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(54) **BACK LIGHT ASSEMBLY AND LIQUID CRYSTAL DISPLAY INCLUDING THE SAME**

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(57) **ABSTRACT**

A back light assembly having uniform interior temperature to prevent quality deterioration of a liquid crystal display and a liquid crystal display including the same includes a light guide plate, a light source unit to emit light to an edge of the light guide plate, a lower cover to receive the light guide plate and the light source unit, heat generated from the light source unit being transferred to the lower cover, and a heat insulator provided adjacent to at least one region of the lower cover in an area to correspond to the light source unit.

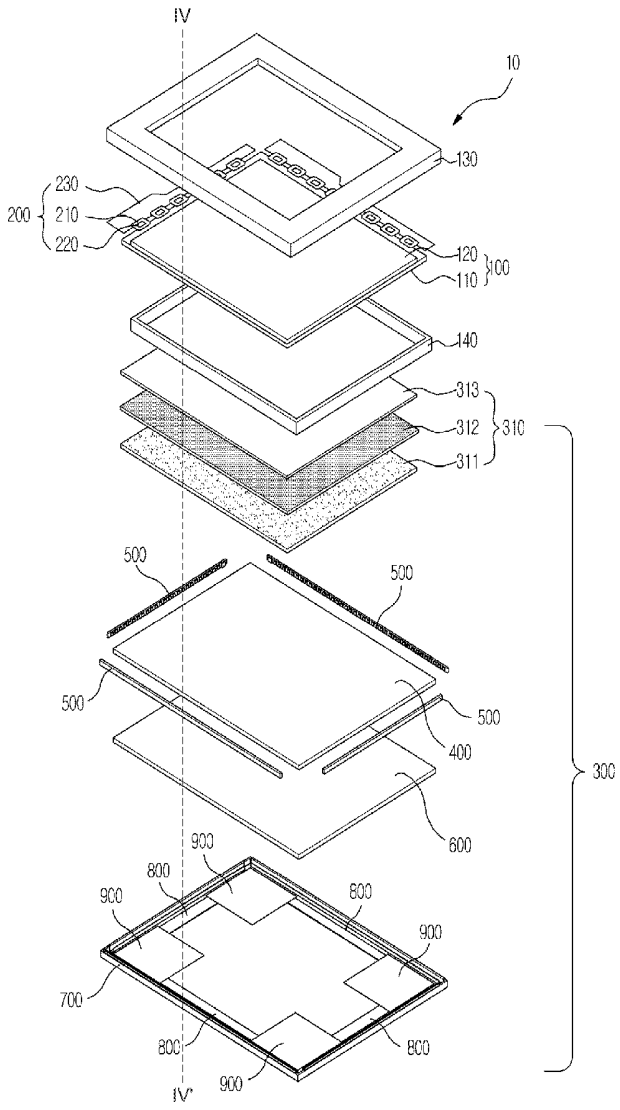


FIG. 1

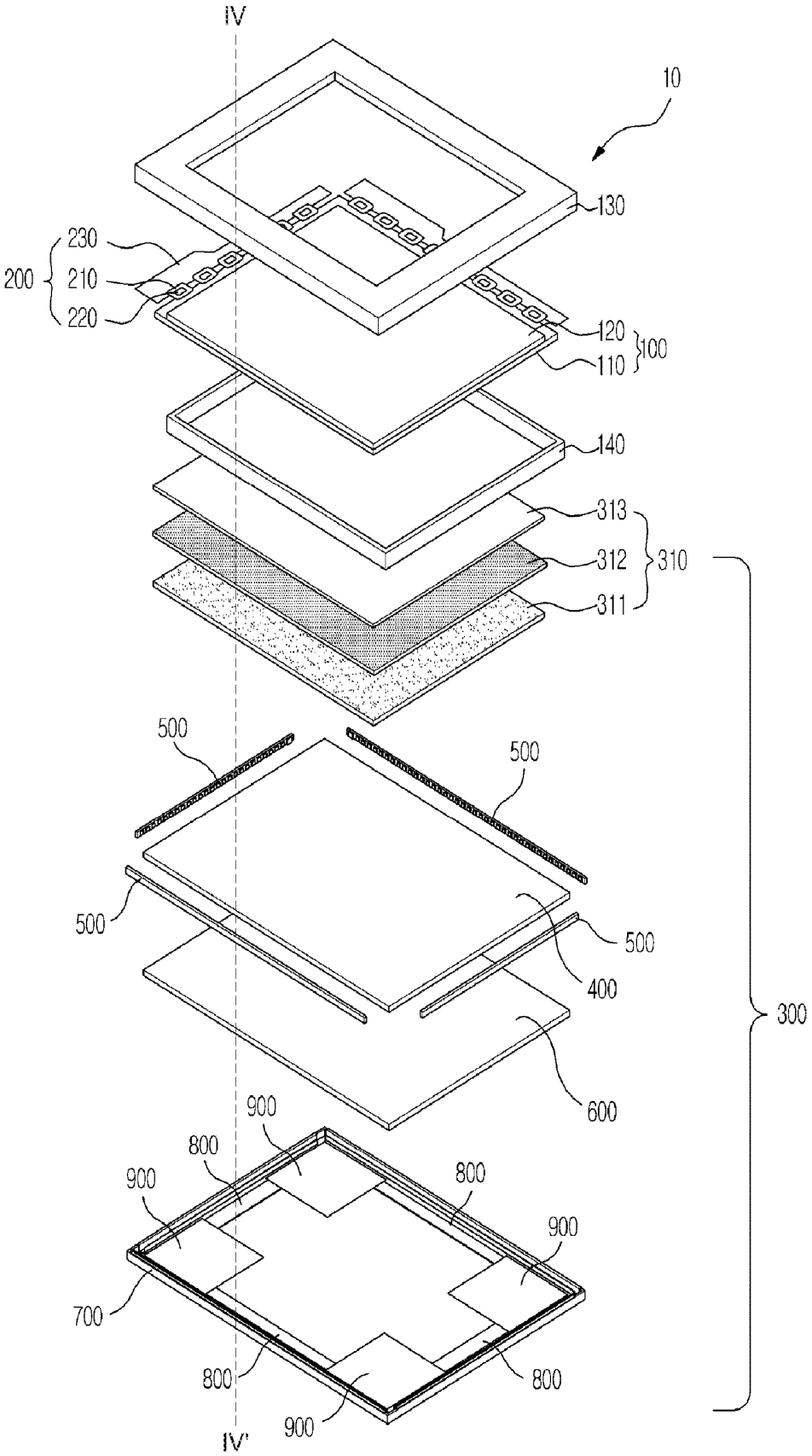

IV
10
130
230
200
210
220
120
110
100
140
313
312
311
310
500
500
500
500
400
300
600
900
800
900
800
900
700
800
800
900
IV'

