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(54) LIQUID CRYSTAL DISPLAY DEVICE AND FABRICATION METHOD THEREOF

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(57) **ABSTRACT**

A LCD and a fabrication process is presented. An upper substrate is coincidently formed with a red, a green and a blue color filters using phase separation. A compound containing a photopolymeric color filter resin and a liquid crystal are coated on an array substrate and then photopolymerized after formation of the array substrate. A seed layer may be provided on the substrate before the compound is applied. Polymerization of the color filter resin permits simultaneous formation of the upper, color filter substrate and liquid crystal layer.

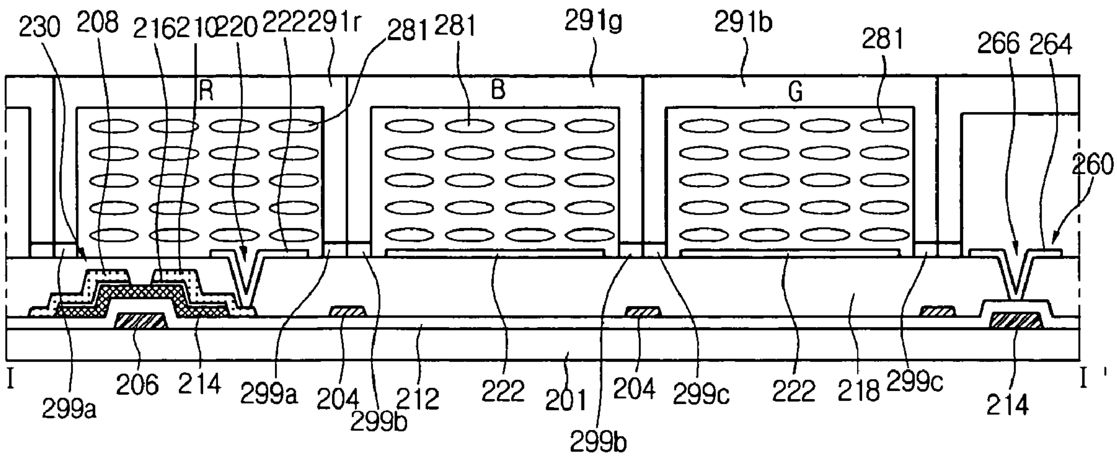


Fig.1
Related Art

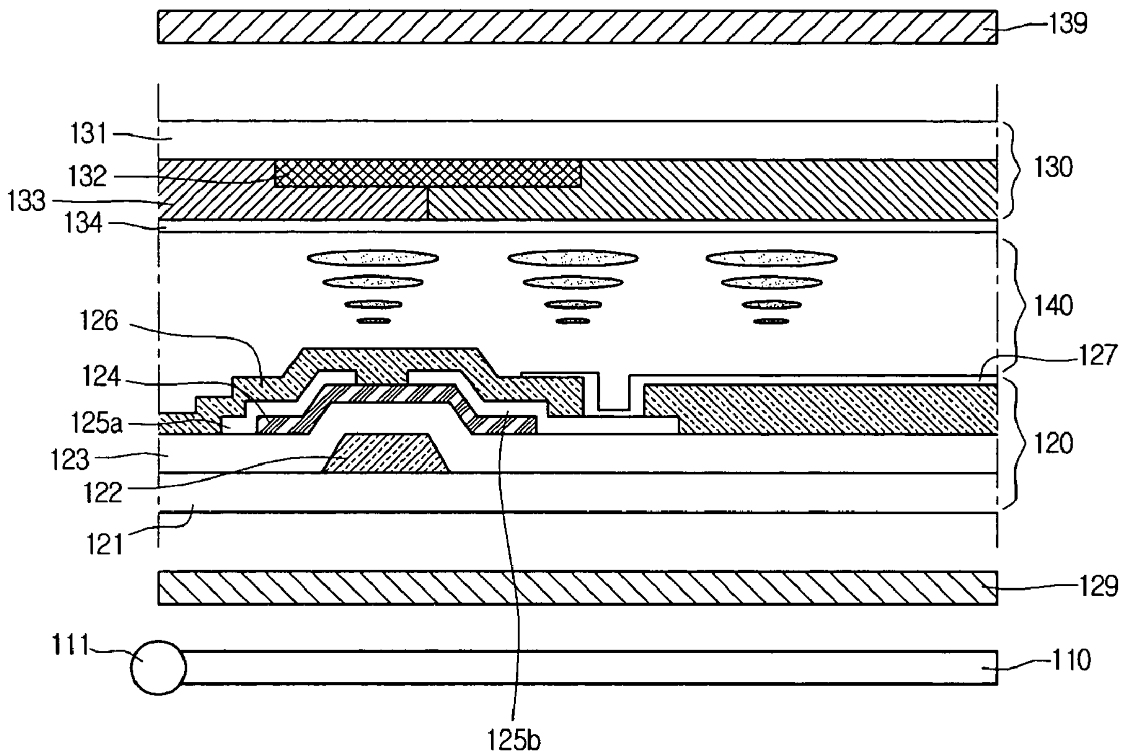
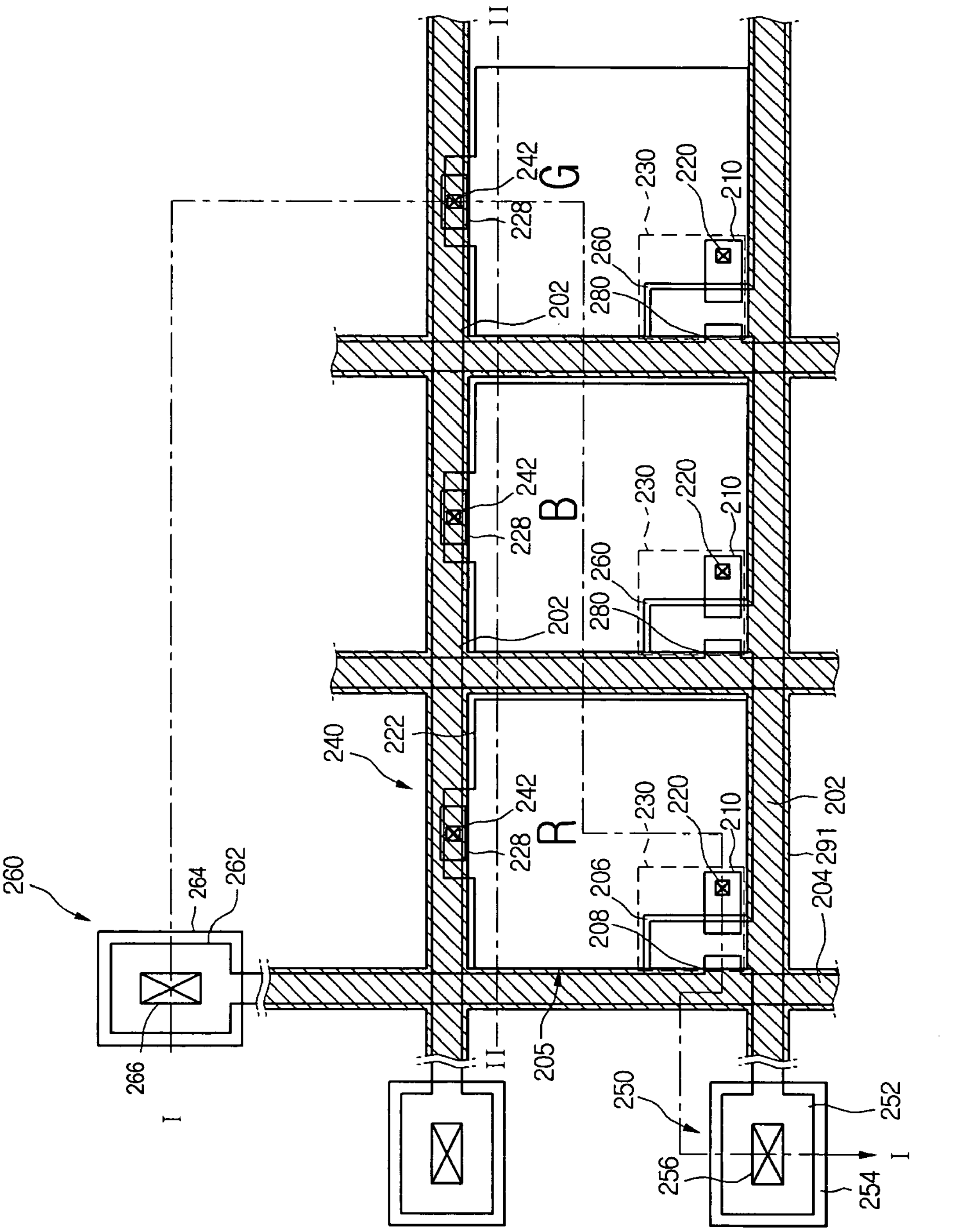


