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(54) Backlight unit

summary

The present invention relates to a backlight unit in which brightness and optical characteristics are stabilized by adding a heat dissipation structure to a PCB board and then attaching a light emitting element to emit the generated heat, comprising: a heat sink; a PCB substrate bonded on the heat sink; It is characterized by comprising a light emitting element attached to the PCB board.

Representative too

Figure 4a

index word

Heat sink, backlight, PCB, light emitting device

Specification

Brief description of the drawing

1 is a diagram for explaining the structure of a general backlight assembly.

Figure 2 is a perspective view showing a backlight unit using a typical fluorescent lamp.

Figure 3a is a side view showing a conventional backlight unit.

Figure 3b is a top view showing a conventional backlight unit.

Figure 4a is a side view showing a backlight unit according to the present invention.

Figure 4b is a top view showing the backlight unit according to the present invention

Explanation of symbols for main parts of the drawing

31: heat sink 32: PCB board

33: light emitting element 34: double-sided tape

DETAILED DESCRIPTION OF THE INVENTION

Purpose of invention

Technology to which the invention belongs and prior art in the field

The present invention relates to backlight units, and in particular to backlight units suitable for stabilizing brightness and optical properties.

CRT (Cathode Ray Tube), one of the commonly used display devices, is used in measuring devices including televisions (TVs).

It is mainly used in monitors such as information terminal devices, but due to the weight and size of CRT, electronic products can be made smaller and lighter. could not actively respond to their demands.

Therefore, in the trend of various electronic products becoming smaller and lighter, CRT has certain limitations in weight and size, and is expected to replace them, such as liquid crystal display (LCD) using electro-optical effects, gas discharge, etc. A plasma display panel (PDP) using a plasma display device (PDP) and an EL display device (ELD) using an electroluminescence effect.

; Electro Luminescence Display), among others, research on liquid crystal displays is actively underway.

In order to replace CRTs, liquid crystal displays, which have advantages such as small size, lightweight, and low power consumption, have recently been developed as flat panel displays. The demand for liquid crystal displays is continuously increasing as they have been developed to the extent that they can sufficiently perform their role as devices and are used not only in laptop-type computer monitors but also in desktop-type computer monitors and large-scale information display devices.

Here, the liquid crystal display device is largely divided into a liquid crystal panel that displays images and a driving unit that applies a driving signal to the liquid crystal panel.

It can be, and the liquid crystal panel is main between the first and second glass substrates bonded with a certain space, and the first and second glass substrates.

It is composed of a layer of liquid crystal.

Here, the first glass substrate (TFT array substrate) includes a plurality of gate lines arranged in one direction at regular intervals and

A plurality of data lines arranged at regular intervals in a direction perpendicular to each of the gate lines, a plurality of pixel electrodes formed in a matrix form in each pixel area defined by intersection of each of the gate lines and the data lines, and the gate lines of

A plurality of thin film transistors are formed that are switched by a signal and transmit the signal of the data line to each pixel electrode.

do.

And on the second glass substrate (color filter substrate), a black matrix layer to block light in areas excluding the pixel area,

R, G, and B color filter layers for expressing color and a common electrode for implementing an image are formed.

The first and second glass substrates are bonded together by a spacer with a certain space and a sealant having a liquid crystal injection hole, and liquid crystal is injected between the two substrates.

Meanwhile, since most liquid crystal displays are light-receiving elements that display images by controlling the amount of light coming from the outside, a separate light source, that is, a backlight, is necessary to irradiate light to the liquid crystal panel. Lamp unit installed Depending on the location, it is divided into edge method and direct method.

Here, the light sources include EL (Electro Luminescence), LED (Light Emitting Diode), and CCFL (Cold Cathode Fluorescent L).

amp), HCFL (Hot Cathode Fluorescent Lamp), etc. are used, and in particular, it has a long lifespan, low power consumption, and can be formed thinly.

The CCFL method is widely used in large-screen color TFT LCDs.