FIG. 2

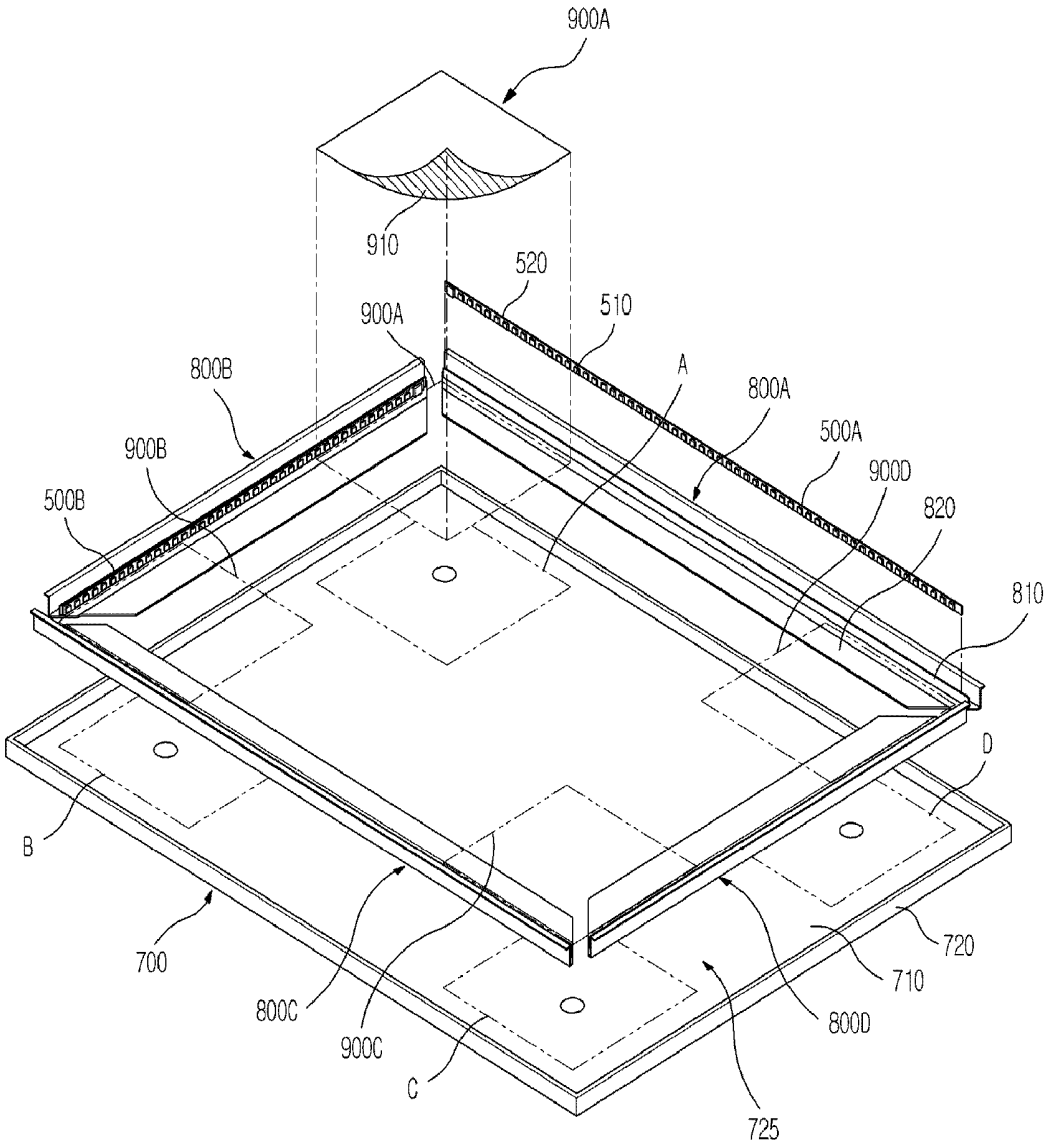

900A
910
520
510
900A
800B
A
800A
500A
900B
900D
500B
820
810
D
B
700
800C
900C
C
800D
710
720
725

FIG. 3

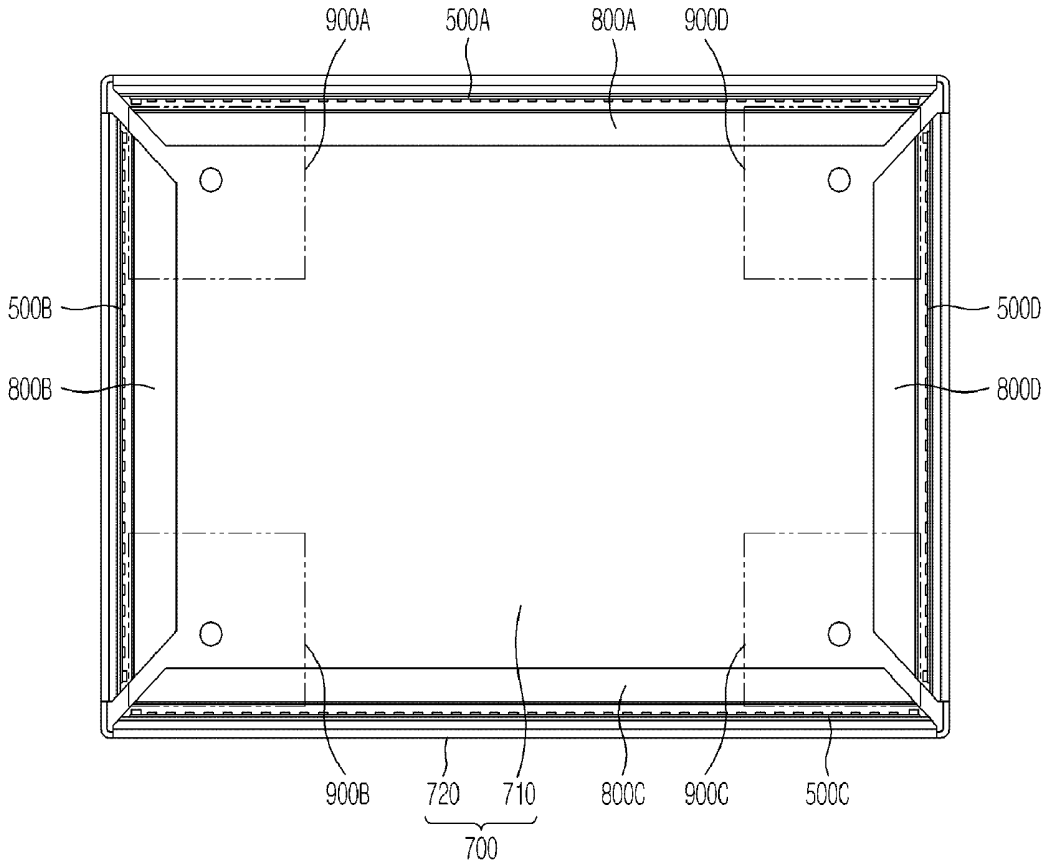

900A
500A
800A
900D
500B
800B
500D
800D
900B
720
710
800C
900C
500C
700

FIG. 4

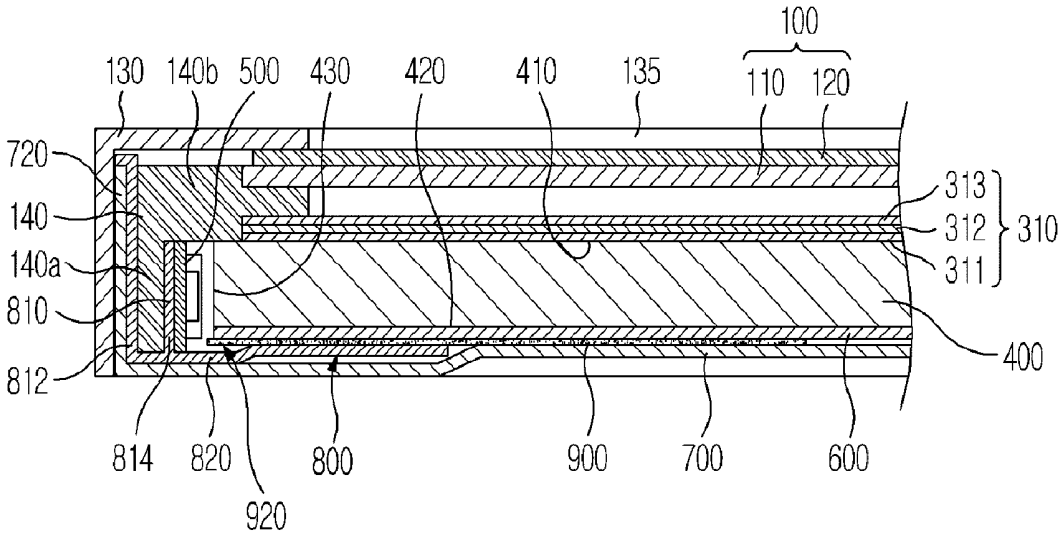

100
130
140b
500
430
420
410
135
110
120
720
140
140a
810
812
313
312
311
310
400
814
820
800
920
900
700
600

