(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

PCT

(43) International Publication Date
18 May 2007 (18.05.2007)

(10) International Publication Number
WO 2007/055486 A1

(51) International Patent Classification:
H01L 33/00 (2006.01)

(21) International Application Number:
PCT/KR2006/004447

(22) International Filing Date: 30 October 2006 (30.10.2006)

(25) Filing Language: Korean

(26) Publication Language: English

(30) Priority Data:
10-2005-0106916
9 November 2005 (09.11.2005) KR

(71) Applicant *(for all designated States except US)*: **ALTI-ELECTRONICS CO., LTD.** [KR/KR]; 90-1 Bongmyeong-ri, Namsa-myeon, Cheoin-gu, Yongin-si, Gyeonggi-do 449-882 (KR).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **PARK, Ik-Seong** [KR/KR]; 108-2304 Dongah Apts., Bongcheon 2-dong, Gwanak-gu, Seoul 151-052 (KR). **LEE, Jin-Won** [KR/KR]; 107-501 Yewonmaeul Ferien Apts., Gorim-dong, Yongin-si, Gyeonggi-do 449-010 (KR). **IN, Chi-Ok** [KR/KR]; 919-1 Geumcheon-ri, Sinpyeong-myeon, Dangjin-gun, Chungcheongnam-do 343-812 (KR). **KIM, Sun-Hong** [KR/KR]; 25-88 Juan 5-dong, Nam-gu, Incheon 402-205 (KR).

(74) Agent: **LEE, Kyeong-Ran**; 502, BYC Bldg., 648-1 Yeoksam 1-dong, Kangnam-ku, Seoul 135-081 (KR).

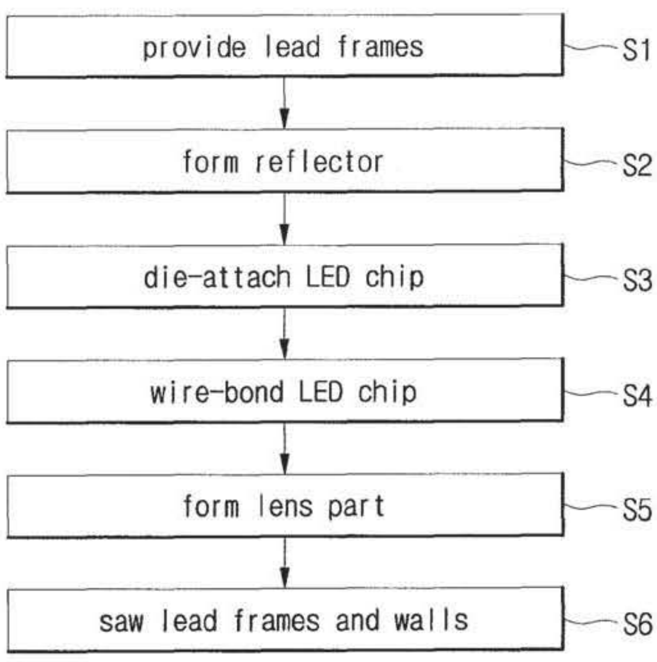
(81) **Designated States** *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KZ, LA, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) **Designated States** *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*

[Continued on next page]

(54) **Title:** LED OF SIDE VIEW TYPE AND THE METHOD FOR MANUFACTURING THE SAME



(57) **Abstract:** A side view type light emitting diode and a method of manufacturing the same are disclosed. A method including (a) providing lead frames which include a cathode terminal and an anode terminal; (b) forming a reflector which surrounds the lead frames, such that portions of the cathode terminal and anode terminal protrude from both sides, and which includes a groove open in the upward direction and a wall surrounding the groove; (c) die-attaching an LED chip onto the lead frames inside the groove; (d) bonding the LED chip to the cathode terminal or to the anode terminal with a conductive wire; (e) dispensing a liquid curable resin into the groove to form a lens part; and (f) sawing the walls facing each other using a sawing machine such that the thicknesses at the upper surfaces are 0.04 to 0.05 mm, provides a side view type light emitting diode in which the thicknesses of the walls of the reflector are made to be 0.04 to 0.05 mm, for an overall thickness of 0.5 mm or lower.