Fig.2



260
264
262
266
I
II'
II
242
228
G
230
220
210
260
280
202
B
240
222
R
208
206
204
291
205
250
252
256
254
I

Fig.3

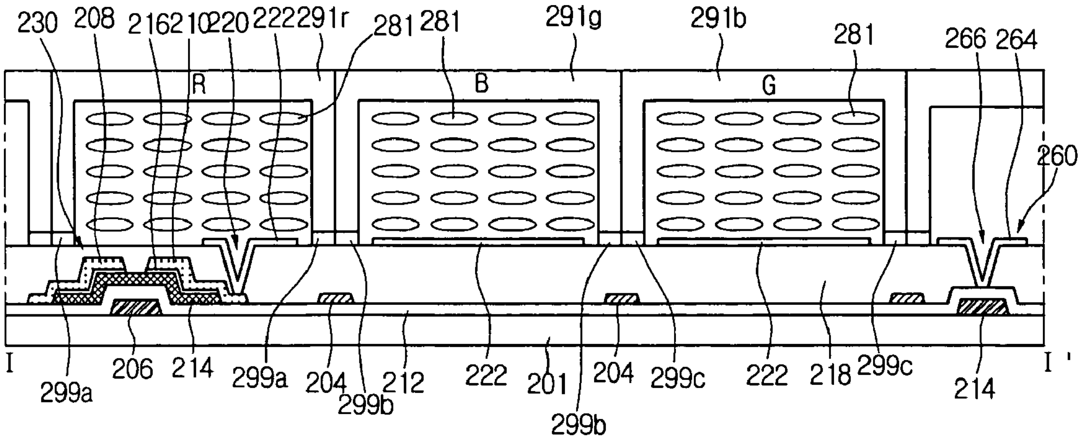


Fig.4A

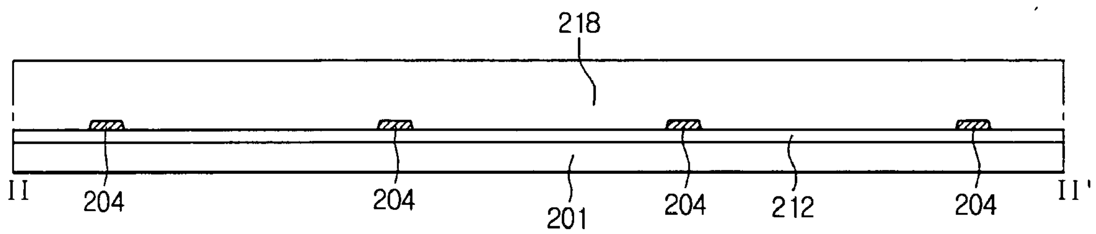


Fig.4B

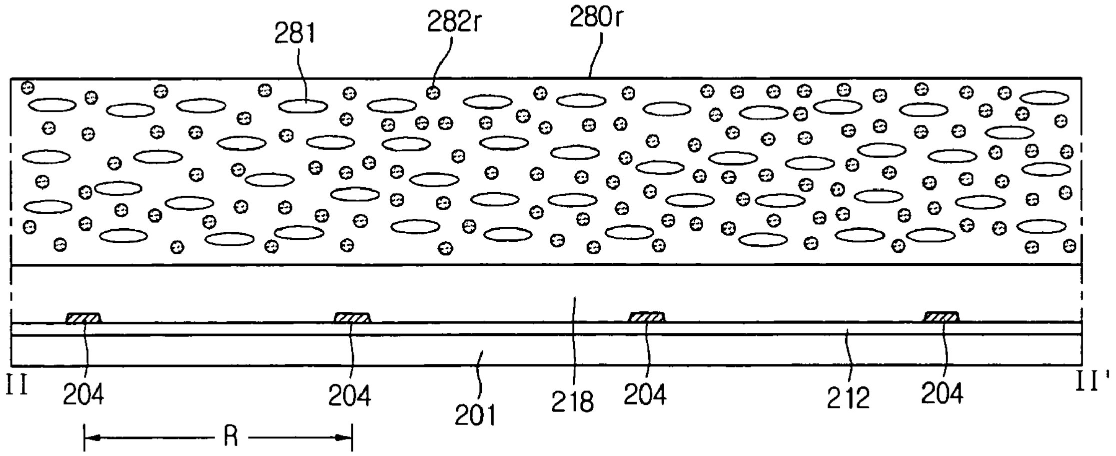


Fig.4C

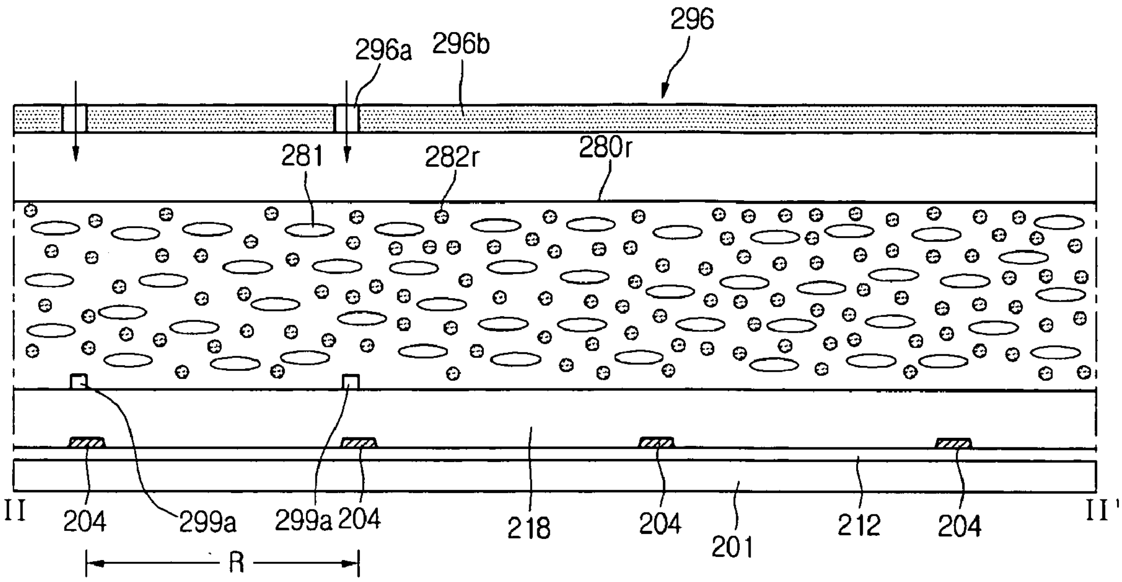
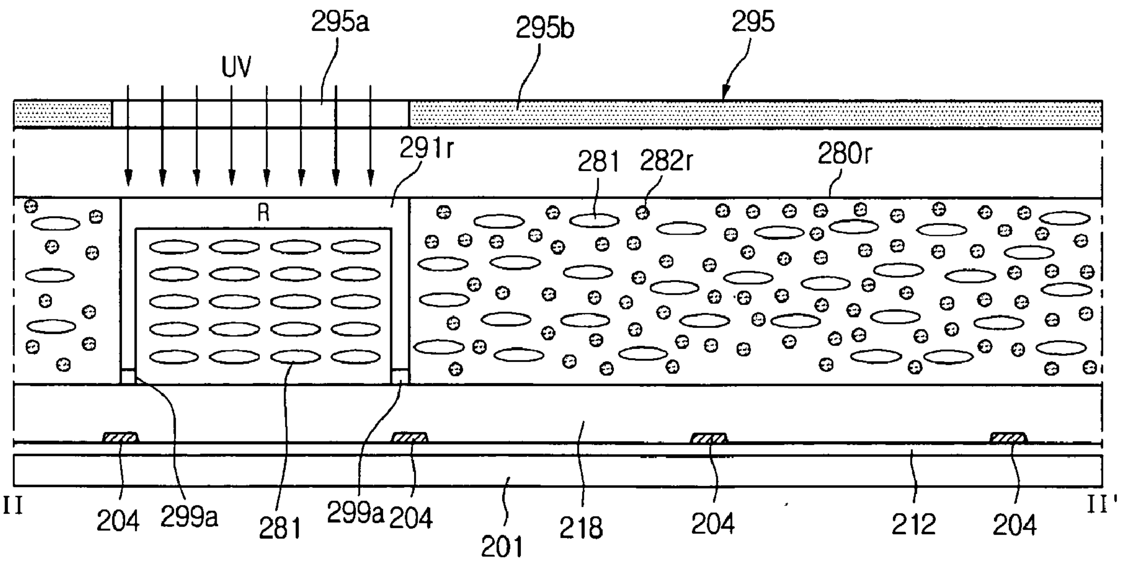

296
296a
296b
281
282r
280r
II
204
299a
299a
204
218
204
201
212
204
II'
R

Fig.4D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295b
295
UV
291r
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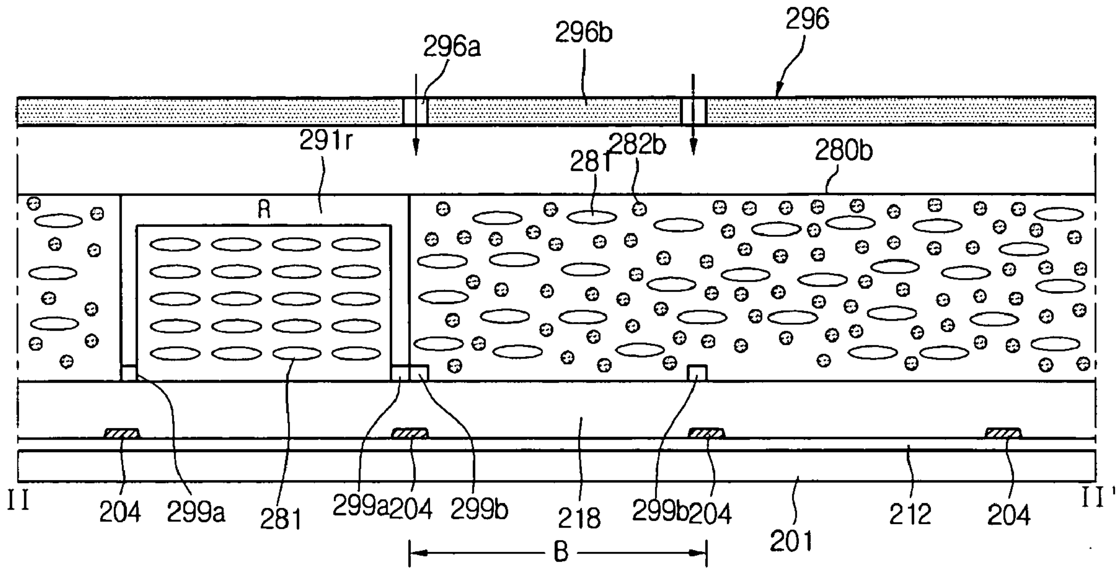
282r
280r
R
II
204
299a
281
299a
204
201
218
204
212
204
II'

Fig.4E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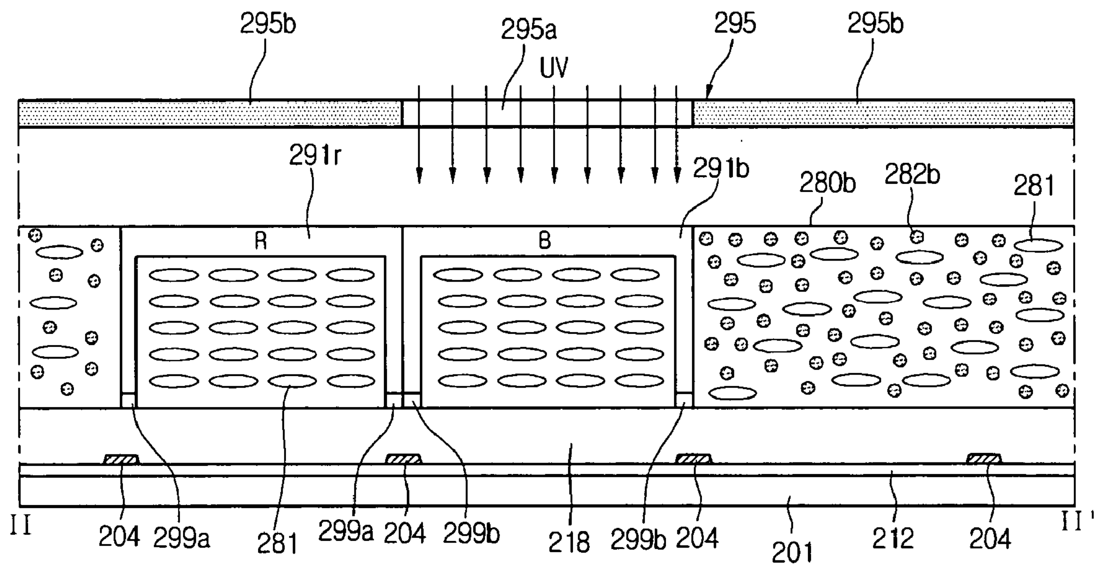
296b
296
291r
281
282b
280b
R
II
204
299a
281
299a
204
299b
218
299b
204
201
212
204
II'
B

Fig.4F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295a
UV
295
295b
291r
291b
280b
282b
281
R
B
II
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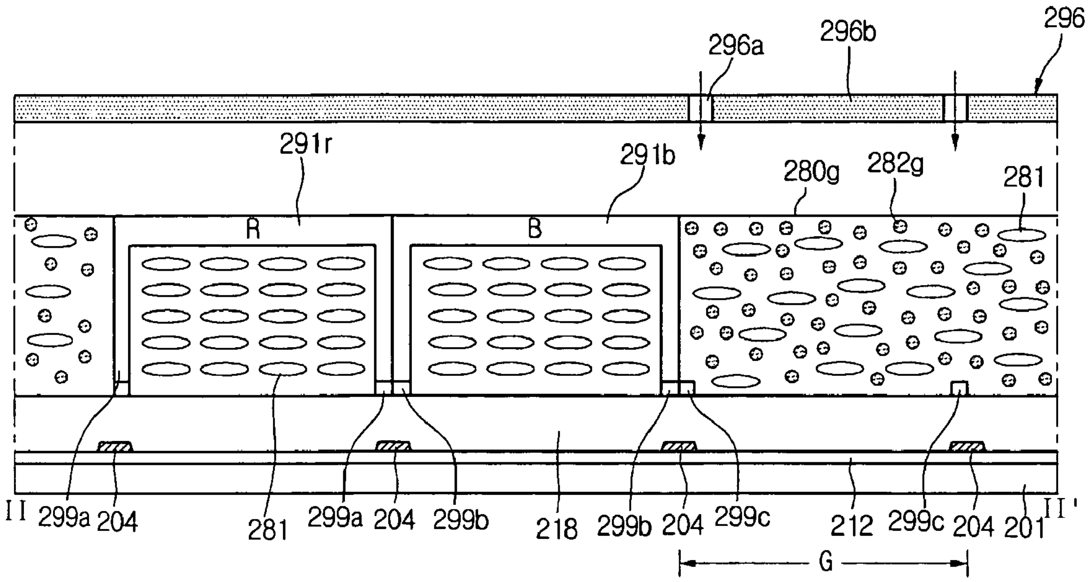
299a
281
299a
204
299b
218
299b
204
201
212
204
II'

Fig.4G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296b
296
291r
291b
280g
282g
281
R
B
II
299a
204
281
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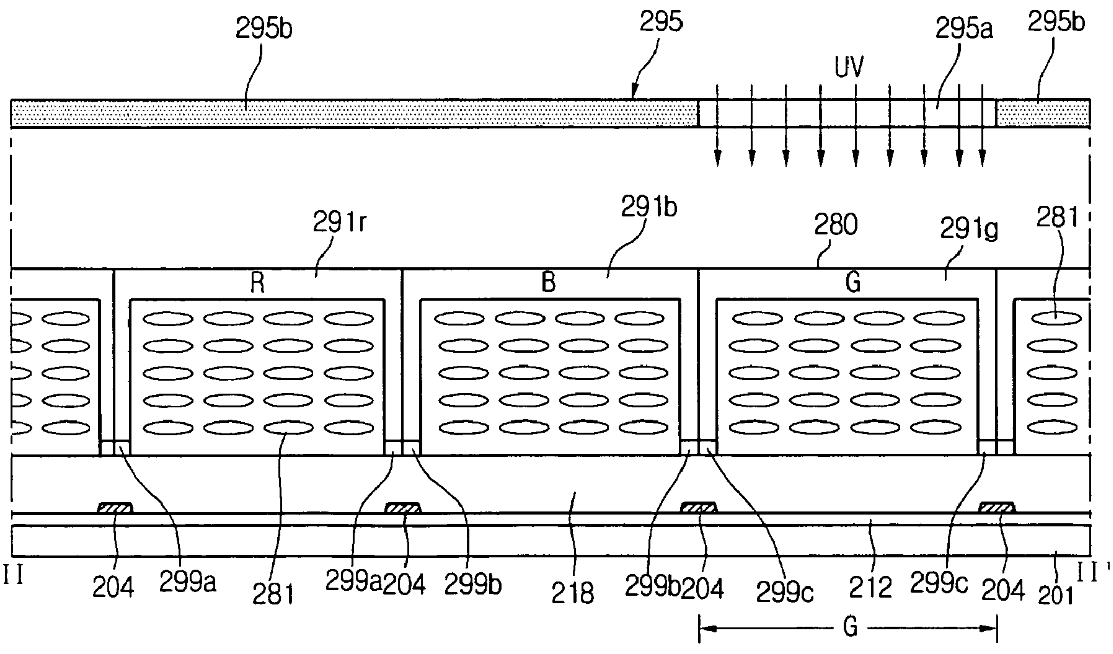
299b
218
299b
204
299c
212
299c
204
201
II'
G