FIG. 5

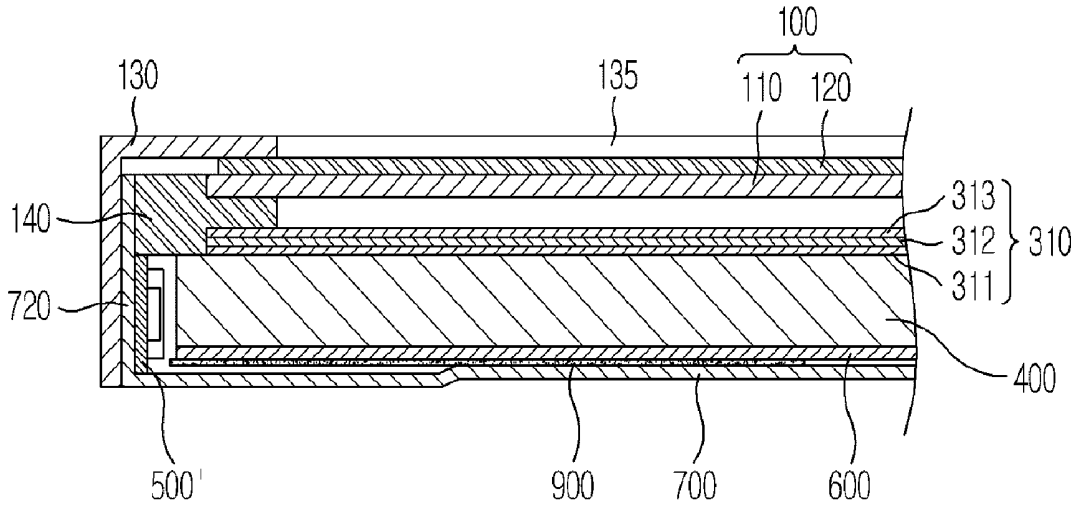


FIG. 6

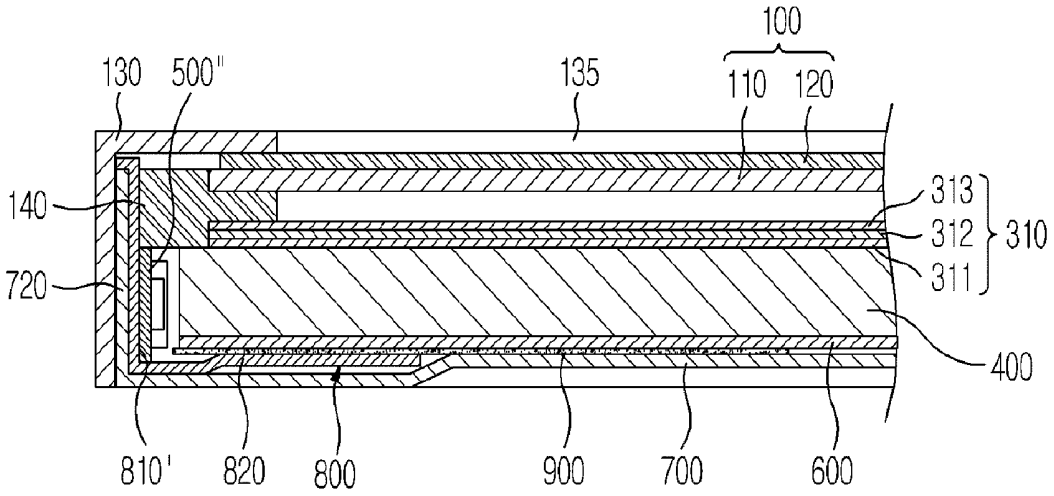

100
130
500"
135
110
120
140
313
312
310
311
720
400
810'
820
800
900
700
600

FIG. 7

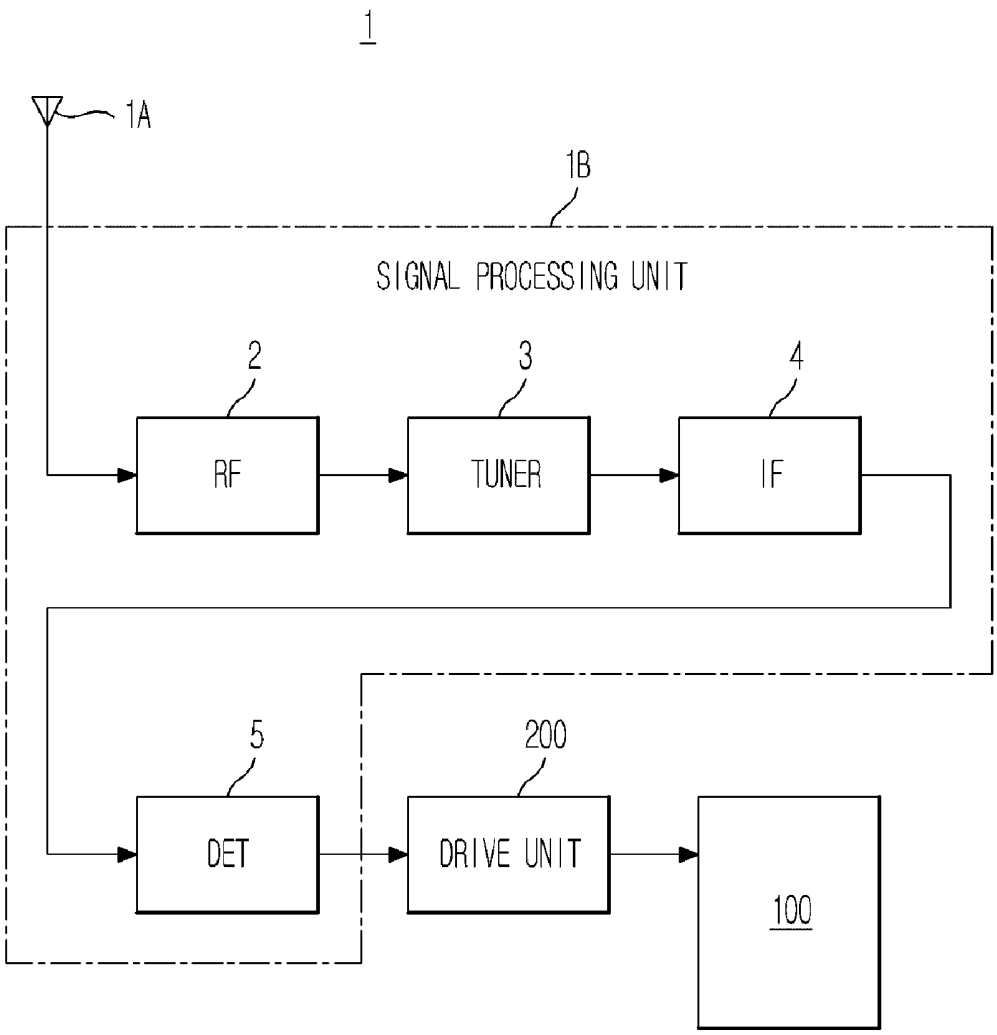
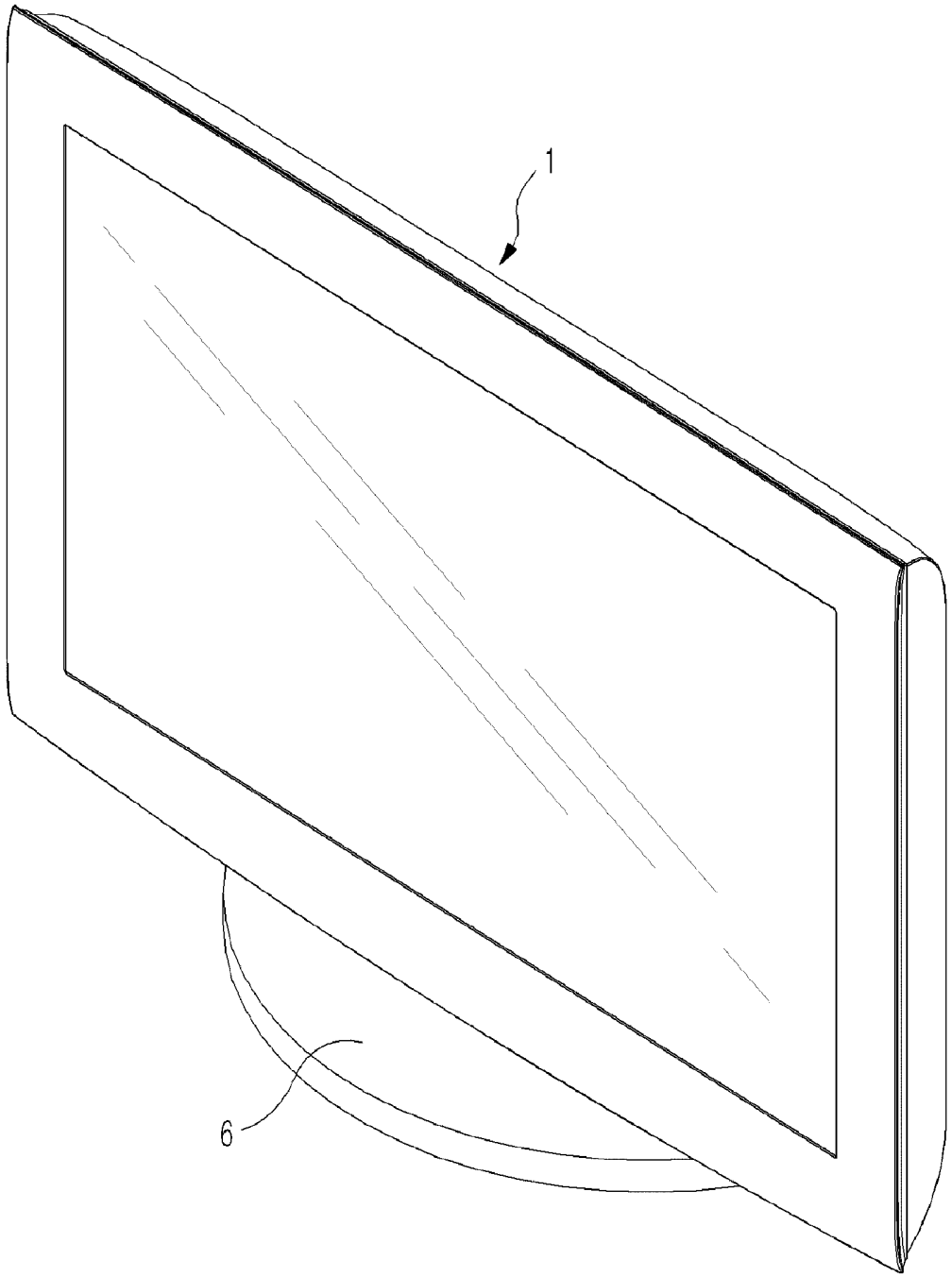

