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(54) **Liquid crystal display device**

Flüssigkristallanzeigevorrichtung

Dispositif d'affichage à cristaux liquides

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EP 2 112 549 B1

Description

RELATED APPLICATION

[0001] The present invention relates to subject matter contained in priority Korean Application No. 10-2008-0036679, filed on April 21, 2008 and 10-2008-0081337, filed on August 20, 2008.

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0002] The present invention relates to a liquid crystal display (LCD) device, and more particularly, to an LCD device having a protection member capable of enhancing reliability against an external impact and preventing outdoor visibility from being lowered due to an external light.

2. Description of the Background Art

[0003] Generally, a cathode ray tube (CRT), one of most widely used display devices is mainly applied to a television, monitors of meters, information terminal devices, etc. However, the CRT may cause problems in implementing a compact and light-weighted configuration of electronic devices due to its weight and size.

[0004] In order to replace these problems of the CRT, liquid crystal display (LCD) devices having advantages such as a small size, a light weight, and a low consumption power have been actively developed. Recently, demands for flat display devices such as a notebook, a desk top, a large monitor having 30 or more inches, and a wall-mounted TV increase.

[0005] The LCD device serves to display images by controlling an amount of light provided from outside. The LCD device is provided with a backlight unit including an additional optical source for irradiating light to an LCD panel. The LCD device is largely divided into an edge type and a direct type according to the position of an optical source with respect to a display surface of the LCD panel. The direct type backlight unit is being widely applied to an LCD device having 30 or more inches, due to its high optical utility, a characteristic to be easily treated, and no limitation in size of the display surface.

[0006] However, the direct type backlight unit has the following problems. When a plurality of cold cathode fluorescent lamps (CCFLs) are driven in parallel with using one transformer, only some of the CCFLs are driven due to discharge characteristics of the CCFLs. More concretely, the CCFLs have an infinite resistance before being discharged, while having a small resistance due to conductive plasmas occurring in a glass tube after being discharged. Accordingly, once the CCFLs are discharged, an amount of current is increased due to a decreased resistance. That is, when a plurality of CCFLs are driven in parallel, a current flows to CCFLs having a small resistance after being discharged. Accordingly, some of the CCFLs are driven, but others thereof are not driven.

[0007] In order to solve these problems, has been proposed a lamp driving device for an LCD device capable of driving a plurality of CCFLs in parallel with using one transformer. According to the lamp driving device, the same equivalent circuit as an external electrode fluorescent lamp (EEFL) is configured by attaching a capacitor having the same capacity (ballast capacitor) onto two electrodes of each CCFL.

[0008] Here, the EEFL is lightened by applying an alternate current (AC) to external electrodes. That is, discharge occurs at a discharge space inside a glass tube by an electric field due to a high frequency voltage applied to one pair of external electrodes, thereby occurring ultraviolet rays. Due to the ultraviolet rays, a fluorescent substance deposited onto an inner circumferential surface of the glass tube emits light, thereby occurring visible rays.

[0009] FIG. 1 is a sectional view of a direct type LCD device in accordance with the conventional art.

[0010] As shown in FIG. 1, the direct type LCD device comprises a backlight unit for providing light; an LC panel 20 disposed above the back light unit and receiving light; polarizers 21 and 22 (or polarizing films) disposed at both side surfaces of the LC panel 20; etc. Here, the backlight unit includes lamps 48 serving as an optical source.

[0011] A reflection plate 42 for reflecting light provided from the lamps 48 to a front surface of the LCD device is attached onto a lower cover 41.

[0012] Balance PCBs 49a and 49b for coupling the plurality of lamps 48 are provided at both sides of the lower cover 41. Inverter PCBs 50a and 50b for applying an AC voltage are connected to the balance PCBs 49a and 49bm, respectively, which will be explained later.

[0013] On the lamps 48, laminated are a diffusion plate 43 for uniformly diffusing light supplied from the lamps 48 and reflected through the reflection plate 42 towards a front surface of the LCD device; and an optical sheet 44 including a prism sheet and/or a protection sheet for compensating an optical function of light that has passed through the diffusion plate 43.

[0014] A main support (not shown) for maintaining a balance of an entire force applied to the LCD device is provided. With consideration of the LC panel 20 deposited thereon, the main support is formed to have a certain pattern of steps on an upper side surface thereof.

[0015] The LC panel 20 deposited on the main support undergoes a plurality of unit processes. That is, the LC panel 20 includes a thin film transistor (TFT) array substrate 20a having a TFT at each unit pixel, a color filter substrate 20b having a color filter for displaying colors, and an LC injected between the two substrates.

[0016] Polarizers 21 and 22 are attached to both side surfaces of the LC panel 20. The polarizers 21 and 22 serve to transmit light vibrating in the same direction as a polarizing shaft among light provided from the backlight unit, while forming light vibrating in one specific direction

by absorbing or reflecting light vibrating in other directions with using a proper medium. The polarizers 21 and 22 are essential components of a TN-mode LCD.

[0017] An upper cover (not shown) covers an outer edge of the LC panel 20 having the polarizers 21 and 22 attached thereto, and a side surface of the main support. The upper cover is coupled to the lower cover 41 by an additional coupling means such as hooks.

[0018] FIG. 2 is a perspective view of a backlight unit in accordance with the conventional art, which shows balance PCBs on the lower cover, and inverter PCBs interworking with the balance PCBs.

[0019] As shown in FIG. 2, the inverter PCBs 50a and 50b converts a DC power provided from outside into an AC high voltage. Then, the AC high voltage is applied to balance PCBs 49a and 49b through output connectors of the inverter PCBs 50a and 50b under control of an integrated circuit.

[0020] Then, the AC high voltage applied to the balance PCBs 49a and 49b is supplied to ballast capacitors 49a1 and 49b1 through conductive wires and high voltage supply patterns (or wires), thereby making the amount of currents introduced into each tube of the lamps 48 the same. Then, the AC high voltage is introduced into the lamps 48 corresponding to the ballast capacitors 49a1 and 49b1, respectively.

[0021] However, the conventional LCD device may have the following problems. When disposed at a public spot such as an airport or a bus terminal, the LCD device may be damaged due to an external impact, etc., or may have scratches by a malicious user on a thin polarizer attached onto an outer surface of an LC panel with a surface hardness of 3H or less than. In order to solve these problems, additional costs are required, which may degrade the reliability of product.

[0022] Furthermore, when the LCD device is disposed under a high level of illumination such as external sunlight or an indoor lamp, if a polarizer attached onto an outer surface of the LC panel does not undergo an additional interface process, a reflectivity of light reflected through the polarizer is 4% to the maximum. When the polarizer attached onto the outer surface of the LC panel undergoes an additional interface process, a reflectivity of light reflected through the polarizer is 1.5% to the minimum. As a result, a contrast ratio of the LCD device is decreased due to its surface reflection. Furthermore, an outdoor visibility of the LCD device is considerably decreased due to a discoloration phenomenon, etc.

[0023] US2008/007675 describes a liquid crystal display comprising a liquid crystal display panel having a polarizer, a backlight unit and a protection member provided on the polarizer. The protection member is made of glass and protects the liquid crystal panel from external impact. The protection member further comprises an anti-reflect layer and an adhesive layer which adheres the protection member onto the liquid crystal display panel.

[0024] JP2005055641 describes a liquid crystal display device in which clouding caused by temperature variation is eliminated by attached a surface protective plate, which is to be attached thereto via spaces and by filling the gap with an adhesive, such that the air bubbles are not caught therein.

[0025] US2007/0258138 describes a push-pull liquid crystal modulator system for creating circularly polarized light of alternating handedness comprising a pair of surface mode liquid crystal cells having orthogonal rub axes to improve the performance of a ZScreen device to increase the enjoyment of perceiving a stereoscopic image in a theatrical environment.

[0026] JP2000347168 and US6,414781 describe an electro-optical device used in a projection display device and comprising a liquid crystal panel module as electro-optical panel accommodated in a specific case member, which does not need to be changed depending on the actual structure of the panel, which can be made thinner than a conventional case member and whose heat dissipation capability is increased.

[0027] US2007/0065091 describes the variation of water resistance, shock resistance and visibility by adjusting a protective and a holding member. US2007/0065091 also describes the use of tempered glass as protective windows in an liquid crystal display.

[0028] US2007/0065091 describes an electro-optical panel having a pair of substrates and an electro-optical layer interposed between the pair of substrates, a protective member composed of a light transmitting substrate mounted on at least one of the pair of substrates and protecting the electro-optical panel, and a holding member that holds the electro-optical panel, wherein the light-transmitting substrate and the electro-optical panel are bonded to each other using an adhesive layer. US2007/0065091 also describes light-shielding members disposed in a region and over-lapping the non-display region of the electro-optical panel to improve display visibility.

[0029] "Improvement of Light Leak for LCD Design" (International Business Machines Corporation, Research Disclosure, Mason Publications, Hampshire, GB, Vol. 420, No. 100, 1 April 1999 (1999-04-01), XP07124221, ISSN: 0374-4353) describes a sample of an LCD module design for a masking method in order to prevent light leakage, thus keeping LCD module quality, wherein a masking paint is applied outside an active area of the LCD module, which is thus used to prevent light leakage.

SUMMARY OF THE INVENTION

[0030] Therefore, it is an object of the present invention to provide a liquid crystal display (LCD) device as described in the claims having a protection member capable of protecting an LC panel from an external impact, and capable of enhancing an outdoor visibility.

[0031] The LCD device having a protection member may have a light leakage phenomenon that light provided from a backlight disposed below the LC panel at an edge

of the protection member leaks.

