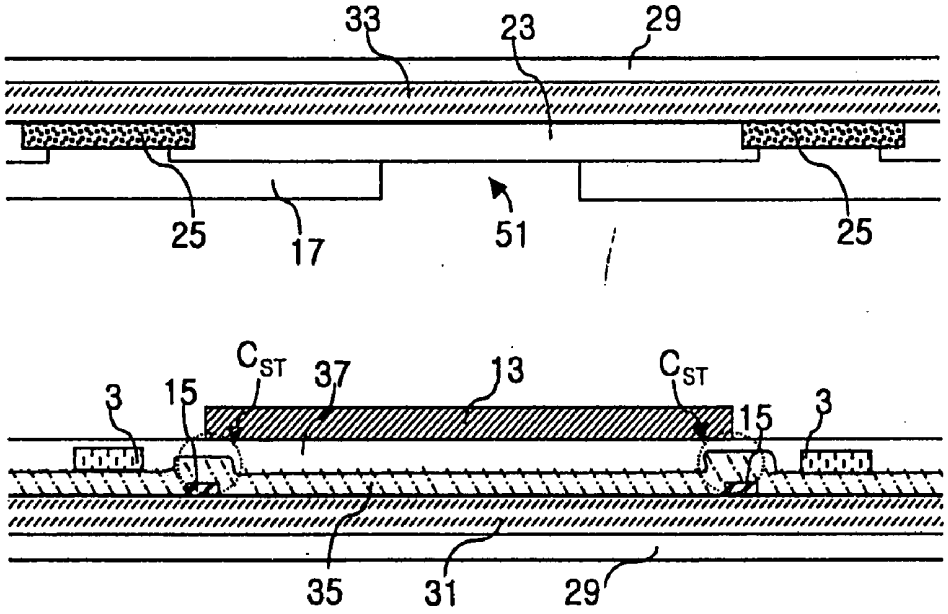


FIG. 33A

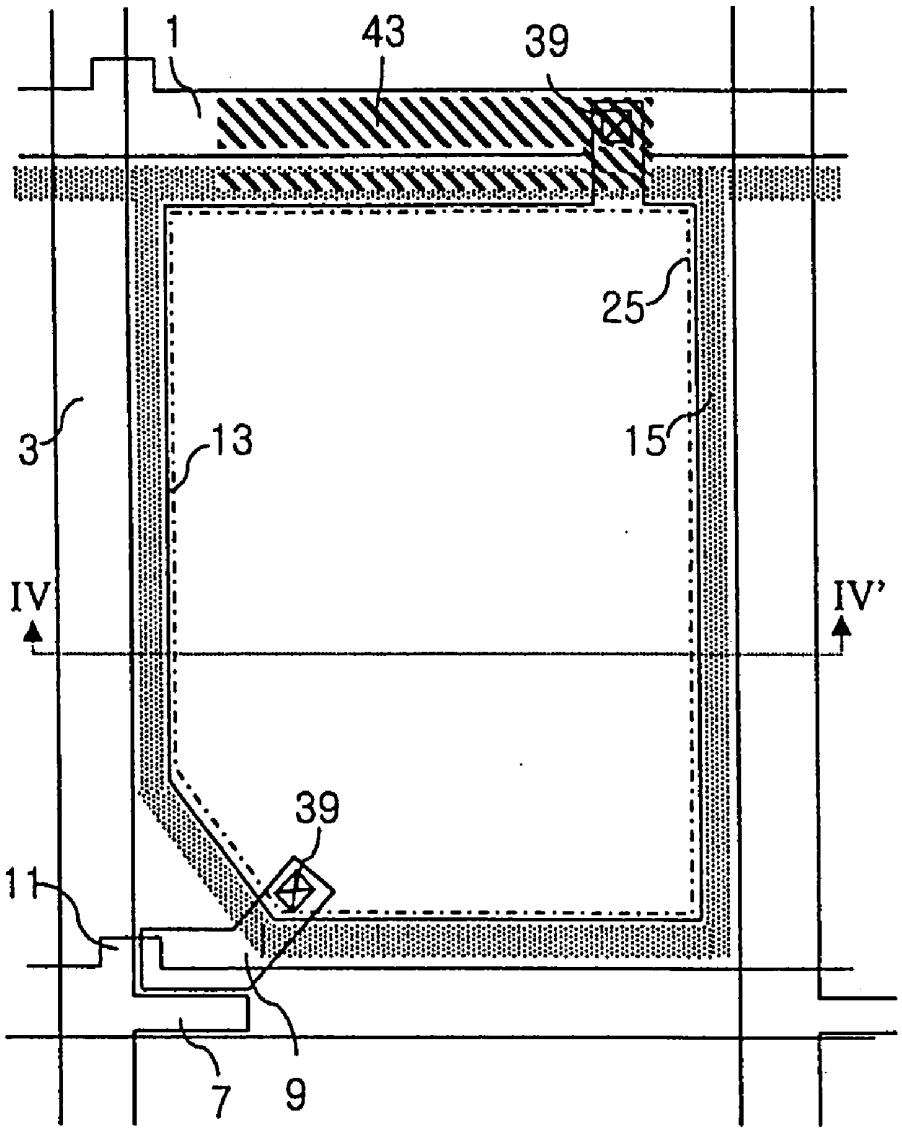


FIG. 33B

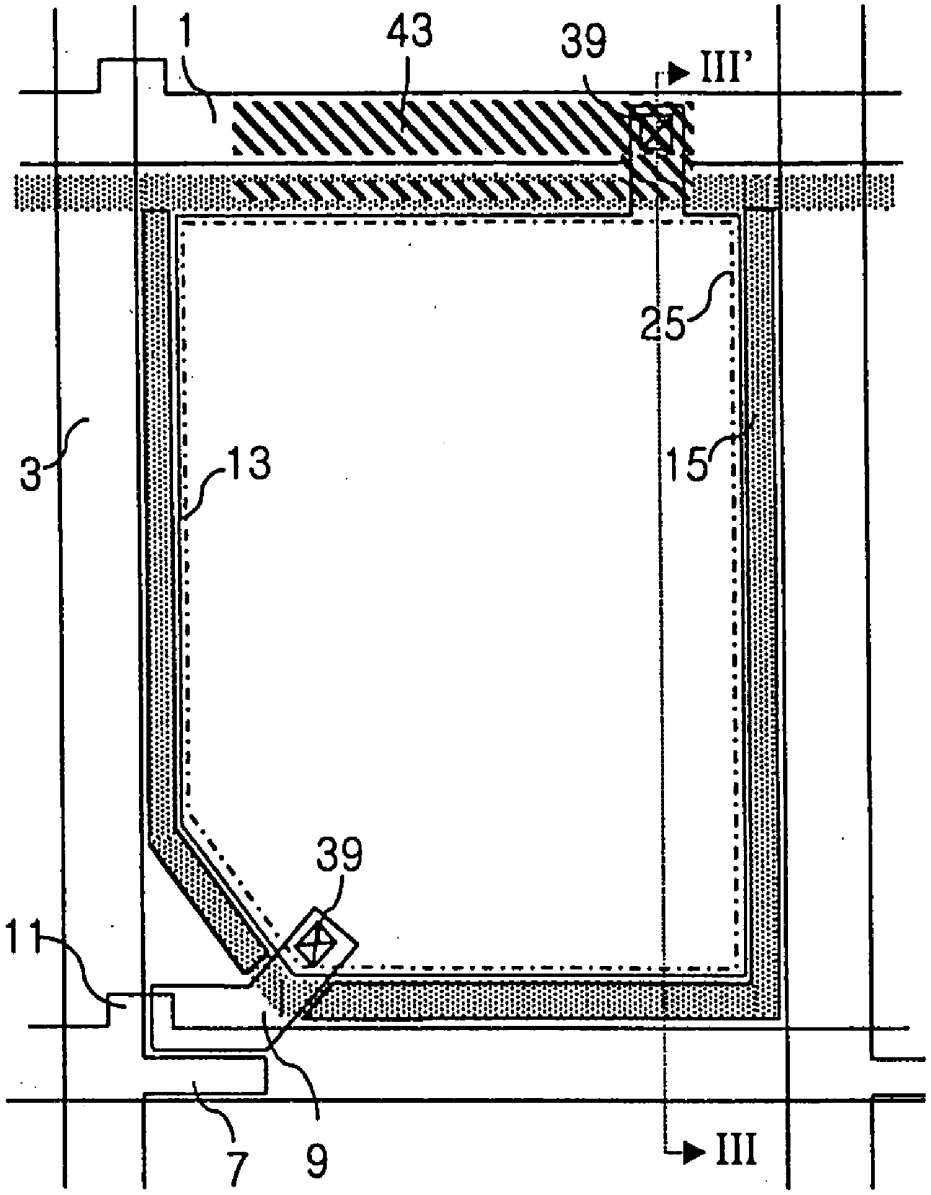


FIG. 33C

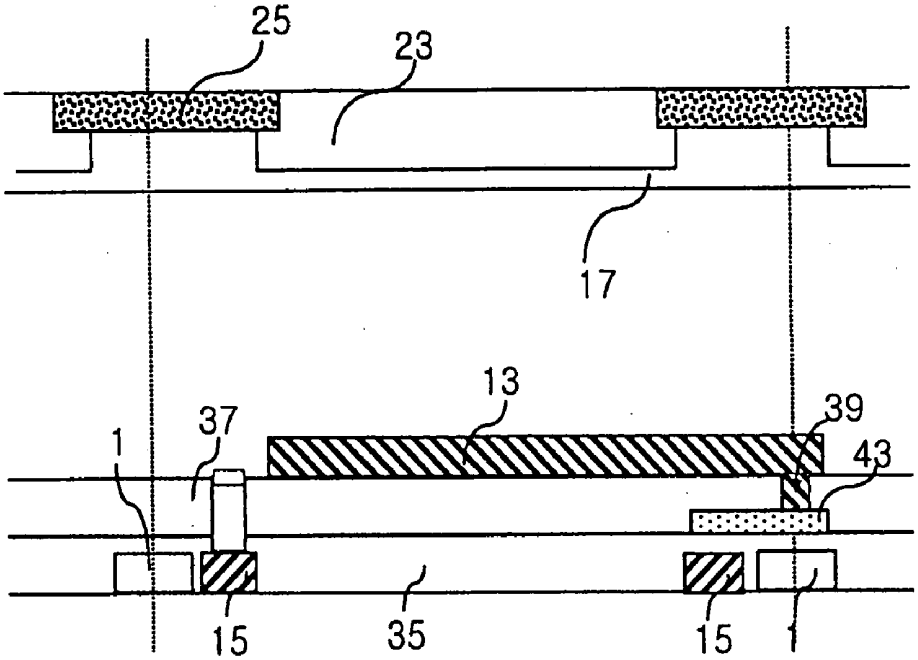


FIG. 33D

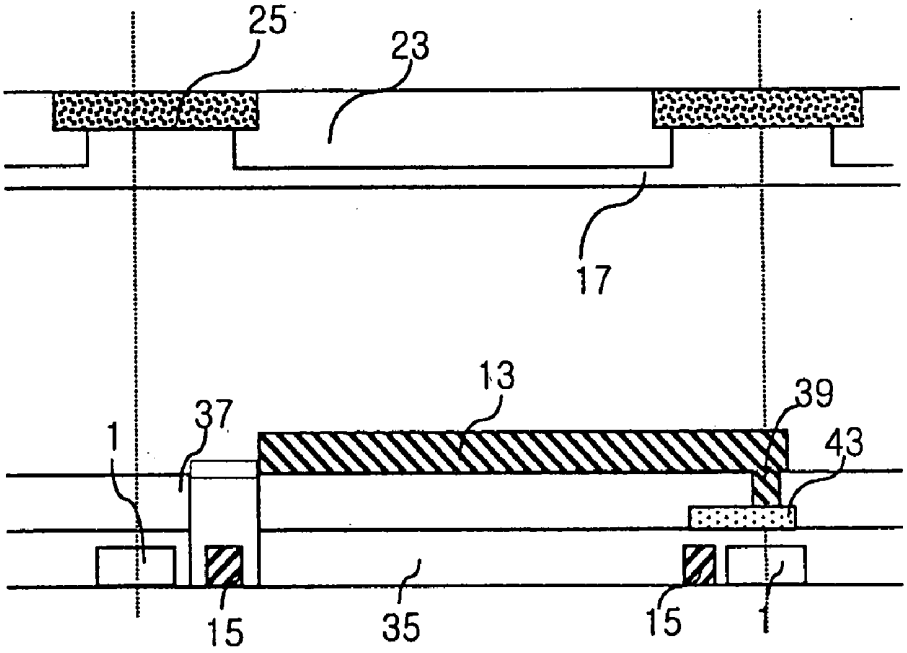


FIG. 33E

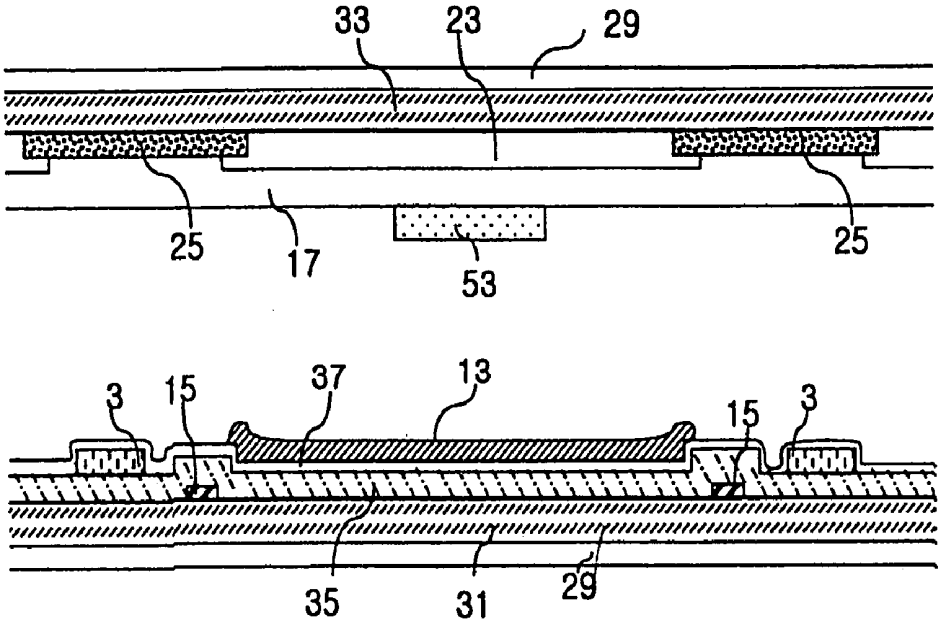


FIG. 33F

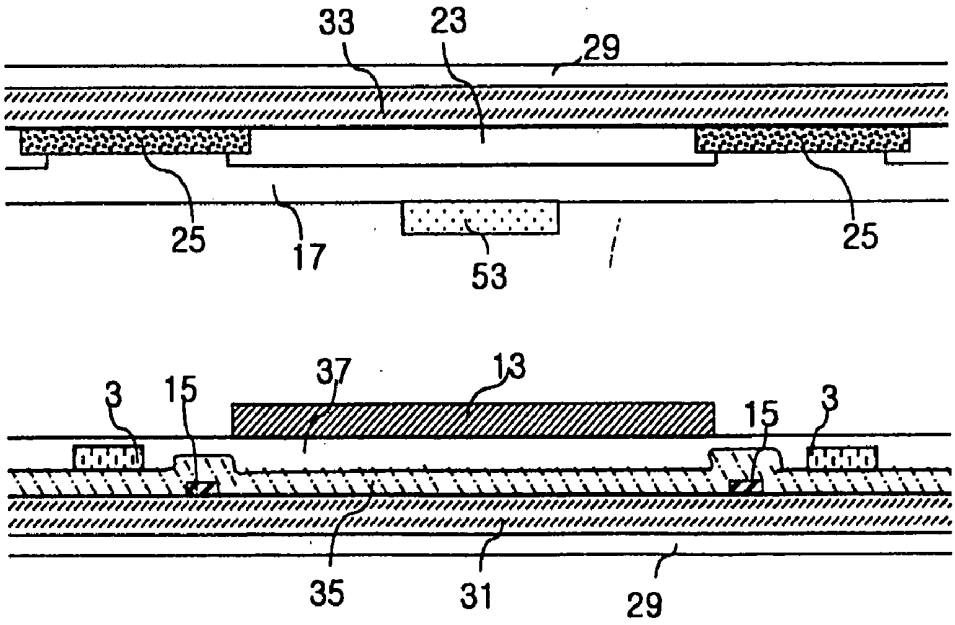


FIG. 33G

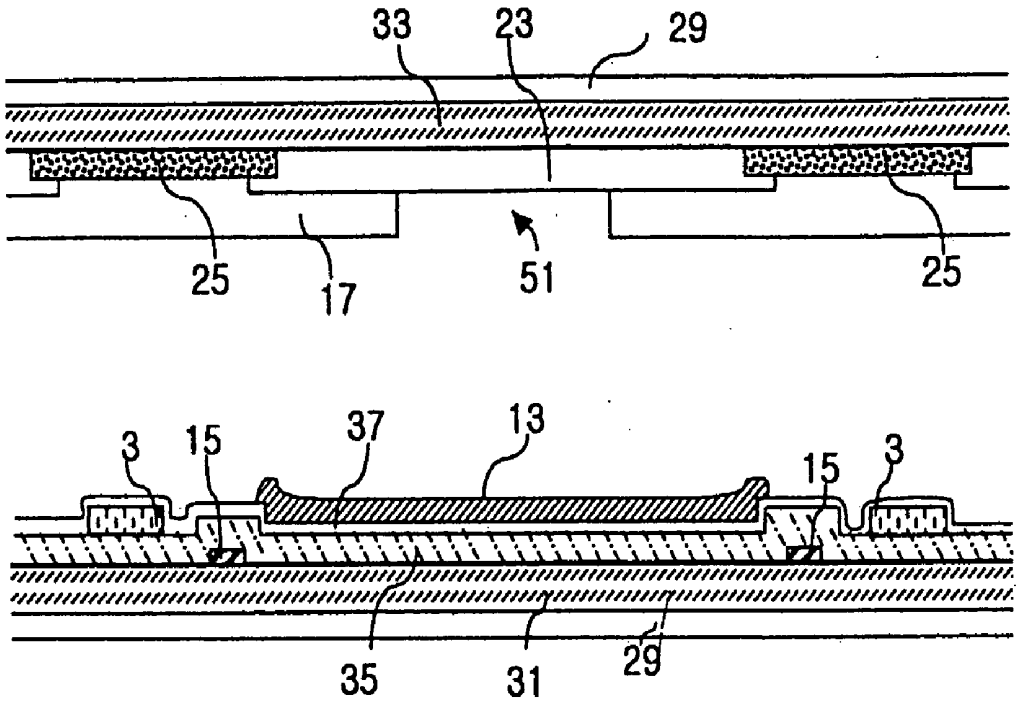


FIG. 33H

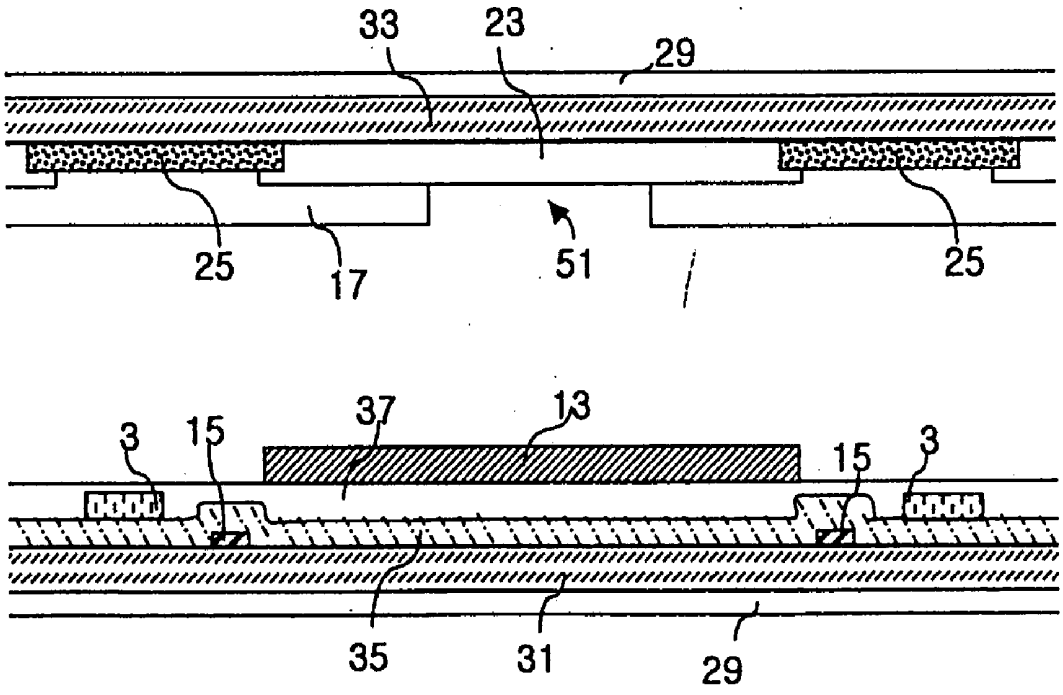


FIG. 34A

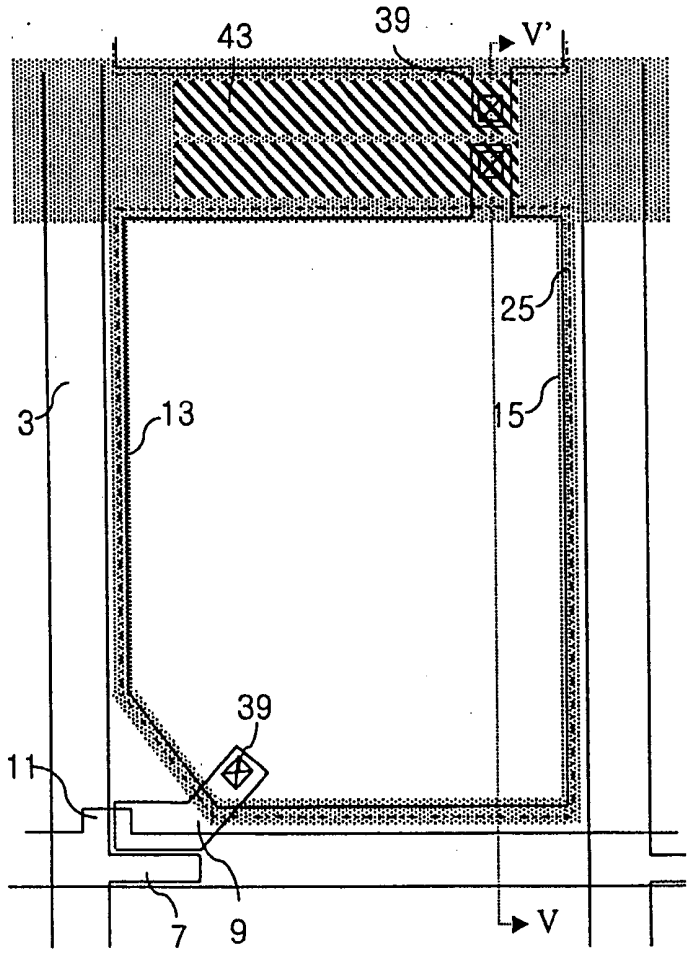