Fig.4H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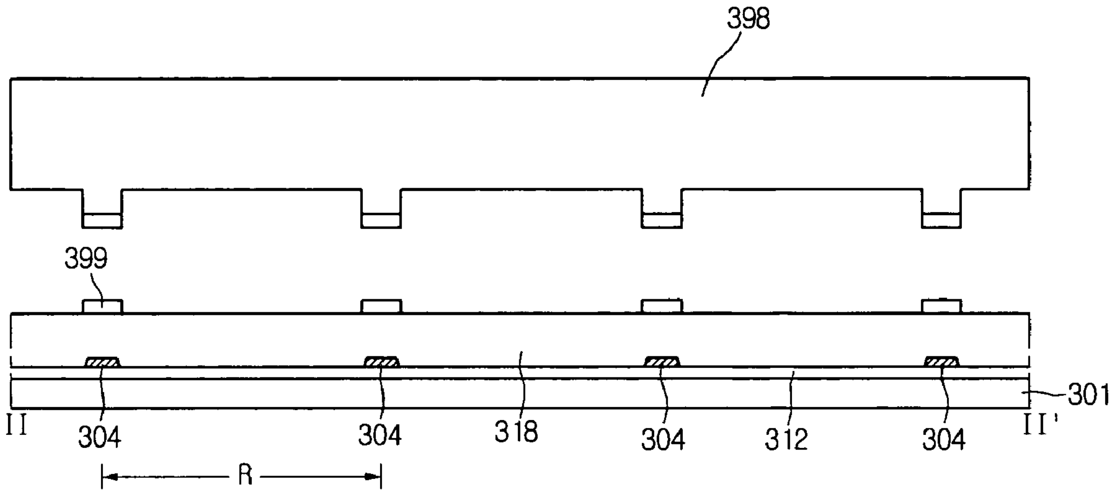
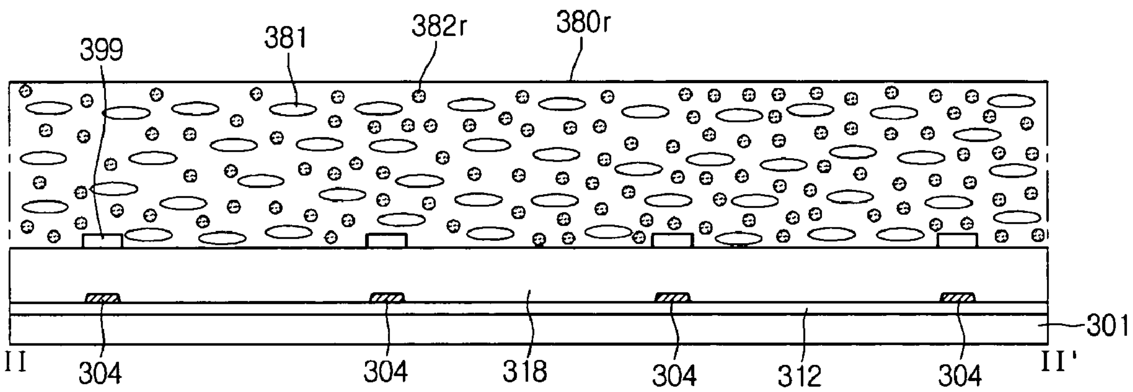
295
295a
295b
UV
291r
291b
280
291g
281
R
B
G
II
204
299a
281
299a
204
299b
218
299b
204
299c
212
299c
204
201
II'
G

Fig.5A



398
399
301
II
304
304
318
304
312
304
II'
R

Fig.5B



399
381
382r
380r
301
II
304
304
318
304
312
304
II'

Fig.5C

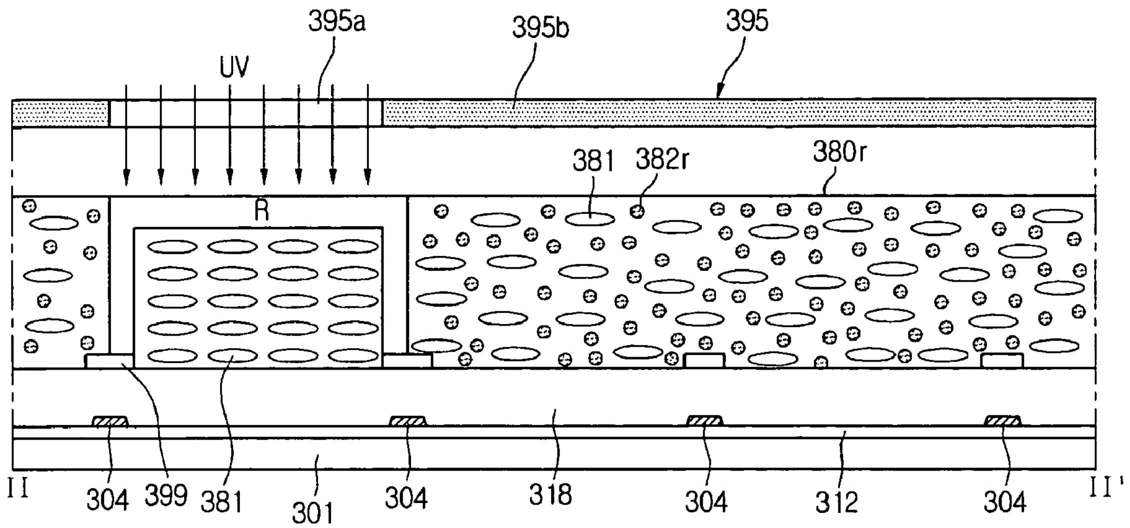
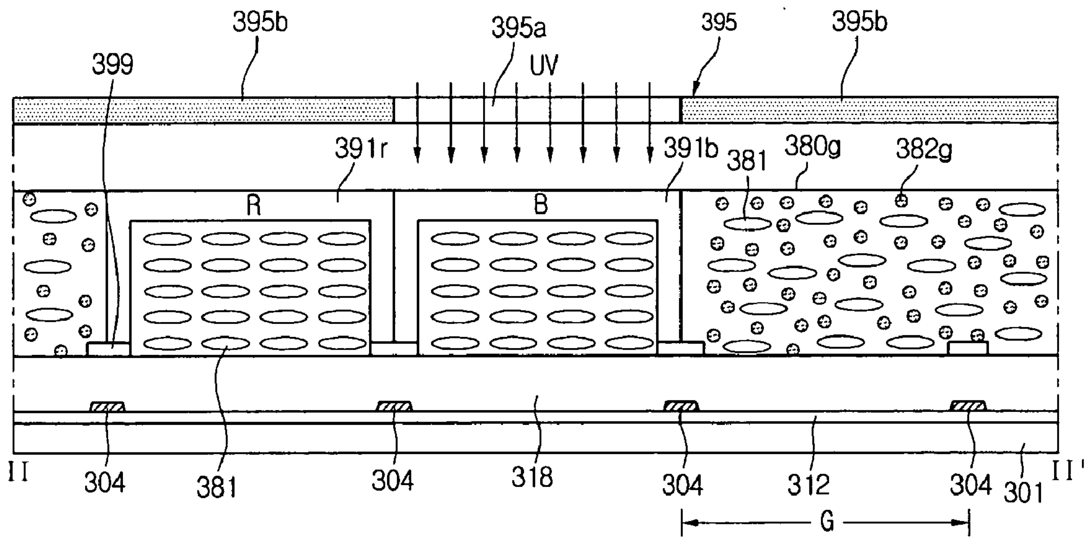

395a
395b
395
UV
381
382r
380r
R
II
304
399
381
301
304
318
304
312
304
II'

Fig.5D


395b
395a
395
395b
399
UV
391r
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381
380g
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R
B
II
304
381
304
318
304
312
304
301
II'
G