[0032] Therefore, it is an object of the present invention to provide a liquid crystal display (LCD) device having a protection member, in which a light leakage preventing unit is formed at one or more edge regions of the protection member.

[0033] To achieve these and other advantages and in accordance with the purpose of the present invention, as embodied and broadly described herein, there is provided a liquid crystal display (LCD) device according to appended claim 1.

[0034] The LCD device comprises a light leakage preventing unit formed at one or more edge regions of the protection member, and preventing leakage of light provided from the backlight unit.

[0035] The foregoing and other objects, features, aspects and advantages of the present invention will become more apparent from the following detailed description of the present invention when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0036] The accompanying drawings serve to explain the principles of the invention.

[0037] In the drawings:

FIG. 1 is a sectional view of a direct type liquid crystal display (LCD) device in accordance with the conventional art;

FIG. 2 is a perspective view of a backlight in accordance with the conventional art;

FIG. 3 is an exploded perspective view of an LCD device helpful to understand the present invention;

FIG. 4 is a partial sectional view showing a coupled state of the LCD device of FIG. 3;

FIG. 5 is a view showing a refractivity of a protection member of FIGS. 3 and 4;

FIG. 6A is a graph showing a contrast ratio (CR) of the LCD device of FIGS. 3 and 4;

FIG. 6B is a graph showing a color reproduction ratio of the LCD device of FIGS. 3 and 4;

FIG. 7 is a partial sectional view of an LCD device according to a first embodiment of the present invention in contrast to FIG. 4; and

FIG. 8 is a perspective view of a protection member of FIG. 7.

DETAILED DESCRIPTION OF THE INVENTION

[0038] Reference will now be made in detail to examples helpful to understand the invention and to a preferred embodiment of the present invention, which are illustrated in the accompanying drawings.

[0039] Hereinafter, a liquid crystal display (LCD) device helpful to understand the present invention will be explained in more detail with reference to the attached drawings.

[0040] FIG. 3 is an exploded perspective view of an LCD device helpful to understand the present invention, FIG. 4 is a partial sectional view showing a coupled state of the LCD device of FIG. 3, and FIG. 5 is a view showing a refractivity of a protection member of FIGS. 3 and 4.

[0041] Referring to FIGS. 3 to 5, the liquid crystal display (LCD) device comprises: a backlight unit (not shown) for providing light by receiving a voltage from outside; an LC panel 150 disposed above the backlight unit, and displaying images; and a protection member 160 consisting of a tempered substrate 160a formed on the LC panel 150 and protecting the LC panel 150 from an external impact, and an anti-reflect layer 160b formed on the tempered substrate 160a and reducing a reflectivity of external light, wherein the protection member 160 includes an adhesive layer 160c formed of a material having a similar refractivity to the tempered substrate 160a of the protection member 160, and adhering the protection member 160 onto the LC panel 150 by being interposed therebetween.

[0042] At two side walls (or additional fixing means) of a lower cover 100 formed of iron or Electrolytic Galvanized Iron (EGI), balance PCBs 101 and 103 for driving lamps 120 by receiving an AC high voltage from external first and second inverters are vertically provided .

[0043] More concretely, the balance PCBs 101 and 103 consist of connectors 101a and 103a for receiving an AC high voltage from external first and second inverters; ballast capacitors 101b and 103b having patterns to stably supply a ballast current to the lamps 120 by receiving the AC high voltage; and lamp sockets 101 c and 103c having conductivity so that a ballast current can be stably supplied to the lamps 120, and each having its own angle of about 90° so as to easily couple the plurality of lamps 120.

[0044] A reflection plate 105 is attached onto the lower cover 100 at a central part between the balance PCBs 101 and 103 vertically arranged at both sides. As the reflection plate 105, a white polyester film, or a film coated with metallic materials such as Ag or Al may be used. The reflection plate 105 has a reflectivity for visible rays corresponding to about 90~97%. The thicker the coated film, the higher the reflectivity is.

[0045] A plurality of lamps 120 are coupled to lamp sockets 101 c and 103c fixed onto the balance PCBs 101 and 103 and bent towards an upper side. Here, the lamps 120 coupled to the lamp sockets 101c and 103c may maintain a constant distance of approximately 5mm from the reflection plate 105 disposed on a rear surface of the lamps 120. If a distance between the lamps 120 and the reflection plate 105 is more than 5mm, an optical sheet (not shown) to be coupled to an upper component may have wrinkles due to heat.

[0046] In order to control a distance between the lamps 120 and the reflection plate 105, the balance PCBs 101 and 103 vertically disposed at both sides of the lower cover 100 can be controlled, or an own angle of each of the lamp sockets 101c and 103c can be controlled.

[0047] In controlling a distance between the lamps 120 and the reflection plate 105 by controlling each own angle of the lamp sockets 101 c and 103c, the lamp sockets 101 c and 103c may be bent in the form of arbitrary shapes as long as the lamps 120 can be coupled thereto. Representative shapes of the lamp sockets 101c and 103c may include 'L' shape shown in drawing, or 'C' shape or 'V' shape. Here, one end of the lamp sockets 101 c and 103c is fixed onto the balance PCBs 101 and 103, and another end thereof serves as a holder for coupling the lamps 120.

[0048] As aforementioned, the plurality of lamps 120 are coupled to the 'L'-shaped lamp sockets 101c and 103c fixed onto the balance PCBs 101 and 103 with a constant interval therebetween. In the case of an LCD TV having a large area of 32 inches, approximately 16 lamps are arranged for high brightness. And, in the case of an LCD TV having a large area of 40 inches, approximately 18~20 lamps are arranged. However, this general principle may be differently applied according to each model. Here, the lamps 120 may be one of Cold Cathode Fluorescent Lamp (CCFL), External Electrode Fluorescent Lamp (EEFL), and Hot Cold Fluorescent Lamp (HCFL).

[0049] On the balance PCBs 101 and 103 including the lamp sockets 101c and 103c positioned at both sides, laminated are side supports 130, that is, fixing members for protecting the balance PCBs 101 and 103 from an external impact. Here, frames of the side support 130 fabricated in a pressing manner include an inclined frame 130b inclined by a certain angle and having a half-circle shaped lamp fixing portion 130b1 for fixing the lamps 120 at a contact portion to the lower cover 100; a vertical frame 130a spacing from the inclined frame 130b, and formed in a vertical direction; and an upper frame 130c extending from an upper side of the two frames in a horizontal direction.

[0050] Here, the vertical frames 130a of the side supports 130 are coupled to two side walls of the lower cover 100. In order to outwardly protrude the connector 101a to which an AC high voltage is applied from external first and second inverters, it is preferable to form holes at some regions of the vertical frame 130a.

[0051] An optical member 140 is disposed on the side support 130 with both sides thereof being supported by the side support 130. The optical member 140 includes a diffusion plate (not shown) for uniformly distributing light directly emitted from the plurality of lamps 120, and light reflected through the reflection plate 105 to an entire surface of the LC panel 150; and an optical sheet (not shown) for providing additional optical characteristics to light passing through the diffusion plate.

[0052] A main support 145 is coupled to an upper side of the backlight unit. When an external impact is applied to the LCD device, the main support 145 having the backlight unit therebelow serves to maintain a balance of an entire force applied to the LCD device. Furthermore, by considering that the LC panel 150 is disposed on a front surface (or upper side surface) of the main support 145, the main support 145 has a pattern that a step is formed between inner and outer side surfaces thereof.

[0053] The LC panel 150 disposed on the main support 145 undergoes a plurality of unit processes. That is, the LC panel 150 includes an array substrate serving as a switching device, and formed as a thin film transistor is formed at each unit pixel; a color filter substrate having a color filter for displaying colors; and an LC injected between the array substrate and the color filter substrate.

[0054] Polarizers 151 and 152 are attached to side surfaces of the LC panel 150. The polarizers 151 and 152 serve to transmit light vibrating in the same direction as a polarizing shaft among light provided from the backlight unit, while forming light vibrating in one specific direction by absorbing or reflecting light vibrating in other directions with using a proper medium.

[0055] A protection member 160 for protecting the LC panel 150 from an external impact, and reducing a reflectivity of light incident form outside is provided on the LC panel 150. More concretely, the protection member 160 includes a tempered substrate 160a for protecting the LC panel 150 from an external impact; an anti-reflect layer 160b exposed to outside by being formed on an upper side surface of the tempered substrate 160a, and contacting external light; and an adhesive layer 160c formed on a lower side surface of the tempered substrate 160a, and contacting the LC panel 150 or the polarizer 151 on the LC panel 150.

[0056] Here, the tempered substrate 160a may be formed of a tempered glass having a thickness of about 3mm so that the LC panel 150 therein can be protected from an external impact. The tempered glass is reinforced by compression-deforming a surface of a molded plate glass and tension-deforming inside thereof, in which the molded plate glass is heated to a temperature of 500°~600°C close to a softening temperature, and then is drastically cooled by a compressed cooling air. The tempered substrate has a bending intensity corresponding to 3-5 times of a general glass, an impact endurance corresponding to 3-8 times of a general glass, and an excellent heat endurance. Since the tempered substrate maintains a balance of an entire force balance therein, even if one side of the tempered substrate is cut off, the entire part is cracked into pieces. Accordingly, it is required to form the tempered substrate in a shape suitable for the purpose before performing a tempered process.