FIG. 34B

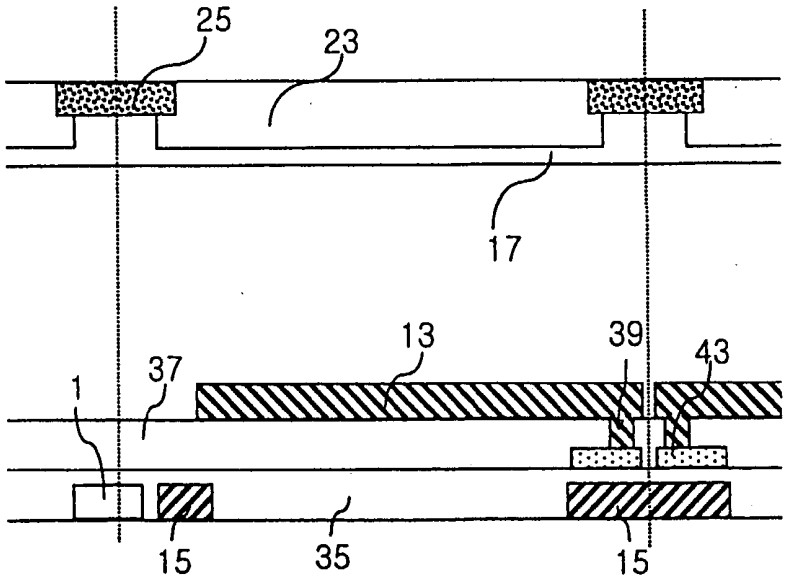


FIG. 35A

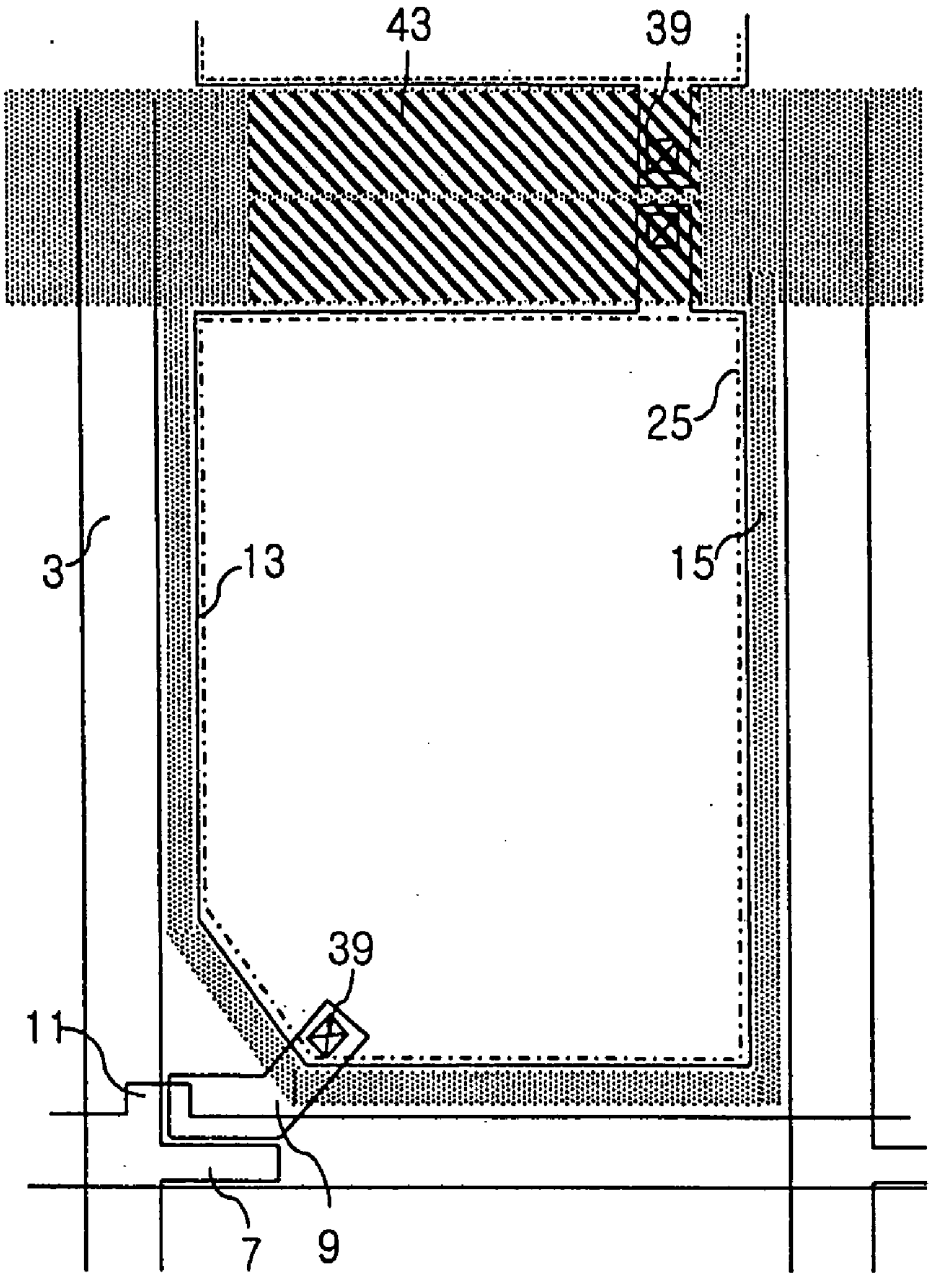


FIG. 35B

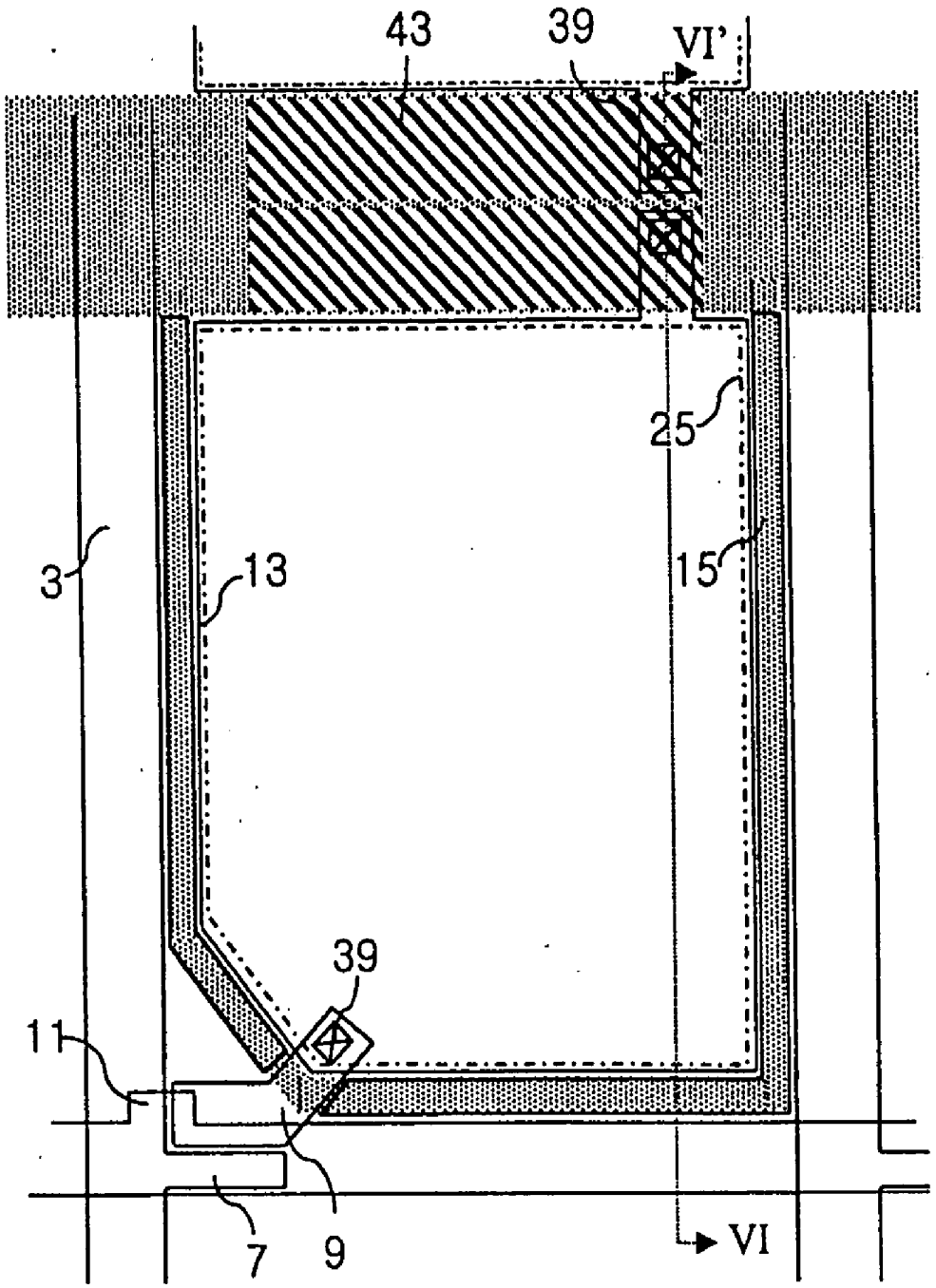


FIG. 35C

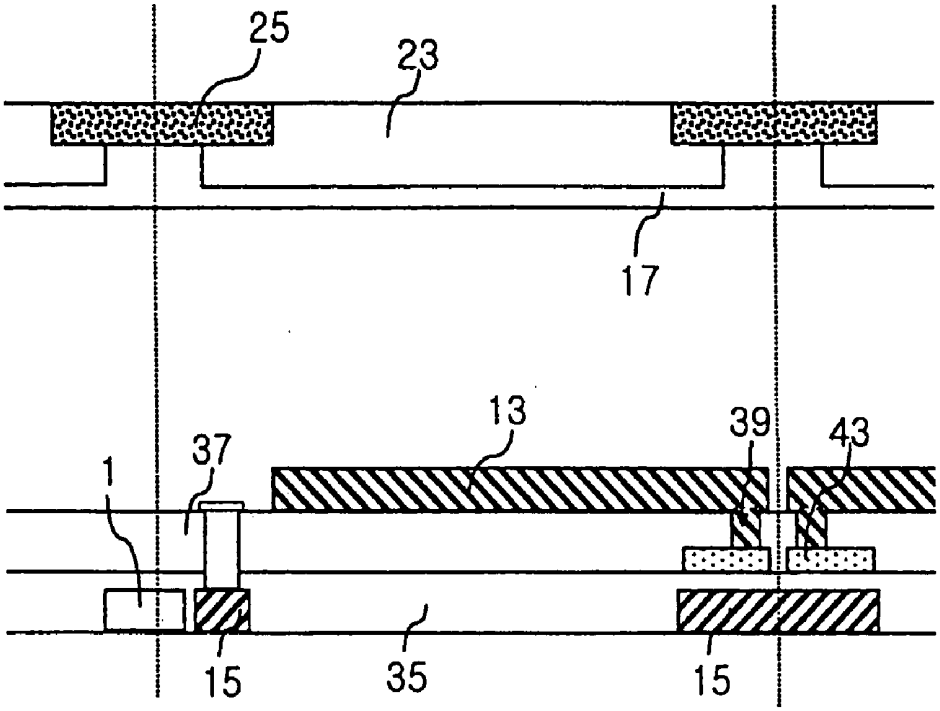


FIG. 35D

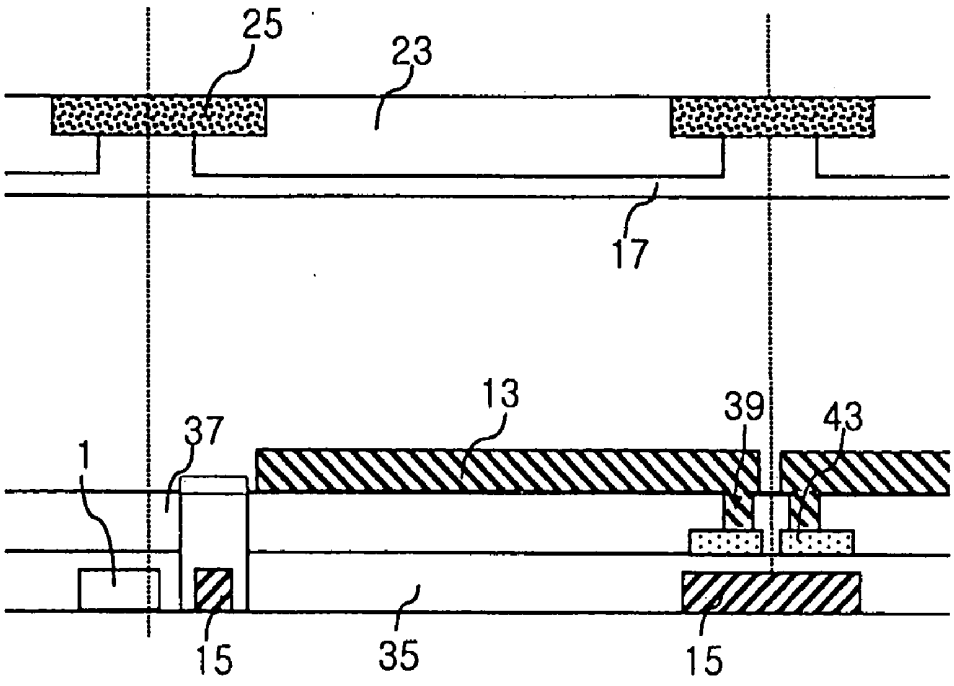


FIG. 36A

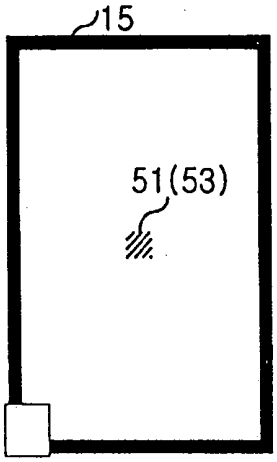


FIG. 36B

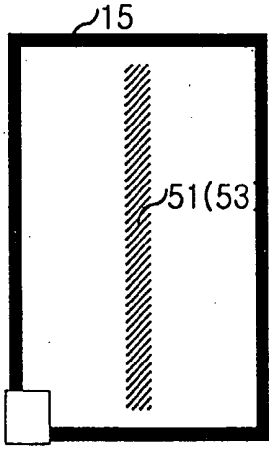


FIG. 36C

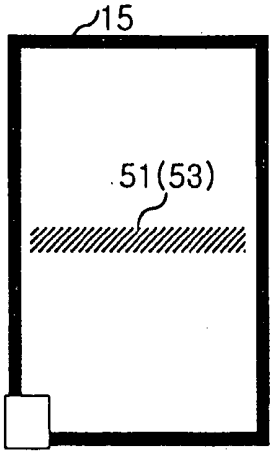


FIG. 36D

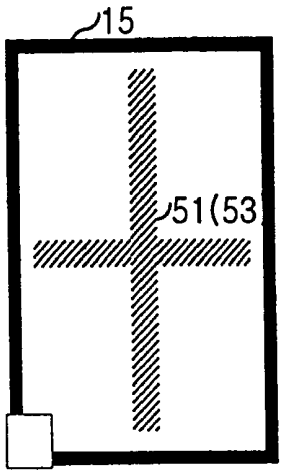


FIG. 36E

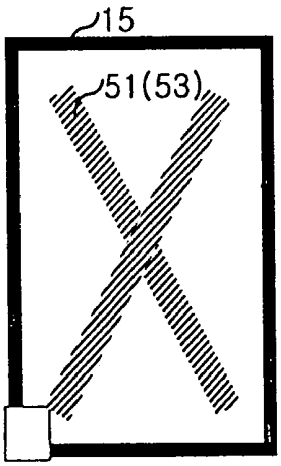