1
1A
1B
SIGNAL PROCESSING UNIT
2
3
4
RF
TUNER
IF
5
200
DET
DRIVE UNIT
100

FIG. 8



BACK LIGHT ASSEMBLY AND LIQUID CRYSTAL DISPLAY INCLUDING THE SAME

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority under 35 U.S.C. §119 from Korean Patent Application No. 2009-0076441, filed on Aug. 18, 2009 and Korean Patent Application No. 2009-0081668, filed on Aug. 31, 2009 in the Korean Intellectual Property Office, the disclosure of which is incorporated herein by reference in its entirety.

BACKGROUND

[0002] 1. Field of the General Inventive Concept

[0003] Embodiments of the present general inventive concept relate to a back light assembly having uniform interior temperature to prevent quality deterioration of a liquid crystal display and a liquid crystal display including the same.

[0004] 2. Description of the Related Art

[0005] A liquid crystal display (LCD) displays an image using electrical and optical characteristics of a liquid crystal. The LCD has a smaller thickness and weight than other displays. Also, the LCD has a lower power consumption and driving voltage than other displays. Therefore, the LCD has been widely used over the whole field of industry.

[0006] The LCD includes a liquid crystal panel having a liquid crystal placed between two transparent substrates. Directions of liquid crystal molecules are changed by applying a voltage to the liquid crystal to change the optical transmissivity such that an image is optically displayed on the liquid crystal panel. Also, the LCD includes a back light assembly to supply light to the liquid crystal panel recently, and continues to grow in use.

[0007] The back light assembly uses a cold cathode fluorescent lamp (CCFL), an external electrode fluorescent lamp (EEFL), a flat fluorescent lamp (FFL), etc. as a light source. In recent years, however, light emitting diodes (LEDs) exhibiting high brightness, long life span and high color purity have been used as a light source of the back light assembly due to limitations of the CCFL in terms of high quality and reduction in weight and size of a device employing the back light assembly. Furthermore, the use of the CCFL has decreased due to strict regulations on environmentally toxic materials, such as mercury, and the use of the LEDs, which are environmentally-friendly parts, is on the rise.

[0008] Based on LED arrangement and shape of a light guide plate, a back light assembly employing LEDs as a light source may be classified as a direct type LED back light assembly or an edge type LED back light assembly. In the direct type LED back light assembly, the LEDs are disposed at the front of the back light assembly, with the result that the direct type LED back light assembly may not have a small thickness. Also, the direct type LED back light assembly uses an excessive number of LEDs, with the result that costs of the direct type LED back light assembly increase.

[0009] In the edge type LED back light assembly, on the other hand, LEDs are mounted at the side of the light guide plate such that light is emitted to the front of the back light assembly through the light guide plate, with the result that the edge type LED back light assembly has a smaller thickness than the direct type LED back light assembly.

[0010] In the edge type LED back light assembly, however, regions where a relatively large number of LEDs are disposed have higher temperatures than other regions where a relatively small number of LEDs are disposed, with the result that the interior temperature of the back light assembly is not uniformly maintained. The nonuniform interior temperature of the back light assembly affects a polarizing plate of a liquid crystal panel, causing light leakage from the liquid crystal panel, thereby deteriorating quality of a liquid crystal display employing the back light assembly.

SUMMARY

[0011] Therefore, features and utilities of the present general inventive concept provide a back light assembly having uniform interior temperature to achieve uniform brightness of a liquid crystal panel, and a liquid crystal display including the same.

[0012] Additional features and utilities of the present general inventive concept will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the general inventive concept

[0013] Embodiments of the present general inventive concept may be achieved by providing a back light assembly including a light guide plate, a light source unit to emit light to an edge of the light guide plate, a lower cover to receive the light guide plate and the light source unit, heat generated from the light source unit being transferred to the lower cover, and a heat insulator provided adjacent at least one region of the lower cover in an area to correspond to the light source unit.

[0014] The back light assembly may further include a carrier member to transfer heat generated from the light source unit to the lower cover, and the heat insulator may be provided at a region of the carrier member and the lower cover.