The CCFL method uses a fluorescent discharge tube containing mercury gas containing argon, neon, etc. at low pressure to utilize the penning effect. Electrodes are formed at both ends of the tube, and the cathode is formed in a wide plate shape, and when voltage is applied,

As in the sputtering phenomenon, charged particles in the discharge tube collide with the plate-shaped cathode to generate secondary electrons, which are then converted to surrounding elements.

excites them to form plasma.

These elements emit strong ultraviolet rays, and these ultraviolet rays excite the phosphor again, causing the phosphor to emit visible light.

In the double edge method, a lamp unit is installed on the side of the light guide plate that guides the light. The lamp unit consists of a lamp that emits light, a lamp holder that is inserted at both ends of the lamp to protect the lamp, and a lamp that surrounds the outer circumference of the lamp and has one side. A lamp reflector is installed on the side of the light guide plate and reflects the light emitted from the lamp toward the light guide plate.

In this way, the edge method, in which a lamp unit is installed on the side of the light guide plate, is mainly applied to relatively small liquid crystal display devices such as monitors of laptop and desktop computers, and has good light uniformity and long durability. It is advantageous for thinning liquid crystal displays.

Meanwhile, the direct type began to be developed intensively as the size of liquid crystal display devices began to increase to 20 inches or more. It directs light to the front of the liquid crystal panel by arranging a plurality of lamps in a row on the lower surface of the diffusion plate. It is done.

Since the direct method has higher light utilization efficiency than the edge method, it is mainly used in large-screen liquid crystal displays that require high brightness.

However, in the case of liquid crystal displays using the direct display system, they are used in large monitors or televisions, so their usage time is longer than that of laptop-type computers, and because the number of lamps is large, lamp failure and lifespan are higher in the direct display system than in the edge display system. As a result, there is a greater possibility of lamps not lighting.

In the direct type, multiple lamps are installed at the bottom of the screen, so if one lamp does not light up due to the lifespan or failure of the lamp, for example, the part where the lamp is not lit becomes significantly darker than the other parts, so the lamp does not light up. The missing part will appear immediately on the screen.

For this reason, lamps are frequently replaced in the direct type, so the lamp unit must have a structure that makes it easy to disassemble and assemble it.

As described above, a liquid crystal display device uses liquid crystals to control the amount of light transmitted to the screen and uses this light to determine the brightness and color of the screen, so it exhibits several characteristics different from general display devices.

For example, the viewing angle where the image quality changes significantly depending on the angle from which the screen is viewed, the transmittance according to the projection type luminous display, and the transmitted light passes through the color filter to produce the colors of red (R), green (G), and blue (B). These include color reproducibility, which depends on the degree of reproduction, luminance, which indicates the brightness and darkness of the image, and afterimage, which leaves traces of the image for a long time when the same image continues for a long period of time.

Currently, liquid crystal displays are expanding beyond the displays of portable products to include monitors for desktop PCs and home TVs. Liquid crystal displays have the physical advantages of being light, thin, and small, but among the above-mentioned characteristics, color reproducibility and luminance are particularly weak compared to CRTs.

Existing liquid crystal displays for laptop monitors have a color reproducibility of 40 to 50% of the NTSC method adopted by the National Television System Committee as a color television broadcasting method, but even this does not affect the user's taste. was able to meet the needs.

However, in the case of TV, which is attracting attention as a new liquid crystal display market, the development of a liquid crystal display device that can achieve color reproducibility at or above the level of CRT is required.

A typical multi-color liquid crystal display device largely consists of a liquid crystal panel, a backlight, and a color filter. In other words, a backlight consisting of a three-wavelength fluorescent lamp is used as a light source, and the white light emitted from it is separated into three colors of red, green, and blue by the color filter, and then additively mixed to create various colors.

The color of a light source is determined by the chromaticity coordinates established by the International Commission on Illumination. That is, after calculating the tristimulus values Next, if the x and y values of red, green, and blue are expressed in orthogonal coordinates, a horseshoe-shaped spectral locus is drawn, which is called a CIE chromaticity diagram. All common light sources have their color coordinates inside this horseshoe shape.