FIG. 36F

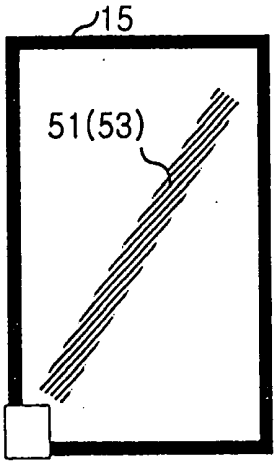
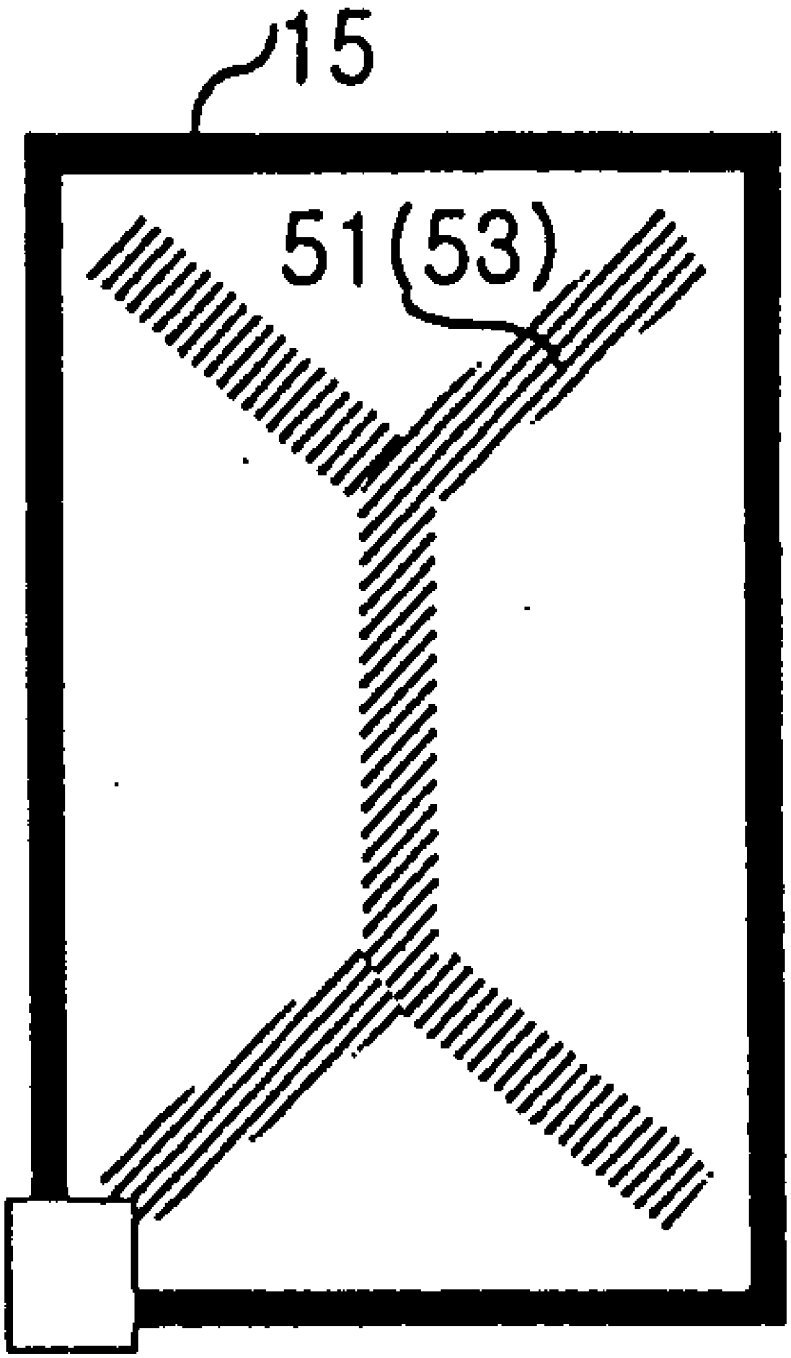


FIG. 36G



MULTI-DOMAIN LIQUID CRYSTAL DISPLAY DEVICE

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] The application is a Continuation-in-Part of U.S. patent application Ser. No. 09/256,180 filed on Feb. 24, 1999 and this application also claims the benefit of Korean Patent Application No. 1999-23194, filed on Jun. 21, 1999 and No. 1999-32945, filed on Aug. 11, 1999, which are hereby incorporated by reference for all purposes as if fully set forth herein.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to a liquid crystal display device (LCD), and more particularly, to a liquid crystal display device having a common-auxiliary electrode.

[0004] 2. Description of the Related Art

[0005] Recently, an LCD has been proposed where the liquid crystal is not aligned and the liquid crystal is driven by side-electrodes insulated from pixel electrodes. **FIG. 1** is sectional view of pixel unit of the conventional LCDs.