Fig.5E

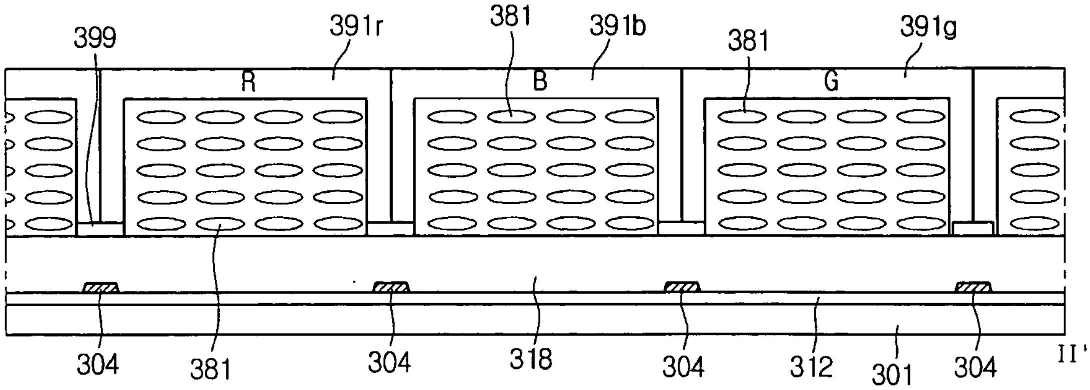


Fig.6

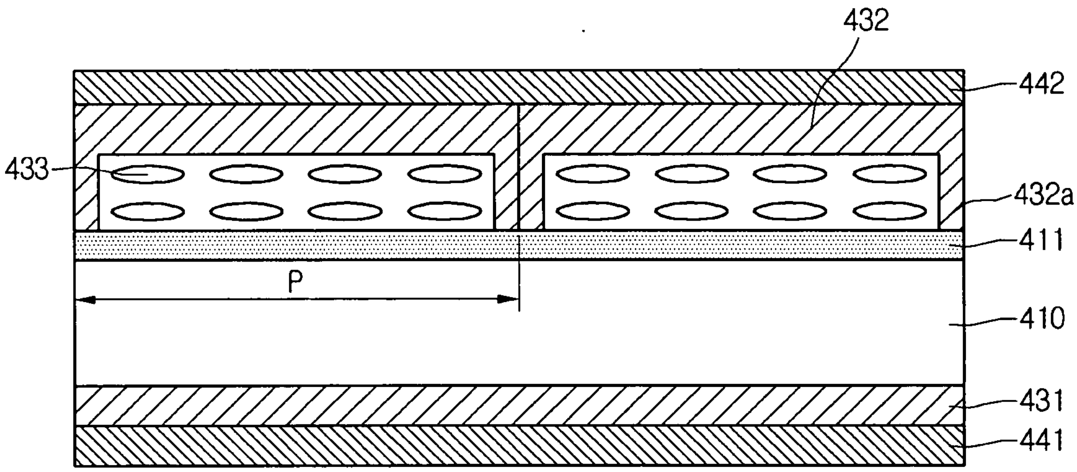


Fig.7A

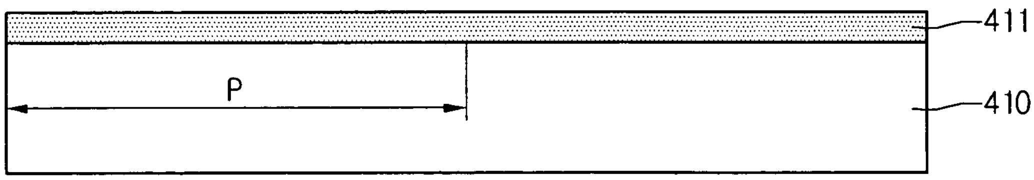


Fig.7B

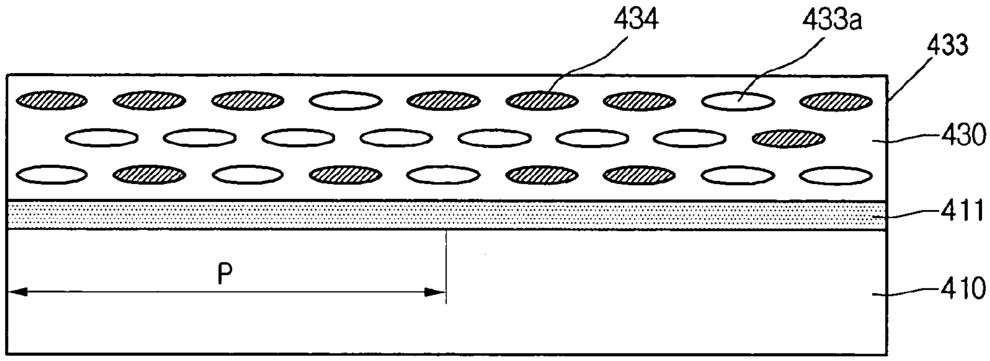
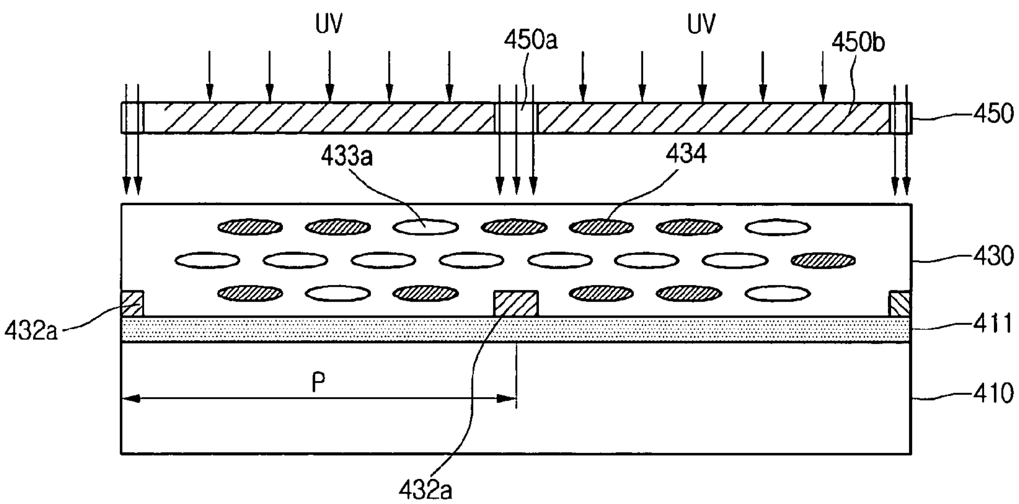

434
433a
433
430
411
410
P

Fig.7C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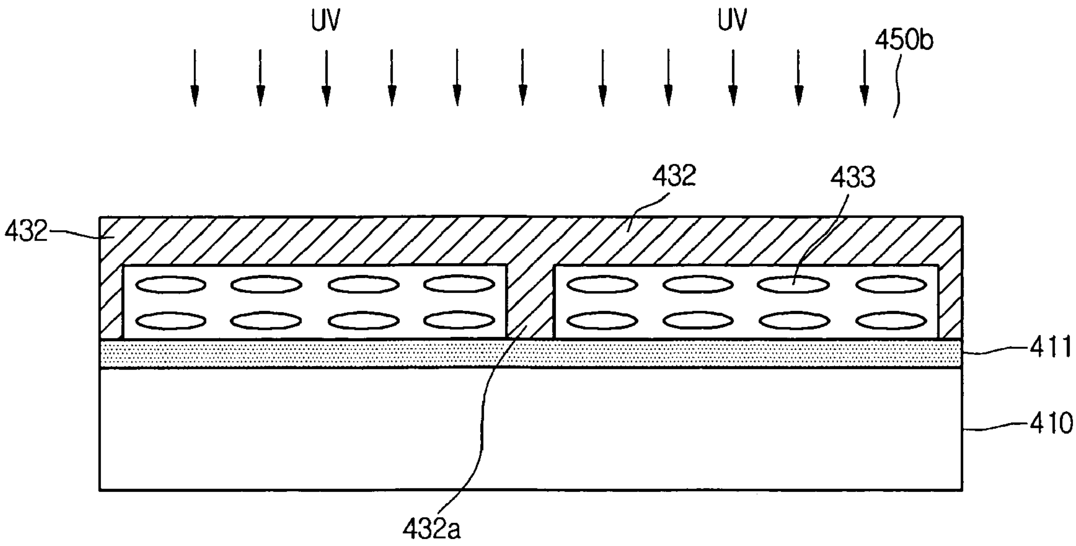
450a
UV
450b
450
433a
434
430
432a
411
P
410
432a

Fig.7D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UV
450b
432
433
432
411
410
432a

