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(54) Improvements in or relating to variable message display

(57) The module is for use in a variable message display and comprises a holder 8 which can accommodate up to nine light emitting diodes which together form one pixel of the display. The holder is provided with a plurality of fins 11 which extend across and over the light emitting diodes to shade the diodes from sunlight. The ends 12 of the fins 11 are reduced in surface area so that the amount of surface which can reflect light is also reduced. The holder 8 is provided with a plurality of holes 10 to accommodating the light emitting diodes and each hole is provided with a protrusions 13 which are suitably shaped so that light emitting diodes having different diameters can be accommodated, thereby enabling the diodes to be correctly mounted in a tight fitting manner. The module is also provided with retaining means 4, 5 which enable the module to be secured to a printed circuit board.

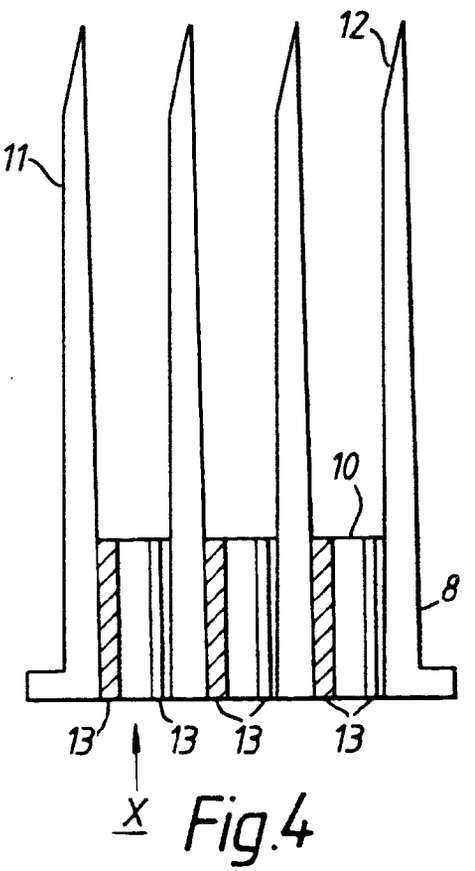

Fig.4

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Description

The present invention relates to improvements in variable message displays which use light emitting diodes to form their display, and which may be used as a road traffic display, and in particular to a module accommodating a number of light emitting diodes which together form a pixel of the display.

All vehicle message displays must meet the requirement of European specifications in respect of light output and in respect of the contrast ratio. The contrast ratio is defined as the ratio of the light output of a character when the pixels are fully lit and when they are off while a similar light source illuminates the character. It is important that when light emitting diodes are fitted to a display, the light emitting diodes are perpendicular to the character axis because this alignment is critical as the light emitting diodes emit light from only a small angle and therefore the light output from the character must always be maximised. There may be as many as three hundred and fifteen light emitting diodes per character and the assembly of the light emitting diodes into a printed circuit board needs to be minimised to reduce manufacturing costs. Furthermore, the light emitting diode component, has a diameter that can vary by as much as plus or minus 0.5mm and so the light emitting diodes must be mounted in a manner which allows for this, whilst maintaining the above mentioned alignment.

The above mentioned problems are overcome by the present invention by the provision of a plastics moulding in which are mounted a plurality of light emitting diodes in a manner which accommodates different diameters of diodes, and a provision of a shade above each diode to obviate the presence of sunlight on the light emitting diode. The shade is substantially shorter in length than shades used in known devices.

According to the present invention there is provided a module for mounting a plurality of light emitting diodes forming a pixel of a variable message display, said module having a plurality orifices, each for locating a light emitting diode, and said module is further provided with means for maximising contrast ratio of the light emitting diodes.

The means for maximising character contrast ratio is a fin which is positioned above each row of light emitting diodes.

The fins are tapered, and are further tapered to reduce the surface area at a front edge thereof, thereby reducing the surface area from which light can be reflected.

Each orifice is provided with means for precisely locating each light emitting diode and comprises a number of protrusions which are arranged to deform a predetermined amount in accordance with the diameter of the light emitting diode when fitted within the orifice.

The present invention will now be described with reference to the accompanying drawings in which,

FIGURE 1 shows a front view of a mounting arrangement for nine light emitting diodes which together form one pixel,

FIGURE 2 shows a side view of the arrangement showing in Figure 1,

FIGURE 3 shows a further side view of the arrangement shown in Figure 1,

FIGURE 4 shows a sectional view through a row of light emitting diode mounting holes, and,

FIGURE 5 shows an enlarged view of a hole as shown in the direction of arrow X of Figure 4.