[0006] Regarding conventional LCDs, a plurality of gate bus lines arranged in a first direction on a first substrate and a plurality of data bus lines arranged in a second direction on the first substrate divide the first substrate into a plurality of pixel regions. A thin film transistor (TFT) applies image signal delivered from the data bus line to a pixel electrode **13** on a passivation layer **37**. The TFT is formed on each pixel region and comprises a gate electrode, a gate insulator, a semiconductor layer, a source electrode, and a drain electrode, etc. Side electrode **15** is formed surrounding the pixel electrode **13** on the gate insulator, thereon passivation layer **37** is formed over the whole first substrate, and a part of pixel electrode **13** overlaps side electrode **15**.

[0007] Alternatively, pixel electrode **13** is formed on the gate insulator, and passivation layer **37** is formed over the whole first substrate.

[0008] On second substrate, a common electrode **17** is formed and together with pixel electrode **13** applies electric field to a liquid crystal layer. Side electrode **21** and open area (slit) **27** distort the electric field applied to the liquid crystal layer. Then in a unit pixel liquid crystal molecules are driven variously. This means that when voltage is applied to the LCD, dielectric energy due to the distorted electric field arranges the liquid crystal directors in needed or desired positions.

[0009] In the LCDs, however, open area **27** in common electrode **17** or pixel electrode **13** is necessary, and the liquid crystal molecules could be driven stably when the open area is wider. If the electrodes do not have an open area or the width of the open area is narrow, the electric field distortion needed to divide the pixel region becomes weak. Then, when voltage over a threshold voltage, V_{th}, is applied, the time needed to stabilize the liquid crystal directors increases. In particular, the response time can be over 100 msec. At this time, disclination occurs from the area where the liquid crystal directors are parallel with a transmittance axis of the polarizer, which results in a decrease in brightness. Further, according to the surface state of LCDs, the liquid crystal texture has an irregular structure.

[0010] Furthermore, in the conventional LCDs, although a storage electrode is formed on the gate bus line to maintain the voltage applied to the pixel electrode, there are still the problems of filters resulted from the shortage generated between the gate bus line and the storage electrode.

SUMMARY OF THE INVENTION

[0011] Accordingly, the present invention is directed to an LCD that substantially obviates one or more problems due to limitations and disadvantages of the related art.

[0012] An object of the present invention is to provide a multi-domain LCD having high response time characteristics and high brightness by stable arrangement of liquid crystal molecules, and preventing the flicker from generating.

[0013] Additional features and advantages of the invention will be set forth in the description which follows, and in part will be apparent from the description, or may be learned by practice of the invention. The objectives and other advantages of the invention will be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

[0014] To achieve the objects and in accordance with the purpose of the invention, as embodied and broadly described herein, a multi-domain liquid crystal display device comprises first and second substrates facing each other; a liquid crystal layer between the first and second substrates; a plurality of gate bus lines arranged in a first direction on the first substrate and a plurality of data bus lines arranged in a second direction on the first substrate to define a plurality of pixel region; a thin film transistor positioned at a crossing area of the data bus line and the gate bus line, the thin film transistor comprising a gate electrode, a semiconductor layer, and source/drain electrodes; a common-auxiliary electrode comprising at least one electrode in the each pixel region; a plurality of pixel electrodes electrically charged through the thin film transistor; and an alignment layer on at least one substrate between the first and second substrates.

[0015] It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of the specification, illustrates embodiments of the invention and together with description serve to explain the principles of the invention.

[0017] In the drawings:

[0018] **FIG. 1** is a sectional view of the liquid crystal display device in the related art;

[0019] **FIGS. 2A** to **2C** are plans of the multi-domain liquid crystal display devices according to the first embodiment of the present invention;

[0020] **FIG. 3** is a sectional view taken along the line I-I of **FIG. 2A**;

[0021] **FIGS. 4A** to **4B** are sectional views taken along the line II-II of **FIG. 2A**

[0022] **FIG. 5** is a sectional view taken along the line III-III of **FIG. 2A**;

[0023] **FIG. 6** is a sectional view taken along the line IV-IV of **FIG. 2A**;

[0024] **FIG. 7** is a sectional view taken along the line V-V of **FIG. 2B**;

[0025] **FIGS. 8A** to **8C** are plan views of the multi-domain liquid crystal display devices according to the second embodiment of the present invention;

[0026] **FIGS. 9A** to **9C** are plan views of the multi-domain liquid crystal display devices according to the third embodiment of the present invention;

[0027] **FIGS. 10A** to **10C** are plan views of the multi-domain liquid crystal display devices according to the fourth embodiment of the present invention;

[0028] **FIGS. 11A** to **11C** are plan views of the multi-domain liquid crystal display devices according to the fifth embodiment of the present invention;

[0029] **FIGS. 12A** to **12C** are plan views of the multi-domain liquid crystal display devices according to the sixth embodiment of the present invention;

[0030] **FIGS. 13A and 13B** are plan views of the multi-domain liquid crystal display devices according to the seventh embodiment of the present invention;

[0031] **FIG. 14** is a plan view of the multi-domain liquid crystal display devices according to the eighth embodiment of the present invention;

[0032] **FIG. 15** is a sectional view taken along the line VI-VI of **FIG. 14**;

[0033] **FIG. 16** is a plan view of the multi-domain liquid crystal display devices according to the ninth embodiment of the present invention;

[0034] **FIG. 17** is a plan view of the multi-domain liquid crystal display devices according to the tenth embodiment of the present invention;

[0035] **FIG. 18** is a plan view of the multi-domain liquid crystal display devices according to the eleventh embodiment of the present invention;

[0036] **FIG. 19** is a plan view of the multi-domain liquid crystal display devices according to the twelfth embodiment of the present invention;

[0037] **FIG. 20** is a plan view of the multi-domain liquid crystal display devices according to the thirteenth embodiment of the present invention;

[0038] **FIGS. 21A** to **21C** are plan views of the multi-domain liquid crystal display devices according to the fourteenth embodiment of the present invention;

[0039] **FIG. 22** is a sectional view taken along the line VII-VII of **FIG. 21A**;

[0040] **FIGS. 23A** to **24D** are sectional views taken along the line VIII-VIII of **FIG. 21A**;

[0041] **FIG. 24** is a sectional view taken along the line IX-IX of **FIG. 21B**;

[0042] **FIGS. 25A** to **25C** are plan views of the multi-domain liquid crystal display devices according to the fifteenth embodiment of the present invention;

[0043] **FIGS. 26A** to **26C** are plan views of the multi-domain liquid crystal display devices according to the sixteenth embodiment of the present invention;

[0044] **FIGS. 27A** to **27C** are plan views of the multi-domain liquid crystal display devices according to the seventeenth embodiment of the present invention;

[0045] **FIGS. 28A** to **28C** are plan views of the multi-domain liquid crystal display devices according to the eighteenth embodiment of the present invention;

[0046] **FIGS. 29A** to **29C** are plan views of the multi-domain liquid crystal display devices according to the nineteenth embodiment of the present invention;

[0047] **FIGS. 30A and 30B** are plan views of the multi-domain liquid crystal display devices according to the twentieth embodiment of the present invention;

[0048] **FIGS. 31A** to **31E** are views showing the forming process of the present multi-domain liquid crystal display device taken along the line X-X of **FIG. 2C**;

[0049] **FIGS. 32A** to **32G** are plan views and sectional views taken along the lines I-I, II-II of **FIG. 32A** of the multi-domain liquid crystal display device according to the twenty-first embodiment of the present invention;

[0050] **FIGS. 33A** to **33H** are plan views and sectional views taken along the lines III-III of **FIG. 33B** and IV-IV of the **FIG. 33A** of the multi-domain liquid crystal display device according to the twenty-second embodiment of the present invention;

[0051] **FIGS. 34A and 34B** are plan view and sectional view taken along the line V-V of **FIG. 34A** of the multi-domain liquid crystal display device according to the twenty-third embodiment of the present invention;

[0052] **FIGS. 35A and 35B** are plan views and sectional views taken along the line VI-VI of **FIG. 35B** of the multi-domain liquid crystal display device according to the twenty-fourth embodiment of the present invention;

[0053] **FIGS. 36A** to **36G** are plan views showing the various windows inducing electric field and dielectric frames according to the embodiments of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0054] Hereinafter, the multi-domain liquid crystal display device of the present invention is explained in detail by accompanying the drawings.

[0055] **FIGS. 2A** to **2C** are plans of the multi-domain liquid crystal display devices according to the first embodiment of the present invention, **FIG. 3** is a sectional view taken along the line I-I of **FIG. 2A**, **FIGS. 4A** to **4B** are sectional views taken along the line II-II of **FIG. 2A**, **FIG.**

5 is a sectional view taken along the line III-III of **FIG. 2A**, **FIG. 6** is a sectional view taken along the line IV-IV of **FIG. 2A**, **FIG. 7** is a sectional view taken along the line V-V of **FIG. 2B**.

[**0056**] As shown in the figures, the present invention comprises first and second substrates, a plurality of gate bus lines **1** arranged in a first direction on a first substrate and a plurality of data bus lines **3** arranged in a second direction on the first substrate, a common-auxiliary electrode **15**, a TFT, a passivation layer **37**, and a pixel electrode **13**.

[**0057**] Data bus lines **3** and gate bus lines **1** divide the first substrate into a plurality of pixel regions. The common-auxiliary electrode **15** comprises at least one electrode in a pixel region on the same layer whereon the gate bus line **1** is formed. The TFT is formed on each pixel region and comprises a gate electrode **11**, a gate insulator **35**, a semiconductor layer **5**, an ohmic contact layer **6**, and source/drain electrodes **7**, **9**. Passivation layer **37** is formed on the whole first substrate **31**. Pixel electrode **13** is coupled to drain electrode **9**.

[**0058**] On a second substrate, a light shielding layer **25** is formed to shield the light leaked from gate and data bus lines **1**, **3**, and the TFT, a color filter layer **23** is formed on the light shielding layer, a common electrode **17** is formed on the color filter layer, and a liquid crystal layer is formed between the first and second substrates.

[**0059**] **FIGS. 31A** to **31**E are views showing the forming process of the present multi-domain liquid crystal display device taken along the line X-X of **FIG. 2C**.

[**0060**] To manufacture the multi-domain LCD of the present invention, in each pixel region on the first substrate **31**, a TFT is formed comprising gate electrode **11**, gate insulator **35**, semiconductor layer **5**, ohmic contact layer **6** and source/drain electrodes **7**, **9**. At this time, a plurality of gate bus lines **1** and a plurality of data bus lines **3** are formed to divide the first substrate **31** into a plurality of pixel regions.

[**0061**] Gate electrode **11** and gate bus line **1** are formed by sputtering and patterning a metal such as Al, Mo, Cr, Ta, Al alloy, etc. At this time, common-auxiliary electrode **15** is formed surrounding the pixel region. (refer to the **FIG. 31A**) The common-auxiliary electrode **15** comprises at least one electrode in each pixel region, the each electrode is driven independently one another. And, as shown in the **FIGS. 2A and 5**, the distance A between the common-auxiliary electrodes is within 7 μm, and preferably 4 to 7 μm at the connecting parts which connect to a common-auxiliary electrode in a pixel region neighboring the pixel region.