Fig.7E

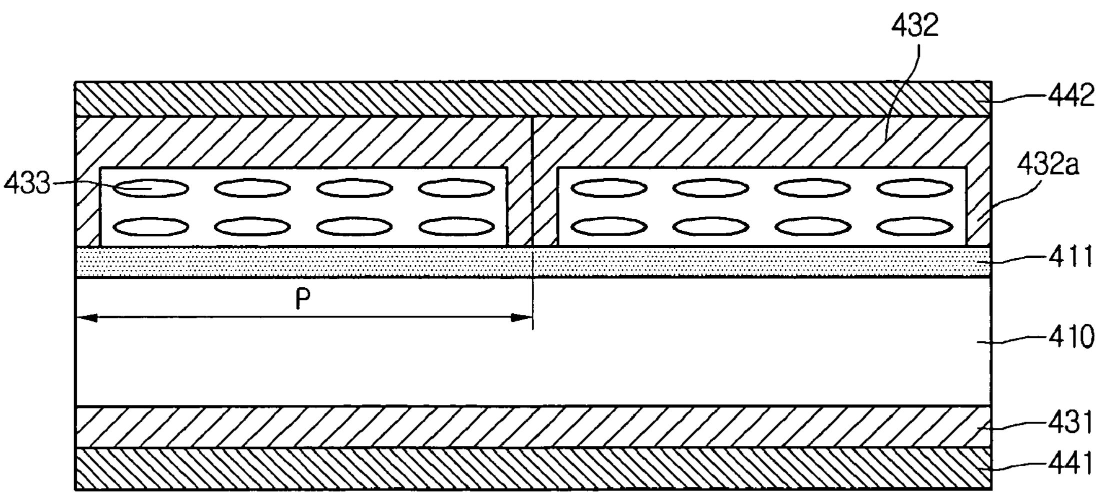

432
442
432a
433
411
P
410
431
441

Fig.8

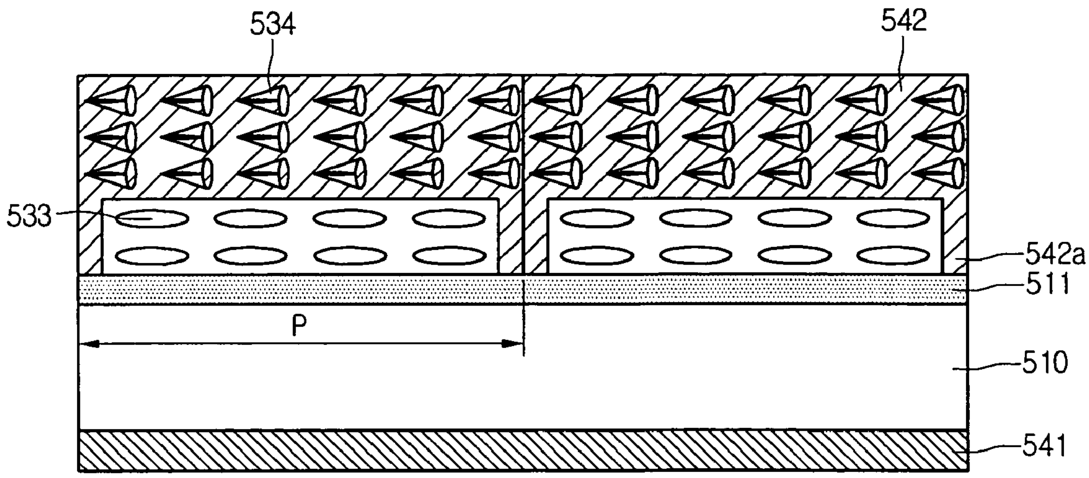


Fig.9A

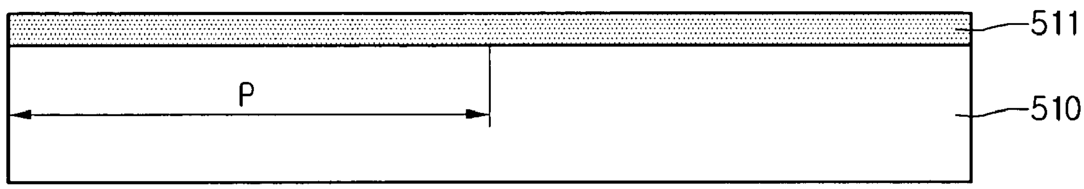


Fig.9B

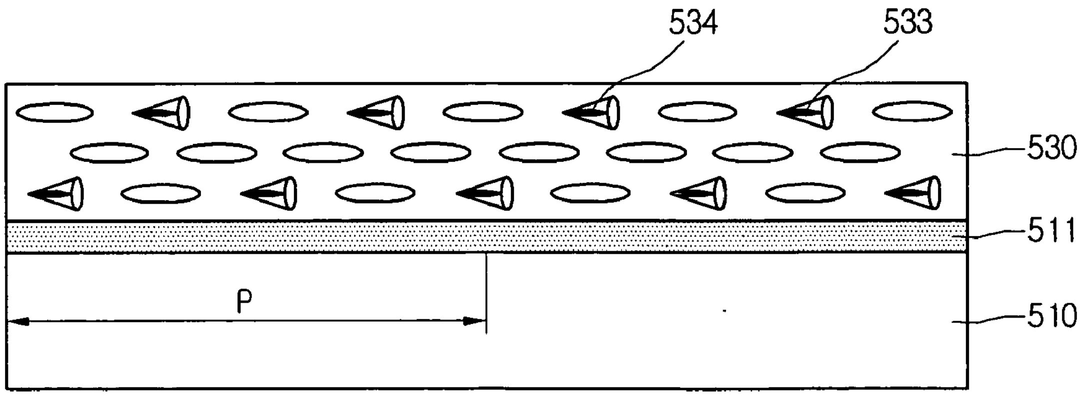


Fig.9C

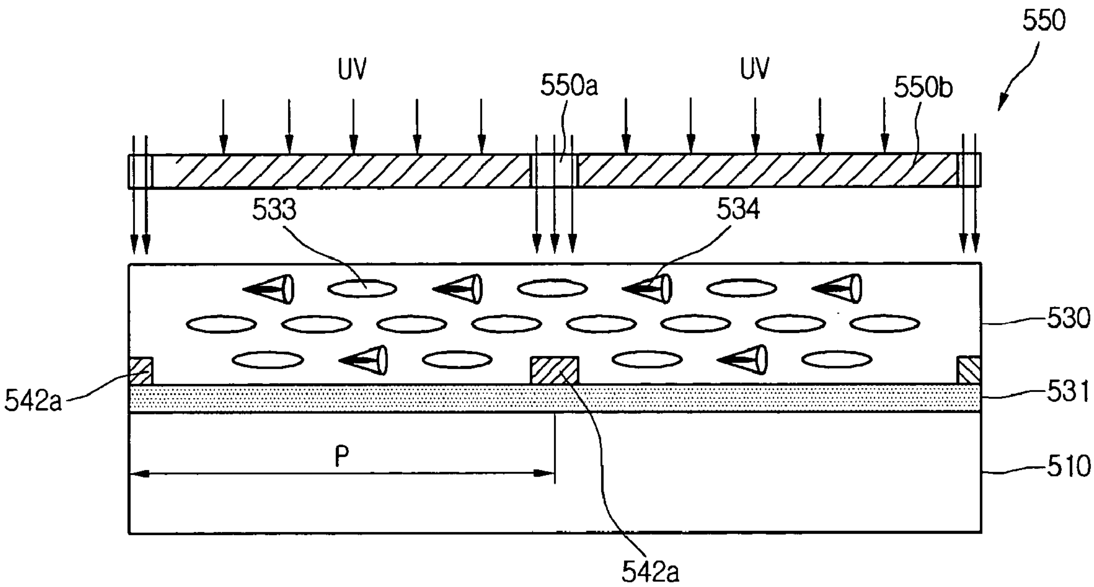

550
UV
550a
UV
550b
533
534
530
542a
531
P
510
542a

Fig.9D

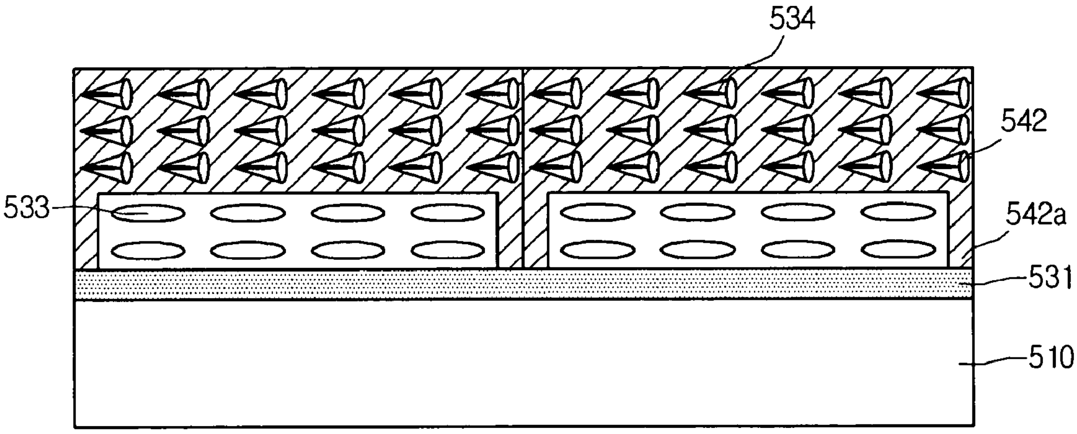
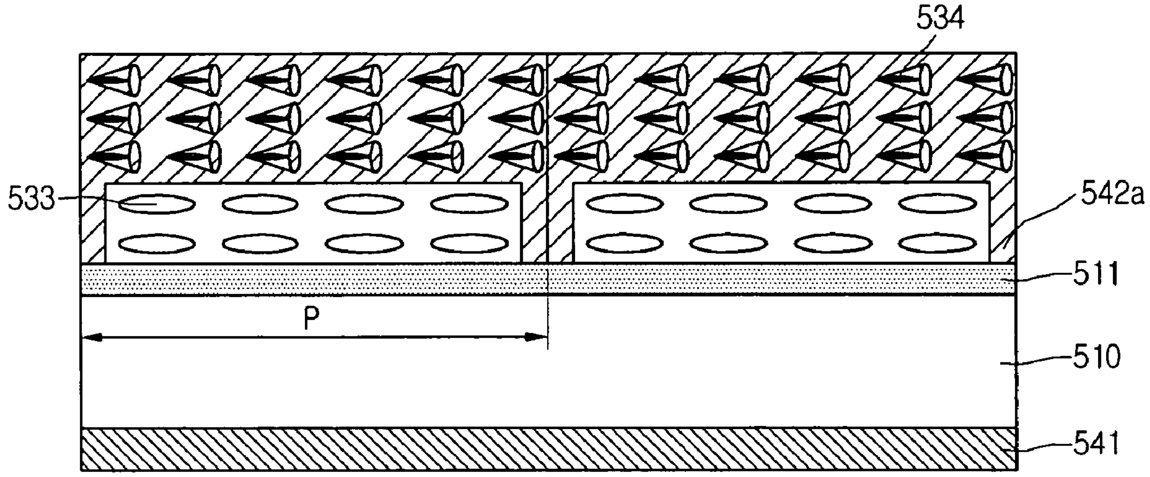

534
542
533
542a
531
510

Fig.9E



LIQUID CRYSTAL DISPLAY DEVICE AND FABRICATION METHOD THEREOF

TECHNICAL FIELD

[0001] The present invention relates to a liquid crystal display device (LCD), and more particularly, to a compact LCD of which a fabrication process is simplified, and the fabrication method thereof.

DESCRIPTION OF THE RELATED ART

[0002] In recent years, civilization has been rapidly advancing toward an information based society. This has created a demand for a flat panel display having properties such as thinness, decreased thickness, and low power consumption.

[0003] In general, since a liquid crystal display device (LCD) is a flat panel display that has improved visibility in comparison with a cathode ray tube (CRT) device. In addition, power consumption of the LCD is lower than that of the CRT for equal screen sizes. The LCD has been used as a next generation display device for mobile phones, computer monitors and televisions, in addition to other flat panel displays such as plasma display panels (PDP) and field emission displays (FED).

[0004] In the LCD, an electric field generation electrode is formed on each of two substrates and the surfaces of the substrate where the electrode are formed oppose each other. After a liquid crystal material is injected between two substrates, the LCD displays an image by controlling light transmissivity through the liquid crystal. The transmissivity varies with degree of rotation of liquid crystal molecules. The amount of rotation is dependent on an electric field generated by applying a voltage to the electrodes.

[0005] Generally, the liquid crystal molecules are anisotropic. The anisotropy of a liquid crystal cell or a film having those liquid crystal molecules is changed according to distributions of the liquid crystal molecules and distributions of tilt angels with respect to a substrate. Anisotropy is a factor for the polarization change of the light according to every viewing angle with respect to the cell or the film configured with the liquid crystal.

[0006] **FIG. 1** is a schematic view illustrating a structure of a related art LCD. As shown in the drawing, the LCD includes a lower substrate **120** having a thin film transistor (TFT), an upper substrate **130** having a color filter **133**, a liquid crystal film **140** filling a gap between the upper electrode **130** and the lower electrode **120**, a first polarizer plate **129** under the lower substrate **120** for transmitting external light as linearly polarized light, and a second polarizer plate **139** over the upper substrate **130** having a transmission axis vertical to the first polarizer plate **129**. The LCD also includes a back light unit **110** supplying light from a light source **111**. The back light unit **110** is disposed under a liquid crystal panel provided with the lower substrate **120**, the upper substrate **130** and the liquid crystal film **140**.

[0007] In the lower substrate **120**, a gate interconnection and a data interconnection are formed on a transparent substrate **121**. The gate interconnection intersects the data interconnection. In addition, a TFT is provided with a gate electrode **122** extended from the gate interconnection, a gate insulating layer **123** formed on the gate electrode **122**, a semiconductor layer **124** formed on the gate insulating layer **123**, source/drain electrodes **125***a* and **125***b* formed on the semiconductor layer **124**. A protection layer **126** is formed on the TFT. A pixel electrode **127** is connected to the drain electrode **125***b* of the TFT through a contact hole formed in the protection layer **126**.

[0008] In the upper electrode **130**, in order to inhibit light from being transmitted to a region other than that corresponding to the pixel electrode **127**, a black matrix **132** is formed on a transparent substrate **131**. Upon the black matrix **132**, color patterns **133** of red, green and blue are formed for displaying various colors. A common electrode **134** is formed on the color filter patterns **133**.

[0009] The first and the second polarizer plates **129** and **139** are formed on outer surfaces of each of the lower and the upper substrates **120** and **130** respectively. A transmission axis of the first polarizer plate **129** and that of the second polarizer plate are orthogonal. Incident light is polarized so that one component is transmitted and the other is absorbed or dispersed. That is, light is an electromagnetic wave having vibration direction is vertical to a propagation direction. The polarized light is biased toward the vibration direction. In other words, the polarized light is light that vibrates strongly in a predetermined direction among light vibrating in a plurality of directions perpendicular to the propagation direction.

[0010] Therefore, light emitted from the back light unit **110** disposed under the liquid crystal panel vibrates uniformly in all directions. The first and the second polarizer plates **129** and **139** transmit only light vibrating in the same direction to the polarization axis and they absorb or reflect light vibrating in the other directions by using a predetermined medium, to thereby make light vibrate in the predetermined direction.

[0011] Since the first and the second polarizer plates **129** and **139** are mounted on the lower and the upper substrates **120** and **130**, respectively, in order that the polarization axis of the polarizer plates **129** and **139** are orthogonal, an intensity of the transmitted light is controlled according to a rotation degree of the polarization axis while passing through the liquid crystal layer **140** so that it is possible to display gray scale between black and white.

[0012] In the LCD having the above structure, each of the upper and the lower substrates **120** and **130** is fabricated through its own fabrication process. The upper and the lower substrates **120** and **130** are then bonded and liquid crystal injected therebetween to form the liquid crystal pane. Thus, since the upper and the lower substrates **120** and **130** are separately fabricated and bonded together, the fabrication time increases for the liquid crystal panel and its fabrication process becomes complicated. Accordingly, the production yield decreases and the fabrication cost increases in the long run.

[0013] In addition, polarized light transmitted by the first polarizer plate **129** mounted on the lower substrate **120** of the liquid crystal panel is converted into non-polarized light while passing through an interior of the liquid crystal panel. Scattering of the light occurs due to stepped portions formed in the lower substrate **120** and the color filters **133** formed in the upper electrode **130** so that the polarized light is converted into non-polarized light. Therefore, light transmissivity of the LCD is decreased because of the non-polarized light, which decreases the contrast ratio.

SUMMARY

[0014] By way of introduction only, in one embodiment an LCD comprises: a first substrate having a plurality of red, green and blue pixel regions; an array device disposed on the first substrate; a second substrate including red, green and blue polymers each integrated with a partition wall that extends towards the first substrate; and a liquid crystal film between the first and the second substrates.

[0015] In another embodiment, an LCD comprises: a first substrate having a plurality of pixel regions; an array device on the first substrate; a partition wall at a boundary of each of the pixel regions on the first substrate; a second substrate having a reactive mesogen integrated with the partition wall; and a liquid crystal film in the pixel region partitioned by the partition wall.

[0016] In another embodiment, a method for fabricating an LCD comprises: a) forming an array device on a lower substrate in each of red, green and blue color pixel regions; b) providing a compound containing a liquid crystal and a photopolymeric color polymer on the lower substrate; c) photo-exposing a boundary of a color filter region to form a partition wall from the photopolymeric color polymer; and d) photo-exposing the photopolymeric color polymer in the red, the green and the blue color pixel regions to form an upper substrate having a color polymer, the color polymer phase-separated from the liquid crystal.

[0017] In another embodiment, a method for fabricating an LCD comprises: a) forming an array device in a pixel region on a lower substrate; b) providing a polymer compound having a liquid crystal and a reactive mesogen on the lower substrate; c) forming a partition wall at a boundary of the pixel region; and d) forming an upper substrate that is phase separated from the liquid crystal by photo-exposing the lower substrate.

[0018] It is to be understood that both the foregoing general description and the following detailed description of the present invention are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this application, illustrate embodiment(s) of the invention and together with the description serve to explain the principle of the invention. In the drawings:

[0020] **FIG. 1** is a schematic view illustrating a structure of a related art liquid crystal display device (LCD);

[0021] **FIGS. 2 and 3** a plan view and a sectional view of an LCD according to a first embodiment of the present invention, respectively;

[0022] **FIGS. 4A** to **4**H are sectional views illustrating a method for fabricating an LCD according to the first embodiment of the present invention;

[0023] **FIGS. 5A** to **5**E are sectional views illustrating a method for fabricating an LCD according to a second embodiment of the present invention;

[0024] **FIG. 6** is a sectional view illustrating a portion of an LCD according to a third embodiment of the present invention;

[0025] **FIGS. 7A** to **7**E are sectional views illustrating a method for fabricating an LCD according to the third embodiment of the present invention;

[0026] **FIG. 8** is a sectional view of an LCD according to a fourth embodiment of the present invention; and

[0027] **FIGS. 9A** to **9**E are sectional views illustrating a method for fabricating an LCD according to the fourth embodiment of the present invention.

DETAILED DESCRIPTION

[0028] Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts.

[0029] **FIGS. 2 and 3** are a plan view and a sectional view of an LCD according to a first embodiment of the present invention, respectively. Referring to **FIGS. 2 and 3**, upon a lower substrate **201**, there are formed a gate line **202**, a data line **204**, a thin film transistor (TFT) **230** formed at every intersection of the gate line **202** and the data line **204**, a pixel electrode **222** formed at a pixel region provided by that intersection structure, a storage capacitor **240** formed at an overlap region of the gate line **202** and a storage electrode **228**, a gate pad **250** connected to the gate line **202**, and a data pad **260** connected to the data line **204**. Herein, the gate line **202** intersects with the data line **204**, while a gate insulating layer **212** is interposed therebetween.

[0030] The gate line **202** applies a gate signal and the data line **204** applies a data signal. The gate line **202** and the data line **204** are formed in a shape of an intersection structure, to thereby define a pixel region **205**.

[0031] The TFT **230** maintains the charge of a pixel signal of the data line **204** at the pixel electrode **222** in response to a gate signal of the gate line **202**. To this end, the TFT **230** is provided with a gate electrode **206** connected to the gate line **202**, a source electrode **208** connected to the data line **204**, and a drain electrode **210** connected to the pixel electrode.

[0032] In addition, the TFT **230** also contains an active layer **214** which forms a channel between the source electrode **208** and the drain electrode **210**. The active layer **214** overlaps the underlying gate insulating layer **212** and the gate electrode **206**. The active layer **214** also overlaps the data line **204**, the data pad lower electrode **262** and the storage electrode **228**. On the active layer **214**, an ohmic contact layer **216** is additionally formed to provide good ohmic contact with the data line **204**, the source electrode **208**, the drain electrode **210**, the data pad lower electrode **262**, and the storage electrode **228**.

[0033] The pixel electrode **222** is connected to the drain electrode **210** of the TFT **230** through a first contact hole **220** penetrating a protection layer **218** and the pixel electrode **222** is formed in the pixel region **205**. As a result, an electric field is generated between a common electrode (not shown) to which a reference voltage is applied and the pixel electrode **222** to which the pixel signal is applied through the TFT **230**.