[0057] The anti-reflect layer 160b formed on an upper side surface of the tempered substrate 160a and exposed to external light has a surface processed by an anti-reflect sputtering. That is, the anti-reflect layer 160b is formed as two materials having different refractivity are alternately formed on the tempered substrate 160a in 5 or 6 layers. For instance, a first layer firstly exposed to sunlight or an external lamp is formed of a material having a low refractivity, a second layer is formed of a material having a high refractivity, and a third layer is again formed of a material having a low refractivity. Under this config-

uration, light incident from outside gradually disappears while passing through each layer, thereby reducing a reflectivity. However, the anti-reflect layer 160a does not necessarily undergo a surface processing using an anti-reflect sputtering. Rather, various surface-processing methods such as an anti-reflect coating, or anti-contamination processing or an anti-fingerprint processing may be applied to the anti-reflect layer 160a.

[0058] The adhesive layer 160c formed on a lower side surface of the tempered substrate 160a and contacting the LC panel 150 is formed of a paste, etc. having a similar refractivity to the upper tempered substrate 160a, or the lower polarizer 151 in a UV or thermal hardening manner. Light incident to the anti-reflect layer 160b and passing through the tempered substrate 160a is made to be continuously absorbed into (or to pass through) the adhesive layer 160c and the polarizer 151 having a similar refractivity to the tempered substrate 160a. Accordingly, a total reflectivity to outside of the LC panel 150 is reduced to the maximum.

[0059] For example, if light passing through the anti-reflect layer 160b contacts air disposed at an air gap between the protection member 160 including the anti-reflect layer 160b and the LC panel 150, the light is outwardly reflected from an interface between the protection member 160 and the air gap, due to different refractivity between the tempered substrate 160a and the air. As a result, a total reflectivity to outside of the LC panel 150 increases.

[0060] To cope with this problem, the adhesive layer 160c on the protection member 160 is formed of a material having a similar refractivity to the tempered substrate 160a, and is formed of a material having a similar refractivity to the lower LC panel 150 or the plarizer 151 on the LC panel 150.

[0061] As the paste having a similar refractivity of 1.3~1.8 to the tempered substrate 160a or the polarizer 151, an optical elastic resin, SVR (super view resin) containing an acryl-based ultraviolet hardening type resin as a main component and made from Sony Corporation of Japan may be used. However, the paste is not limited to the specific paste. Rather, any paste may be used as long as it is within the scope of the present invention defined in the appended claims, and a UV or thermal hardening process for facilitation is possible .

[0062] Here, the paste may additionally include at least one of a solvent, a plasticizer, and/or an interface activator. The paste enhances a bonding force between the tempered substrate 160a and the polarizer 151 on the LC panel 150. An amount of the paste may be varied to accelerate a UV or thermal hardening process.

[0063] The paste is disposed on a lower side surface of the tempered substrate 160a in the form of liquid, and the tempered substrate 160a having the paste thereunder is attached onto the polarizer 151 formed on one side surface of the LC panel 150. Then, the paste is hardened by undergoing UV irradiation from an upper side of the tempered substrate 160a, or heat supply from a lower side of the LC panel 150. As a result, the protection member 160 coupled to the LC panel 150 is formed.

[0064] Rather than the method that a paste formed on a lower side surface of the tempered substrate 160a is adhered onto the LC panel 150, other methods may be used. That is, a paste may be formed on the polarizer 151 on the LC panel 150, or may be directly formed on the LC panel 150 when the polarizer 151 is not implemented. Then, the tempered substrate 160a is attached onto the paste. Then, the paste may undergo UV irradiation from an upper side of the tempered substrate 160a, or heat supply from a lower side of the LC panel 150, thereby being hardened. Accordingly, the protection member 160 coupled to the LC panel 150 may be formed.

[0065] An upper cover 170 is coupled to the lower cover 100 with encompassing four edges of the protection member 160 on the LC panel 150, and side surfaces of the main support 145.

[0066] Referring to FIG. 5, light incident onto the protection member 160 from outside is firstly reflected at an interface thereof since a refractivity (n1) of air and a refractivity (n2) of the anti-reflect layer 160b of the protection member 160 are different from each other. Here, light passing through the anti-reflect layer 160b is outwardly diffused while passing through a plurality of layers that two different materials are alternately formed, thereby gradually disappearing. Then, the light passes through the tempered substrate 160a having a similar refractivity (n3) to the anti-reflect layer 160b, the adhesive layer 160c having a similar refractivity (n4) to the anti-reflect layer 160b, and the polarizer 151 on the LC panel 150, sequentially. Accordingly, the light is not reflected at each interface, thereby reducing a total reflectivity of light reflected to outside of the LC panel 150 or the protection member 160.

[0067] Here, when the tempered substrate 160a has a refractivity (n3) of 1.4~1.7, and the polarizer 151 has a refractivity (n5) of 1.4~1.6, the adhesive layer 160c has a refractivity (n4) of 1.3~1.8. Each refractivity of the tempered substrate 160a, the adhesive layer 160c, and the polarizer 151 is set so that the difference therebetween can not exceed '0.2'.

[0068] Accordingly, not only a surface reflectivity on the protection member 160, but also an interface reflectivity occurring from each medium can be reduced, thereby reducing the total reflectivity.

[0069] Hereinafter, a simulation relating to a reflectivity of an LCD device having the protection member 160 will be explained.

[0070] As experimental conditions, a 42-inch sized LCD device having 18 lamps was used, and a level of illumination was measurable up to 4000 lux.

[0071] FIG. 6A is a graph showing a contrast ratio (CR) of the LCD device of FIGS. 3 and 4, and FIG. 6B is a graph showing a color reproduction ratio of the LCD device of FIGS. 3 and 4.

[0072] As shown in FIG. 6A, very similar contrast ratios (CR) were observed in an LCD device having a protection

member and having an anti-reflect layer formed on an upper side surface of a tempered substrate by a sputtering process (AG+ single surface ARS), and an LCD device having an anti-reflect layer formed on upper and lower side surfaces of a tempered substrate by a sputtering process (AG+ two-surface ARS).

[0073] On the contrary, an LCD device (AG Pol) that a polarizer is attached onto an LC panel without an additional anti-reflect process (surface process), and an LCD device (ARC Pol) that an anti-reflect coating is performed on one side surface of the polarizer showed contrast ratios considerably different from each other based on 4000 lux.

[0074] More concretely, as shown in FIG. 6A, under an assumption that every contrast ratio (CR) of an LCD device is 1000:1 in a dark circumstance, an LCD device (AG+ single surface/ two-surface ARS) shows a contrast ratio (CR) of about 600:1 in an illumination circumstance of 4000lux. On the contrary, an LCD device (AG Pol) having a polarizer attached onto an LC panel without an additional anti-reflect process (surface process) shows a contrast ratio (CR) of about 100:1, and an LCD device (ARC Pol) that an anti-reflect coating is performed on one side surface of a polarizer shows a contrast ratio (CR) of about 300:1.

[0075] Through these measured values, prediction values may be obtained. For instance, if an LCD device completely exposed to sunlight in an outdoor environment has a level of illumination corresponding to 1000, 000 lux, an LCD device exposed to sunlight in an indoor circumstance (semi-outdoor circumstance) has a level of illumination corresponding to about 10, 000 lux. And, the brightest lamp among indoor lamps has a level of illumination corresponding to about 5, 000 lux. FIG. 6A is a graph showing each contrast ratio (CR) according to different levels of illumination.

[0076] It can be observed that a contrast ratio (CR) is inversely proportional to a level of illumination on the basis of 4,000 lux.

[0077] Hereinafter, referring to FIG. 6B, a color reproduction ratio of an LCD device according to each level of illumination in the same condition as FIG. 6A will be explained.

[0078] Referring to FIG. 6B, under an assumption that all LCD devices show a color reproduction ratio of 73.4% in a dark room, an LCD device according to the present invention shows a color reproduction ratio of about 72.4% in a level of illumination of 4,000 lux. On the contrary, an LCD device (AG Pol) having a polarizer attached onto an LC panel without an additional anti-reflect process (surface process) shows a color reproduction ratio of about 69.1%, and an LCD device (ARC Pol) that an anti-reflect coating is performed on one side surface of a polarizer shows a color reproduction ratio of about 71%.

[0079] In the LCD device according to the present invention, when a protection member is provided on an LC panel, an anti-reflect layer is formed on the protection member exposed to external light, and an adhesive layer having a similar refractivity to the LC panel and the protection member is formed between the protection member and the LC panel. Accordingly, can be prevented a phenomenon that light incident onto the protection member is outwardly reflected due to different refractivity at each interface between components of the LCD device. As a result, a total reflectivity of light to outside of the LCD device is considerably decreased to enhance an outdoor visibility.

[0080] In the present invention, rather than the method for implementing the protection member by forming a paste in a UV or thermal hardening manner, other methods may be used. For example, an adhesive layer may be implemented as a double-sided tape, a sheet, or a plate. Here, the double-sided tape, the sheet, or the plate have to be formed of a material having a similar refractivity to the tempered substrate and the polarizer (or the LC panel when the polarizer is not implemented) without an air gap.

[0081] In the previously described example of an LCD device helpful to understand the present invention, the protection member is provided on the LC panel, thereby enhancing an outdoor visibility against an external impact and/or external light. However, this LCD device may have another problem due to its increased thickness. That is, light leakage may occur at edge regions of the LC panel having the protection member thereon due to internal light (or backlight light) provided from the backlight unit disposed below the LC panel.

[0082] In order to solve this problem, an LCD device according to a first embodiment of the present invention will be explained.

[0083] FIG. 7 is a partial sectional view of an LCD device according to a first embodiment of the present invention in contrast to FIG. 4, and FIG. 8 is a perspective view of a protection member of FIG. 7.

