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(54) DISPLAY DEVICE

(71) We, KABUSHIKI KAISHA SUWA SEIKOSHA, a Japanese company, of 3-4, 4-chome, Ginza, Chuo-ku, Tokyo, Japan, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed to be particularly described in and by the following statement:—

This invention relates to display devices.

The present invention seeks to provide a display device which can be unambiguously read.

Conventional display devices have at least seven segments. Wires to each segment are needed to connect the display device to an electronic control circuit so that the segment can be selectively energised to display any of the numerals 0 to 9.

According to one aspect of the present invention there is provided a display device for displaying any of the numerals 0 to 9 comprising: an upper segment; an upper left segment; an upper right segment; a lower left segment; a lower right segment, these segments being arranged in a figure-of-eight configuration; and a lower central segment disposed within an area bounded by the lower left segment and the lower right segment, the upper left segment being curved and extending between the upper segment and a common point at which the upper left segment, upper right segment, lower left segment, lower right segment and the lower central segment meet, the upper right segment being linear and extending from the upper segment to the common point, the lower left segment being curved and extending from the common point to the lower right segment, the lower right segment being curved and extending from the common point to the lower left segment, the lower central segment being linear and extending from the common point to the lower left segment, and portions of the lower left segment and lower right segment overlapping.

In the latter case portions of the upper segment and the upper left segment may overlap.

Preferably, each segment is a liquid crystal element or a solid state element.

According to another aspect of the present invention there is provided a watch having a display device as recited above.

The invention is illustrated, merely by way of example, in the accompanying drawings, in which:

Figure 1 illustrates a conventional display device and also the form of the numerals displayed thereby;

Figure 2 illustrates one embodiment of a display device according to the present invention; and

Figure 3 illustrates the form of the numerals displayed by the display device of Figure 2.

In the following description and in the claims the terms "upper", "lower", "left", "right" etc. refer to the directions as seen in the drawings.

Referring first to Figure 1 of the drawings, there is shown a conventional display device and also the form of numerals displayed thereby. The conventional display device has seven segments disposed in a figure-of-eight configuration. By selectively energising the segments any of the numerals 0 to 9 can be displayed. The form of the numerals displayed is, it will be seen, stylistic which means that they can easily be misread. The conventional display device has no segment which is diagonally arranged with respect to the display device so that the form of the numerals 2, 3, 7 and 8 is angular. Furthermore, the numeral 1 is displayed assymmetrically of the display device and this is aesthetically displeasing to the eye. Moreover, the form of the numerals 5 and 6, the form of the numerals 8 and 9, and the form of the numerals 8 and 0 may lead to confusion therebetween because their forms are similar. Thus the form of the numerals displayed by the conventional display device tends to lead to misreading and, in general, is displeasing to the eye.

Referring to Figure 2 there is shown a display device according to the present invention. This display device, in contrast to the conventional display device, has only six segments

each of which may, for example, be a solid state element or a liquid crystal element.

The display device of Figure 2 has an upper segment 11, an upper left segment 12, an upper right segment 13, a lower left segment 14, and a lower right segment 16. These segments 11, 12, 13, 14, 16 are arranged in a figure-of-eight configuration. The upper segment 11 is substantially linear but with one curved end portion. The upper left segment 12 is curved and extends between the curved end portion of the upper segment 11 and a common point at which the upper left segment 12, the upper right segment 13, the lower left segment 14, and the lower right segment 16 meet. The upper right segment 13 is substantially linear and extends from the upper segment 11 to the common point. The lower left segment 14 is curved and extends from the lower right segment 16 to the common point. Similarly, the lower right segment 16 is curved and extends from the lower left segment 14 to the common point. A portion 24 of the lower left segment 14 and a portion 26 of the lower right segment 16 overlap, these portions being disposed adjacent and parallel to one another. A lower central segment 15 disposed within an area defined by the lower left segment 14 and the lower right segment 16 is linear and extends from the common point to the lower left segment 14 adjacent the portion 24.

By selectively energising the segments, any one of the numerals 0 to 9 may be displayed by the display device. The form of the numerals so displayed is illustrated in Figure 3. The following Table shows which segments are energised to display a given numeral.

TABLE

Numeral	Segments Energised
0	14, 16
1	13, 15
2	11, 13, 14
3	11, 13, 16
4	12, 13, 15
5	11, 12, 16
6	13, 14, 16
7	11, 13, 15
8	11, 12, 13, 14, 16
9	11, 12, 13, 15

Not only is the form of the numerals displayed by this display device clearer than in the conventional display device but also the form of the numerals is less stylistic. The numeral 1 is displayed substantially symmetrically in the display device. By using only six segments in the display device of Figure 2, an electronic control circuit required

to selectively energise the segments may have fewer components and thus be smaller than the electronic control circuit of the conventional display device which has seven segments.

In Figure 2 the upper segment 11 and the upper left segment 12 overlap, this overlap being similar to that between the portion 24 of the lower left segment 14 and the portion 26 of the lower right segment 16. The overlap between the upper segment 11 and the upper left segment 12 is, however, not essential.

A display device according to the present invention is particularly suitable for use in a wrist watch utilising liquid crystal elements or solid state elements. By use of such a display device the reliability of the watch can be increased.

WHAT WE CLAIM IS:—

1. A display device for displaying any of the numerals 0 to 9 comprising: an upper segment; an upper left segment; an upper right segment; a lower left segment; a lower right segment, these segments being arranged in a figure-of-eight configuration; and a lower central segment disposed within an area bounded by the lower left segment and the lower right segment, the upper left segment being curved and extending between the upper segment and a common point at which the upper left segment, upper right segment, lower left segment, lower right segment and the lower central segment meet, the upper right segment being linear and extending from the upper segment to the common point, the lower left segment being curved and extending from the common point to the lower right segment, the lower right segment being curved and extending from the common point to the lower left segment, the lower central segment being linear and extending from the common point to the lower left segment, and portions of the lower left segment and lower right segment overlapping.

2. A display device as claimed in claim 1 in which portions of the upper segment and the upper left segment overlap.

3. A display device as claimed in claim 1 or 2 in which each segment is a liquid crystal element or a solid state element.

4. A display device substantially as herein described with reference to and as shown in Figure 2 of the accompanying drawings.

5. A watch having a display device as claimed in any preceding claim.

J. MILLER & CO.,
Agents for the Applicants,
Chartered Patent Agents,
262 High Holborn,
London, WC1V 7EF.



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