[0034] In in-plane switching devices, the common electrode may be formed on the substrate **201** adjacent to the pixel electrode **222** and have a plurality of branches in the pixel region **205**. In this case, a traverse electric field between the pixel electrode **222** and the common electrode is formed.

[0035] The storage capacitor **240** is provided with the gate line **202** and the storage electrode **228**. The storage electrode **228** overlaps the underlying gate insulating layer **212** and the gate line **202**. The storage electrode **228** is connected to the pixel electrode **222** through a second contact hole **242** which is formed in a protection layer **218** disposed on the TFT **230** and on which the pixel electrode **222** is formed. The storage capacitor **240** helps to maintain the pixel signal charged at the pixel electrode **222** until the next pixel signal is charged thereat.

[0036] The gate pad **250** is connected to a gate driver (not shown) so as to apply the gate signal to the gate line **202**. The gate pad **250** is provided with a gate pad lower electrode **252** extended from the gate line **202**, a gate pad upper electrode **254** connected to the gate pad lower electrode **252** through a third contact hole **256** penetrating the gate insulating layer **212** and the protection layer **218**.

[0037] The data pad **260** is connected to a data driver (not shown) so as to apply the data signal to the data line **204**. The data pad **260** is provided with a data pad lower electrode **262** extended from the data line **204**, and the data pad upper electrode **264** connected to the data pad lower electrode **262** through a fourth contact hole **266** penetrating the protection layer **218**.

[0038] Upon the lower substrate **201** of the LCD having the aforementioned structure, an alignment layer (not shown) is formed. An upper substrate **291** provides a color filter corresponding to every pixel region over the lower substrate **201** and a liquid crystal film is formed between the upper substrate **291** and the lower substrate **201**.

[0039] The upper substrate **291** is provided with a red color filter substrate **291***r*, a green color filter substrate **291***g*, and a blue color filter substrate **291***b*. The upper substrate **291** is separated from the lower substrate **201** by a predetermined space, and is formed of high molecular polymer material. Partition walls **299** separate adjacent color filters **291***r*, **291***g* and **291***b*. The partition walls **299** may be formed in various structures such as a stripe, a square, a diamond, a triangle or the like.

[0040] Since the upper substrate **291** is formed by gradual growth over the lower substrate **201** using a photoreaction, it is possible to simultaneously form the upper substrate **291** and the liquid crystal film during the fabrication of the lower substrate **201**. This decreases the amount of time to fabricate the LCD and increases the yield of the LCD as the LCD is fabricated without fabricating an additional substrate and then bonding the fabricated upper substrate together with the lower substrate. In addition, as the upper substrate and the lower substrate are integrated so that bonding is not used, which further improves the fabrication yield and reduces the cost as sealant for bonding is not used.

[0041] Moreover, in forming the upper substrate in the LCD according to the present invention, the partition walls are formed at boundaries of the pixel regions so that the partition walls act as spacers of the upper substrate. The partition walls of the LCD thus additionally maintain a uniform thickness of the liquid crystal panel without the use of additional spacers.

[0042] **FIGS. 4A** to **4**H are sectional views illustrating a method for fabricating an LCD according to the first embodiment of the present invention. Herein, a description for the TFT will be omitted because it has been illustrated already. Thus, detail descriptions are focused on processes for forming the liquid crystal film and the upper substrate for each of red, green and blue pixels.

[0043] Referring to **FIG. 4A**, the gate insulating layer **212** is formed on the lower substrate **201** and the data lines **204** for identifying the pixel region of red, green and blue are formed on the gate insulating layer **212**. Thereafter, the protection layer **218** is formed on the data lines **204**. The alignment layer may be formed on the protection layer **218**.

[0044] Referring to **FIG. 4B**, a red compound **280***r* is formed on the lower substrate **201**. The red compound **280***r* contains a photopolymeric red color filter resin monomer **282***r*, a liquid crystal (LC) **281**, and a binder monomer (not shown). The red color filter resin monomer **282***r* becomes polymerized when irradiated with ultraviolet (UV) light.

[0045] Thereafter, referring to **FIG. 4C**, after providing a mask **296** at a predetermined location over the lower substrate **201** where the red compound **280***r* is formed, boundaries of the red pixel region R are photo-exposed first. The mask **296** has a transmission part **296***a* and a blocking part **296***b*. The transmission part **296***a* is formed corresponding to the boundary of the red pixel region R on the lower substrate **201**. Therefore, when UV light irradiates the mask **296**, the UV light passing through the transmission part **296***a* polymerizes the underlying photopolymeric red color filter resin monomer **282***r* of the red compound **280***r* to thereby form a partition wall **299***a* which acts as a seed.

[0046] Referring to **FIG. 4D**, a mask **295** is provided at a predetermined location over the lower substrate **201** where the partition wall **299***a* is formed, and then the red pixel region R is photo-exposed. The mask **295** has a transmission part **295***a* and a blocking part **295***b*. The transmission part **295***a* is formed corresponding to the red pixel region R on the lower substrate **201**. Accordingly, if the UV light irradiates the mask **295**, the UV light passing through the transmission part **295***a* polymerizes the underlying photopolymeric red color filter resin monomer **282***r* of the red compound **280***r* that is formed on the red pixel region R.

[0047] Due to polymerization of the red color filter resin monomer **282***r*, the liquid crystal **281** and the polymer are separated from each other so that the red color filter resin monomer **282***r* and the binder monomer grow from the partition wall **299***a*, to thereby form the upper substrate and the red color filter substrate **291***r* acting as the red color filter. Thus, the liquid crystal **281** and the red color filter substrate **291***r* are formed on the red pixel region R of the lower substrate **201**.

[0048] Afterwards, the red compound **280***r* formed on the blue and the green pixel regions B and G are removed. Subsequently, referring to **FIG. 4E**, a partition wall **299***b*, which serves as a seed, is formed at a boundary of the blue pixel region B over the lower substrate **201**.

[0049] To this end, a blue compound **280***b* is formed on the lower substrate **201**. The blue compound **280***b* contains a photopolymeric blue color filter resin monomer **282***b*, a liquid crystal (LC) **281**, and a binder monomer (not shown). The blue color filter resin monomer **282***b* becomes polymerized when irradiated with UV light.

[0050] Thereafter, after providing a mask **296** at a predetermined location over the substrate **201** where the blue compound **280***b* is formed, a boundary of the blue pixel region B is photo-exposed first. The mask **296** has a transmission part **296***a* and a blocking part **296***b*. The transmission part **296***a* is formed corresponding to the boundary of the blue pixel region B on the lower substrate **201**. Although the reference number of the above mask **296** is identical to that of the mask **296** used for forming the partition wall **299***a* of the red color filter substrate **291***r*, the same mask may be used by shifting the mask used for the red color filter substrate **291***r* or a different mask may be used. When UV light irradiates the mask **296**, the UV light passing through the transmission part **296***a* polymerizes the photopolymeric blue color filter resin monomer **282***b* of the blue compound **280***b* to thereby form the partition wall **299***b*. The partition wall **299***b*, in turn, acts as the seed.

[0051] Referring to **FIG. 4F**, a mask **295** is positioned at a predetermined location over the substrate **201** where the partition wall **299**B is formed, and then the blue pixel region B is photo-exposed. The mask **295** has a transmission part **295***a* and a blocking part **295***b*. The transmission part **295***a* is formed corresponding to the blue pixel region B on the lower substrate **201**. Accordingly, if UV light irradiates the mask **295**, the UV light passing through the transmission part **295***a* polymerizes the photo polymer blue color filter resin monomer **282***b* of the blue compound **280***b* that is formed on the blue pixel region B. Again, although the reference number of the above mask **295** is identical to that of the mask **295** used for forming the red color filter substrate **291***r*, the same mask may be used by shifting the mask for the red color filter substrate **291***r* by a predetermined distance or a different mask may be used.

[0052] Due to polymerization of the blue color filter resin monomer **282***b*, the liquid crystal **281** and the polymer are phase-separated from each other so that the blue color filter resin monomer **282***b* and the binder monomer grow from the partition wall **299***b*, to thereby form the blue color filter substrate **291***b* of the upper substrate. Therefore, the liquid crystal **281** and the blue color filter substrate **291***b* are formed on the blue pixel region B of the lower substrate **201**. Afterwards, the blue compound **280***b* formed on the red and the green pixel regions R and G are removed.

[0053] Referring to **FIG. 4G**, a partition wall **299***g*, which serves as a seed, is formed at a boundary of the green pixel region G over the lower substrate **201**. To begin with, a green compound **280***g* is formed on the lower substrate **201**. The green compound **280***g* contains a photopolymeric green color filter resin monomer **282***g*, a liquid crystal (LC) **281**, and a binder monomer (not shown). The green color filter resin monomer **282***g* becomes polymerized when irradiated with UV light.

[0054] Thereafter, after providing a mask **296** at a predetermined location over the substrate **201** where the green compound **280***g* is formed, a boundary of the green pixel region G is photo-exposed first. The mask **296** has a transmission part **296***a* and a blocking part **296***b*. The transmission part **296***a* is formed corresponding to the boundary of the green pixel region G on the lower substrate **201**. Although the reference number of the above mask **296** are identical to that of the mask **296** used for forming the partition walls **299***a* and **299***b* of the red and blue color filter substrates **291***r* and **291***b*, the same mask may be used by shifting the mask used for the red or the blue color filter substrate **291***r* and **291***b* by a predetermined distance or a different mask may be used. When the UV light irradiates the mask **296**, the UV light passing through the transmission part **296***a* polymerizes the photo polymer green color filter resin monomer **282***g* of the green compound **280***g* to thereby form the partition wall **299***g*. The partition wall **299***g* acts as the seed.

[0055] Referring to **FIG. 4H**, a mask **295** is provided at a predetermined location over the substrate **201** where the partition wall **299***c* is formed, and then the green pixel region G is photo-exposed. The mask **295** has a transmission part **295***a* and a blocking part **295***b*. The transmission part **295***a* is formed corresponding to the green pixel region G on the lower substrate **201**. Although the reference number of the above mask **295** are identical to that of the mask **295** used for forming the red and the blue color filter substrates **291***r* and **291***b*, the same mask used for the red or the blue color filter substrate **291***r* and **291***b* may be used by shifting the mask by a predetermined distance or a different mask may be used.

[0056] When the UV light irradiates the mask **295**, the UV light passing through the transmission part **295***a* of the mask **295** polymerizes the photopolymeric green color filter resin monomer **282***g* of the green compound **280***g* formed on the green pixel region G. Due to polymerization of the green color filter resin monomer **282***g*, the liquid crystal **281** and the polymer are phase-separated from each other so that the green color filter resin monomer **282***g* and the binder monomer grow from the partition wall **299***g*, to thereby form the green color filter substrate **291***g* of the upper substrate **291**. Therefore, the liquid crystal **281** and the green color filter substrate **291***b* are formed on the green pixel region G of the lower substrate **201**. Afterwards, the other green compound **280***g* is removed.

[0057] As described above, the upper substrate **291** is formed for each pixel region over the lower electrode **201** and the liquid crystal **281** is formed between the upper substrate **291** and the lower substrate **201**. The upper substrate **291** is provided with the red color filter substrate **291***r*, the green color filter substrate **291***g*, and the blue color filter substrate **291***b*. There are partition walls **299** between two of the color filter substrates **291***r*, **291***g* and **291***b* in the upper substrate **291** so that one color filter substrate is separated from another.

[0058] Therefore, according to the present invention, since the upper substrate and the liquid crystal film are simultaneously formed on the lower substrate by phase separation during fabrication of the lower substrate of the LCD, the upper and the lower substrates of the liquid crystal panel can be integrated so that it is possible to enhance fabrication yield and simplify the fabrication process, and further increase expediency. Furthermore, the upper substrate and the lower substrate integrated so that bonding of the substrates and an additional fabrication process for the upper substrate may be avoided, which further improves the fabrication yield. In addition, use of a sealant for bonding the upper and the lower substrates may be avoided thereby reducing the fabrication cost. In forming the upper substrate in the LCD, the partition walls are formed at boundaries of the pixel regions so that the partition walls maintain a uniform thickness of the liquid crystal panel and uniform image.

[0059] **FIGS. 5A** to **5**E are sectional views illustrating a method for fabricating an LCD according to a second embodiment of the present invention. Herein, like reference numerals in the drawings denote like elements so that detail descriptions for those elements, which are identical to the elements illustrated in **FIGS. 4A** to **4**H, are omitted.

[0060] To begin with, referring to **FIG. 5A**, a seed **399** is formed at boundaries of a red, a green and a blue pixel regions on a lower substrate **301**. The seed **399** comprises a polymer material and is formed at the boundaries of the pixel regions of the lower substrate **301** by a method using a stamp **398** or a mold. The method for forming the seed **399** on the lower substrate **301** may employ a printing method using a silk screen, a transcription method of a pattern, or an imprinting method.

