

**ILLUMINATION UNIT AND LIQUID CRYSTAL DISPLAY COMPRISING IT**

## TECHNICAL FIELD

[0001] The present invention relates both to a lighting unit and to a liquid crystal display device using the same.

## BACKGROUND ART

[0002] Recently, a liquid crystal display device has been widely used as a display device of an information device such as a notebook-type personal computer, a word processor and the like, or as a display device of a video device such as a portable television, a video movie, a car navigation system and the like, by taking advantage of characteristics in which the liquid crystal display device is light and thin, and consumes small electricity. Such liquid crystal display device typically has a structure in which a display element is illuminated from behind by a built-in lighting unit for obtaining a bright display screen.

[0003] As a structure of the lighting unit, there is an edge light type in which a light guiding plate is disposed on a rear surface of the display element, and a linear light source such as a fluorescent discharge tube is disposed on an end face of the light guiding plate. The edge light type excels in achieving a thin lighting unit and a light emitting surface thereof with a uniform luminance. Therefore, this is commonly adopted as a backlight type of the liquid crystal display device used in the notebook-type personal computer or the like in order to give priority to thinness of the liquid crystal display device. In the liquid crystal display device used in a portable television, a car navigation system and the like, the edge light type in which the light sources are disposed on both right and left sides of the light guiding plate, or the light source is disposed on one side of the light guiding plate is commonly adopted in order for the thinness and the luminance to be compatible with each other.

[0004] FIG. 7 shows a conventional lighting unit UT of the edge light type in which light sources are disposed on both sides of the light guiding plate, and a liquid crystal display device L including the same. The lighting unit UT comprises a flat transparent light guiding plate 3 configured to transmit light to an entire rear surface thereof, light sources 2 disposed on one side surface of the light guiding plate 3, a reflecting sheet 5 for guiding light generated from the light sources 2 to end faces 3a of the light guiding plate 3, a light correction sheet 9 for uniformizing or the like the light emanating from the light guiding plate 3, and housings 10 for holding the light guiding plate 3, reflectors 4, the reflecting sheet 5, and the light correction sheet 9.

[0005] The light guiding plate 3 is made of a material having optimal optical characteristics, such as transmissivity and a refractive index or the like required for transmitting light, for example, acrylic. The reflecting sheet 5 serves to return the light emanating from the light guiding plate 3 to the same again, thereby increasing an illumination light emanating from a light emanating surface. White resinous film having high reflectivity is used as the reflecting sheet 5.

[0006] The reflector 4 is configured to allow the light from the light sources 2 to efficiently enter the incident end face 3a of the light guiding plate 3, and folded in U-shape in cross-section so as to enclose the light sources 2. The

reflector 4 may be integral with the reflecting sheet 5 by folding a portion of the reflecting sheet 5 in substantially U-shape around the vicinity of the light sources 2 (the reflector portion).

[0007] The housing 10 is disposed in the vicinity of the reflector 4 so as to enclose side and upper surfaces thereof. The housing 10 serves to hold a liquid crystal display panel 1, the light sources 2, and the light guiding plate 3 as well as the reflector. The housing 10 is made of polycarbonate resin, for example, and a rear surface thereof is covered with a rear cover RC.

[0008] The light correction sheet 9 is disposed on an illuminating surface side of the light guiding plate 1. As the light correction sheet 9, there is a diffusion sheet, a prism sheet, and the like. By providing a plurality of sheets of various specifications as necessary, the light illuminated from the light guiding plate is diffused, and thereby uniform and highly luminous illumination light is obtained. The light correction sheet 9 is stored within a space formed by the light guiding plate 3, a contact holding portion 10s of the housing 10, and a sheet holding portion 10b, a lower surface of which is cut, with a predetermined clearance kept.

[0009] The liquid crystal display device L is structured such that a liquid crystal display panel 1 is mounted on a front (above in the drawing) of the lighting unit UT structured as described above. And, the light emitted from the light source 2 is guided to the light guiding plate 3 directly or by being collected by means of the reflector 4, and uniformly transmitted to an entire rear surface of the liquid crystal display panel 1. Thereby, characters and images reflected in a display surface 1a of the liquid crystal display panel 1 are visually recognized.

[0010] In the above-described conventional structure, however, there has been a problem that any of the components of the lighting unit UT and the liquid crystal display device L disagreeably cracks. The disagreeable crack is generated not only while using the lighting unit UT and the liquid crystal display device L, but also after using the same, but it is not clear where the crack is generated.

## DISCLOSURE OF THE INVENTION

[0011] The present invention is aimed at solving the above-described problem. A cause of occurrence of a disagreeable crack in a lighting unit and a liquid crystal display device is examined. And, an object of the present invention is to provide a lighting unit and a liquid crystal display device using the same capable of inhibiting occurrence of the crack.

[0012] The inventors or the like of the present invention clarified a mechanism of occurrence of the disagreeable crack as described below, by an experiment in which a light source of the lighting unit and the liquid crystal display device was turned on and off repeatedly. When the liquid crystal display device is turned off and left under an environment of a constant temperature for a long time, since surfaces of a light guiding plate and of a housing at a contact portion are very smooth and pressed against each other by a predetermined pressure, the light guiding plate and the housing weakly adhere to each other by van der Waals forces or the like at the contact portion thereof to form adhesive surfaces. However, if the liquid crystal display device is