At this time, the triangular area formed by each color coordinate of red, green, and blue becomes the color reproduction area, and the larger the triangular area, the higher the color reproducibility. Color reproducibility depends on color purity and luminance. As color purity and luminance increase, color reproducibility increases.

Here, the tristimulus values X, Y, and Z represent the weights of individual color-matching functions close to a certain spectrum, and in particular, Y represents the stimulus value for brightness.

Meanwhile, color temperature refers to the color of white based on the color change of light emitted depending on the temperature of the heat source. There are three major color temperatures on the monitor: 9300K, 6500K, and 5000K.

The closer the color temperature is to 9000K, the more white it is with a touch of blue, the closer the color temperature is to 6500K, the more white it is with a hint of red, and the closer the color temperature is to 5000K, the more neutral the color is. The color temperature is obtained from the color coordinates (x, y) of white, and the closer the color temperature is to 9000K, the more likely it is to satisfy the European Broadcasting Union (EBU) standards.

In the case of the above-mentioned liquid crystal display device, the emission spectrum of the backlight is combined with the color matching function and the transmission spectrum of the color filter to determine the tristimulus value for each wavelength in the visible light region. Therefore, in order to realize various colors, the backlight, color filter, and tristimulus are combined. The correlation between stimulus values must be appropriately adjusted. That is, in order to optimize color reproducibility and color temperature, the emission spectrum of the backlight must be changed, and the transmission spectrum of the color filter must be adjusted correspondingly to maximize luminous efficiency.

In order to implement white color, blue, green, and red LEDs must be used simultaneously, which causes many application problems. In particular, when using blue, green, and red LEDs at the same time, it is difficult to apply it realistically because of the technical problem of creating white by combining different colors depending on the position of each LED.

Therefore, in order to implement white light, all three wavelengths from one LED are required to emit light at a certain intensity or higher.

There is an urgent need for the development of a backlight that can take advantage of the advantages of cold cathode fluorescent lights in laptops, which have an excellent color reproduction range, as well as the advantages of SMD (Surface Mounting Device) LED backlights in mobile phones, which are not only small but also consume very little power. there is.

Meanwhile, the configuration of a general backlight assembly is as follows.

1 is a diagram for explaining the structure of a general backlight assembly.

As shown in Figure 1, it is composed of a fluorescent lamp (1), a light guide plate (2), a diffusion material (3), a reflector plate (4), a diffusion plate (5), and a prism sheet (6).

First, when a voltage is applied to the fluorescent lamp (1), the residual electrons present in the fluorescent lamp (1) move to the anode, and the moving residual electrons collide with argon (Ar), causing the argon to be excited and multiply positive ions. , the proliferated positive ions collide with the cathode and emit secondary electrons.

When the emitted secondary electrons flow through the tube and initiate a discharge, the flow of electrons caused by the discharge collides with mercury vapor and ionizes, emitting ultraviolet rays and visible light. The emitted ultraviolet rays excite the phosphor applied to the inner wall of the lamp, producing visible light. It emits light.

Next, the light guide plate 2 is a wave guide that causes the light emitted from the fluorescent lamp 1 to enter the inside and emit a surface light source upward, and is made of PMMA (Poly Methyl Meth) with excellent light transmission. Acrylate) resin is used.

Factors related to the light incident efficiency of the light guide plate 2 include the light guide plate thickness vs. lamp diameter, the distance between the light guide plate and the lamp, and the shape of the lamp reflector. In general, the fluorescent lamp 1 is positioned at a distance greater than the center of the light guide plate 2. By deviating in the thickness direction, the light incident efficiency increases.

The light guide plate 2 of the LCD backlight unit includes a printed light guide plate, a V-cut type light guide plate, and a scattering light guide plate.