[0084] Referring to FIGS. 7 and 8, the a liquid crystal display (LCD) device according to a first embodiment of the present invention comprises: a backlight unit (not shown) for providing light by receiving a voltage from outside; an LC panel 250 disposed above the backlight unit, and displaying images; and a protection member 260 consisting of a tempered substrate 260a formed on the LC panel 250 and protecting the LC panel 250 from an external impact, and an anti-reflect layer 260b formed on the tempered substrate 260a and reducing a reflectivity of external light, wherein the protection member 260 includes an adhesive layer 260c formed of a material having a similar refractivity to the tempered substrate 260a of the protection member 260, and adhering the protection member 260 onto the LC panel 250 ; and a light leakage preventing unit 261 formed at one or more edge regions of the anti-reflect layer 260b of the protection member 260.

[0085] More concretely, the protection member 260 may consist of a tempered substrate 260a for protecting the LC panel 250 from an external impact; an anti-reflect layer 260b formed on an upper side surface of the tem-

pered substrate 260a to be outwardly exposed, and contacting external light; an adhesive layer 260c formed on a lower side surface of the tempered substrate 260a, and contacting the LC panel 250 or the polarizer 251 on the LC panel 250; and a light leakage preventing unit 261 formed at one or more edge regions of the anti-reflect layer 260b, and preventing leakage of light provided from the backlight unit disposed below the protection member 260.

[0086] Here, the tempered substrate 260a may be formed of a tempered glass having a thickness of about 2~5mm so that the LC panel 250 therein can be protected from an external impact. The tempered glass is reinforced by compression-deforming a surface of a molded plate glass and tension-deforming inside thereof, in which the molded plate glass is heated to a temperature of 500°~600°C close to a softening temperature, and then is drastically cooled by a compressed cooling air. The tempered substrate has a bending intensity corresponding to 3-5 times of a general glass, an impact endurance corresponding to 3-8 times of a general glass, and an excellent heat endurance. Since the tempered substrate maintains a balance of an entire force therein, even if one side of the tempered substrate is cut off, the entire part is cracked into pieces. Accordingly, it is required to form the tempered substrate in a shape suitable for the purpose before performing a tempered process.

[0087] The anti-reflect layer 260b formed on an upper side surface of the tempered substrate 260a and exposed to external light has a surface processed by an anti-reflect sputtering. That is, the anti-reflect layer 260b is formed as two materials having different refractivity are alternately formed on the tempered substrate 260a in 5 or 6 layers. For instance, a first layer firstly exposed to sunlight or an external lamp is formed of a material having a low refractivity, a second layer is formed of a material having a high refractivity, and a third layer is again formed of a material having a low refractivity. Under this configuration, light incident from outside gradually disappears while passing through each layer, thereby reducing a reflectivity. However, the anti-reflect layer 260a does not necessarily undergo a surface processing using a sputtering method. Rather, various methods such as an anti-reflect coating, or anti-contamination processing or an anti-fingerprint processing may be applied to the anti-reflect layer 160a.

[0088] The adhesive layer 260c formed on a lower side surface of the tempered substrate 260a and contacting the LC panel 250 is formed of a paste, etc. having a similar refractivity to the upper tempered substrate 260a, or the lower polarizer 251 in a UV or thermal hardening manner. Light incident to the anti-reflect layer 260b and passing through the tempered substrate 260a is made to be continuously absorbed into (or to pass through) the adhesive layer 260c and the polarizer 251 having a similar refractivity to the tempered substrate 260a. Accordingly, a total reflectivity to outside of the LC panel 250 is reduced to the maximum.

[0089] For example, if light passing through the anti-reflect layer 260b contacts air disposed at an air gap between the protection member 260 including the anti-reflect layer 260b and the LC panel 250, the light is outwardly reflected from an interface between the protection member 260 and the air gap, due to different refractivity between the tempered substrate 260a and the air. As a result, a total reflectivity to outside of the LC panel 250 increases.

[0090] To cope with this problem, the adhesive layer 260c on the protection member 260 is formed of a material having a similar refractivity to the tempered substrate 260a, and is formed of a material having a similar refractivity to the lower LC panel 250 or the plarizer 251 on the LC panel 250.

[0091] As the paste having a similar refractivity of 1.3~1.8 to the tempered substrate 260a or the polarizer 251, an optical elastic resin, SVR (super view resin) containing an acryl-based ultraviolet hardening type resin as a main component and made from Sony Corporation of Japan may be used. However, the paste of the present invention is not limited to the specific paste. Rather, any paste may be used as long as it is within the scope of the present invention, and a UV or thermal hardening process for facilitation is possible .

[0092] Here, the paste may additionally include at least one of a solvent, a plasticizer, and/or an interface activator. The paste enhances a bonding force between the tempered substrate 260a and the polarizer 251 on the LC panel 250. An amount of the paste may be varied to accelerate a UV or thermal hardening process.

[0093] The paste is disposed on a lower side surface of the tempered substrate 260a in the form of liquid, and the tempered substrate 260a having the paste thereunder is attached onto the polarizer 251 formed on one side surface of the LC panel 250. Then, the paste is hardened by undergoing UV irradiation from an upper side of the tempered substrate 260a, or heat supply from a lower side of the LC panel 150. As a result, the protection member 260 coupled to the LC panel 250 is formed.

[0094] Rather than the method that a paste formed on a lower side surface of the tempered substrate 260a is adhered onto the LC panel 250, other methods may be used. That is, a paste may be formed on the polarizer 251 on the LC panel 250, or may be directly formed on the LC panel 250 when the polarizer 251 is not implemented. Then, the tempered substrate 260a is attached onto the paste. Then, the paste undergoes UV irradiation from an upper side of the tempered substrate 260a, or heat supply from a lower side of the LC panel 250, thereby being hardened. Accordingly, the protection member 260 coupled to the LC panel 250 may be formed.

[0095] A light leakage preventing unit (or a light leakage preventing member) 261 is formed below one or more edge regions of the protection member 260, thereby preventing leakage of light provided to the LC panel 25. Here, the light leakage preventing unit 261 may be implemented as an additional sheet, or may be a resin

based black matrix (BM) formed by a sputtering process or a photolithography process using a coating method in the same manner as a black matrix (BM) of a color filter substrate. The light leakage preventing unit 261 may be implemented as a metallic chrome oxide (CrOx) in one layer.

[0096] In the present invention, since lamps 220 serving as an optical source of the backlight unit are implemented as direct type lamps, the light leakage preventing unit 261 is formed at four edge regions of the protection member 260 (or at four edge regions of a sheet). However, if the lamps 220 serving as an optical source of the backlight unit are implemented as edge type lamps provided at one edge region, the light leakage preventing unit 261 on the protection member 260 has to be formed only at one edge region corresponding to the lamps 220. The position of the light leakage preventing unit 261 is not limited to a specific position.

[0097] When the LC panel 250 is divided into a first region for displaying images and a second region disposed at one side of the first region and displaying no image, the light leakage preventing unit 261 is preferably formed at the second region. Accordingly, the light leakage preventing unit 261 may be divided into a covered region covered with the upper cover 270 by contacting thereto, and an exposed region exposed to external light on the protection member 260.

[0098] In order to equally maintain a reflectivity of the light leakage preventing unit 261 exposed to external light to a total reflectivity of light reflected to the first region (image region) of the LC panel 250, the light leakage preventing unit 261 is formed of a material having a similar refractivity to the anti-reflect layer 260b of the protection member 260, the tempered glass 260a, and the adhesive layer 260c. Under this configuration, the light leakage preventing unit 261 has a reflectivity of 0.5~1.5%.

[0099] Except for the light leakage preventing unit 261, other components of the LCD device according to the first embodiment of the present invention, such as the lamps 220 and a balance PCB 201 of the backlight unit are similar to those of the previously described example of an LCD device helpful to understand the present invention. Accordingly, explanation for the similar components will be omitted.

[0100] The LCD device according to the first embodiment of the present invention may have various modifications. For instance, as shown in FIG. 7, in order to maximize a function to prevent leakage of light provided from the backlight unit disposed below the LC panel 250, a second light leakage preventing unit may be further formed at an outer edge region between two substrates attached to each other, in correspondence to the aforementioned light leakage preventing unit 261.

[0101] Here, the second light leakage preventing unit may be formed to have the same or different width as/from that of the first light leakage preventing unit 261. However, it is preferable to form the second light leakage preventing unit with the same width as that of the first light leakage preventing unit 261, in which an interface between the first region for displaying images and the second region disposed at one or more sides of the first region in the first light leakage preventing unit 261 is consistent with an interface between a first region and a second region in the second light leakage preventing unit. That is, the second light leakage preventing unit is formed so that the first region that displays images can not be covered.

[0102] Although not shown, the present invention may be implemented as an LCD device capable of reducing a total reflectivity of external light at an image region of an LC panel, and preventing leakage of internal light provided therebelow.

[0103] For instance, in order to form a protection member, an adhesive layer is formed on a polarizer on an LC panel, an anti-reflect layer is formed on the adhesive layer by a coating method, etc., and a light leakage preventing unit for preventing leakage of light provided from a backlight unit is formed at one or more edge regions of the anti-reflect layer.

[0104] Accordingly, the protection member may consist of only an anti-reflect layer for reducing reflectivity of external light; an adhesive layer adhered to an LC panel without an air gap, and formed of a material having a similar refractivity as the LC panel and the anti-reflect layer, for passing through light absorbed through the anti-reflect layer; and a light leakage preventing unit formed at one or more edge regions of the anti-reflect layer, for preventing leakage of light provided from a backlight unit.

[0105] The present invention may have various modifications according to its purposes within the scope of the appended claims.

[0106] The LCD device according to the present invention enhances reliability by protecting the LC panel from an external impact, etc. Furthermore, the adhesive layer is formed of a material having a similar refractivity to the tempered substrate of the protection member and the LC panel, without an air gap from the tempered substrate and the LC panel. Accordingly, a total reflectivity of light to outside of the LC panel is lowered, thereby enhancing an outdoor visibility.

