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SPECIFICATION

1. Title of the Invention: SURFACE LIGHT SOURCE DEVICE

2. Claims

(1) A surface light source device comprising a light diffusion layer, a transparent light guide layer, and a reflective layer, which are successively stacked in a direction of a line of sight, the transparent light guide layer having an embossed pattern on at least one surface thereof, the embossed pattern including discontinuously arranged oblique surfaces, at least one or more of which are disposed in each cell of a grid with a pitch in a range of 0.1 to 1.0 mm, wherein a light source and a light-source reflective layer are arranged on an edge of the transparent light guide layer.

(2) A surface light source device comprising a light

diffusion layer, a transparent light guide layer, and a reflective layer, which are successively stacked in a direction of a line of sight, wherein a light source and a light-source reflective layer are arranged on at least one edge of the transparent light guide layer, the transparent light guide layer having an embossed pattern on at least one surface thereof, the embossed pattern including a quadrangular-pyramid-shaped projection or recess in each cell of a grid with a pitch in a range of 0.1 to 1.0 mm, the quadrangular-pyramid-shaped projections or recesses having oblique surfaces at an angle in a range of 20° to 80°.

(3) The surface light source device according to Claim 1 or 2, wherein the embossed pattern is such that the projection area of the cells of the grid increases as a perpendicular distance from the light source increases.

3. Detailed Description of the Invention

[Industrial Field of Application]

The present invention relates to surface light source devices used for illumination or the like, and more particularly, to illumination devices used as surface light sources for uniformly illuminating a relatively large area by using light from a point light source or a linear light source. For example, the present invention relates to surface light source devices used as an illumination panel for an advertisement display or the like or a backlight of a

transmissive liquid crystal display apparatus, and more particularly, to a high-brightness surface light source device having a uniform brightness distribution.

[Description of the Related Art]

In general, in the case where fluorescent lamps are used for indoor illumination or to illuminate, for example, an outdoor advertising board during the night, several fluorescent lamps are arranged next to each other and a light-diffusing plate-shaped object, such as a milk-white plate, is disposed above the fluorescent lamps, so that light emitted from the linear light sources is converted into pseudo-surface light source. In this method according to the related art, because light flux that is emitted from each fluorescent lamp uniformly over the entire circumference is roughly spread along a plane at a certain position, the brightness distribution along a planer region in which the light diffusing plate is arranged may include unattractive non-uniform portions. These portions visually show the outlines or the like of the fluorescent lamps, and may degrade the appearance of the illuminating device. To prevent this, it is necessary to place the light diffusing plate at a position far from the fluorescent lamps, and this is a disadvantage from the viewpoint of space requirements or the like.

Recently, there has been an increasing demand for a

relatively small surface light source having a uniform brightness distribution for use as a backlight of a liquid crystal television set, a portable personal computer, or a liquid crystal display.

To comply with such a demand, electroluminescence (EL) devices and direct backlights, in which fluorescent lamps are arranged directly below and the brightness distribution is adjusted with a light shielding filter or the like, have been developed. However, these devices have poor durability and do not provide sufficiently satisfactory diffused illumination. Accordingly, Japanese Unexamined Patent Application Publication No. 51-88042, for example, has proposed a technology for achieving diffused illumination of a plane by using a single transparent light guide plate and guiding light from a side edge of the transparent light guide plate. This technology has already been put into practical use in some applications.

[Problems to be Solved by the Invention]

However, in the case where a single transparent light guide plate is used in the structure of the related art, since the transparent light guide plate itself has a low light diffusion coefficient and the brightness provided thereby is low, it is necessary to form a hairline-patterned rough surface on a back surface or print an appropriate pattern on the back surface by using reflective paint so

that light can be efficiently scattered and the brightness can be increased. These methods of improvement have limitations, and satisfactory results cannot be obtained even though cumbersome processes are required. Also, it is necessary to increase the thickness of the transparent light guide layer by a considerably large amount to achieve the surface brightness required of the surface light source device, and there is a problem in that requirements for reduction in size and weight of the device cannot be satisfied.

The present invention has been made to solve the above-described problems of the related art, and an object of the present invention is to provide an inexpensive surface light source device which includes an extremely thin transparent light guide layer but emits light with a brightness that is equivalent to or higher than that of light emitted by a structure of the related art, which can be reduced in size and weight, and which has a simple structure that can be easily manufactured.

[Means for Solving the Problems]

According to the present invention, a surface light source device is characterized by including a light diffusion layer, a transparent light guide layer, and a reflective layer, which are successively stacked in a direction of a line of sight, the transparent light guide

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