Next, the diffusion material 3 is composed of SiO₂ particles, PMMA, solvent, etc. At this time, it is used for the above-mentioned SiO₂ diffusion and has a porous particle structure. PMMA is also used for SiO₂. To attach particles to the lower surface of the light guide plate (2)

The diffusion material 3 is applied to the lower surface of the light guide plate in the form of a dot, and the area of the dots increases step by step to obtain a uniform surface light source at the top of the light guide plate 2. In other words, the area closer to the fluorescent lamp (1) has a smaller area ratio occupied by dots per unit area, and the

Far from P(1), the area ratio occupied by dots per unit area is large.

At this time, the shape of the dot can be of various shapes, and if the area ratio of the dot per unit area is the same, the same brightness effect can be obtained at the top of the light guide plate regardless of the shape of the dot.

Next, the reflector 4 is installed at the rear of the light guide plate 2 to allow the light emitted from the fluorescent lamp 1 to enter the light guide plate 2.

And the diffusion plate (5) is installed on the upper part of the light guide plate (2) on which the dot pattern is applied to obtain uniform luminance according to the viewing angle. The material of the diffusion plate (5) is PET or PC (Poly Carbonate) resin is used, and there is a particle coating layer on the top of the diffusion plate (5) that plays a diffusion role.

Next, the prism sheet 6 is used to increase the front brightness of the light transmitted and reflected through the upper part of the diffusion plate 5. The above-described prism sheet 6 allows only light at a specific angle to be transmitted, and light incident at the remaining angles is used. Total internal reflection occurs and returns to the bottom of the prism sheet (6). As described above, the returning light is reflected by the reflector 4 attached to the lower part of the light guide plate 2.

The backlight assembly configured as above is fixed to the mold frame, the display unit disposed on the upper surface of the backlight assembly is protected by the top chassis, and the top chassis and mold frame are combined to accommodate the backlight assembly and display unit between them. .

Figure 2 is a perspective view showing a backlight unit using a general fluorescent lamp.

As shown in FIG. 2, a fluorescent lamp 11 is coated on the inside with a phosphor and emits light, and the fluorescent lamp 11 is fixed and the light emitted from the fluorescent lamp 11 is directed in one direction. a lamp housing 12 that condenses light, a light guide plate 13 that supplies the light emitted from the fluorescent lamp 11 to the liquid crystal panel on the top of the backlight, and a light guide plate 13 attached to the lower part of the light guide plate 13 to the opposite side of the liquid crystal panel. A reflector 14 that reflects the light coming out of the light guide plate 13, a diffusion plate 15 located on top of the light guide plate 13 to uniformly diffuse the light coming from the light guide plate 13, and the diffusion plate (15) A prism sheet 16 located at the top to condense the light diffused from the diffusion plate 15 and transmit it to the liquid crystal panel, and a prism sheet 16 located at the top of the prism sheet 16 to protect the prism sheet 16. It consists of a protective sheet (17) and a main support (18) that houses and secures the components.

In the backlight unit configured as above, the light emitted from the fluorescent lamp 11 is concentrated on the light incident surface of the light guide plate 13, passes through the light guide plate 13, passes through the diffusion plate 15, and the prism sheet 16 in that order to the liquid crystal panel. It is delivered.

However, a backlight unit using a conventional fluorescent lamp as described above has a low color reproduction rate due to the luminous characteristics of the light source itself. Additionally, it is difficult to obtain a high-brightness backlight unit due to limitations in the size and capacity of fluorescent lamps.

On the other hand, recent backlight units have been used to read information displayed on the screen of a liquid crystal display device in dark places, but recently, due to various requirements such as design, low power consumption, and thinning, the light guide plate has been made thinner. In addition to the ability to express various colors, technology is being developed to reduce power consumption using LED (Light Emitting Diode).

Hereinafter, the backlight unit of a conventional liquid crystal display device will be described with reference to the attached drawings.

Figure 3a is a side view showing a conventional backlight unit, and Figure 3b is a top view showing a conventional backlight unit.

As shown in FIGS. 3A and 3B, a plurality of light emitting devices 21 are arranged at regular intervals on a PCB substrate 22 made of Al.