[0015] The light source unit may include a plurality of light source units disposed at four side edges of the lower cover, the carrier member may include a plurality of carrier members disposed at the four side edges of the lower cover to transfer heat generated from the light source units to the lower cover, and the heat insulator may include a plurality of heat insulators attached to correspond to corners of the lower covers.

[0016] The back light assembly may further include a reflective sheet provided between the light guide plate and the lower cover, and the heat insulator may be provided between the reflective sheet and the lower cover.

[0017] The carrier member may include a support to support the light source unit and a heat sink to transfer heat generated from the light source unit to the lower case.

[0018] The heat insulator may be formed of one selected from a group consisting of plaster, texture, rubber, and graphite.

[0019] The heat insulator may include a tape to enable the heat insulator to be attached to the lower cover.

[0020] The light source unit may include a printed circuit board supported at an edge of the lower cover by the carrier member and a light emitting diode mounted to the printed circuit board.

[0021] Embodiments of the present general inventive concept may also be achieved by providing a liquid crystal display including a liquid crystal panel to display an image and a back light assembly to supply light to the liquid crystal panel, and the back light assembly includes a light guide plate, a plurality of light source units to emit light to incidence surfaces of the light guide plate, a lower cover to receive the

light guide plate and the light source units, heat generated from the light source units being transferred to the lower cover, and a heat insulator provided adjacent at least one region of the lower cover to prevent heat transferred to the lower cover from being transferred to the liquid crystal panel.

[0022] The back light assembly may further include a plurality of carrier members to transfer heat generated from the light source units to the lower cover, and the heat insulator may be provided adjacent at least one region of the carrier members and the lower cover to prevent heat transferred to the carrier members and the lower cover from being transferred to the liquid crystal panel.

[0023] Each of the light source units may include a printed circuit board supported by a corresponding one of the carrier members, the printed circuit board extending along a corresponding one of the incidence surfaces, and a light emitting diode mounted to the printed circuit board.

[0024] The printed circuit board may be coupled to the corresponding carrier member at a corresponding side edge of the lower cover, and the heat insulator may be attached to a corner of the lower cover where the neighboring printed circuit boards are adjacent to each other.

[0025] The back light assembly may further include a reflective sheet to reflect some of the light emitted from the light source units to the light guide plate, and the heat insulator may be attached to a top of the lower cover such that the heat insulator is in tight contact with a bottom of the reflective sheet.

[0026] The heat insulator may be formed of one selected from a group consisting of acrylic resin, polyurethane, polystyrene, and graphite.

[0027] Embodiments of the present general inventive concept may also be achieved by providing a display including a signal processing unit to process a video signal and an audio signal received from an external source, a liquid crystal panel to display a video signal supplied from the signal processing unit, and a back light assembly to supply light to the liquid crystal panel, and the back light assembly includes a light guide plate, a plurality of light source units to emit light to incidence surfaces of the light guide plate, a lower cover to receive the light guide plate and the light source units, heat generated from the light source units being transferred to the lower cover, and a heat insulator provided adjacent at least one region of the lower cover to prevent heat transferred to the lower cover from being transferred to the liquid crystal panel.

[0028] Embodiments of the present general inventive concept may also be achieved by providing an upper cover to cover a front of a liquid crystal display panel, a lower cover in contact with the upper cover to cover a back of the liquid crystal display panel and having a plurality of side walls, a light source unit disposed adjacent to a first side wall of the lower cover, and a first carrier member in contact with an upper edge of the first side wall of the lower cover and the first light source unit to transfer heat generated from the first light source unit to the lower cover.

[0029] A second light source unit may be disposed adjacent a second side wall of the lower cover, and a second carrier member in contact with an upper edge of the second side wall of the lower cover and the second light source to transfer heat generated from the second light source unit to the lower cover.

[0030] A plurality of heat insulators may be in contact with the first and second carrier members and the lower cover to prevent heat from the first and second light sources from being transferred to the liquid crystal display panel.

[0031] Embodiments of the present general inventive concept may also be achieved by providing an upper cover and a lower cover to cover a liquid crystal display panel, the lower cover having an inside edge extending between a plurality of corners of the lower cover, a light source unit extending along the inside edge of the lower cover to emit light to the liquid crystal display panel, a heat sink extending along the inside edge of the lower cover and adjacent to the plurality of corners to remove heat generated by the light source unit from the liquid crystal display apparatus, and a plurality of heat insulators disposed adjacent to the plurality of corners to prevent the heat generated by the light source unit from being transferred from the plurality of corners to the liquid crystal display panel.

[0032] The heat sink may contact the light source unit and the plurality of heat insulators do not contact the light source unit.

[0033] Embodiments of the present general inventive concept may also be achieved by providing a first and second cover in which to mount a light guide plate and a liquid crystal display panel, the light guide plate having an edge, a light source unit disposed between the first cover and the second cover, the light source unit extending along the edge of the light guide plate to emit light to the light guide plate, a heat sink including a first portion in contact with the light source unit and a second portion in contact with the second cover to transfer heat from the light source unit to the second cover, and a mold frame disposed above the light guide plate and below the liquid crystal display panel to provide support and framing for the liquid crystal display panel and the light guide plate.

[0034] The mold frame may be disposed between the light source unit and the second cover. The mold frame may be disposed between the first heat sink portion and the second heat sink portion.

[0035] A heat insulator may be disposed adjacent the light source unit and covering a portion of the heat sink and the second cover to prevent heat from the light source unit from being transferred to the liquid crystal panel.

BRIEF DESCRIPTION OF THE DRAWINGS

[0036] These and/or other features and utilities of the general inventive concept will become apparent and more readily appreciated from the following description of the embodiments, taken in conjunction with the accompanying drawings of which:

[0037] FIG. **1** is a perspective view illustrating a liquid crystal display according to an embodiment of the present general inventive concept;

[0038] FIG. **2** is an exploded perspective view illustrating part of a back light assembly illustrated in FIG. **1**;

[0039] FIG. **3** is a plan view illustrating part of the back light assembly of FIG. **1**;

[0040] FIG. **4** is a sectional view taken along line IV-IV' of FIG. **1**;

[0041] FIG. **5** is a sectional view illustrating a modified arrangement example of a light source unit according to an embodiment of the present general inventive concept;

[0042] FIG. **6** is a sectional view illustrating another modified arrangement example of the light source unit according to the embodiment of the present general inventive concept;

[0043] FIG. **7** is a construction view illustrating a display apparatus as a display using a liquid crystal display according to an embodiment of the present general inventive concept; and

[0044] FIG. **8** is an exterior view illustrating a display apparatus as a display according to an embodiment of the present general inventive concept

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0045] Reference will now be made in detail to the embodiments of the present general inventive concept, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to like elements throughout

[0046] Reference will now be made in detail to the embodiments of the present general inventive concept, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to the like elements throughout. The embodiments are described below in order to explain the present general inventive concept by referring to the figures.

[0047] FIG. **1** is a perspective view illustrating a liquid crystal display **10** according to an embodiment of the present general inventive concept, FIG. **2** is an exploded perspective view illustrating part of a back light assembly illustrated in FIG. **1**, FIG. **3** is a plan view illustrating part of the back light assembly of FIG. **1**, and FIG. **4** is a sectional view taken along line IV-IV' of FIG.

[0048] As illustrated in FIGS. **1** to **4**, the liquid crystal display **10** includes a liquid crystal panel **100** on which an image is formed, a drive unit **200** connected to one side of the liquid crystal panel **100** to drive the liquid crystal panel **100**, and a back light assembly **300** to irradiate light to the liquid crystal panel **100**.

[0049] An edge of the liquid crystal panel **100** may be supported by a mold frame **140**. The liquid crystal panel **100** is received in the mold frame **140**. The mold frame **10** may be partially open to transmit light emitted from the back light assembly **300**.