Referring to Figures 1, 2, and 3, there is shown a housing, for accommodating nine light emitting diodes. The housing may be moulded as a single item. The housing has a base portion 1 having spacers 2a, 3a and locating pins 2, 3, for the purpose of spacing the housing from, and locating the housing on printed circuit board. The locating pins 2, 3 may have different diameters to ensure that the housing can only be mounted in a particular orientation on the board. The base portion also has extended therefrom two retaining means 4, 5 in the form of resilient legs having an inclined surface 6 and a recess 7. When the housing is mounted on a printed circuit board the legs 4, 5 move towards each other as the inclined surface 6 makes contact with a hole within the board and once the inclined surface has fully passed through the hole in the board the legs return to their normal position and are thereby securely located with the recess 7 located under the board. The legs 4, 5 may be offset as shown in Figure 1 and Figure 3. The base portion 1 is provided with holes 10 passing therethrough for accommodating the light emitting diodes. The base portion 1 incorporates a light emitting diode holder 8 through which the holes 10 pass for the purpose of mounting the light emitting diodes. The diodes are arranged in three rows comprising three light emitting diodes. The holder 8 has four fins 11 which may be tapered, extending therefrom. The fins are 50mm in length. The tip of each fin is further tapered by an inclined surface 12. Each fin 11 extends across and above a row of light emitting diodes with the inclined surface 12 being on the underside of each fin 11. The fins 11 provide the shade for the light emitting diodes thus preventing them from reflecting sunlight when they are inactive. The inclined surface 12 reduces the surface area of the front edge of each fin from which light can be reflected The module is mounted so that when viewed, the fins 11 lie in a horizontal plane.

Referring to Figure 4 there is shown in cross section a view of Figure 3 where the sectional view is taken across a row of holes which accommodate the light emitting diodes. It will be seen that each hole 10 includes a number of protrusions 13 which form a crushable grip for the light emitting diode. The grip deforms so that it can accommodate a light emitting diode having a diameter falling within a lower tolerance, and it deforms to a greater extent to accommodate a light emitting diode

which has a tolerance falling within a higher tolerance. In this manner, all light emitting diodes which fall within the manufacturing tolerance range can be securely located within a respective hole 10 within the holder 8.

Referring to Figure 5 there is shown a view of a hole 10 when viewed in a direction of arrow X of Figure 4. Each hole 10 has three protrusions 13 equally spaced around the circumference of the hole. The protrusions are generally V shaped, terminating at a point which faces inwardly of the hole. The protrusions are arranged to deform or crush when a light emitting diode is inserted in the hole 10, thereby accommodating light emitting diodes having different diameters.

The arrangement as discussed, describes means which addresses a number of technical problems experienced with the use of light emitting diodes which form characters in a variable message display. The invention as described maximises character contrast ratio by reducing the value of the light output when the pixels are inactive. This is done in two ways, firstly, the light emitting diodes are shaded from the sun by the fins 11 as described above, and thus the light emitting diodes cannot reflect sunlight, and, secondly because the end of the fins 11 have a reduced surface area produced by the tapered region 12 as described above, the area of reflecting surface is therefore reduced.

The light emitting diodes are manufactured with a lip, and conveniently this lip is used to ensure that each light emitting diode is aligned perpendicular to the character axis. This is achieved by ensuring that the light emitting diodes are fixed such that the lip of the light emitting diode is used as a mechanical reference point by fixing the light emitting diode with the lip hard against a flat surface of the holder 8 perpendicular to the character face. The light emitting diodes are usually fitted to the holder 8 from the direction of arrow X in Figure 4.

With respect to light emitting diode component diameter tolerance, the deformable protrusions 13 as described above accommodates a tolerance of plus/minus 0.5mm, whereby the protrusions 13 are deformed in respect of those diodes having a smaller diameter and will be deformed further in respect of those light emitting diodes having a larger diameter.

From a manufacturing point of view, the invention described lends itself to ease of assembly in that the light emitting diodes which need to be aligned before insertion into the printed circuit board is achievable by holding the light emitting diodes in the desired array orientated correctly for insertion into the printed circuit boards.

It will be appreciated by those skilled the art that various modifications are possible which fall within the scope of the following claims. For example the deformable insert may have a variety of different forms of protrusions other than those described. Also, each pixel may comprise more than nine light emitting diodes, and the deformable legs may be provided in different positions than shown.

Claims

1. A module for mounting a plurality of light emitting diodes forming a pixel of a variable message display, said module having a plurality orifices, each for locating a light emitting diode, and said module is further provided with means for maximising contrast ratio of the light emitting diodes.

2. A module as claimed in Claim 1, wherein the means for maximising character contrast ratio is a fin which is positioned above each row of light emitting diodes.

3. A module as claimed in Claim 2, wherein the fin is tapered.

4. A module as claimed in Claim 2 or Claim 3, wherein each fin is further tapered to reduce the surface area at a front edge thereof, thereby reducing the surface area from which light can be reflected.