That is, with a plurality of light emitting devices 21 arranged on the front of the PCB board 22, the PCB board 22 is placed under a light guide plate (not shown) to directly illuminate the liquid crystal panel.

Here, the light emitting element 21 attached to the PCB board 22 includes a light emitting part 21a made of a light emitting chip and a transparent mold, a cathode 21b attached to the light emitting part 21a, and the cathode (A lead frame 21c is connected to both ends of 21b), and the lead frame 21c is attached to the PCB board 22 using soldering or the like.

However, the conventional backlight unit as described above attaches a plurality of light-emitting elements directly onto a PCB substrate made of Al, so a large amount of light-emitting elements are used in a single area, so heat is dissipated, and the optical characteristics change due to this dissipated heat, which is fatal. There is a definite weakness.

In other words, when light-emitting device chips are mounted directly on a PCB board at high density and used for signals or lighting equipment, the light-emitting device chips emit more heat, and the amount of heat dissipation increases in proportion to the total light-emitting area, improving optical characteristics and brightness. Defects occur.

Technical task that the invention aims to achieve

The present invention was devised to solve the above-described conventional problems, and provides a backlight unit that stabilizes brightness and optical characteristics by adding a heat dissipation structure to a PCB board and then attaching a light emitting element to emit the generated heat. There is that purpose.

Composition and operation of the invention

The backlight unit according to the present invention for achieving the above object is characterized by comprising a heat sink, a PCB board attached to the heat sink, and a light emitting element attached to the PCB board.

Here, the heat sink is made of alumina.

Additionally, the heat sink has a larger area than the PCB board.

Additionally, the heat sink and the PCB board are adhered using double-sided tape.

In addition, the heat sink includes a connection surface to which the PCB board is connected, and a plurality of heat dissipation fins arranged at regular intervals below the connection surface.

Hereinafter, the backlight unit according to the present invention will be described in detail with reference to the attached drawings.

Figure 4a is a side view showing the backlight unit according to the present invention, and Figure 4b is a top view showing the backlight unit according to the present invention.

As shown in FIGS. 4A and 4B, a heat sink () made of alumina, a PCB board (32) adhered on the heat sink (31), and a plurality of light emitting devices attached at regular intervals to the PCB board (32). It is comprised including an element 33.

Here, the heat sink 31 is configured to have an area approximately four times larger than the PCB board 32.

Meanwhile, the PCB board 32 and the heat sink 31 are adhered using double-sided adhesive tape.

In addition, the light-emitting element 33 attached to the PCB board 32 includes a light-emitting part 33a made of a light-emitting chip and a transparent mold, a cathode 33b attached to the light-emitting part 33a, and the cathode (A lead frame 33c is connected to both ends of 33b), and the lead frame 33c is attached to the PCB board 32 using soldering or the like.

Therefore, as described above, the PCB board 32 is adhered to a certain area on the heat sink 31 using double-sided tape 34, and a plurality of light emitting devices 33 are soldered on the PCB board 32, etc. Attach.

Here, the PCB board 32 can be any board on which the light emitting device 33 can be mounted at high density.

For example, the PCB substrate 32 includes alumina, quartz, calcium zirconate, forsterite, SiC, graphite, fused silica, and mullite (mullite, cordierite, zirconia, beryllia, and aluminum nitride.

Accordingly, the material of the PCB substrate 32 is not particularly limited, but alumina or SiC is particularly suitable. More preferably, alumina is used.

The alumina ceramic has great electrical insulation and high thermal conductivity. In addition, alumina ceramics have excellent heat resistance, chemical resistance, and mechanical strength, and especially have the advantage of low radiation emission.

In addition, the heat sink 31 includes a connection surface 31a to which the PCB board 32 is connected, and a plurality of heat dissipation fins 31b formed at regular intervals below the connection surface 31a. By doing so, the heat dissipation surface can be increased to maximize the heat dissipation effect.