[0061] The seed **399** may be formed of a polymer material containing a black resin. The seed **399** may be formed in a black matrix pattern, i.e., region of a gate line, data line, a boundary of a pixel region, a TFT region and so forth so that it may be substituted for the black matrix.

[0062] Thereafter, referring to **FIG. 5B**, a red compound **380***r* is formed on the lower substrate **301**. The red compound **380***r* contains a photopolymeric red color filter resin monomer **382***r*, a liquid crystal (LC) **381**, and a binder monomer (not shown).

[0063] Thereafter, referring to **FIG. 5C**, after providing a mask **395** at a predetermined location over the substrate **301** where the seed **399** is formed, the red pixel region R is photo-exposed. The mask **395** has a transmission part **395***a* and a blocking part **395***b*. The transmission part **395***a* is formed corresponding to the red pixel region R on the lower substrate **301**. When UV light irradiates the mask **395**, the UV light passing through the transmission part **395***a* polymerizes the photopolymeric red color filter resin monomer **382***r* of the red compound **380***r* formed on the red pixel region R.

[0064] Due to polymerization of the red color filter resin monomer **382***r*, the liquid crystal and the polymer are phase-separated from each other so that the red color filter resin monomer **382***r* and the binder monomer grow from the seed **399**, to thereby form the red color filter substrate **391***r* of the upper substrate **391**. Therefore, the liquid crystal **381** and a red color filter substrate **391***r* are formed on the red pixel region R of the lower substrate **301**. Afterwards, the red compound **380***r* formed on the blue and the green pixel regions B and G are removed.

[0065] Referring to **FIG. 5D**, a blue compound **380***b* is formed on the lower substrate **301** and a mask **395** is disposed at a predetermined location over the lower substrate **301**. Then, a photo-exposure is performed so as to form a blue color filter substrate **391***b* and the liquid crystal **381** on the blue pixel region by phase separation. Thereafter, the blue compound **380***b* formed on the other regions is removed.

[0066] Subsequently, referring to **FIG. 5E**, a green compound **380***g* is formed on the lower substrate **301** and a mask **395** is formed at a predetermined location over the lower substrate **301**. Then, a photo-exposure is performed so as to form a green color filter substrate **391***g* and the liquid crystal **381** on the green pixel region by the phase separation. Thereafter, the green compound **380***g* formed on the other regions is removed.

[0067] As described above, since it is possible to reduce the fabrication process by forming the seed **399** on the boundary of each pixel region at an initial stage of the fabrication process, the fabrication yield is improved. In addition, after the liquid crystal and the photopolymeric color filter resin are mixed and coated on the array substrate following the formation of the array substrate, the upper layer is formed coincidently with the red, the green and the blue color filters by the phase separation. Therefore, this also enhances the fabrication yield, simplifies the fabrication process and reduces the fabrication cost.

[0068] In addition, the upper substrate is used as the color filter substrate without preparing an additional color filter layer, which decreases the thickness of the LCD. Also, in an LCD of the present invention incorporating a polarizer film or a compensation film, the upper substrate and one of the polarizer film and the compensation film may be integrated while the array substrate is formed, and then the liquid crystal film may also be formed using the phase separation.

[0069] **FIG. 6** is a sectional view illustrating a portion of an LCD according to a third embodiment of the present invention. In the LCD of the third embodiment of the present invention, an alignment layer **411** is formed on an array substrate **410** where an array device having a plurality of TFTs in a matrix shape is formed. Though the array device is formed between the array substrate **410** and the alignment layer **411**, the drawing is not shown in detail.

[0070] Referring to **FIG. 6**, the alignment layer **411** is formed on the array substrate **410** and a reactive liquid crystal substrate **432** is formed at each pixel region on the array substrate **410**. The liquid crystal film **433** is formed between the reactive liquid crystal substrate **432** and the array substrate **410**.

[0071] The reactive liquid crystal substrate **432** is opposite to the array substrate **410** and is separated from the array substrate **410** by a predetermined space. The reactive liquid crystal substrate **432** contains a reactive mesogen **434** and a binder monomer (not shown) and acts as a retarder. The reactive liquid crystal substrate **432** for each pixel region is also separated from each other by means of a partition wall **432***a*.

[0072] Under the lower substrate **410**, a lower polarizer film **441** is formed and an upper polarizer film **442** is formed on the reactive liquid crystal substrate **432**. A lower retarder **431** is formed between the array substrate **410** and the lower polarizer film **442**.

[0073] In addition, since the reactive liquid crystal substrate **432** is formed coincidently with the liquid crystal film **433** on the array substrate **410** by virtue of the phase separation, the liquid crystal panel is completed while fabricating the array substrate **410**. This improves the fabrication yield, simplifies the fabrication process and further increases expediency. Furthermore, since the lower array substrate **410** and the reactive liquid crystal substrate **432** are integrated, bonding, formation of the upper substrate, and formation of the retarder may be avoided. Therefore, the fabrication yield is further enhanced and the fabrication cost can be reduced because use of the sealant may be avoided.

[0074] The reactive liquid crystal substrate **432** may serve as a color filter by employing a color filter resin as well as the reactive mesogen **434** and the binder monomer (not shown). Dependent on various pixel structures of the red, green and blue pixels, it is possible to apply the partition wall **432***a* to various structures such as a stripe, a square, a diamond, a triangle structure or the like. The color filter may also be formed on the array substrate **410**.

[0075] The reactive liquid crystal substrate acts as the retarder to compensate for a phase difference in the transmitted light. Since the reactive liquid crystal substrate may be formed at each pixel or be formed at a predetermined pixel group arbitrarily selected from the pixels, it is possible to compensate the phase difference for every pixel with different retardations or to control failure pixels generated at a specific location by means of the phase compensation.

[0076] In the reactive liquid crystal substrate of the LCD according to the present invention, the upper substrate is formed incorporating the partition walls therein at the boundaries of the pixel regions so that the partition walls maintain a uniform thickness of the liquid crystal panel and also keep the image of the LCD uniform.

[0077] Detail descriptions regarding a method for fabricating the liquid crystal panel having the above structure will be set forth hereinafter as illustrated in **FIGS. 7A** to **7**E. **FIGS. 7A** to **7**E are sectional views illustrating a method for fabricating the LCD according to a third embodiment of the present invention. Herein, an explanation for the fabrication of the TFT is omitted but detail illustrations focus on processes of forming a liquid crystal film and a reactive liquid crystal substrate.

[0078] Though it is not shown in the drawings, gate and data interconnections are formed on an array substrate, while the gate and data lines intersect each other. In addition, the LCD contains a TFT provided with a gate electrode extended from the gate interconnection, a gate insulating layer formed over entire the structure having the gate electrode, a semiconductor layer formed on the gate insulating layer, and source/drain electrodes formed on the semiconductor layer. A pixel electrode is connected to the drain electrode of the TFT through a contact hole formed in a protection layer.

[0079] An electric field is generated between the pixel electrode to which the pixel signal is applied through the TFT and the common electrode to which the reference voltage is applied. In an in-plane mode device, the common electrode may have a plurality of branches interdigitated with the pixel electrode in the pixel region. In this case, a traverse electric field is formed between the pixel electrode and the common electrode. Transmissivity of the light transmitted through the pixel region varies with the degree of rotation of the liquid crystal molecules, to thereby provide a gradation. Moreover, a fringe field between the pixel electrode and the common electrode drives the liquid crystal since the common electrode is formed under the pixel electrode on the lower substrate and the pixel electrode has a plurality of branches.

[0080] Referring to **FIG. 7A**, an alignment layer **411** is formed wholly on the substrate in which a predetermined structure described above has been completed.

[0081] As illustrated in **FIG. 7B**, a liquid crystal compound **430** is coated on the array substrate **410**. The liquid crystal compound **430** contains a UV curable reactive mesogen **434**, a binder monomer (not shown) and a liquid crystal **433***a*. The reactive mesogen **434** is polymerized when irradiated with UV light to form a reactive liquid crystal substrate **432** which serves as an upper substrate with the binder monomer.

[0082] Thereafter, referring to **FIG. 7C**, after providing a mask **450** at a predetermined location over the substrate **410**, a boundary of the pixel region P is photo-exposed first. The mask **450** has a transmission part **450***a* and a blocking part **450***b*, wherein the transmission part **450***a* is formed corresponding to the boundary of the pixel region P on the lower substrate **410**. When the UV light irradiates the mask **450**, the UV light passing through the transmission part **450***a* polymerizes the reactive mesogen **434** and the binder monomer of the liquid crystal compound **430** to thereby form a partition wall **432***a* of a polymer. The partition wall **432***a* acts as a seed.

[0083] Dependent on the pixel structures of the red, green and blue pixels, it is possible to apply the partition wall **432***a* to various structures such as a stripe, a square, a diamond, a triangle structure or the like. The partition wall **432***a* may be formed by a seed at the boundary of the pixel region disposed on the array substrate **410**. To this end, the polymer seed **399** is formed at the boundaries of the pixel regions disposed on the lower substrate **410** by a method using a stamp or a mold. The method for forming the seed on the lower substrate may employ a printing method using a silk screen, a transcription method of a pattern, or an imprinting method. The seed may be formed of a polymer material incorporating a black resin. The seed may be formed in a black matrix pattern, i.e., region of a gate line, data line, a boundary of a pixel region, a TFT region and so forth so that it may substitute for the black matrix.

[0084] Afterwards, referring to **FIG. 7D**, the UV light irradiates the array substrate **410** where the partition wall **432***a* is formed. Since the UV light polymerizes the reactive mesogen **434** and the binder monomer of the liquid crystal compound **430**, the polymer gradually grows from the partition wall **432***a* and is phase-separated from the liquid crystal **433***a*, so as to form the reactive liquid crystal substrate **432**. That is, due to polymerizing of the reactive mesogen **434** and the binder monomer by means of the photopolymerization, the liquid crystal **433***a* and the polymer are phase-separated from each other so that the reactive liquid crystal substrate **432** of the upper substrate is formed from the partition wall **432***a*. Accordingly, the liquid crystal film **433** and the reactive liquid crystal substrate **432** are formed wholly on the array substrate **410**.

[0085] The reactive liquid crystal substrate **432** serves as a retarder. Provided that the reactive liquid crystal substrate **432** has d in thickness, a retardation becomes Δnd, where Δn denotes a birefringence index of the reactive mesogen.

[0086] Referring to **FIG. 7E**, an upper polarizer film **442** is formed on the reactive liquid crystal substrate **432** and a lower polarizer film **441** is formed below the array substrate

410 to complete the liquid crystal panel. Since the reactive liquid crystal substrate **432** serving as the retarder is coincidently formed with the liquid crystal film **433** during fabrication of the array substrate of the liquid crystal panel through phase separation, the upper and the lower substrates are integrated. As a result, the fabrication yield increases, the fabrication process is simplified and expediency is increased.

[0087] In addition, the reactive liquid crystal substrate **432** may act as a color filter by incorporating therein a color filter resin as well as the reactive mesogen **434** and the binder monomer (not shown). Dependent on the various pixel structures of the red, green and blue pixels, it is possible to apply the partition wall **432***a* to various structures such as a stripe, a square, a diamond, a triangle structure or the like. The color filter may be formed on the array substrate.

[0088] According to the present invention, since the reactive liquid crystal substrate **432** and the liquid crystal film **433** are simultaneously formed on the lower substrate **410** by phase separation during fabrication of the lower substrate of the LCD, the liquid crystal panel can be completed while fabricating the array substrate **410**. This enhances fabrication yield and simplifies the fabrication process. Moreover, in forming the upper substrate in the LCD according to the present invention, the partition walls are formed at boundaries of the pixel regions so that the partition walls act as spacers of the upper substrate. In addition, because the upper substrate and the retarder are formed at the same time, use of an additional retarder may be avoided, decreasing the thickness of the LCD. In addition, the reactive liquid crystal substrate acts as a retarder to compensate for the phase difference. Because the reactive liquid crystal substrate may be formed at each pixel or be formed at a predetermined pixel group arbitrarily selected from the pixels, it is possible to compensate the phase difference for every pixel with different retardations or to control failure pixels generated at a specific location by means of the phase compensation.

[0089] **FIG. 8** is a sectional view illustrating a portion of an LCD according to a fourth embodiment of the present invention. As described already, an array device where TFTs are formed in a shape of a matrix is configured on an array substrate **510**. An alignment layer is formed on the array substrate **510**.

[0090] Referring to **FIG. 8**, a polarizer substrate **542** is formed for each pixel region on the array substrate **510** and a liquid crystal film **533** is formed between the polarizer substrate **542** and the array substrate **510**. The polarizer substrate **542** is opposite to the array substrate **510** and is separated from the array substrate **510** by a predetermined space.

[0091] The polarizer substrate **542** contains a reactive mesogen **534** and a binder monomer (not shown). The reactive mesogen **534** is a smetic liquid crystal monomer. In particular, it is preferable to use a smetic-A phase liquid crystal.

