

TITLE OF THE INVENTION**A SELF-ORIENTING LED DISPLAY UNIT****BACKGROUND OF THE INVENTION****(a) Technical Field**

The present invention relates to a light emitting diode (LED) display unit, and in particular, to a self-orienting LED display unit where text or images are always displaced in right orientation for viewing.

(b) Description of The Prior Art

Conventional LED display unit employed to visibly display a plurality of characters, text or images is constructed as shown in Fig. 1 and Fig. 2. Fig. 1 shows the front elevational view of the conventional LED display unit, and Fig. 2 is a cross-sectional view taken along the line, II-II in Fig. 1. As shown in the figures, the conventional LED display unit comprises a plurality of LEDs 20 mounted on a printed circuit board 10, and portions of the respective LEDs 20 (except for light-emitting sections thereof), are sealed by a resin 30 to form an LED arrangement. The LED arrangement is then mounted within a plastic case 40. A plurality of cases are arranged on an attaching plate 50 or are fixedly mounted on the attaching plate 50 by respective screws 60, thereby to form a large-sized display panel. The reference numeral 70 in Fig. 2 denotes lead wires which extend rearwardly from the printed circuit board 10 through a back or rear wall of the case 40 and the attaching plate 50. A display unit of this type is expensive to produce and the characters, text or images can only be visibly observed from one direction. The display unit has to be positioned in an upright position in order to display its text, characters or image in the right orientation. Additionally, for outdoor displaying, an LED large-sized display panels which are high in luminance or brightness and are wide in viewing will be required, and it will be required to mount more LEDs 20 onto the printed circuit boards 10. However, the LED display unit having the above conventional construction will not meet this requirement.

US Patent No. 5,036,248 issued to McEwan et al on 30 July 1991 discloses a light emitting diode clusters assembly for use in outdoor displays. The cluster on a circuit board is

housed in a first socket open to its front and nested in an outer connector socket. The connector socket is provided with first electric contacts within the socket and an electric connection means through a rear wall and adapted for connection into the outlet. A plurality of light emitting diodes are positioned on a circuit board and is embedded in potting compound with the housing socket. Such arrangement may be advantageous in that it is inexpensively and easily assembled without the need for encapsulating the LED clusters in a frangible glass bulb. However, this arrangement is not self-orienting and the structure thereof is complicated.

Other conventional LED display units can either display text or messages horizontally or vertically. In addition, they do not allow for easy message changing.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a self-orienting LED display unit in which the characters, text and images can be displayed horizontally or vertically.

It is yet another object of the present invention to provide a self-orienting LED display unit which is capable of displaying both English and Chinese fonts, and graphics.

Yet another object of the present invention is to provide a self-orienting LED display unit which can be rolled from one point to another by having a plurality of flaps formed at the end caps mounted to the display unit.

A further object of the present invention is to provide a self-orienting LED display unit which is powered with easily available D-size battery.

Yet a further object of the present invention is to provide a self-orienting LED display unit, wherein the structure of the unit is simple and the manufacturing cost of the display unit is low.

One aspect of the present invention is to provide a self-orienting LED display unit comprising (a) three LED panels arranged to form an enclosed space; (b) a housing to enclose said LED panels; (c) a pair of end caps mounted at the end of the housing enclosing the LED panels; and (d) a sensor module mounted onto the inner wall of the housing, characterized in that the sensor module includes a plurality of hall-effect sensors and a swinging magnet which is hingedly mounted on a shaft within the sensor module, thereby the swinging magnet senses any

one of the hall-effect sensors, an LED display orientation is determined.

These and other objects, features, aspects and advantages of the present invention will become more apparent from the following detailed description of the present invention when taken in conjunction of the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a front elevational view of a conventional LED display unit.

Fig. 2 is a cross-sectional view taken along a line II-II in Fig. 1.

Fig. 3 is a perspective view of an LED display unit according to the present invention, wherein the display unit can be positioned in a vertical position or in a horizontal position but the text displayed by the display unit is always at upright position.

Fig. 4 is a perspective view of a sensor module in accordance with the present invention.

Fig. 5 is a top view of the sensor module of Fig. 3 of the present invention, wherein the hall-effect sensors are provided at the inner wall of the module.

Fig. 6 is a schematic view of the sensor module in accordance with the present invention.

Fig. 7 is a sectional view of the sensor module taken along line VII in Fig. 5.

