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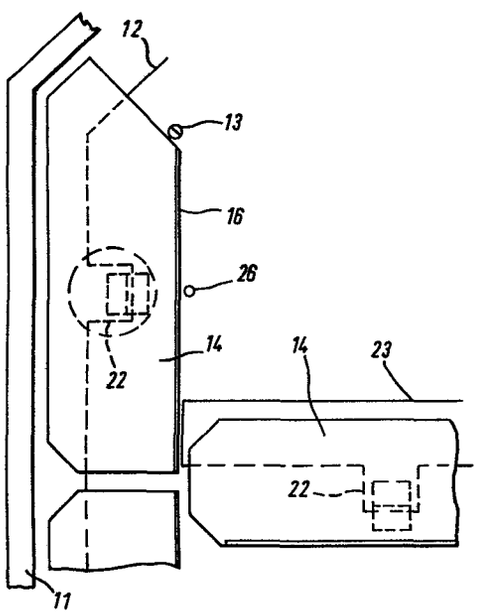
## (54) Display devices.

(57) A display device which includes a casing (11) in which is provided a mounting face plate (12) spaced from the rear of the casing (11) and supporting a number of display elements (14), and electro-magnetic drive motors (15) for moving each element (14) selectively between a display position in front of the plane of the mounting plate (12) and a retracted position behind the mounting plate (12), each element (14) being moved around the edge of the mounting plate (12) or through an aperture (23) or slot in the mounting plate (12).

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Title:- DISPLAY DEVICES

This invention relates to display devices which consist of a number of flat or generally flat elements movable selectively between an exposed display position and a retracted position so that by moving a selection of the elements to their display positions a character or symbol, such as a numeral or letter of the alphabet, or other information may be displayed by the device. The device may be arranged to display more than one character or symbol or a number of devices may be positioned together for this purpose.

It is convenient to regard the display device being positioned vertically so that the exposed display position of each element can be regarded as a front position and the retracted position as a rear position.

In the prior art, such display devices usually have electro-mechanical means for moving the elements, and their construction tends to be divided into those devices which use a full face plate or mask in front of the elements to conceal the elements when in a retracted rear position and those which use no face plate at all.

The advantage of using a face plate is that rotation of each element can be limited to generally less than 90° and often much less, such as 20°, thus ensuring good magnetic torque. This assists in achieving a fast change of display with minimum power usage. The main disadvantage is that the angle of viewing is reduced and the general appearance of the device is degraded since the elements are viewed through the face plate or are set deeper in the display. The devices that use no face plate have a greater viewing angle since the elements when in the exposed position can be arranged to be near the front of the display. To overcome the lack of a face plate the elements are usually arranged to be rotated through about 120° thus increasing the power required to change the display. Also the lack of a face plate gives little support or protection for the elements which are generally fragile and easily bent out of shape when handling the device and so forth.

It is an object of the present invention to provide an improved construction of display device.

The present invention consists in a display device which includes a face plate and a number of display elements, wherein means are provided for moving each element selectively between a display position in front of the plane of the face plate and a retracted position behind

the face plate, each element being arranged to be moved around the edge of the face plate or through an aperture or slot in the face plate.

The present invention further consists in a display device which includes a casing in which is provided a mounting face plate spaced from the rear of the casing and supporting a number of display elements, and electro-magnetic means for moving each element selectively between a display position in front of the plane of the mounting plate and a retracted position behind the mounting plate, each element being arranged to be moved around the edge of the mounting plate or through an aperture or slot in the mounting plate.

The invention still further consists in a display device as set forth in either of the two preceding paragraphs wherein each element is rotated through 90° and has a tab or like marginal portion at right angles to the face of the element serving to obscure the view of the front display surface of the element when in the retracted position.

The invention still further consists in a display device as set forth in the preceding paragraph, wherein in the retracted position the tab or like marginal portion lies in, or to the rear of, the plane of the face or mounting plate.

By mounting the means for moving the elements on the face plate and limiting rotation to only 90° or less and rotating the elements around and/or through the face plate, the increased viewing angle is retained, angular movement is reduced ensuring good torque and thus fast change, excellent support is provided for the flimsy elements when in the display and retracted positions, power to change the display is reduced compared with that of the units rotating over 90°, and the effect of the face plate makes the overall display device very pleasing to the eye.