[0107] Furthermore, a light leakage phenomenon that light provided from the backlight unit disposed below the LC panel leaks at one or more edge regions of the LC panel having the protection member is prevented, thereby maintaining a uniform brightness of the LCD device.

[0108] The foregoing embodiments and advantages are merely exemplary and are not to be construed as limiting the present invention. The present teachings can be readily applied to other types of apparatuses. This description is intended to be illustrative, and not to limit the scope of the claims. Many alternatives, modifications, and variations will be apparent to those skilled in the art. The features, structures, methods, and other characteristics of the exemplary embodiments described herein may be combined in various ways to obtain additional and/or alternative exemplary embodiments.

[0109] As the present features may be embodied in several forms without departing from the characteristics thereof, it should also be understood that the above-described embodiments are not limited by any of the details of the foregoing description, unless otherwise specified, but rather should be construed broadly within the scope of protection defined by the appended claims.

Claims

1. A liquid crystal display device, comprising:

a liquid crystal panel (250) and a polarizer (251) on at least an upper surface of the liquid crystal panel (250), and displaying images;
a backlight unit being disposed below the liquid cristal panel (250), the backlight unit comprising a plurality of lamps (220), which are providing light, and a reflection plate (205) being disposed below the lamps (220) in a controlled distance to the lamps (220), the reflection plate (205) having a reflectivity for visible rays,
a protection member (260) being provided on the polarizer (251), and being made of a tempered substrate (260a) for protecting the liquid crystal panel (250) from an external impact and an anti-reflect layer (260b) being formed on the tempered substrate (260a) for reducing the reflectivity of external light; and
an adhesive layer (260c) adhering the protection member (260) to the liquid crystal panel (250) by being interposed between said polarizer (251) and the protection member (260) and being formed of a material having a refractive index similar to the polarizer (251) and the tempered substrate (260a) of the protection member (260), respectively,
wherein, at a given wavelength, the tempered substrate (260a) has a refractive indix in the range of 1.4-1.7, the polarizer (251) has a refractive indix in the range (260a) of 1.4-1.6, and the adhesive layer (260c) has a refractive indix in the range of 1.3-1.8, so that the refractive indices of the tempered substrate (260a), the adhesive layer (260c) and the polarizer (251) mutually differ not more than by 0.2 at said given wavelength,
wherein a light leakage preventing unit (261) configured to prevent leakage of light provided from the backlight unit is provided by being formed at one or more edge regions of the protection member (260),
wherein the light-leakage preventing unit (261) is formed of a material having a similar refractive index as the anti-reflect layer (260b) of the protection member (260), the tempered glass (260a), and the adhesive layer (260c), so as to have a reflectivity of 0.5~1.5% to display-external light.

2. The liquid crystal display device of claim 1, wherein the tempered substrate (260a) is implemented as tempered glass.

3. The liquid crystal display device of one of claims 1 to 2, wherein the anti-reflect layer (260b) has undergone a surface processing by an anti-reflect sputtering.

4. The liquid crystal display device of one of claims 1 to 3, wherein the adhesive layer (260c) includes at least one of a solvent, a plasticizer, and/or an interface activator.

5. The liquid crystal display device of claim 1, wherein the liquid crystal panel (250) is divided into a first region displaying images, and a second region displaying no images by being disposed at one or more sides of the first region,
wherein the adhesive layer (250c) is formed to be adhered onto the liquid crystal panel (250) without an air gap, and reduces the reflectivity of external light provided from outside in correspondence to the first region of the liquid crystal panel (250), and
wherein the light leakage preventing unit (261) prevents leakage of light provided from the backlight unit by being provided in correspondence to the second region of the liquid crystal panel (250).

6. The liquid crystal display device of claim 5, wherein the adhesive layer (260c) is formed on a lower surface of the protection member (260), and the light leakage preventing unit (261) is formed in correspondence to the second region in an upper surface of the protection member (260).

7. The liquid crystal display device of claim 1, wherein the adhesive layer (260c) is formed by a UV or thermal hardening process.

8. The liquid crystal display device of claim 1, wherein the light leakage preventing unit (261) is implemented by a resin-based black matrix or a metallic chrome oxide, CrOx, in one layer.

Patentansprüche

1. Flüssigkristallanzeigevorrichtung, aufweisend:

ein Flüssigkristallpanel (250) und einen Polarisationsfilter (251) auf mindestens einer oberen Oberfläche des Flüssigkristallpanels (250), das Bilder anzeigt;
eine unterhalb des Flüssigkristallpanels (250)

angeordnete Hintergrundbeleuchtungseinheit, wobei die Hintergrundbeleuchtungseinheit eine Mehrzahl von Lampen (220) aufweist, die Licht bereitstellen, und eine Reflexionsplatte (205), die unterhalb der Lampen (220) in einem kontrollierten Abstand zu den Lampen (220) angeordnet ist, wobei die Reflexionsplatte (205) Reflexionsvermögen für sichtbare Strahlen aufweist;
ein auf dem Polarisationsfilter (251) angeordnetes Schutzelement (260), das aus einem gehärteten Substrat (260a) zum Schützen des Flüssigkristallpanels (250) vor einem äußeren Stoß gebildet ist, und eine auf dem gehärteten Substrat (260a) gebildeten Antireflexschicht (260b) zum Reduzieren des Reflexionsvermögens für externes Licht; und
eine Adhäsionsschicht (260c), die das Schutzelement (260) an dem Flüssigkristallpanel (250) festklebt, indem sie zwischen dem Polarisationsfilter (251) und dem Schutzelement (260) eingeschoben und aus einem Material gebildet ist, das einen ähnlichen Brechungsindex wie der Polarisationsfilter (251) bzw. das gehärtete Substrat (260a) des Schutzelements (260) aufweist, wobei das gehärtete Substrat (260a) bei einer gegebenen Wellenlänge einen Brechungsindex im Bereich von 1,4-1,7 aufweist, der Polarisationsfilter (251) einen Brechungsindex im Bereich von 1,4-1,6 aufweist, und die Adhäsionsschicht (260c) einen Brechungsindex im Bereich von 1,3-1,8 aufweist, so dass die Brechungsindizes des gehärteten Substrats (260a), der Adhäsionsschicht (260c) und des Polarisationsfilters (251) bei der genannten Wellenlänge gegenseitig um nicht mehr als 0,2 voneinander abweichen,
wobei eine Lichtleckage verhindernde Einheit (261), die eingerichtet ist, Lichtleckage von von der Hintergrundbeleuchtungseinheit bereitgestelltem Licht zu verhindern, bereitgestellt ist, indem sie an einem oder mehr Kantenbereichen des Schutzelements (260) gebildet ist,
wobei die Lichtleckage verhindernde Einheit (261) aus einem Material gebildet ist, das einen ähnlichen Brechungsindex aufweist wie die Antireflexschicht (260b) des Schutzelements (260), das gehärtete Substrat (260a) und die Adhäsionsschicht (260c), so dass sie ein Reflexionsvermögen von 0,5~1,5 % für von zu der Anzeige externem Licht aufweist.

2. Flüssigkristallanzeigevorrichtung gemäß Anspruch 1, wobei das gehärtete Substrat (260a) als gehärtetes Glas ausgeführt ist.

3. Flüssigkristallanzeigevorrichtung gemäß einem der Ansprüche 1 bis 2, wobei die Antireflexschicht (260b) einer Oberflächenbehandlung mittels Antireflex-Sputterns unterzogen wurde.

4. Flüssigkristallanzeigevorrichtung gemäß einem der Ansprüche 1 bis 3, wobei die Adhäsionsschicht (260c) mindestens eines von einem Lösungsmittel, einem Plastifizierungsmittel und/oder einem Grenzschicht-Aktivierungsmittel aufweist.

5. Flüssigkristallanzeigevorrichtung gemäß Anspruch 1, wobei das Flüssigkristallpanel (250) in einen Bilder anzeigenden ersten Bereich und einen zweiten Bereich unterteilt ist, der dadurch, dass er an einer oder mehr Seiten des ersten Bereichs angeordnet ist, keine Bilder anzeigt,
wobei die Adhäsionsschicht (250c) derart gebildet ist, dass sie ohne einen Luftspalt mit dem Flüssigkristallpanel (250) verbunden ist, und das Reflexionsvermögen von von außen kommendem externem Licht entsprechend dem ersten Bereich des Flüssigkristallpanels (250) reduziert, und
wobei die Lichtleckage verhindernde Einheit (261) verhindert, dass von der Hintergrundbeleuchtungseinheit bereitgestelltes Licht austritt, indem sie entsprechend dem zweiten Bereich des Flüssigkristallpanels (250) bereitgestellt ist.

6. Flüssigkristallanzeigevorrichtung gemäß Anspruch 5, wobei die Adhäsionsschicht (260c) auf einer unteren Oberfläche des Schutzelements (260) gebildet ist, und die Lichtleckage verhindernde Einheit (261) in einer oberen Oberfläche des Schutzelements (260) entsprechend dem zweiten Bereich gebildet ist.

7. Flüssigkristallanzeigevorrichtung gemäß Anspruch 1, wobei die Adhäsionsschicht (260c) mittels eines UV- oder thermischen Härtevorgangs gebildet ist.

8. Flüssigkristallanzeigevorrichtung gemäß Anspruch 1, wobei die Lichtleckage verhindernde Einheit (261) mittels einer Schwarzmatrix auf Harzbasis oder einem metallischen Chromoxid, CrOx, in einer Schicht ausgeführt ist.