WO 2007/055486 A1

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

【DESCRIPTION】

【Invention Title】

LED OF SIDE VIEW TYPE AND THE METHOD FOR MANUFACTURING THE SAME

【Technical Field】

The present invention relates to a method of manufacturing a diode, more particularly to a method of manufacturing a side view type light emitting diode.

【Background Art】

With reference to Figs. 1 and 2, the composition of a backlight device in a liquid crystal display (LCD) in a mobile communication equipment is typically as illustrated in Fig. 1. That is, in a backlight device 10, a flat light guide plate 14 is arranged on the board, and side light emitting diodes, i.e. LED's 20, are arranged at the sides of this light guide plate 14. Typically, a plurality of LED's 20 are arranged in the form of arrays. The light L from the LED's 20 incident on the light guide plate 14 is reflected upwards by means of minute reflective patterns or a reflective sheet 16 arranged at the bottom surface of the light guide plate 14, and is emitted from the light guide plate 14 to provide a backlight for the LCD panel 18 above the light guide plate 14.

Fig. 2 is a front view showing an example of a conventional LED 20 such as that illustrated in Fig. 1. Referring to Fig. 2, an LED 20 includes a cup-shaped groove 28 housing an LED chip 22 (see Fig. 1) within, and a package body 23 having thin walls 24 at the top and bottom and relatively thick walls 26 to the left and right of the groove 28. In order to guide the light generated at the LED chip 22 to the exterior, the cup-shaped groove 28 is open towards the front of the drawing to form an LED window, which is filled with a transparent resin to seal the LED chip from the exterior. Here, a fluorescent element, etc., may be included in the resin for converting a single color light into white light. Also, a pair of terminals 29 are installed on both sides of the package body 23 to electrically connect the LED chip 22 to an exterior power source.

With this composition, the terminals 29 are not superposed with the groove 28, so that the overall thickness of the LED 20 is reduced.

In particular, there is currently a demand for the reduction of thickness in LCD backlight devices, and a thickness reduction in the LED's is advantageous for the thickness reduction in backlight devices. At present, there is a demand for a thickness of about 0.6 mm or lower for side view type light emitting diodes (LED's) in LCD backlight devices, and it is expected that the demand will be for thicknesses of 0.5mm or lower in the future.

However, with the LED 20 having a structure such as that illustrated in Figs. 1 and 2, it is difficult to ensure a package thickness, i.e. fitted height, of 0.5 mm or lower. This is because the opening of the groove 28, i.e. the LED window, requires a certain amount of width for guiding the light generated at the LED chip 22 to the exterior, the walls 24 at the top and bottom of the LED window also require a certain amount of thickness to ensure a desired strength, and it is difficult to make this thickness go below a certain amount with only the injection-molding type of manufacturing method.

Another problem in the conventional LED applied to LCD backlight devices is that the opening of the groove 28, i.e. the LED window is separated upwards by a thickness t_h of the lower wall 24 from the bottom of the light guide plate 14. Thus, the light L generated at the LED chip 22 and emitted downwards towards the exterior of the groove 28 proceeds along a predetermined length before reaching the reflective sheet 16 at the bottom of the light guide plate 14. This creates first dark spots 33, in which the light L is dim, on the reflective sheet 16, to degrade the overall efficiency of the LCD backlight device.

Meanwhile, with the miniaturization of mobile communication equipment on which the LCD backlight device is equipped, there is also a trend of reducing the thickness of the light guide plate for the LCD backlight device. That is, the thickness of the light guide plate is being reduced to 0.5 mm and lower.

In this case, another problem occurs in the LCD backlight device that employs conventional LED's, as described below with reference to Fig. 3. As illustrated in Fig. 3, when the thickness of the light guide plate 14a is 0.5 mm or lower, the thickness of the LED's 20a is made greater than that of the light guide plate 14a. Then, a substantial

DOCKET ALARM

Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts

Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research

With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips

Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.

WHAT WILL YOU BUILD? | **sales@docketalarm.com** | **1-866-77-FASTCASE**

fastcase®
Smarter legal research.