Mounting of the element offset from its centre ensures that when retracted, the element is moved deeper into the display device thus improving concealment of the element. This combined with a tab (although not essential in all positions) ensures that the retracted elements are well hidden.

This effect can also be achieved by mounting the means for rotating the elements on the rear of the unit and fitting a face plate arranged such that the elements rotate around or through it.

In the accompanying drawings :

Figure 1 is a diagrammatic front view of part of one

form of display device according to the present invention with segments shown in the display position;

Figure 2 is a similar view with a segment in its retracted position; and

Figures 3 and 4 are diagrammatic sections in a horizontal plane corresponding to figures 1 and 2 respectively.

In carrying the invention into effect according to one convenient mode by way of example, the drawings show a display device which includes an outer casing 11 in which is provided a face or mounting plate 12 supported upon posts 13 fixed to the rear board of the casing 11.

Upon the mounting plate 12 there are provided seven display elements 14 shaped and positioned so as to achieve a conventional seven-segment display. Each element has an electro-mechanical drive motor 15 for rotating the element between a display position (as shown in figures 1 and 3) in which a brightly-coloured display face of the element is presented to the exterior of the casing 11 and a retracted position (as shown in Figures 2 snd 4) in which the display face is concealed within the casing.

Each element is rotated through 90° between the display and retracted positions and in order to assist in concealing the display face of the element when in the retraction position, each element has its front (with respect to its retracted position) longitudinal edge folded over to form a tab 16 at right angles to the display face, the front surface having the same colour as the front surface of the mounting plate 12 (preferably matt black).

Each drive motor 15 consists of a coil 17 having pole pieces 18 extending to each side of a diametrically magnetised magnetic rotor 19 fixed on a shaft 20 located in bearings 28. Also fixed to the shaft 20 is an arm 21 to one end of which is fixed the element 14.

To permit the arm 21 to pass through the plane of the mounting plate 12, the plate 12 is provided with cut-outs or slots 22 and, in the case of the central element an aperture 23. In this way the elements can be rotated around the edges of the mounting plate 12 or through its <u>via</u> aperture 23.

The end of the arm 21 is secured to the segment 14 at a point offset with respect to the centre line 24 of the element (as shown in Figure 3) so that the distance between the shaft 20 and the mounting plate 12 is equal

to or greater than the distance between the tab 16 and the point of attachment of the arm 21 to the segment 14. As a result, when the element is in the retracted position the tab 16 lies in or below the plane of the mounting plate 12.

An aperture 26 is provided to permit the segment to be rotated from the retracted to the display position by means of a rod or stick in the event of a power failure. Each element can be balanced upon its arm 21 by means of a vertical rod 27 fitted into a hole in the arm 21, the length of the rod being cut or chosen to achieve balance.

The display position of the element is defined by engagement of the arm 21 with the margin of the mounting plate 12 in its cut-out 22, and the retracted position is defined at 90° with respect to the display position by engagement of the arm 21 with a stop 25 provided on the underneath of the mounting plate 12.

Electrical power is required only when moving an element from one position to another, and this is kept to a minimum by limiting the rotation to 90°, with consequent savings in the power unit required. At the same time a good visual effect is obtained by the use of the tabs 16 in combination with the mounting plate 12 and the casing 11.

The casing 11 and mounting plate 12 also serve to protect the drive motors and the elements 14 when in the retracted position and also give a good visual effect.

In an alternative arrangement (not shown), the drive motors 15 may be mounted upon the base of the casing instead of upon the mounting plate 12.

In a further alternative arrangement (not shown), the mounting plate may be enlarged and provided with seven apertures, one for each element, or five apertures, each aligned pair of elements sharing a single aperture, so that all the elements are moved through apertures between the display and retracted positions. In this arrangement, the casing may be replaced by side walls, extending rearwardly from the margins of the mounting plate, thus forming a tray. The mounting plate may be supported by the side walls or by a base plate or bearers fitted to the open end of the tray.

Although reference has been made to front and rear to assist in description, it will be appreciated that the display device may be installed for use in a position in which the display segments are not in a vertical plane.