5. A module as claimed in any preceding Claim, wherein each orifice is provided with means for precisely locating each light emitting diode, said means being arranged to deform a predetermined amount in accordance with the diameter of the light emitting diode when fitted within the orifice.

6. A module as claimed in Claim 5, wherein the means for locating the light emitting diodes is constituted by a plurality of protrusions which are substantially V shaped and are equally spaced about the circumference of the orifice and which protrude towards the centre of the orifice.

7. A module as claimed in any preceding Claim, wherein the module is provided with retaining means for securing the module to a printed circuit board.

8. A module as claimed in Claim 7, wherein the retaining means comprises two resilient legs which extend through the board and each leg includes a recess for securing the leg to the board.

9. A module as claimed in any preceding Claim, wherein the module is provided with locating means to enable the module to be correctly positioned on a printed circuit board.

10. A variable message display incorporating a plurality of modules as claimed in any preceding Claim.

11. A module substantially is herein described with reference to Figures 1 to 5 of the accompanying drawings.

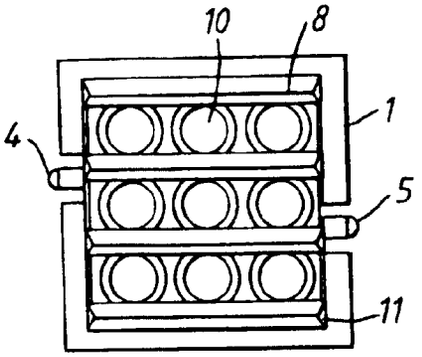

Fig.1

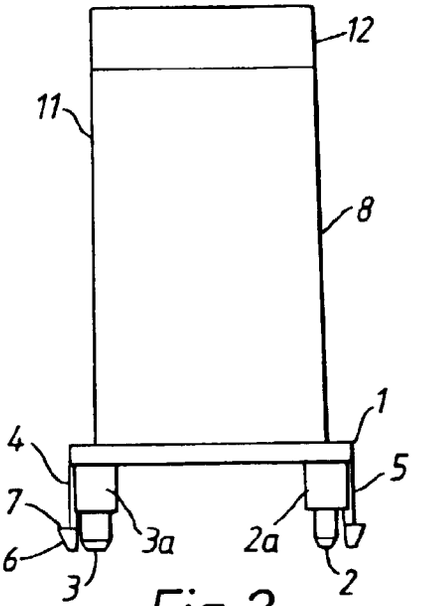

Fig.2

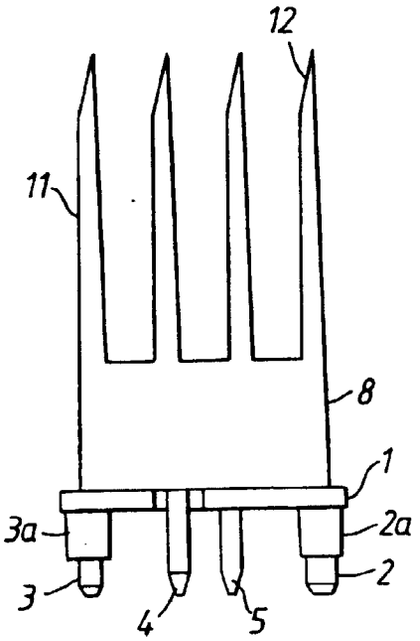

Fig.3

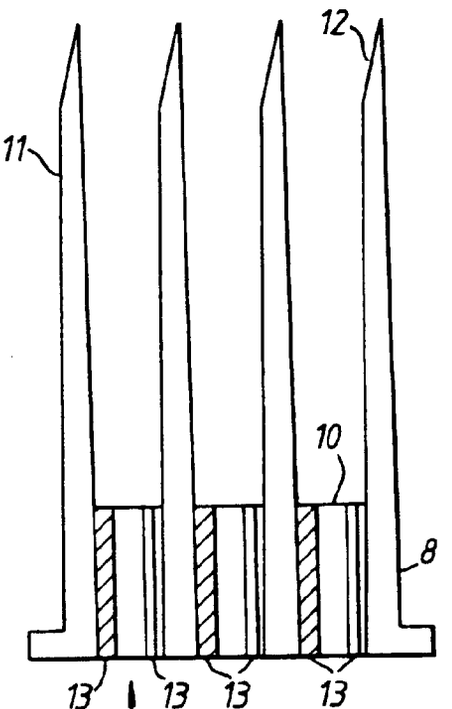

Fig.4

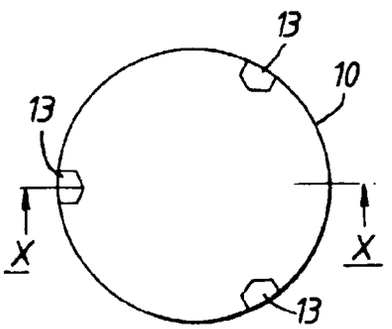

Fig.5