DETAILED DESCRIPTION OF THE PRESENT INVENTION

Referring now to Fig. 3, in accordance with a preferred embodiment of the invention, a self-orienting LED display unit 100 comprises three LED panels 12 of rectangular shape, mounted along the longer edges of the panels 12 to form a triangular display unit; a housing 122 having a triangular shape to enclose said LED panels 12; and a pair of substantially circular end caps 14, each mounted to the ends of the triangular display unit. In accordance with the present invention, the end cap 14 includes a plurality of flaps 16 which are hinged along the circumference of the end cap 14 so that the flaps 16 can be adjusted sideways to allow the display unit 100 to firmly position on a flat platform.

As shown in Fig. 3, the three LED panels 12 form into a display unit 100 of three display boards 18, and the position and numbers of the flaps 16 are corresponding to that of the display boards 18. In order to place the display unit 100 horizontally on a flat surface, one of the flaps

16 on each of the end caps 14 is flapped out sideways so that the display unit 100 can stand on the flap 16 with one display board 18 facing downward. In accordance with the present invention, if the display unit 100 is to be placed vertically, the display unit 100 can stand on one of the end caps 14. On both instances, the characters or text on the display board 18 is self-aligned and upright for viewing, which is shown in Fig. 3. In accordance with the preferred embodiment of the present invention, for instance, a text "WELCOME" is always aligned in an upright position when the display unit 100 is placed either vertically or horizontally.

The display unit 100 further includes a sensor module 42, which is shown in Figs. 4-7, having five hall-effect sensors 32 (only 3 hall-effect sensors are shown Fig. 5), one swinging magnet 34 (refer to Fig. 4) hingedly mounted on a shaft 44; a control board (not shown) including a micro controller (not shown), and a driver board (not shown). In accordance with the present invention, the sensor module 42 and the control board and the driver board are housed within the space formed within the housing 122. The sensor module 42 is used to determine the text display orientation of the display unit.

Referring again to Figs. 4 and 5, the sensor module 42 is substantially octagonal enclosing a hollow space, and the five hall effect sensors are disposed onto the inner wall of the sensor module 42. The swinging magnet 34 positioned within the center of the module 42 is rotatably hinged to the shaft 44 mounted across the hollow space of the sensor module 42. The entire sensor module 42 is mounted within the space formed by the three LED panels 12 within the housing 122 by a pair of supporting rods 36, 38, such that when the display unit 100 is placed horizontally, the swinging magnet 34 faces downward and a hall effect is thus formed. Accordingly, the sensor module 42, built with the five hall-effect sensors 32 and the swinging magnet 34, determines the orientation of the displaying text on the displaying boards 18. In the present preferred embodiment, at any time, the display unit 100 will be resting on one of the five faces, i.e., three horizontal and two vertical position, of the unit 100. The swinging magnet 34 will sense one of the five hall-effect sensors 32 and determine the LED display orientation. The display unit 100 can be rotated horizontally on a flat platform, rest on a flat platform or tilted vertically but the displayed text will be self-adjusted automatically to the right orientation for viewing.

In the present preferred embodiment, each of the LED panels 12 is formed by stacking seven 16 by 16 dots LED modules back to back. The text to be displayed is received as ASCII

code, by an infrared receiver (not shown) mounted via the serial port of the micro-controller (not shown) located on the control board within the housing 122. Programs in the micro controller then perform calculations to centralize the text to be displayed. The text are then converted to bitmaps and shifted into registers (not shown) on the display boards 18 at a clock rate of 1 MHz. In this present invention, all the three LED panels 12 are daisy chained together and the total clocking time needed is 336 microseconds.

While the invention has been described in detail, the foregoing description is in all aspects illustrative and not restrictive. It is understood that numerous other modifications and variations can be devised without departing from the subject and spirit of the invention as defined in the following claims.

CLAIMS



1. A self-orienting LED display unit comprising
 - (a) three LED panels of rectangular shape being arranged to form a triangular display unit with an enclosed space;
 - (b) a housing used to enclose said LED panels;
 - (c) a pair of circular end caps mounted at the end of the housing enclosing the LED panels; and
 - (d) a sensor module mounted onto the inner wall of the housing, characterized in that the sensor module includes five hall-effect sensors and a swinging magnet which is hingedly mounted on a shaft within the sensor module, thereby the swinging magnet senses any one of the hall-effect sensors, an LED display orientation is determined.
2. A self-orienting LED display unit as set forth in Claim 1, wherein the end cap includes a plurality of adjustable flaps to facilitate the positioning of the display unit horizontally by flapping one of the flap on each end cap side way.
3. A self-orienting LED display unit as set forth in Claim 1, wherein the end caps at the end of the housing allow the display unit to roll from one point to another.
4. A self-orienting LED display unit as set forth in Claim 1, wherein the displaying board is capable of displaying both English and Chinese fonts, and graphics.