Revendications

1. Dispositif d'affichage à cristaux liquides, comprenant :

un panneau à cristaux liquides (250) et un polariseur (251) sur au moins une surface supérieure du panneau à cristaux liquides (250), et affichant des images ;
une unité de rétroéclairage qui est agencée audessous du panneau à cristaux liquides (250), l'unité de rétroéclairage comprenant une plura-

lité de lampes (220), qui fournissent de la lumière, et une plaque réfléchissante (205) qui est agencée au-dessous des lampes (220) à une distance contrôlée des lampes (220), la plaque réfléchissante (205) ayant une réflectivité pour les rayons visibles ;
un élément de protection (260) qui est délivré sur le polariseur (251), et est constitué d'un substrat trempé (260a) destiné à protéger le panneau à cristaux liquides (250) de chocs externes, et une couche antireflet (260b) est formée sur le substrat trempé (260a) en vue de réduire la réflectivité de la lumière extérieure ; et une couche adhésive (260c) qui fait adhérer l'élément de protection (260) au panneau à cristaux liquides (250), en ce qu'elle est interposée entre ledit polariseur (251) et l'élément de protection (260), et qui est formée d'un matériau ayant un indice de réfraction similaire à celui du polariseur (251) et du substrat trempé (260a) de l'élément de protection (260), respectivement ;
dans lequel, à une longueur d'onde donnée, le substrat trempé présente un indice de réfraction de l'ordre de 1,4 à 1,7, le polariseur (251) présente un indice de réfraction de l'ordre de 1,4 à 1,6, et la couche adhésive présente un indice de réfraction de l'ordre de 1,3 à 1,8, de sorte que les indices de réfraction du substrat trempé (260a), de la couche adhésive (260c) et du polariseur (251) diffèrent mutuellement de 0,2 tout au plus à ladite longueur d'onde donnée ;
dans lequel une unité de prévention de fuite de lumière (261) configurée de manière à prévenir une fuite de la lumière fournie à partir de l'unité de rétroéclairage est délivrée en étant formée au niveau d'une ou plusieurs zones de bord de l'élément de protection (260) ;
dans lequel l'unité de prévention de fuite de lumière (261) est formée d'un matériau ayant un indice de réfraction similaire à celui de la couche antireflet (260b) de l'élément de protection (260), du verre trempé (260a), et de la couche adhésive (260c), de manière à présenter une réflectivité de 0,5 à 1,5 % pour afficher la lumière extérieure.

2. Dispositif d'affichage à cristaux liquides selon la revendication 1, dans lequel le substrat trempé (260a) est mis en oeuvre sous la forme de verre trempé.

3. Dispositif d'affichage à cristaux liquides selon l'une quelconque des revendications 1 à 2, dans lequel la couche antireflet (260b) a subi un traitement de surface par une pulvérisation antireflet.

4. Dispositif d'affichage à cristaux liquides selon l'une quelconque des revendications 1 à 3, dans lequel la couche adhésive (260c) comprend au moins l'un parmi un solvant, un plastifiant et/ou un activateur d'interface.

5. Dispositif d'affichage à cristaux liquides selon la revendication 1, dans lequel le panneau à cristaux liquides (250) est divisé en une première zone affichant des images, et une seconde zone n'affichant pas d'image, en ce qu'il est agencé au niveau d'un ou plusieurs côtés de la première zone ;
dans lequel la couche adhésive (250c) est formée de manière à être collée sur le panneau à cristaux liquides (250), sans entrefer, et réduit la réflectivité de la lumière externe fournie depuis l'extérieur en correspondance avec la première zone du panneau à cristaux liquides (250) ; et
dans lequel l'unité de prévention de fuite de lumière (261) prévient la fuite de la lumière fournie à partir de l'unité de rétroéclairage en ce qu'elle est délivrée en correspondance avec la seconde zone du panneau à cristaux liquides (250).

6. Dispositif d'affichage à cristaux liquides selon la revendication 5, dans lequel la couche adhésive (260c) est formée sur une surface inférieure de l'élément de protection (260), et l'unité de prévention de fuite de lumière (261) est formée en correspondance avec la seconde zone dans une surface supérieure de l'élément de protection (260).

7. Dispositif d'affichage à cristaux liquides selon la revendication 1, dans lequel la couche adhésive (260c) est formée par un processus de durcissement UV ou thermique.

8. Dispositif d'affichage à cristaux liquides selon la revendication 1, dans lequel l'unité de prévention de fuite de lumière (261) est mise en oeuvre par une matrice noire à base de résine ou un oxyde de chrome métallique, CrOx, en une couche unique.