[0050] The mold frame **140** and the back light assembly **300** may be coupled to an upper cover **130** to cover the front of the liquid crystal panel **100**. The upper cover **130** serves to cover the liquid crystal panel **100** such that an effective display area of the liquid crystal panel **100** where an image is displayed is exposed. The upper cover **130** guides the position of the liquid crystal panel **100** and fixes the liquid crystal panel **100** to the mold frame **140**.

[0051] Between the upper cover **130** and the liquid crystal panel **100** is a transparent cover **135** to form an outer shell and protect the liquid crystal panel **100** and internal components from the external environment.

[0052] The liquid crystal panel **100** includes a thin film transistor substrate **110**, a color filter substrate **120** opposite to the thin film transistor substrate **110**, and a liquid crystal (not illustrated) placed between the thin film transistor substrate **110** and the color filter substrate **120**. The liquid crystal panel **100** adjusts optical transmissivity of liquid crystal cells, according to image signal information transmitted from the drive unit **200**, to form an image.

[0053] The drive unit **200** may be provided at one side of the thin film transistor substrate **110** to apply a drive signal to the liquid crystal panel **100**. The drive unit **200** includes a flexible printed circuit board **210**, a drive chip **220** mounted to the flexible printed circuit board **210**, and a circuit board **230** connected to the flexible printed circuit board **210**.

[0054] The back light assembly **300** may be located at the rear of the liquid crystal panel **100**. The back light assembly **300** may include optical sheets **310** stacked on the rear of the liquid crystal panel **100** to diffuse and condense light, a light guide plate **400** disposed at the rear of the optical sheets **310**, a light source unit **500** provided along the edge of the light guide plate **400** to emit light to the liquid crystal panel **100**, a reflective sheet **600** provided at the rear of the light guide plate **400**, a lower cover **700** to receive the light guide plate **400** and the reflective sheet **600**, and a carrier member **800** to transfer heat generated from the light source unit **500** to the lower cover **700**.

[0055] The optical sheets **310**, disposed at the rear of the liquid crystal panel **100** in parallel, include a diffusion sheet **311**, a prism sheet **312**, and a protective sheet **313**, which are consecutively stacked. The diffusion sheet **311** includes a base film (not illustrated) and a diffusion coating layer (not illustrated) formed at the front of the base film. The diffusion sheet **311** serves to diffuse light emitted from the light source unit **500** and to supply the diffused light to the liquid crystal panel **100**.

[0056] The prism sheet **312** and the protective sheet **313** are provided on the diffusion sheet **311**. The prism sheet **312** has prisms arranged on the top thereof in a predetermined pattern. The prism sheet **312** allows light transmitted through the diffusion sheet **311** to advance perpendicularly to improve brightness. The protective sheet **313** is provided on the prism sheet **312** to prevent external impact from being applied to the diffusion sheet **311** and the prism sheet **312** or to prevent external foreign matter from being introduced to the diffusion sheet **311** and the prism sheet **312**, thereby protecting the diffusion sheet **311** and the prism sheet **312**, which are sensitive to dust and scratches.

[0057] The light guide plate **400** has an exit surface **410** facing the liquid crystal panel **100**, a reflection surface **420** opposite to the exit surface **410**, and incidence surfaces **430** connected between the exit surface **410** and the reflection surface **420** while facing the light source unit **500**.

[0058] The light guide plate **400** may be formed of polymethyl methacrylate (PMMA) having high strength, so as not to be easily deformed or broken, and high transmissivity. The light guide plate **400** may be of a plate type in which the exit surface **410** and the reflection surface **420** are disposed in parallel.

[0059] The light source unit **500** includes a plurality of light source units provided at the edge of the lower cover **700** such that the light source units **500** face the corresponding incident surfaces **430** of the light guide plate **400**. For example, the light source units **500** may be disposed along the edge of the lower cover **700**. That is, the light source units **500** may be disposed at four side edges of the lower cover **700**.

[0060] As illustrated in FIGS. **2** and **3**, the light source units **500** may include a first light source unit **500**A disposed at the upper edge of the lower cover **700**, a second light source unit **500**B disposed at the left edge of the lower cover **700**, a third light source unit **500**C disposed at the lower edge of the lower cover **700**, and a fourth light source unit **500**D disposed at the right edge of the lower cover **700**.

[0061] The first light source unit **500**A, the second light source unit **500**B, the third light source unit **500**C, and the fourth light source unit **500**D may have the same construction. Therefore, only the first light source unit **500**A will be described hereinafter in detail, and descriptions of the second to fourth light source units **500**B to **500**D will not be given.

[0062] As illustrated in FIG. **2**, the first light source unit **500**A includes a printed circuit board **510** and a light emitting diode **520** mounted to the printed circuit board **510**. The printed circuit board **510** is formed in the shape of a long bar facing the corresponding incidence surface **430**. The printed circuit board **510** may be mainly formed of aluminum exhibiting high thermal conductivity to conduct heat generated from the first light source unit **500**A. The printed circuit board **510** may be embodied by various printed circuit boards, such as a metal core printed circuit board, a hard printed circuit board or a flexible printed circuit board.

[0063] A light emitting diode **520** may include a plurality of light emitting diodes arranged on the printed circuit board **510** at regular intervals. The respective light emitting diodes **520** may be white light supply units including blue, red and green light emitting diodes to supply white light.

[0064] The reflective sheet **600** reflects light emitted from the light source units **500** and discharged in the direction opposite to the liquid crystal panel **100** to the light guide plate **400** to reduce light loss. The reflective sheet **600** may be formed of polyethylene terephthalate (PET) or poly carbonate (PC).

[0065] As illustrated in FIG. **2**, the lower cover **700** is located below the reflective sheet **600**. The lower cover **700** may be formed in the shape of a rectangular parallel-piped box, open at the top thereof such that the lower cover **700** has a receiving space **725** of a predetermined depth. That is, the lower cover **700** includes a base plate **710** and a plurality of side walls **720** perpendicularly extending from the base plate **710**. The receiving space **725** is defined by the base plate **710** and the side walls **720**.

[0066] The reflective sheet **600**, the light guide plate **400**, and the optical sheets **310** are consecutively received in the receiving space **725** of the lower cover **700**. The base plate **710** of the lower cover **700** is partially open such that heat generated from the light source units **500** is rapidly discharged outside.

[0067] A carrier member **800** is provided between the lower cover **700** and the light source units **500**. The carrier member **800** can be formed of a hard metal material, such as aluminum, to support the light source units **500** and, at the same time, to transfer heat generated from the light source units **500** to the lower cover **700**.

[0068] As illustrated in FIGS. **2** and **3**, the carrier member **800** includes a first carrier member **800**A corresponding to the first light source unit **500**A, a second carrier member **800**B corresponding to the second light source unit **500**B, a third carrier member **800**C corresponding to the third light source unit **500**C, and a fourth carrier member **800**D corresponding to the fourth light source unit **500**D.

[0069] The first carrier member **800**A may be fixed to the upper edge of the lower cover **700** to support the first light source unit **500**A and to transfer heat generated from the first light source unit **500**A to the lower cover **700**. The second carrier member **800**B is fixed to the left edge of the lower cover **700** to support the second light source unit **500**B and to transfer heat generated from the second light source unit **500**B to the lower cover **700**.

[0070] Also, the third carrier member **800**C is fixed to the lower edge of the lower cover **700** to support the third light source unit **500**C and to transfer heat generated from the third light source unit **500**C to the lower cover **700**. The fourth carrier member **800**D is fixed to the right edge of the lower cover **700** to support the fourth light source unit **500**D and to transfer heat generated from the fourth light source unit **500**D to the lower cover **700**.

[0071] The first carrier member **800**A, the second carrier member **800**B, the third carrier member **800**C, and the fourth carrier member **800**D have the same construction. Therefore, only the first carrier member **800**A will be described hereinafter in detail, and descriptions of the second to fourth carrier members **800**B to **800**D will not be given.