Meanwhile, the present invention described above is not limited to the above-described embodiments and the accompanying drawings, and various substitutions, modifications, and changes are possible without departing from the technical spirit of the present invention. It will be clear to a person with ordinary knowledge.

Effects of the Invention

As described above, the backlight unit according to the present invention has the following effects.

In other words, by adhering a PCB board onto a heat sink made of alumina and then attaching a light emitting device, the heat emitted from the light emitting device can be effectively dissipated to improve brightness and optical properties.

(57) Scope of claims

Claim 1. A
heat sink;

A PCB board glued on the heat sink,

A backlight unit comprising a light emitting element attached to the PCB board.

Claim 2.
The backlight unit of claim 1, wherein the heat sink is made of alumina.

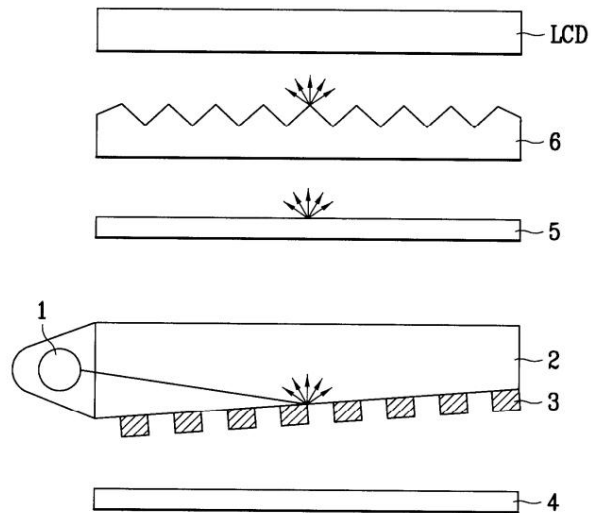
Claim 3.
The backlight unit of claim 1, wherein the heat sink has an area larger than the PCB board.

Claim 4.
The backlight unit of claim 1, wherein the heat sink and the PCB board are adhered using double-sided tape.

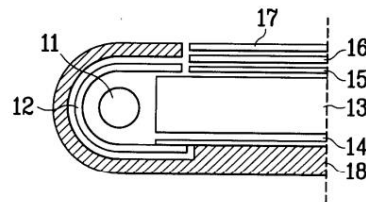
5. The
backlight unit of claim 1, wherein the heat sink includes a connection surface to which the PCB board is connected, and a plurality of heat dissipation fins formed at regular intervals below the connection surface.

floor plan

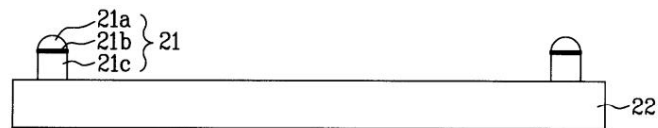
Drawing 1



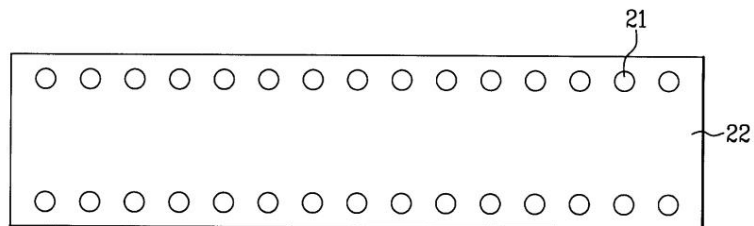
Drawing 2



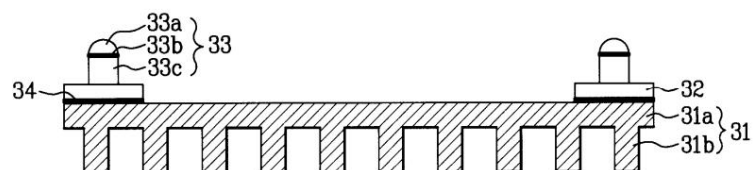
Drawing 3a



Drawing 3b



Drawing 4a



Drawing 4b