[0092] The polarizer substrate **542** has a separation structure that it is separated by means of the partition wall **542***a* in every pixel region. Dependent on the various pixel structures of the red, green and blue pixels, it is possible to apply the partition wall **542***a* to various structures such as a stripe, a square, a diamond, a triangle structure or the like.

[0093] The polarizer substrate **542** serves as a polarizer film as well as the upper substrate. In addition, because the polarizer substrate **542** and the liquid crystal film **533** are simultaneously formed on the array substrate **510** by phase separation during fabrication of the lower substrate of the LCD, the liquid crystal panel can be completed while fabricating the array substrate **510**. This enhances fabrication yield and simplifies the fabrication process.

[0094] Moreover, the polarizer substrate **542** of the liquid panel has the partition walls therein which are formed at boundaries of the pixel regions so as to form the upper substrate so that the partition walls act as spacers of the upper substrate. In addition, because the upper substrate and the polarizer substrate are formed at the same time in the liquid crystal panel, use of an additional polarizer film may be avoided, decreasing the thickness of the LCD.

[0095] Detail descriptions regarding a method for fabricating the liquid crystal panel having the above structure will be set forth hereinafter as illustrated in **FIGS. 9A** to **9**E. **FIGS. 9A** to 9E are sectional views illustrating a method for fabricating the LCD according to a fourth embodiment of the present invention. Herein, an explanation for the fabrication of the TFT is omitted but detail illustrations focus on processes of forming a liquid crystal film and an upper polarizer substrate.

[0096] To begin with, referring to **FIG. 9A**, an alignment layer **511** is formed on an array substrate **510**.

[0097] Referring to **FIG. 9B**, a liquid crystal compound **530** is coated on the array substrate **510**. The liquid crystal compound **530** contains a reactive mesogen **534**, a binder monomer and a liquid crystal **533**.

[0098] The reactive mesogen **534** is formed of a smetic liquid crystal. The reactive mesogen **534** is polymerized when irradiated with UV light to form the polarizer substrate **542** serving as the upper substrate with the binder monomer.

[0099] The liquid crystal compound **530** contains a black dye. The liquid crystal **533** and the black dye are aligned by virtue of the alignment layer **511**.

[0100] Thereafter, referring to **FIG. 9C**, after providing a mask **550** at a predetermined location over the array substrate **510**, a boundary of the pixel region is photo-exposed first. The mask **550** has a transmission part **550***a* and a blocking part **550***b*. The transmission part **550***a* is formed corresponding to the boundary of the pixel region on the array substrate **510**. When UV light irradiates the mask **550**, the UV light passing through the transmission part **550***a* polymerizes the reactive mesogen **534** and the binder monomer of the liquid crystal compound **530** through photopolymerization to thereby form a partition wall **542***a*. The partition wall **542***a* acts as a seed.

[0101] Dependent on the various pixel structures of the red, green and blue pixels, it is possible to apply the partition wall **542***a* to various structures such as a stripe, a square, a diamond, a triangle structure or the like. The partition wall **542***a* may be formed by a seed at the boundary of the pixel region disposed on the array substrate **510**. To this end, the seed of a polymer material is formed at the boundaries of the pixel regions disposed on the array substrate **510** by a method using a stamp or a mold. The method for forming the seed on the lower substrate may employ a printing method using a silk screen, a transcription method of a pattern, or an imprinting method.

[0102] The seed may be formed of a polymer material containing a black resin. The seed may be formed in a black matrix pattern, i.e., region of a gate line, data line, a boundary of a pixel region, a TFT region and so forth so that it may be substituted for the black matrix.

[0103] Afterwards, referring to **FIG. 9D**, the UV light irradiates the array substrate **510** where the partition wall **542***a* is formed. The UV light polymerizes the reactive mesogen **534** and the binder monomer of the liquid crystal compound **530** so that the polymer grows from the partition wall **542***a* and is phase-separated from the liquid crystal **533**, thereby forming a polarizer substrate **542**.

[0104] That is, due to polymerizing of the reactive mesogen **534** and the binder monomer by means of photo-polymerization, the liquid crystal **533** and the polymer are phase-separated from each other so that the polarizer substrate **542** are formed from the partition wall **542***a*, which serves as a polarizer film as well as the upper substrate.

[0105] The polarizer substrate **542** forms absorption gratings for the polarized light by structuring smetic liquid crystals, e.g., smetic A-phase liquid crystals, in a shape of a bookshelf. Therefore, by virtue of the polymerization, the polarizer substrate **542**, in which the upper substrate and the upper polarizer film are integrated, is formed coincidently with the liquid crystal film **530** through the phase separation. Since it is possible to form the polarizer substrate **542** with a sufficient thickness, it is possible to secure an optical density (OD). The liquid crystal film **530** and the polarizer substrate **542** are wholly formed on the array substrate **510**.

[0106] Referring to **FIG. 9E**, a lower polarizer film **541** is formed under the array substrate **510**. Since the polarizer substrate and the liquid crystal film are simultaneously formed on the lower substrate by phase separation during fabrication of the lower substrate of the LCD, the liquid crystal panel can be completed while fabricating the array substrate so that it is possible to enhance a fabrication yield and simplify the fabrication process.

[0107] In addition, because there is polarization effect at the polarizer substrate in the liquid crystal panel, use of an additional polarizer film may be avoided, thereby decreasing the thickness of the LCD. Since the polarizer substrate serving as a polarizer plate is coincidently formed with the liquid crystal film during fabrication of the array substrate of the liquid crystal panel through the phase separation, the upper and the lower substrates integrated. As a result, the fabrication yield increases and the fabrication process simplified.

[0108] In the reactive liquid crystal substrate and the polarizer substrate of the LCD according to the present invention, the partition wall is formed at the boundary of the pixel region in forming the upper substrate so that the partition wall maintains a uniform thickness of the liquid crystal panel and also keeps a uniform image of the LCD. In addition, since the upper substrate is formed coincidently with the polarizer substrate in the liquid crystal panel according to the present invention, use of an additional polarizer film may be avoided, decreasing the thickness of the LCD.

[0109] It will be apparent to those skilled in the art that various modifications and variations can be made in the present 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.

What is claimed is:

1. An LCD (liquid crystal display device) comprising:

a first substrate having a plurality of red, green and blue pixel regions;

an array device disposed on the first substrate;

a second substrate including red, green and blue polymers each integrated with a partition wall that extends towards the first substrate; and

a liquid crystal film between the first and the second substrates.

2. The LCD according to claim 1, wherein the second substrate includes a photopolymeric color filter resin monomer and a binder monomer.

3. The LCD according to claim 1, wherein the partition wall is disposed on the first substrate.

4. The LCD according to claim 1, wherein the partition wall is disposed at boundaries of the red, the green and the blue pixel regions.

5. The LCD according to claim 4, wherein the partition wall has the same color as the polymer from which the partition wall extends.

6. The LCD according to claim 1, wherein the partition wall has a predetermined structure selected from the group consisting of a stripe structure, a diamond structure, a square structure and a triangle structure.

7. The LCD according to claim 1, wherein a seed is disposed on the first substrate at a position corresponding to the partition wall.

8. The LCD according to claim 7, wherein the seed comprises a black pattern.

9. The LCD according to claim 7, wherein the partition wall contacts the seed.

10. The LCD according to claim 1, wherein different color partition walls contact each other along the entirety of the partition walls.

11. A method for fabricating an LCD, comprising:

a) forming an array device on a lower substrate in each of red, green and blue color pixel regions;

b) providing a compound containing a liquid crystal and a photopolymeric color polymer on the lower substrate;

c) photo-exposing a boundary of a color filter region to form a partition wall from the photopolymeric color polymer; and

d) photo-exposing the photopolymeric color polymer in the red, the green and the blue color pixel regions to form an upper substrate having a color polymer, the color polymer phase-separated from the liquid crystal.

12. The method according to claim 11, wherein the color polymer includes a red, a green and a blue color filter resin monomers and a binder monomer.

13. The method according to claim 11, wherein the upper substrate is partitioned at every pixel region.

14. The method according to claim 11, wherein the liquid crystal in each of the pixel regions is separated by the partition wall.

15. The method according to claim 11, wherein the partition wall has the same color as the polymer from which the partition wall extends.

16. The method according to claim 11, wherein the partition wall has a predetermined structure selected from the group consisting of a stripe structure, a diamond structure, a square structure and a triangle structure.

17. The method according to claim 11, wherein different color partition walls contact each other along the entirety of the partition walls.

18. The method according to claim 11, wherein c) and d) are sequentially carried out for the red, the green and the blue color pixel regions.

19. The method according to claim 11, further comprising, before c), forming a seed at the boundary of each of the color pixel regions on the lower substrate.

20. The method according to claim 19, wherein the partition wall contacts the seed.

21. The method according to claim 19, wherein the seed comprises a black polymer material.

22. The method according to claim 19, wherein the seed is formed by using a stamp or a mold.

23. The method according to claim 19, wherein the seed is formed by using a method selected from the group consisting of a silk screen method, a printing method, an imprinting method and a transcription method.

24. The method according to claim 19, wherein the color filter in the red, the green and the blue color pixel regions is formed sequentially.

25. The method according to claim 24, wherein the compound is removed after being photo-exposed and a compound containing a photopolymeric color polymer having a color different from the color filter of the upper substrate is provided on the lower substrate.

26. The method according to claim 19, wherein the seed is formed at boundaries having a plurality of the same-colored pixel regions.

27. The method according to claim 19, wherein the seed has a predetermined structure selected from the group consisting of a stripe structure, a diamond structure, a square structure and a triangle structure.

28. The method according to claim 19, wherein the color polymer of the upper substrate is grown from the seed.

29. The method according to claim 11, wherein the partition wall and color polymer of the upper substrate are integral.

30. An LCD comprising:

a first substrate having a plurality of pixel regions;

an array device on the first substrate;

a partition wall at a boundary of each of the pixel regions on the first substrate;

a second substrate having a reactive mesogen integrated with the partition wall; and

a liquid crystal film in the pixel region partitioned by the partition wall.

31. The LCD according to claim 30, wherein the second substrate includes a nematic liquid crystal.

32. The LCD according to claim 30, wherein the second substrate includes a smetic liquid crystal.

33. The LCD according to claim 30, wherein the second substrate includes a smetic A-phase liquid crystal.

34. The LCD according to claim 30, wherein the second substrate includes a binder monomer.

35. The LCD according to claim 30, wherein the second substrate transmits polarized light therethrough.

36. The LCD according to claim 30, wherein the second substrate retards a phase of light transmitted therethrough.

37. The LCD according to claim 30, wherein the second substrate includes a black dye.

38. The LCD according to claim 37, further comprising an alignment layer disposed on the second substrate.

39. The LCD according to claim 38, wherein the black dye is aligned by the alignment layer.

40. A method for fabricating an LCD, comprising:

a) forming an array device in a pixel region on a lower substrate;

b) providing a polymer compound having a liquid crystal and a reactive mesogen on the lower substrate;

c) forming a partition wall at a boundary of the pixel region; and

d) forming an upper substrate that is phase separated from the liquid crystal by photo-exposing the lower substrate.

41. The method according to claim 40, wherein the upper substrate is grown from the partition wall and is formed through polymerization.

42. The method according to claim 40, wherein the upper substrate includes the reactive mesogen.

43. The method according to claim 40, wherein the polymer compound includes a black dye.

44. The method according to claim 40, wherein the polymer compound includes a binder monomer.

45. The method according to claim 40, wherein the upper substrate has a predetermined retardation.

46. The method according to claim 40, wherein the upper substrate transmits polarized light therethrough.

47. The method according to claim 40, wherein a nematic liquid crystal is disposed between the upper substrate and the lower substrate.

48. The method according to claim 40, wherein a smetic liquid crystal is disposed between the upper substrate and the lower substrate.

49. The method according to claim 40, further comprising, after a), forming an alignment layer on the lower substrate.

50. The method according to claim 40, wherein c) is carried out by polymerizing the polymer compound through photo-exposing the boundary of the pixel region.

51. The method according to claim 40, wherein c) is carried out by using a stamp or a mold.

52. The method according to claim 40, wherein the partition wall is formed by using a method selected from the group consisting of a silk screen method, a printing method, an imprinting method, and a transcription method.

53. The method according to claim 40, wherein a color filter is formed on the lower substrate.

54. The method according to claim 40, wherein the partition wall has a predetermined structure selected from the group consisting of a stripe structure, a diamond structure, a square structure and a triangle structure.

* * * * *

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当前申请(专利权)人(译)	LG DISPLAY CO.，LTD.		
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摘要(译)

提出了LCD和制造工艺。使用相分离将上基板与红色，绿色和蓝色滤色器重合地形成。将含有光聚合物滤色器树脂和液晶的化合物涂覆在阵列基板上，然后在形成阵列基板后进行光聚合。在施加化合物之前，可以在基底上提供种子层。滤色器树脂的聚合允许同时形成上部滤色器基板和液晶层。