[**0062**] The gate insulator **35** is formed by depositing SiN_x or SiO_x using PECVD thereon. Semiconductor layer **5** and the ohmic contact layer **6** are formed by depositing with PECVD(Plasma Enhanced Chemical Vapor Deposition) and patterning amorphous silicon (a-Si) and doped amorphous silicon (n^+ a-Si), respectively. Also, gate insulator **35**, amorphous silicon (a-Si), and doped amorphous silicon (n^+ a-Si) are formed by PECVD and patterned. (refer to the **FIG. 31B**)

[**0063**] Data bus line **3** and source/drain electrodes **7**, **9** are formed by sputtering and patterning a metal such as Al, Mo, Cr, Ta, Al alloy, etc. (refer to the **FIG. 31C**)

[**0064**] A storage electrode **43** is formed to overlap gate bus line **1** and/or common-auxiliary electrode **15** at the same time, the storage electrode **43** makes a storage capacitor with gate bus line **1** and/or common-auxiliary electrode **15**.

[**0065**] Subsequently, passivation layer **37** is formed with BCB (BenzoCycloButene), acrylic resin, polyimide based material, SiN_x or SiO_x on the whole first substrate. Pixel electrode **13** is formed by sputtering and patterning a metal such as ITO(indium tin oxide). (refer to the **FIG. 31D**)

[**0066**] A contact hole **39** is formed to connect the pixel electrode to the drain and storage electrodes by opening and patterning a part of the passivation layer on drain electrode **9**. (refer to the **FIG. 31E**)

[**0067**] When common-auxiliary electrode **15** and gate bus line **1** are formed with the same material, the common-auxiliary and gate electrodes are simultaneously formed with one mask and connected electrically to common electrode **17**, or it is possible to form them with different materials or double layer with additional masks.

[**0068**] On the second substrate **33**, a light shielding layer **25** is formed to shield any light leakage from gate and data bus lines **1**, **3**, the TFT, and common-auxiliary electrode **15**. A color filter layer **23** is formed R, G, B (red, green, blue) elements to alternate on the light shielding layer. A common electrode **17** is formed with ITO on the color filter layer, and a liquid crystal layer is formed by injecting liquid crystal between the first and second substrates.

[**0069**] The liquid crystal layer may include liquid crystal molecules having positive or negative dielectric anisotropy. Also, the liquid crystal layer may include chirals dopants.

[**0070**] On at least one substrate between the first and second substrates, a dielectric frame **53** is formed by depositing photosensitive material in a region other than a region where the pixel electrode **13** is formed and patterning in various shapes using photolithography.

[**0071**] The dielectric frame **53** includes material of which dielectric constant is same or smaller than that of the liquid crystal, and the dielectric constant thereof is preferably below **3**, for example, photoacrylate or BCB (BenzoCycloButene).

[**0072**] To apply voltage (V_{com}) to common-auxiliary electrode **15**, Ag-dotting part is formed in each corner of driving area on first substrate **31**, electric field is applied with second substrate **33**, and the liquid crystal molecules are driven by the potential different. A voltage (V_{com}) is applied to common-auxiliary electrode **15** by connecting the Ag-dotting part to the common-auxiliary electrode, which is accomplished simultaneously by forming the common-auxiliary electrode.

[**0073**] On at least one substrate, a compensation film **29** is formed with polymer. The compensation film is a negative uniaxial film, which has one optical axis, and compensates the phase difference of the direction according to viewing-angle. Hence, it is possible to compensate effectively the right-left viewing-angle by widening the area without gray inversion, increasing contrast ratio in an inclined direction, and forming one pixel to multi-domain.

[**0074**] In the present multi-domain liquid crystal display device, it is possible to form a negative biaxial film as the

compensation film, which has two optical axes and wider viewing-angle characteristics as compared with the negative uniaxial film. The compensation film could be formed on both substrates or on one of them.

[0075] After forming the compensation film, polarizer is formed on at least one substrate. At this time, the compensation film and polarizer are preferably composed as one.

[0076] In the multi-domain liquid crystal display device of the present invention, the pixel electrode **13** overlaps common-auxiliary electrode **15**, light shielding layer **25** overlaps the common-auxiliary electrode, and then the aperture ratio is improved. Storage electrode **43** forms a storage capacitor C_{ST} by overlapping gate bus line **1** and/or the common-auxiliary electrode **15**.

[0077] In the multi-domain liquid crystal display device of the in the **FIG. 2A**, two common-auxiliary electrode **15** surround the pixel region and are driven independently in the pixel region. The each common-auxiliary electrode has connecting parts which connect to a common-auxiliary electrode in a pixel region neighboring the pixel region. A storage electrode **43** is formed overlapping the common-auxiliary electrode **15** and the gate bus line **1** to obtain storage capacitance.

[0078] In the multi-domain liquid crystal display device of the in the **FIG. 2B**, two common-auxiliary electrode **15** surround the pixel region and are driven independently in the pixel region. The each common-auxiliary electrode has connecting parts which connect to a common-auxiliary electrode in a pixel region neighboring the pixel region. A storage electrode **43** is formed overlapping the common-auxiliary electrode **15**, the gate bus line **1**, and a common-auxiliary electrode in a pixel region neighboring the pixel region to obtain storage capacitance.

[0079] In the multi-domain liquid crystal display device of the in the **FIG. 2C**, two common-auxiliary electrode **15** surround the pixel region and are driven independently in the pixel region. The each common-auxiliary electrode has connecting parts which connect to a common-auxiliary electrode in a pixel region neighboring the pixel region. A storage electrode **43** is formed overlapping the common-auxiliary electrode **15** and a common-auxiliary electrode in a pixel region neighboring the pixel region to obtain storage capacitance and to remove the signal delay of the bus lines.

[0080] **FIGS. 8A** to **8**C are plan views of the multi-domain liquid crystal display devices according to the second embodiment of the present invention, **FIGS. 9A** to **9**C are plan views of the multi-domain liquid crystal display devices according to the third embodiment of the present invention, **FIGS. 10A** to **10**C are plan views of the multi-domain liquid crystal display devices according to the fourth embodiment of the present invention, **FIGS. 11A** to **11**C are plan views of the multi-domain liquid crystal display devices according to the fifth embodiment of the present invention, **FIGS. 12A** to **12**C are plan views of the multi-domain liquid crystal display devices according to the sixth embodiment of the present invention, **FIGS. 13A and 13B** are plan views of the multi-domain liquid crystal display devices according to the seventh embodiment of the present invention.

[0081] In the multi-domain liquid crystal display device of the in the **FIG. 8**, two common-auxiliary electrode **15** surround the pixel region and are driven independently in the pixel region. The each common-auxiliary electrode has connecting parts which connect to a common-auxiliary electrode in a pixel region neighboring the pixel region, and the connecting part has protrusions.

[0082] A storage electrode **43** is formed overlapping the common-auxiliary electrode **15** and the gate bus line **1** (**FIG. 8A**), the common-auxiliary electrode **15**, the gate bus line **1**, and a common-auxiliary electrode in a pixel region neighboring the pixel region (**FIG. 8B**), the common-auxiliary electrode **15** and a common-auxiliary electrode in a pixel region neighboring the pixel region (**FIG. 8C**) to obtain storage capacitance.

[0083] In the multi-domain liquid crystal display device of the in the **FIG. 9**, two common-auxiliary electrode **15** surround the pixel region and are driven independently in the pixel region. The each common-auxiliary electrode has connecting parts which connect to a common-auxiliary electrode in a pixel region neighboring the pixel region, and the connecting parts are formed on the side of the gate bus line **1**.

[0084] A storage electrode **43** is formed overlapping the common-auxiliary electrode **15** and the gate bus line **1** (**FIG. 9A**), the common-auxiliary electrode **15**, the gate bus line **1**, and a common-auxiliary electrode in a pixel region neighboring the pixel region (**FIG. 9B**), the common-auxiliary electrode **15** and a common-auxiliary electrode in a pixel region neighboring the pixel region (**FIG. 9C**) to obtain storage capacitance.

[0085] In the multi-domain liquid crystal display device of the in the **FIG. 10**, two common-auxiliary electrode **15** surround the pixel region and are driven independently in the pixel region. The each common-auxiliary electrode has two connecting parts which connect to a common-auxiliary electrode in a pixel region neighboring the pixel region.

[0086] A storage electrode **43** is formed overlapping the common-auxiliary electrode **15** and the gate bus line **1** (**FIG. 10A**), the common-auxiliary electrode **15**, the gate bus line **1**, and a common-auxiliary electrode in a pixel region neighboring the pixel region (**FIG. 10B**), the common-auxiliary electrode **15** and a common-auxiliary electrode in a pixel region neighboring the pixel region (**FIG. 10C**) to obtain storage capacitance.

[0087] In the multi-domain liquid crystal display device of the in the **FIG. 11**, two common-auxiliary electrode **15** surround the pixel region. The each common-auxiliary electrode has connecting parts which connect to a common-auxiliary electrode in a pixel region neighboring the pixel region, and the common-auxiliary electrodes are connected each other at one of the connecting parts.

[0088] A storage electrode **43** is formed overlapping the common-auxiliary electrode **15** and the gate bus line **1** (**FIG. 11A**), the common-auxiliary electrode **15**, the gate bus line **1**, and a common-auxiliary electrode in a pixel region neighboring the pixel region (**FIG. 11B**), the common-auxiliary electrode **15** and a common-auxiliary electrode in a pixel region neighboring the pixel region (**FIG. 11C**) to obtain storage capacitance.

[0089] In the multi-domain liquid crystal display device of the in the **FIG. 12**, two common-auxiliary electrode **15**

surround the pixel region. The each common-auxiliary electrode has connecting parts which connect to a common-auxiliary electrode in a pixel region neighboring the pixel region, and the common-auxiliary electrodes are connected each other at the every connecting parts.

[0090] A storage electrode **43** is formed overlapping the common-auxiliary electrode **15** and the gate bus line **1** (**FIG. 12A**), the common-auxiliary electrode **15**, the gate bus line **1**, and a common-auxiliary electrode in a pixel region neighboring the pixel region (**FIG. 12B**), the common-auxiliary electrode **15** and a common-auxiliary electrode in a pixel region neighboring the pixel region (**FIG. 12C**) to obtain storage capacitance.

[0091] In the multi-domain liquid crystal display device of the in the **FIG. 13**, one common-auxiliary electrode **15** surrounds the pixel region. The common-auxiliary electrode has connecting parts which connect to a common-auxiliary electrode in a pixel region neighboring the pixel region.

[0092] A storage electrode **43** is formed overlapping the common-auxiliary electrode **15** and the gate bus line **1** (**FIG. 13A**), the common-auxiliary electrode **15**, the gate bus line **1**, and a common-auxiliary electrode in a pixel region neighboring the pixel region (**FIG. 13B**), the common-auxiliary electrode **15** and a common-auxiliary electrode in a pixel region neighboring the pixel region (**FIG. 13C**) to obtain storage capacitance.