FIG. 1
RELATED ART

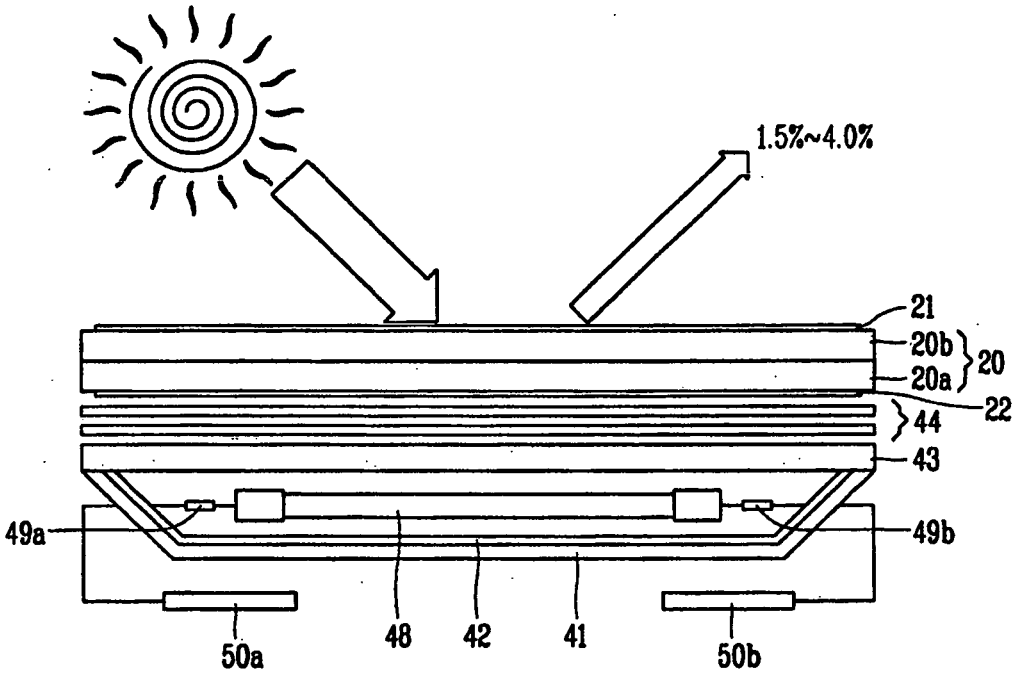


FIG. 2
RELATED ART

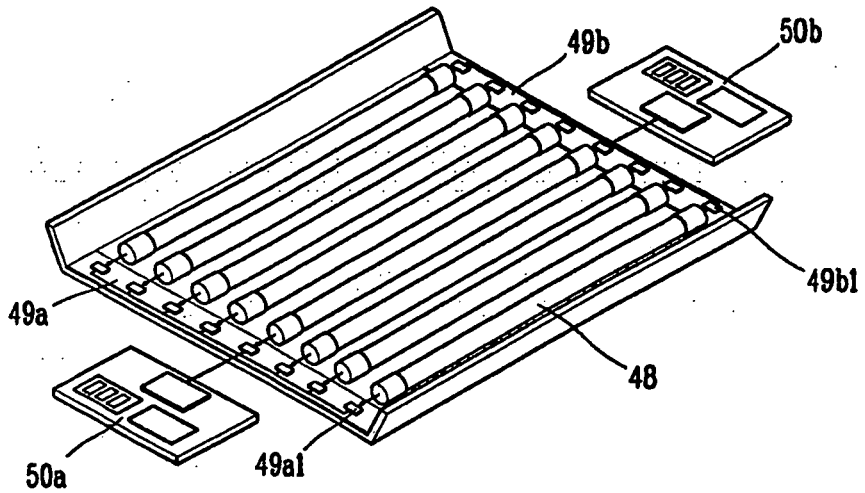


FIG. 3

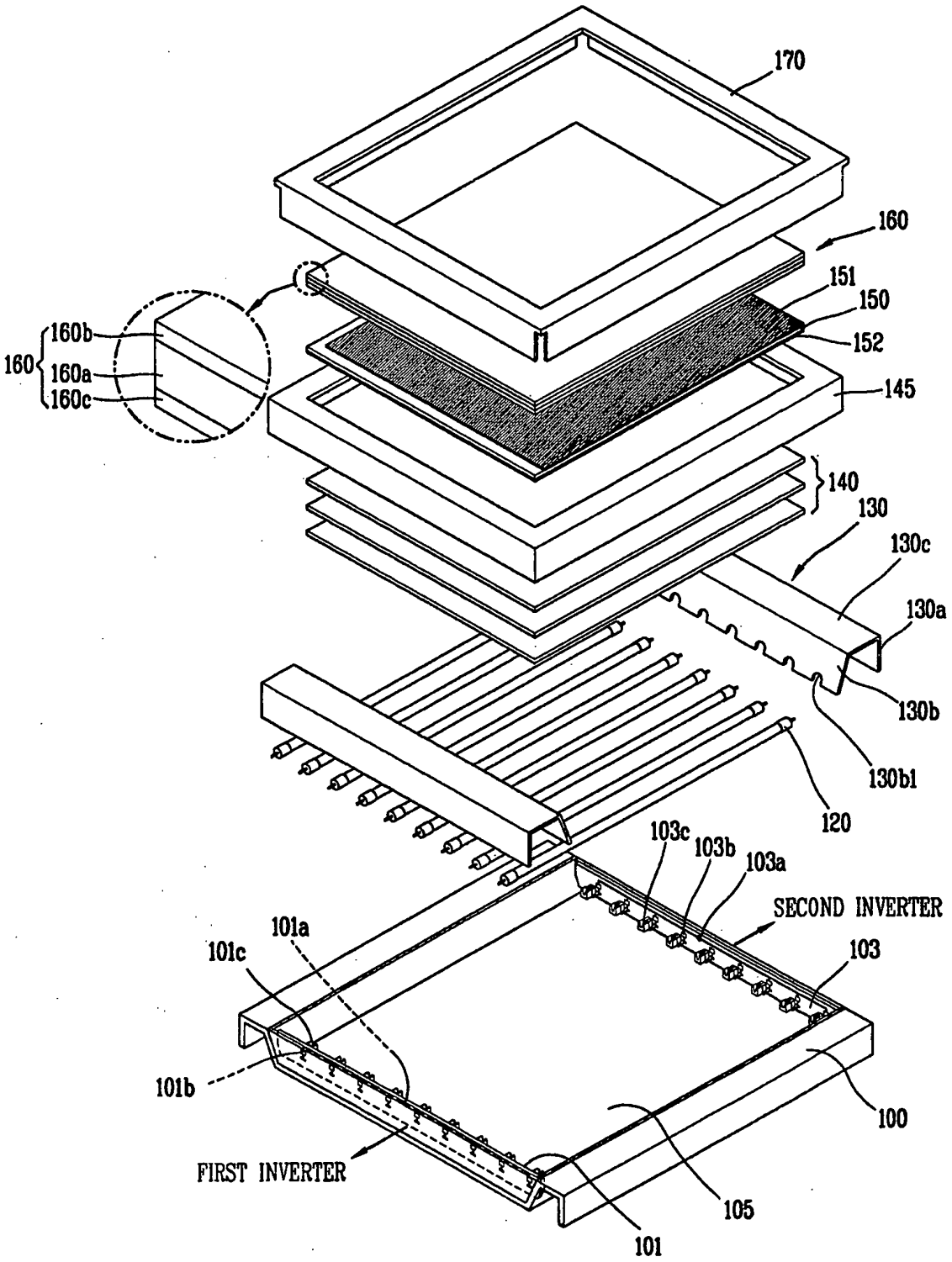

170
160
151
150
152
145
160b
160
160a
160c
140
130
130c
130a
130b
130b1
120
103c
103b
103a
SECOND INVERTER
101a
101c
103
101b
100
FIRST INVERTER
105
101

FIG. 4

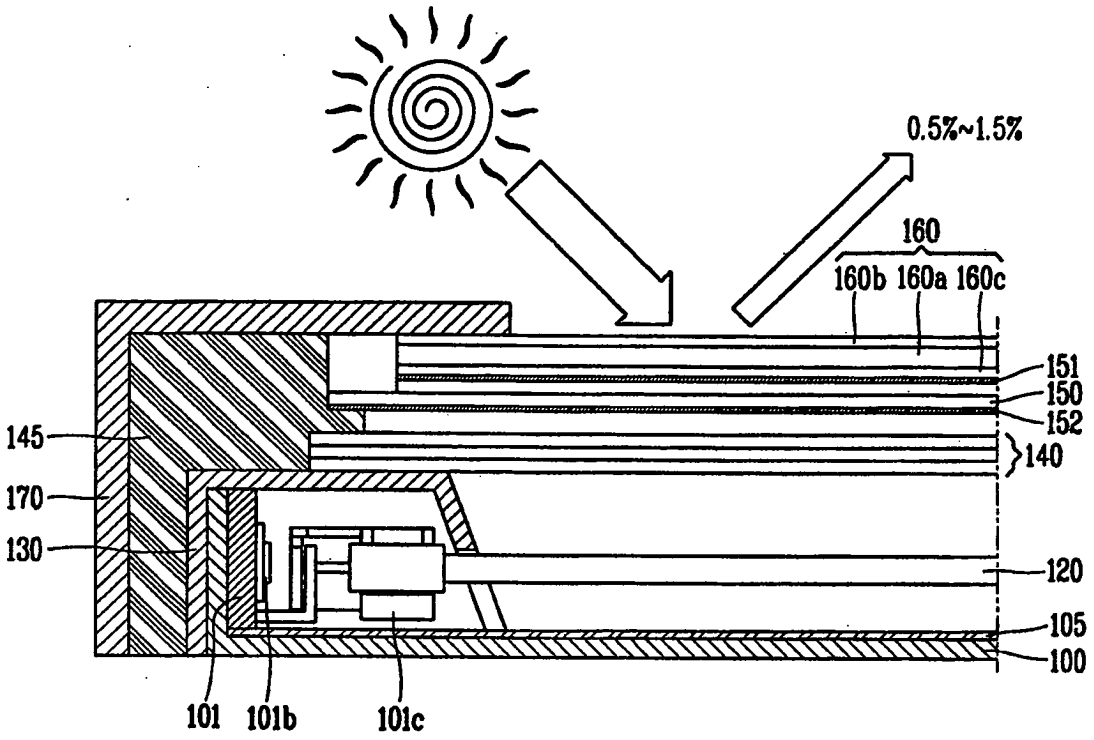

0.5%~1.5%
160
160b 160a 160c
151
150
152
140
145
170
130
120
105
100
101 101b 101c

FIG. 5

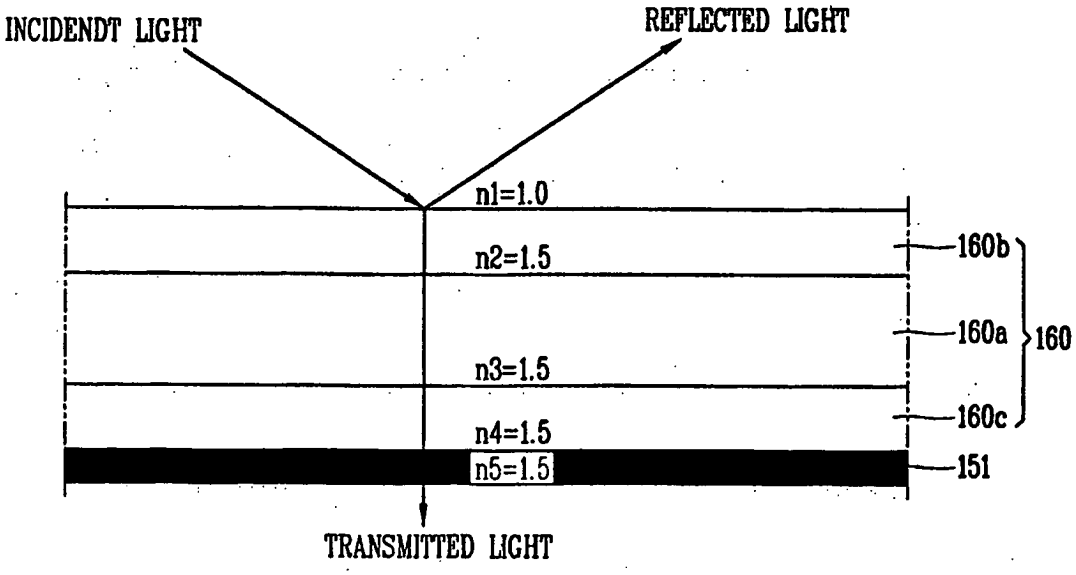

INCIDENDT LIGHT
REFLECTED LIGHT
n1=1.0
n2=1.5
n3=1.5
n4=1.5
n5=1.5
160b
160a
160
160c
151
TRANSMITTED LIGHT

FIG. 6A

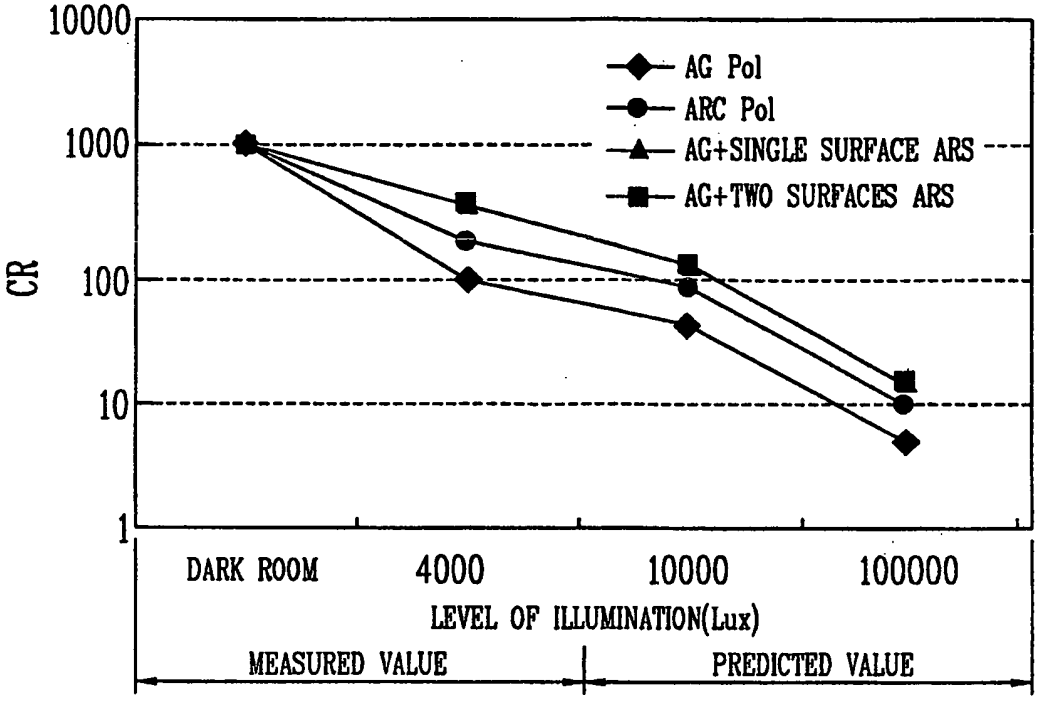

10000
1000
100
10
1
CR
AG Pol
ARC Pol
AG+SINGLE SURFACE ARS
AG+TWO SURFACES ARS
DARK ROOM
4000
10000
100000
LEVEL OF ILLUMINATION(Lux)
MEASURED VALUE
PREDICTED VALUE

