

BACKLIGHT CONTROL APPARATUS FOR KEYBOARD

BACKGROUND OF THE INVENTION

1 Technical Field of the Invention

5 The present invention relates generally to an improvement on a backlight control apparatus designed to control the activation of a backlight which provides illumination from behind, for example, a keyboard used in portable information terminal devices or portable telephones.

10 2 Background Art

Fig. 4 is a block diagram which shows a conventional backlight control device commonly used in portable telephones.

15 The backlight control device includes a control circuit 3 designed to keep a backlight 2 turn on once one of push buttons on a keyboard 1 is depressed regardless of the ambient brightness level. Specifically, the backlight 2 is kept turned on even if the ambient brightness level is enough to visually perceive characters printed on the push bottoms, thereby consuming the electrical energy in a storage battery 4 undesirably.

20 SUMMARY OF THE INVENTION

It is therefore a principal object of the present invention to avoid the disadvantages of the prior art.

25 It is another object of the present invention to provide a backlight control device designed to activate a backlight for a keyboard, for example, only when the ambient brightness level is insufficient to visually perceive characters printed on push buttons

disposed on the keyboard.

According to one aspect of the present invention, there is provided a backlight control apparatus for controlling a backlight which provides illumination from behind a switch operation board
5 which comprises, a photosensor that detects a brightness level of light surrounding the switch operation board and a control circuit that controls activation of the backlight according to the brightness level of the light detected by the photosensor.

In the preferred mode of the invention, the switch operation
10 board is mounted in a casing. The casing has formed therein an opening through which the light surrounding the switch operation board enters the photosensor.

The control circuit compares with the brightness level of the light detected by the photosensor with a given level. If it is
15 determined that the brightness level is higher than the given level, the control circuit keeps the backlight turned off.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be understood more fully from the detailed description given hereinbelow and from the accompanying
20 drawings of the preferred embodiment of the invention, which, however, should not be taken to limit the invention to the specific embodiment but are for explanation and understanding only.

In the drawings:

Fig. 1 is a block diagram which shows a backlight control
25 apparatus according to the present invention;

Fig. 2 is a perspective view which shows a portable wireless



telephone equipped with the backlight control apparatus in Fig. 1;

Fig. 3(a) is a front view which shows another portable wireless telephone equipped with the backlight control apparatus in Fig. 1;

Fig. 3(b) is an illustration which shows a backlight disposed on
5 a circuit board in the telephone of Fig. 3(a); and

Fig. 4 is a block diagram which shows a conventional backlight control apparatus.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, particularly to Fig. 1, there is
10 shown a backlight control device according to the present invention which may be employed in portable information terminal devices or portable telephones.

The backlight control device generally includes a control
circuit 16, a photosensor 13, a resistor 14, and a switching
15 transistor 15.

The photosensor 13 converts the input light into an electric current. The resistor 14 translates the current outputted from the photosensor 13 into the voltage which is, in turn, applied to the switching transistor 15. The switching transistor 15 is connected
20 at a collector to the resistor 14, at a base to the control circuit 16, and at an emitter to ground. The control circuit 16 provides a control signal to a backlight 12 to control activation thereof. The backlight 12 includes light-emitting diodes which are energized with power supplied from a storage battery 17 to illuminate from
25 behind a switch operation board 11 for facilitating the visual perception of characters printed on switches disposed on the

switch operation board 11. The switch operation board 11 may be a keyboard having disposed thereon push buttons or a liquid crystal display having disposed thereon force-sensitive switches or touch switches.

5 Fig. 2 shows a portable wireless telephone equipped with the backlight control device of the invention.

 A plurality of push buttons 22 are disposed on a front surface of a casing 21. The backlight 12 is mounted behind the push buttons 22 in the casing 21. The casing 21 has formed in the front
10 surface an opening 24 through which the photosensor 13 is exposed to the ambient light.

 Figs. 3(a) and 3(b) show another portable wireless telephone equipped with the backlight control device of the invention.

 A plurality of push buttons 22 are, as shown in Fig. 3(a),
15 disposed on a front surface of a casing 31. The light-emitting diodes of the backlight 12 are, as shown in Fig. 3(b), mounted on a substrate 33 to illuminate characters printed on the push buttons 32. The casing 31 has formed therein an opening 35. The
20 photosensor 13 is installed on a portion of the substrate 33 where the light surrounding the casing 31 reaches the photosensor 13 through the opening 35.

 In operation, when one of the push buttons 22 is turned on or depressed, it outputs a depression indicative signal **a**, as shown in Fig. 1, to the control circuit 1. The control circuit 1 is responsive
25 to the depression indicative signal **a** to apply the voltage to the base of the transistor 15 so that the transistor 15 is turned on. When the

transistor 15 is turned on, it will cause the voltage proportional to the current generated in the photosensor 13 to appear at an end of the resistor 14. This voltage is inputted as a brightness level signal **b** to the control circuit 16. The control circuit 16 determines
5 whether the brightness level signal **b** is higher than a given level or not. If it is determined that the brightness level signal **b** is lower than the given level, then the control circuit 16 allows the supply of power to the backlight 12 from the storage battery 17 to illuminate the push buttons 22. Alternatively, if it is determined that the
10 brightness level signal **b** is higher than or equal to the given level, then the control circuit 16 keeps the backlight 12 turned off. This minimizes the consumption of power of the battery 17.

While the present invention has been disclosed in terms of the preferred embodiment in order to facilitate better
15 understanding thereof, it should be appreciated that the invention can be embodied in various ways without departing from the principle of the invention. Therefore, the invention should be understood to include all possible embodiments and modification to the shown embodiments which can be embodied without departing
20 from the principle of the invention as set forth in the appended claims.



WHAT IS CLAIMED IS:

1. A backlight control apparatus for controlling a backlight which provides illumination from behind a switch operation board
5 comprising:
a photosensor that detects a brightness level of light surrounding the switch operation board; and
a control circuit that controls activation of the backlight according to the brightness level of the light detected by said
10 photosensor.
2. A backlight control apparatus as set forth in claim 1, wherein the switch operation board is mounted in a casing, the casing having formed therein an opening through which the light surrounding the
15 switch operation board enters said photosensor.
3. A backlight control apparatus as set forth in claim 1, wherein said control circuit compares with the brightness level of the light detected by said photosensor with a given level and keeps the
20 backlight turned off if the brightness level is determined to be higher than the given level.