[0093] **FIGS. 4A and 4C** show that passivation layer **37** includes SiN_x or SiO_x and **FIGS. 4B and 4D** show that passivation layer **37** includes BCB or acrylic resin in the LCD. Also, **FIGS. 4A and 4B** show that dielectric frame **53** is formed on the common electrode **17**, and **FIGS. 4C and 4D** show that window inducing electric field **51** is formed in the common electrode **17**.

[0094] **FIG. 14** is a plan view of the multi-domain liquid crystal display devices according to the eighth embodiment of the present invention, **FIG. 15** is a sectional view taken along the line VI-VI of **FIG. 14**, **FIG. 16** is a plan view of the multi-domain liquid crystal display devices according to the ninth embodiment of the present invention, **FIG. 17** is a plan view of the multi-domain liquid crystal display devices according to the tenth embodiment of the present invention, **FIG. 18** is a plan view of the multi-domain liquid crystal display devices according to the eleventh embodiment of the present invention, **FIG. 19** is a plan view of the multi-domain liquid crystal display devices according to the twelfth embodiment of the present invention, **FIG. 20** is a plan view of the multi-domain liquid crystal display devices according to the thirteenth embodiment of the present invention.

[0095] Regarding to the multi-domain liquid crystal display devices according to the eighth to thirteenth embodiments of the present invention, the LCDs have the same structures of the first to sixth embodiments except not comprising the storage electrode. The pixel electrode **13** overlaps the common-auxiliary electrode **15** to obtain storage capacitance, and the light shielding layer **25** overlaps the common-auxiliary electrode **15**. The **FIG. 15** shows the structure that it does not form the storage electrode in LCDs.

[0096] **FIGS. 21A** to **21**C are plan views of the multi-domain liquid crystal display devices according to the fourteenth embodiment of the present invention, **FIG. 22** is a sectional view taken along the line VII-VII of **FIG. 21A**, **FIGS. 23A** to **24**D are sectional views taken along the line VIII-VIII of **FIG. 21A**, **FIG. 24** is a sectional view taken along the line IX-IX of **FIG. 21B**, **FIGS. 25A** to **25**C are plan views of the multi-domain liquid crystal display devices according to the fifteenth embodiment of the present invention, **FIGS. 26A** to **26**C are plan views of the multi-domain liquid crystal display devices according to the sixteenth embodiment of the present invention, **FIGS. 27A** to **27**C are plan views of the multi-domain liquid crystal display devices according to the seventeenth embodiment of the present invention, **FIGS. 28A** to **28**C are plan views of the multi-domain liquid crystal display devices according to the eighteenth embodiment of the present invention, **FIGS. 29A** to **29**C are plan views of the multi-domain liquid crystal display devices according to the nineteenth embodiment of the present invention, **FIGS. 30A and 30B** are plan views of the multi-domain liquid crystal display devices according to the twentieth embodiment of the present invention.

[0097] Regarding to the multi-domain liquid crystal display devices according to the fourteenth to twentieth embodiments of the present invention, the LCDs have the same structures of the first to sixth embodiments except that the pixel electrode **13** does not overlap the common-auxiliary electrode **15**, and the light shielding layer **25** overlaps the pixel electrode **13**.

[0098] **FIG. 22** show the structure that a storage electrode **43** overlaps the common-auxiliary electrode **15** and the gate bus line **1** to obtain storage capacitance.

[0099] In the **FIG. 24**, a storage electrode **43** is formed overlapping the common-auxiliary electrode **15**, the gate bus line **1**, and a common-auxiliary electrode in a pixel region neighboring the pixel region, or the common-auxiliary electrode **15** and a common-auxiliary electrode in a pixel region neighboring the pixel region to obtain storage capacitance.

[0100] **FIGS. 23***a* and **23**C show that passivation layer **37** includes SiN_x or SiO_x and **FIGS. 23B and 23D** show that passivation layer **37** includes BCB or acrylic resin in the LCD. Also, **FIGS. 23A and 23B** show that dielectric frame **53** is formed on the common electrode **17**, and **FIGS. 23C and 23D** show that window inducing electric field **51** is formed in the common electrode **17**.

[0101] **FIGS. 32A and 32B** are plan views of the multi-domain liquid crystal display device according to the twenty-first embodiment of the present invention, **FIG. 32C** is a sectional view taken along the line I-I of **FIG. 32A**, and **FIGS. 32D** to **32**G are sectional view taken along the lines I-I, II-II of **FIG. 32A**.

[0102] In the twenty-first embodiment of the present invention, the pixel electrode **13** has a prolonged part toward the gate bus line **1** to partially overlap the storage electrode **43**, the passivation **37** below the prolonged part is removed to form the contact hole **39** between the pixel electrode **13** and the storage electrode **43**.

[0103] The pixel electrode **13** overlaps common-auxiliary electrode **15**, the light shielding layer **25** overlaps the common-auxiliary electrode **15**, and the storage electrode **43** overlaps common-auxiliary electrode **15** and gate bus line **1** to forms a storage capacitance.

[0104] **FIGS. 32D and 32E** show that dielectric frame **53** is formed on the common electrode **17**, and **FIGS. 32F, 32G**

show that electric field inducing window **51** is formed in the common electrode **17**. Also, **FIGS. 32D and 32F** show that passivation layer **37** includes SiN_x or SiO_x and **FIGS. 32E and 32G** show that passivation layer **37** includes BCB or acrylic resin in the LCD.

[**0105**] **FIGS. 33A, 33B** are plan views of the multi-domain liquid crystal display device according to the twenty-second embodiment of the present invention, **FIGS. 33C, 33D** are sectional views taken along the line III-III of **FIG. 33B**, and **FIGS. 33E** to **33**H are sectional views taken along the line IV-IV of the **FIG. 33A**.

[**0106**] The pixel electrode **13** does not overlap common-auxiliary electrode **15**, the light shielding layer **25** overlaps the common-auxiliary electrode **15**, and the storage electrode **43** overlaps common-auxiliary electrode **15** and gate bus line **1** to forms a storage capacitance.

[**0107**] At this time, the gate insulator **35** and the passivation layer **37** on the common-auxiliary electrode **15** are removed, which intensifies the electric field of common-auxiliary electrode **15** that is applied to the pixel electrode **13**.

[**0108**] The **FIG. 33C** shows a portion of the gate insulator **35** and passivation layer **37** that are removed to expose a part of the common-auxiliary electrode **15**, and the **FIG. 3D** shows that three sides of the common-auxiliary electrode **15** are exposed.

[**0109**] **FIGS. 33E and 33F** show that dielectric frame **53** is formed on the common electrode **17**, and **FIGS. 33G, 33H** show that electric field inducing window **51** is formed in the common electrode **17**. Also, **FIGS. 33E and 33G** show that passivation layer **37** includes SiN_x or SiO_x and **FIGS. 33F and 33H** show that passivation layer **37** includes BCB or acrylic resin in the LCD.

[**0110**] **FIGS. 34A and 34B** are plan view and sectional view taken along the line V-V of **FIG. 34A** of the multi-domain liquid crystal display device according to the twenty-third embodiment of the present invention.

[**0111**] In this embodiment, a pair of upper-lower pixel regions co-owns one common-auxiliary electrode **15**, and the storage electrodes **43** in the upper-lower pixel regions are formed on the common-auxiliary electrode **15**, so that the aperture ratio is largely improved.

[**0112**] The pixel electrode **13** overlaps common-auxiliary electrode **15**, the light shielding layer **25** overlaps the common-auxiliary electrode **15**, and the storage electrode **43** overlaps common-auxiliary electrode **15** and gate bus line **1** to forms a storage capacitance.

[**0113**] In addition, in this embodiment it is possible to form the dielectric frame **53** on the common electrode **17** or the electric field inducing window **51** in the common electrode **17**.

[**0114**] **FIGS. 35A and 35B** are plan views and sectional views taken along the line VI-VI of **FIG. 35B** of the multi-domain liquid crystal display device according to the twenty-fourth embodiment of the present invention.

[**0115**] The multi-domain LCD has the same structure as in the third embodiment of the present invention except as follows.

[**0116**] Pixel electrode **13** does not overlap common-auxiliary electrode **15**, and the light shielding layer **25** overlaps the pixel electrode **13**. At this time, a portion of the gate insulator **35** and passivation layer **37** on the common-auxiliary electrode **15** are removed, which intensifies the electric field of common-auxiliary electrode **15** that is applied to the pixel electrode **13** (refer to **FIG. 35B**).

[**0117**] **FIG. 35C** shows a portion of the gate insulator **35** and passivation layer **37** that are removed to expose a part of the common-auxiliary electrode **15**, and the **FIG. 35D** shows that three sides of the common-auxiliary electrode **15** are exposed.

[**0118**] In the multi-domain LCD of the present invention, the aperture ratio is enhanced by an optimum structure design of a n-line thin film transistor (U.S. Pat. No. 5,694,185) so as to reduce power consumption, increase luminance, and lower reflection, thus improving contrast ratio. Aperture ratio is increased by forming the TFT above the gate line and providing a n-line TFT. The parasitic capacitor, occurring between the gate bus line and the drain electrode, can be reduced when a TFT having the same channel length as the symmetrical TFT structure is manufactured due to effect of channel length extension.

[**0119**] **FIGS. 36A** to **36**G are plan views showing the various windows inducing electric field **51** and dielectric frames **53** according to the embodiments of the present invention.

[**0120**] The multi-domain LCD of the present invention has a dielectric frame **53** on the pixel electrode and/or common electrode, or an window inducing electric field **51** like a hole or slit in the pixel electrode, passivation layer, gate insulator, color filter layer, and/or common electrode by patterning, thereby electric field distortion effect and multi-domain are obtained.

[**0121**] That is, from forming window inducing electric field **51** or dielectric frame **53**, the multi-domain is obtained by dividing each pixel into four domains such as in a +, x, or double Y shape, or dividing each pixel horizontally, vertically, and/or diagonally, and differently alignment-treating or forming alignment directions on each domain and on each substrate.

[**0122**] Furthermore, in multi-domain LCD of the present invention, an alignment layer(not shown in the figure) is formed over the whole first and/or second substrates. The alignment layer includes a material such as polyamide or polyimide based materials, PVA (polyvinylalcohol), polyamic acid or SiO_2. When rubbing is used to determine an alignment direction, it should be possible to apply any material suitable for the rubbing treatment.

[**0123**] Moreover, it is possible to form the alignment layer with a photosensitive material such as PVCN (polyvinylcinnamate), PSCN (polysiloxanecinnamate), and CelCN (cellulosecinnamate) based materials. Any material suitable for the photo-aligning treatment may be used. Irradiating light once on the alignment layer determines the alignment or pretilt direction and the pretilt angle. The light used in the photo-alignment is preferably a light in a range of ultraviolet light, and any of unpolarized light, linearly polarized light, and partially polarized light can be used.

[0124] In the rubbing or photo-alignment treatment, it is possible to apply one or both of the first and second substrates, and to apply different aligning-treatment on each substrate.

[0125] From the aligning-treatment, a multi-domain LCD is formed with at least two domains, and LC molecules of the LC layer are aligned differently one another on each domain. That is, the multi-domain is obtained by dividing each pixel into four domains such as in a + or x shape, or dividing each pixel horizontally, vertically, and/or diagonally, and differently alignment-treating or forming alignment directions on each domain and on each substrate.