FIG. 6B

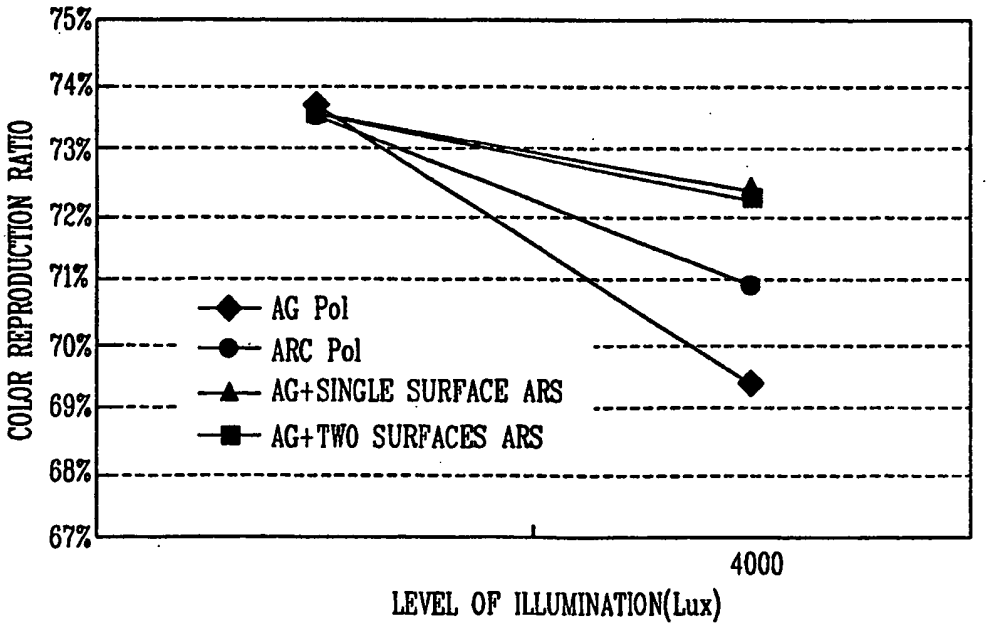

75%
74%
73%
72%
71%
70%
69%
68%
67%
COLOR REPRODUCTION RATIO
AG Pol
ARC Pol
AG+SINGLE SURFACE ARS
AG+TWO SURFACES ARS
4000
LEVEL OF ILLUMINATION(Lux)

FIG. 7

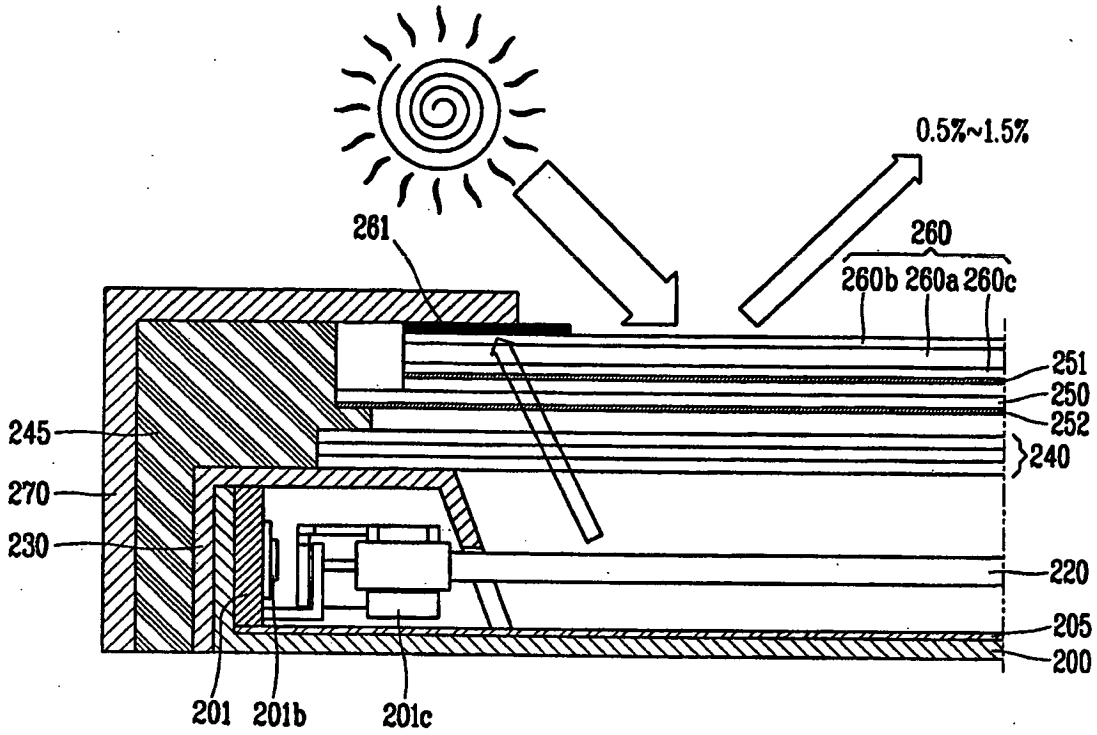
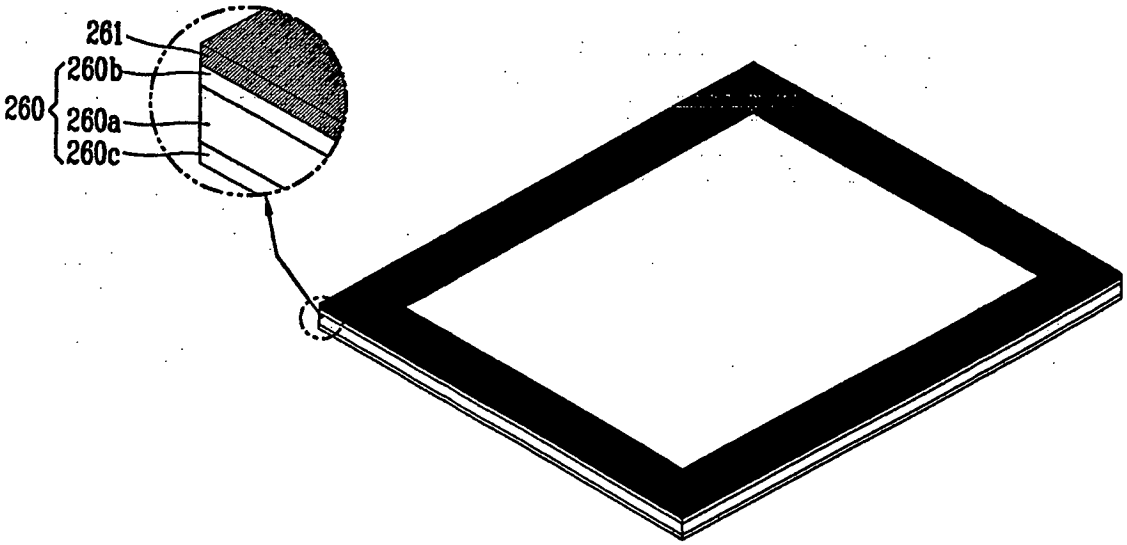

0.5%~1.5%
261
260
260b 260a 260c
251
250
252
240
245
270
230
220
205
200
201
201b
201c

FIG. 8


261
260b
260
260a
260c

REFERENCES CITED IN THE DESCRIPTION

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Non-patent literature cited in the description

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专利名称(译)	液晶显示装置		
公开(公告)号	EP2112549B1	公开(公告)日	2013-06-26
申请号	EP2008164260	申请日	2008-09-12
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IPC分类号	G02F1/1335		
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代理机构(译)	庆祝活动，JENTSCHURA & PARTNER		
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其他公开文献	EP2112549A1		
外部链接	Espacenet		

摘要(译)

公开了一种液晶显示（LCD）装置，其具有能够增强抵抗外部冲击的可靠性的保护构件（160）和对外部光的室外可见性。 LCD装置包括：LC面板（150），用于显示图像;背光单元，设置在LC面板（150）下方，并提供光;保护构件（160）设置在LC面板（150）上，并且由用于保护LC面板（150）免受外部冲击的回火基板（160a）和形成在回火上的抗反射层（160b）组成基板（160a）并降低外部光的反射率;粘合层（160c）由折射率与LC面板（150）的前偏振器（151）和保护构件（160）的回火基板（160a）的折射率相似的材料形成，用于通过将保护构件（160）插入其间而将保护构件（160）粘附到LC面板（150）上。

FIG. 1
RELATED ART

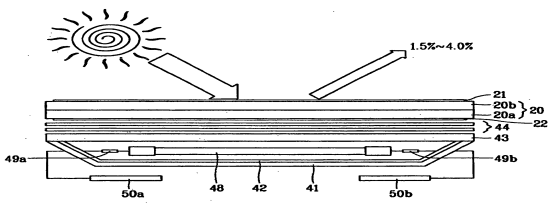

FIG. 2
RELATED ART