[0072] As illustrated in FIG. **4**, the first carrier member **800**A may include a support **810** to support the first light source unit **500**A and a heat sink **820** to transfer heat generated from the first light source unit **500**A to the lower case **700**. The lower **700** case then transfers the heat to the outside environment.

[0073] The support **810** may protrude in parallel portions to correspond to the side walls **720** of the lower cover **700**. Below the support **810**, the heat sink **820** may extend from the base plate **710** of the lower cover **700** along the corresponding side wall **720**. The support **810** and the heat sink **820** may be integrally formed by injection-molding a hard metal material, such as aluminum. Thus, the support **810** is also a heat sink that transfers heat from the light sources **500** through the upper and lower covers **700** and **300** to the external environment.

[0074] The parallel portions of the support **810** may include a first sub portion **812** to extend substantially the same height as the upper cover and a second sub portion **814** to be substantially the same height as the light source unit **500**. The first and second sub portions **812** and **814** enclose a portion **140***a* of the mold portion on three sides thereof. A second portion **140***b* of the mold frame **140** may be disposed above the light source **500** and adjacent the first and second sub portions **812** and **814** of the support **810**. The lower portion **140***a* of the mold frame **140** may be positioned between the side wall **720** and the light source **500**. Thus, the mold frame **140** may be disposed adjacent multiple sides of the light source units **500** to provide support and framing for the light guide plate **400** and liquid crystal display panel **100**.

[0075] To the lower cover **700** is attached a heat insulator **900** to prevent heat transferred from the first to fourth light source units **500** to the lower cover **700** from being transferred to the liquid crystal panel **100** by heat radiation or convection to uniformly maintain the interior temperature of the back light assembly **300**.

[0076] In this example embodiment, the heat insulator **900** is formed of a material having high heat insulation efficiency. The heat insulator **900** may be formed of, for example, graphite, plaster, texture, rubber, reflective sheet, acrylic resin, polyurethane, polystyrene, etc. The heat insulator **900** may include a heat sink material to rapidly discharge heat generated from the light source units **500** out of the liquid crystal display **10** and a heat transfer preventing material to prevent heat generated from the light source units **500** from being transferred into the liquid crystal display **10**.

[0077] As illustrated in FIGS. **2** and **3**, the heat insulator **900** may include a first heat insulator **900**A to insulate heat generated from a left upper corner A of the lower cover **700** where the first light source unit **500**A and the second light source unit **500**B are adjacent to each other, a second heat insulator **900**B to insulate heat generated from a left lower corner B of the lower cover **700** where the second light source unit **500**B and the third light source unit **500**C are adjacent to each other, a third heat insulator **900**C to insulate heat gener-

ated from a right lower corner C of the lower cover **700** where the third light source unit **500**C and the fourth light source unit **500**D are adjacent to each other, and a fourth heat insulator **900**D to insulate heat generated from a right upper corner D of the lower cover **700** where the fourth light source unit **500**D and the first light source unit **500**A are adjacent to each other.

[0078] The first to fourth heat insulators **900**A to **900**D each may include a tape **910** by which the first to fourth heat insulators **900**A to **900**D are attached to the base plate **710** of the lower cover **700**.

[0079] The operation of the back light assembly and the liquid crystal display including the same will be additionally described.

[0080] As the first to fourth light source units **500** emit light, heat is generated from the first to fourth light source units **500**. Heat from the light source units **500** is conducted to the first to fourth carrier members **800**. The heat conducted to the first to fourth carrier members **800** is discharged outside through the lower cover **700** coupled to the first to fourth carrier members **800** through the heat sinks **820**.

[0081] Relatively high or increased temperatures may appear at the respective corners A, B, C, and D of the lower cover **700** where the neighboring light unit sources **500** are adjacent to each other. Although the temperatures at the respective corners A, B, C, and D of the lower cover **700** are nonuniform, however, the heat insulators **900** prevent heat from being transferred from the respective corners A, B, C, and D of the lower cover **700** to the liquid crystal panel **100** by heat radiation or convection.

[0082] Also at the corners, the heat sinks **820** come together to form dual heat sinks to correspond to the temperatures at the corners. Thus, along with the heat insulators **900**, the coming together of the heat sinks at each corner provides significant heat conduction to lower or offset the heat that may accumulate at each corner as a result an increase in heat from the light sources at the respective corners.

[0083] As illustrated in FIG. **4**, inside, outer, or corner ends/edges **920** of the heat insulators **900** are positioned adjacent, but not touching the light source units **500**. An end of the heat insulator **920** may protrude or extend past the incident surfaces **430** towards the light source unit **500** a greater distance than the light guide plate **400**. As a result of this configuration, the heat insulators **900** do not prevent heat from radiating downward to the heat sinks **820**, yet at the same time prevents heat from being transferred from the corners to the liquid crystal panel **100**.

[0084] Therefore, the interior temperature of the back light assembly **300** may be uniformly maintained even at the regions where the neighboring light unit sources **500** are adjacent to each other, thereby achieving uniform brightness of the liquid crystal panel **100**.

[0085] The light source unit may be coupled to the lower cover in various ways. FIG. **5** is a sectional view illustrating a modified arrangement example of the light source unit, and FIG. **6** is a sectional view illustrating another modified arrangement example of the light source unit.

[0086] As illustrated in FIG. **5**, a light source unit **500'** may be directly supported at the corresponding side wall **720** of the lower cover **700**. Also, as illustrated in FIG. **6**, a light source unit **500"** may be supported between the support **810'** of the corresponding carrier member **800** and the corresponding side wall **720** of the lower cover **700** without an additional space.

[0087] In FIGS. **5** and **6**, the mold frame **140** may be disposed above the light sources **500** and adjacent an upper portion of the support **810'**. Such a configuration may allow more space to allow the light guide plates **400** and the covers **130** to allow more of the LCD screen to be used for displaying images.

[0088] FIG. **7** is a construction view illustrating a display apparatus as a display using a liquid crystal display according to an embodiment of the present general inventive concept.

[0089] As illustrated in FIG. **7**, a display apparatus **1** may include a computer monitor, a television monitor, flat screen of a digital camera, video camera, cellular telephone, and other displays using LCD screens and backlights such as displays on photocopiers, faxes, multifunction devices, etc.

[0090] When a display apparatus **1** may be a television set for example, an external signal may be received by an antenna **1**A from a television broadcast antenna, from a local cable operator, or from a cable or television converter within a user's home or business. The transmission signal may be input by the display apparatus **1** into an RF receiver **2**. The input signals received by the RF receiver **2** may be transmitted to a tuner **3** in order to filter out undesired signals. Audio, video, control, and other signals may then be passed though an intermediate frequency module **4** to a detector **5** to further filter signals to be reproduced on the LCD panel.

[0091] After passing through these several components the amplitude of the image data signals may be weakened and thus the drive unit **200** amplifies and outputs the signals to drive the liquid crystal panel **100**. The internal control of the display apparatus may be controlled by a controller (not illustrated) internal to the display apparatus. Control of the components of the display apparatus **1** may also be embedded in a received signal from an external controller.

[0092] FIG. **8** is an exterior view illustrating the display apparatus **1** as a display according to an embodiment of the present general inventive concept. As illustrated, the display apparatus **1** may be mounted on a stand **6** to support the display apparatus. The display apparatus may alternatively be mounted on a wall, hung from a ceiling, or mounted on other types of base members.

[0093] In example embodiments of the present general inventive concept, the back light assembly and the liquid crystal display including the same have a fundamental technical concept in that the heat insulators are provided at the regions where the neighboring light unit sources are adjacent to each other to uniformly maintain the interior temperature of the back light assembly.