[0126] It is possible to have at least one domain of the divided domains unaligned. It is also possible to have all domains unaligned.

[0127] Consequently, since the multi-domain LCD of the present invention forms the gate electrode and the common-auxiliary electrode on the same layer and, a storage electrode **43** overlapping the common-auxiliary electrode **15**, the gate bus line **1**, and/or a common-auxiliary electrode in a pixel region neighboring the pixel region, an appropriate capacitance is obtained, the viewing angle is improved, and a high voltage is not needed to raise the intensity of the electric field applied between the two electrodes. Also, in the case of conducting an alignment-treatment, a high response time and a stable LC structure can be obtained by a pretilt angle and an anchoring energy. Moreover, the disclination is thus removed to thereby improve the brightness.

[0128] It will be apparent to those skilled in the art that various modifications can be made in the liquid crystal display device of the present invention without departing from the sprit or scope of the invention. Thus, it is intended that the present invention covers the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

1-5. (canceled)

6. A multi-domain liquid crystal display device, comprising:

first and second substrates facing each other;

a liquid crystal layer between said first and second substrates;

a plurality of gate bus lines arranged in a first direction on said first substrate and a plurality of data bus lines arranged in a second direction on said first substrate to define a plurality of pixel regions;

a thin film transistor positioned at a crossing area of said data bus line and said gate bus line, said thin film transistor comprising a gate electrode, a semiconductor layer, and source/drain electrodes;

a common-auxiliary electrode comprising at least one electrode in the each pixel region;

a plurality of pixel electrodes electrically charged through the thin film transistor; and an alignment layer on at least one substrate between said first and second substrates;

wherein said pixel electrode does not overlap said common-auxiliary electrode.

7. (canceled)

8. A multi-domain liquid crystal display device, comprising:

first and second substrates facing each other;

a liquid crystal layer between said first and second substrates;

a plurality of gate bus lines arranged in a first direction on said first substrate and a plurality of data bus lines arranged in a second direction on said first substrate to define a plurality of pixel regions;

a thin film transistor positioned at a crossing area of said data bus line and said gate bus line, said thin film transistor comprising a gate electrode, a semiconductor layer, and source/drain electrodes;

a common-auxiliary electrode comprising at least one electrode in the each pixel region;

a plurality of pixel electrodes electrically charged through the thin film transistor; and an alignment layer on at least one substrate between said first and second substrates;

a storage electrode overlapping said common-auxiliary electrode.

9-16. (canceled)

17. A multi-domain liquid crystal display device, comprising:

first and second substrates facing each other;

a liquid crystal layer between said first and second substrates;

a plurality of gate bus lines arranged in a first direction on said first substrate and a plurality of data bus lines arranged in a second direction on said first substrate to define a plurality of pixel regions;

a common-auxiliary electrode surrounding said pixel regions on a same layer whereon said gate bus line is formed;

a gate insulator over said whole first substrate;

a storage electrode overlapping said gate bus line on the gate insulator, the storage electrode connecting electrically the pixel electrode on an area except the pixel region;

a passivation layer on said gate insulator over said whole first substrate;

a pixel electrode electrically charged through said data bus line in said pixel region;

a light shielding layer on said second substrate;

a color filter layer on said light shielding layer;

a common electrode on said color filter layer; and an alignment layer on at least one substrate between said first and second substrates;

wherein said pixel electrode does not overlap said common-auxiliary electrode.

18. The multi-domain liquid crystal display device according to claim 17, wherein said light shielding layer overlaps said pixel electrode.

19-20. (canceled)

21. A multi-domain liquid crystal display device, comprising:

first and second substrates facing each other;

a liquid crystal layer between said first and second substrates;

a plurality of gate bus lines arranged in a first direction on said first substrate and a plurality of data bus lines arranged in a second direction on said first substrate to define a plurality of pixel regions;

a common-auxiliary electrode surrounding said pixel region on a same layer whereon said gate bus line is formed;

a gate insulator over said whole first substrate;

a storage electrode overlapping said gate bus line on the gate insulator, the storage electrode connecting electrically the pixel electrode on an area except the pixel region;

a passivation layer on said gate insulator over said whole first substrate;

a pixel electrode electrically charged through said data bus line in said pixel region;

a light shielding layer on said second substrate;

a color filter layer on said light shielding layer;

a common electrode on said color filter layer; and an alignment layer on at least one substrate between said first and second substrates;

a dielectric frame for distorting electric field on said pixel electrode.

22-30. (canceled)

31. A multi-domain liquid crystal display device, comprising:

first and second substrates facing each other;

a liquid crystal layer between said first and second substrates;

a plurality of gate bus lines arranged in a first direction on said first substrate and a plurality of data bus lines arranged in a second direction on said first substrate to define a plurality of pixel regions;

a common-auxiliary electrode surrounding said pixel region on a same layer whereon said gate bus line is formed;

a gate insulator over said whole first substrate;

a storage electrode overlapping said gate bus line on the gate insulator, the storage electrode connecting electrically the pixel electrode on an area except the pixel region;

a passivation layer on said gate insulator over said whole first substrate;

a pixel electrode electrically charged through said data bus line in said pixel region;

a light shielding layer on said second substrate;

a color filter layer on said light shielding layer;

a common electrode on said color filter layer; and an alignment layer on at least one substrate between said first and second substrates;

wherein said passivation layer includes a material selected from the group consisting of silicon nitride and silicon oxide.

32-36. (canceled)

37. A multi-domain liquid crystal display device, comprising:

first and second substrates facing each other;

a liquid crystal layer between said first and second substrates;

a plurality of gate bus lines arranged in a first direction on said first substrate and a plurality of data bus lines arranged in a second direction on said first substrate to define a plurality of pixel regions;

a common-auxiliary electrode surrounding said pixel region on a same layer whereon said gate bus line is formed;

a gate insulator over said whole first substrate;

a storage electrode overlapping said gate bus line on the gate insulator, the storage electrode connecting electrically the pixel electrode on an area except the pixel region;

a passivation layer on said gate insulator over said whole first substrate;

a pixel electrode electrically charged through said data bus line in said pixel region;

a light shielding layer on said second substrate;

a color filter layer on said light shielding layer;

a common electrode on said color filter layer; and an alignment layer on at least one substrate between said first and second substrates, said alignment layer being divided into at least two portions, liquid crystal molecules in the liquid crystal layer in each portion being aligned differently from each other; and

wherein at least one portion of said at least two portions of the alignment layer is alignment-treated.

38. (canceled)

39. A multi-domain liquid crystal display device, comprising:

first and second substrates facing each other;

a liquid crystal layer between said first and second substrates;

a plurality of gate bus lines arranged in a first direction on said first substrate and a plurality of data bus lines arranged in a second direction on said first substrate to define a plurality of pixel regions;

a common-auxiliary electrode surrounding said pixel region on a same layer whereon said gate bus line is formed;

a gate insulator over said whole first substrate;

a storage electrode overlapping said gate bus line on the gate insulator, the storage electrode connecting electrically the pixel electrode on an area except the pixel region;

a passivation layer on said gate insulator over said whole first substrate;

a pixel electrode electrically charged through said data bus line in said pixel region;

a light shielding layer on said second substrate;

a color filter layer on said light shielding layer;

a common electrode on said color filter layer; and an alignment layer on at least one substrate between said first and second substrates;

wherein said liquid crystal layer includes liquid crystal molecules having positive dielectric anisotropy.

40. (canceled)

41. A multi-domain liquid crystal display device, comprising:

first and second substrates facing each other;

a liquid crystal layer between said first and second substrates;

a plurality of gate bus lines arranged in a first direction on said first substrate and a plurality of data bus lines arranged in a second direction on said first substrate to define a plurality of pixel regions;

a common-auxiliary electrode surrounding said pixel region on a same layer whereon said gate bus line is formed;

a gate insulator over said whole first substrate;

a storage electrode overlapping said gate bus line on the gate insulator, the storage electrode connecting electrically the pixel electrode on an area except the pixel region;

a passivation layer on said gate insulator over said whole first substrate;

a pixel electrode electrically charged through said data bus line in said pixel region;

a light shielding layer on said second substrate;

a color filter layer on said light shielding layer;

a common electrode on said color filter layer; and an alignment layer on at least one substrate between said first and second substrates; and

a negative uniaxial film on at least one substrate.

42-43. (canceled)

* * * * *

专利名称(译)	多域液晶显示装置		
公开(公告)号	US20050105030A1	公开(公告)日	2005-05-19
申请号	US10/938854	申请日	2004-09-13
[标]申请(专利权)人(译)	KIM观选团Ĵ 柯斗h LEE JOUN ^ h 金正日小号 金正日^ h 赵龙W¯ 褚MIķ		
申请(专利权)人(译)	KIM观选团J. 高斗H. LEE JOUN H. 金正日S. 金正日H. 赵龙W. 褚MI K.		
当前申请(专利权)人(译)	LG DISPLAY CO.，LTD.		
[标]发明人	KIM JEOM JAE KO DOO HYUN LEE JOUN HO KIM JONG SOON KIM JONG HWAN CHO YOUNG WOO CHU MI KYUNG		
发明人	KIM, JEOM JAE KO, DOO HYUN LEE, JOUN HO KIM, JONG SOON KIM, JONG HWAN CHO, YOUNG WOO CHU, MI KYUNG		
IPC分类号	G02F1/1362 G02F1/1337		
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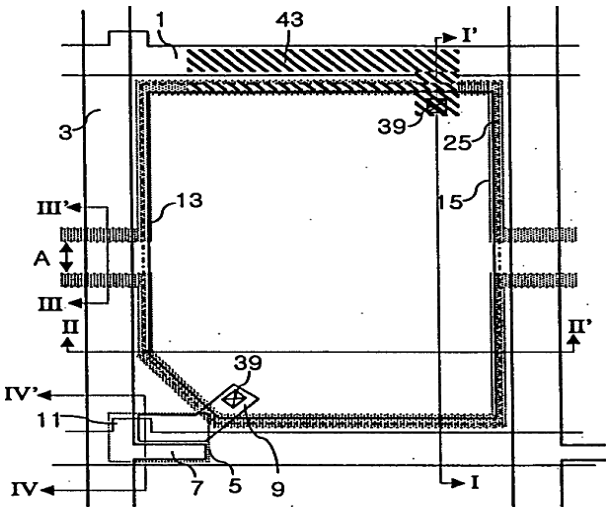
优先权	1019990023194 1999-06-21 KR 1019990032945 1999-08-11 KR		
其他公开文献	US7095469		
外部链接	Espacenet USPTO		

摘要(译)

多畴液晶显示装置包括彼此面对的第一和第二基板;第一和第二基板之间的液晶层;在第一基板上沿第一方向排列的多条栅极总线和在第一基板上沿第二方向排列的多条数据总线，以限定多个像素区域;薄膜晶体管，位于数据总线和栅极总线的交叉区域，薄膜晶体管包括栅电极，半导体层和源/漏电极;共用辅助电极，在每个像素区域中包括至少一个电极;多个像素电极通过薄膜晶体管充电;以及在第一和第二基板之间的至少一个基板上的对准层。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III'
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I