[0094] As is apparent from the above description, heat conducted to the lower cover is prevented from being transferred to the liquid crystal panel by the heat insulators disposed adjacent to the light source units, thereby uniformly maintaining the interior temperature of the back light assembly and thus achieving uniform brightness of the liquid crystal panel of the liquid crystal display including the back light assembly.

[0095] Although a few embodiments of the present general inventive concept have been illustrated and described, it would be appreciated by those skilled in the art that changes may be made in these embodiments without departing from the principles and spirit of the general inventive concept, the scope of which is defined in the claims and their equivalents.

What is claimed is:

1. A back light assembly comprising:
a light guide plate;
a light source unit to emit light to an edge of the light guide plate;
a lower cover to receive the light guide plate and the light source unit, heat generated from the light source unit being transferred to the lower cover; and
a heat insulator provided adjacent to at least one region of the lower cover in an area to correspond to the light source unit.

2. The back light assembly according to claim 1, further comprising:
a carrier member to transfer heat generated from the light source unit to the lower cover, wherein
the heat insulator is provided at a region of the carrier member and the lower cover.

3. The back light assembly according to claim 2, wherein
the light source unit comprises a plurality of light source units disposed at four side edges of the lower cover,
the carrier member comprises a plurality of carrier members disposed at the four side edges of the lower cover to transfer heat generated from the light source units to the lower cover, and
the heat insulator comprises a plurality of heat insulators attached to correspond to corners of the lower covers.

4. The back light assembly according to claim 1, further comprising:
a reflective sheet provided between the light guide plate and the lower cover, wherein the heat insulator is provided between the reflective sheet and the lower cover.

5. The back light assembly according to claim 2, wherein the carrier member comprises:
a support to support the light source unit; and
a heat sink to transfer heat generated from the light source unit to the lower case.

6. The back light assembly according to claim 1, wherein the heat insulator is formed of one selected from a group consisting of plaster, texture, rubber, and graphite.

7. The back light assembly according to claim 1, wherein the heat insulator comprises a tape to enable the heat insulator to be attached to the lower cover.

8. The back light assembly according to claim 2, wherein the light source unit comprises:
a printed circuit board supported at an edge of the lower cover by the carrier member; and
a light emitting diode mounted to the printed circuit board.

9. A liquid crystal display apparatus comprising:
a liquid crystal panel to display an image; and
a back light assembly to supply light to the liquid crystal panel, wherein
the back light assembly comprises:
a light guide plate;
a plurality of light source units to emit light to incidence surfaces of the light guide plate;
a lower cover to receive the light guide plate and the light source units, heat generated from the light source units being transferred to the lower cover; and
a heat insulator provided adjacent to at least one region of the lower cover to prevent heat transferred to the lower cover from being transferred to the liquid crystal panel.

10. The liquid crystal display apparatus according to claim 9, wherein
the back light assembly further comprises a plurality of carrier members to transfer heat generated from the light source units to the lower cover, and
the heat insulator is provided adjacent to at least one region of the carrier members and the lower cover to prevent heat transferred to the carrier members and the lower cover from being transferred to the liquid crystal panel.

11. The liquid crystal display apparatus according to claim 10, wherein each of the light source units comprises:
a printed circuit board supported by a corresponding one of the carrier members, the printed circuit board extending along a corresponding one of the incidence surfaces; and
a light emitting diode mounted to the printed circuit board.

12. The liquid crystal display apparatus according to claim 11, wherein
the printed circuit board is coupled to the corresponding carrier member at a corresponding side edge of the lower cover, and
the heat insulator is attached to a corner of the lower cover where the neighboring printed circuit boards are adjacent to each other.

13. The liquid crystal display apparatus according to claim 9, wherein
the back light assembly further comprises a reflective sheet to reflect some of the light emitted from the light source units to the light guide plate, and
the heat insulator is attached to a top of the lower cover such that the heat insulator is in tight contact with a bottom of the reflective sheet.

14. The liquid crystal display apparatus according to claim 9, wherein the heat insulator is formed of one selected from a group consisting of acrylic resin, polyurethane, polystyrene, and graphite.

15. A liquid crystal display apparatus, comprising:
a signal processing unit to process a video signal and an audio signal received from an external source;
a liquid crystal panel to display a video signal supplied from the signal processing unit; and
a back light assembly to supply light to the liquid crystal panel, wherein
the back light assembly comprises:
a light guide plate;
a plurality of light source units to emit light to incidence surfaces of the light guide plate;
a lower cover to receive the light guide plate and the light source units, heat generated from the light source units being transferred to the lower cover; and
a heat insulator provided adjacent to least one region of the lower cover to prevent heat transferred to the lower cover from being transferred to the liquid crystal panel.

16. A liquid crystal display apparatus, comprising:
an upper cover to cover a front of a liquid crystal display panel;
a lower cover in contact with the upper cover to cover a back of the liquid crystal display panel and having a plurality of side walls;
a light source unit disposed adjacent to a first side wall of the lower cover; and
a first carrier member in contact with an upper edge of the first side wall of the lower cover and the first light source unit to transfer heat generated from the first light source unit to the lower cover.

17. The apparatus of claim 16, further comprising:

a second light source unit disposed adjacent a second side wall of the lower cover; and

a second carrier member in contact with an upper edge of the second side wall of the lower cover and the second light source to transfer heat generated from the second light source unit to the lower cover.

18. The apparatus of claim 17, further comprising a plurality of heat insulators in contact with the first and second carrier members and the lower cover to prevent heat from the first and second light sources from being transferred to the liquid crystal display panel.

19. A liquid crystal display apparatus, comprising:

an upper cover and a lower cover to cover a liquid crystal display panel, the lower cover having an inside edge extending between a plurality of corners of the lower cover;

a light source unit extending along the inside edge of the lower cover to emit light to the liquid crystal display panel;

a heat sink extending along the inside edge of the lower cover and adjacent to the plurality of corners to remove heat generated by the light source unit from the liquid crystal display apparatus; and

a plurality of heat insulators disposed adjacent to the plurality of corners to prevent the heat generated by the light source unit from being transferred from the plurality of corners to the liquid crystal display panel.

20. The apparatus of claim 19, wherein the heat sink contacts the light source unit and the plurality of heat insulators do not contact the light source unit.

21. A liquid crystal display apparatus, comprising:

a first and second cover in which to mount a light guide plate and a liquid crystal display panel, the light guide plate having an edge;

a light source unit disposed between the first cover and the second cover, the light source unit extending along the edge of the light guide plate to emit light to the light guide plate;

a heat sink including a first portion in contact with the light source unit and a second portion in contact with the second cover to transfer heat from the light source unit to the second cover; and

a mold frame disposed above the light guide plate and below the liquid crystal display panel to provide support and framing for the liquid crystal display panel and the light guide plate.

22. The apparatus of claim 21, wherein the mold frame is disposed between the light source unit and the second cover.

23. The apparatus of claim 22, wherein the mold frame is disposed between the first heat sink portion and the second heat sink portion.

24. The apparatus of claim 21, further comprising a heat insulator disposed adjacent the light source unit and covering a portion of the heat sink and the second cover to prevent heat from the light source unit from being transferred to the liquid crystal panel.

* * * * *

专利名称(译)	背光组件和包括其的液晶显示器		
公开(公告)号	US20110043721A1	公开(公告)日	2011-02-24
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[标]申请(专利权)人(译)	三星电子株式会社		
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摘要(译)

具有均匀内部温度以防止液晶显示器质量劣化的背光组件和包括该背光组件的液晶显示器包括导光板，将光发射到导光板边缘的光源单元，下盖接收导光板和光源单元，光源单元产生的热量传递到下盖，以及与下盖的至少一个区域相邻设置的热绝缘体，对应于光源的区域单元。