Furthermore, although specific reference has been made to a seven-element display the numbers, positions and shapes of the elements and the colours of their faces and the colour of the front surface of the mounting plate may be varied to achieve any desired visual effect. One particular useful arrangement is to mount a number of circular elements in the form of an array so that a dot-matrix presentation can be achieved.

CLAIMS:

1. A display device which includes a face plate (12) and a number of display elements (14), wherein means are provided for moving each element (14) selectively between a display position in front of the plane of the face plate (12) and a retracted position behind the face plate (12), each element (14) being arranged to be moved around the edge of the face plate (12) or through an aperture (23) or slot (22) in the face plate (12).

2. A display device which includes a casing (11) in which is provided a mounting face plate (12) spaced from the rear of the casing (11) and supporting a number of display elements (14), and electro-magnetic means (15) for moving each element (14) selectively between a display position in front of the plane of the mounting plate (12) and a retracted position behind the mounting plate (12), each element (14) being arranged to be moved around the edge of the mounting plate (12) or through an aperture (23) or slot (22) in the mounting plate (12).

3. A display device as claimed in Claim 1 or 2, wherein each element (14) is arranged to be rotated through 90° or less.

4. A display device as claimed in Claim 1, 2 or 3, wherein each element (14) is arranged to be rotated through 90° and has a tab (16) or like marginal portion at right angles to the face of the element (14) serving to obscure the view of the front display surface of the element (14) when in the retracted position.

5. A display device as claimed in Claim 4, wherein in the retracted position the tab (16) or like marginal portion lies in, or to the rear of, the plane of the face or mounting plate (12).

6 A display device as claimed in any of the preceding claims, wherein seven elements (14) are arranged to provide a conventional seven-segment display.

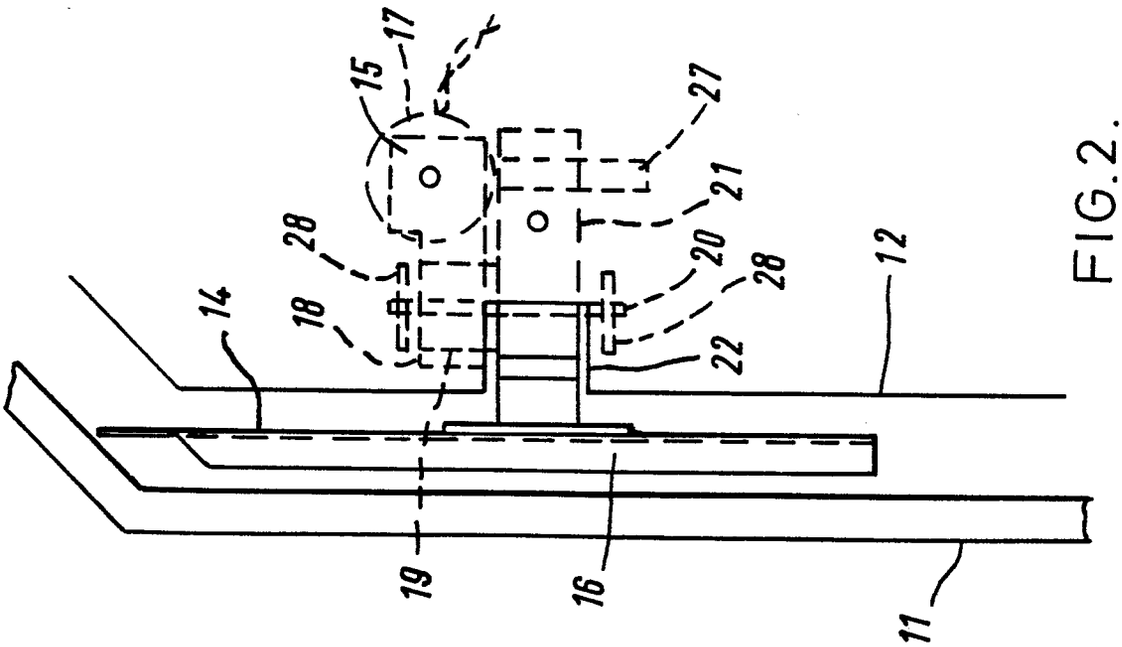


FIG.2.

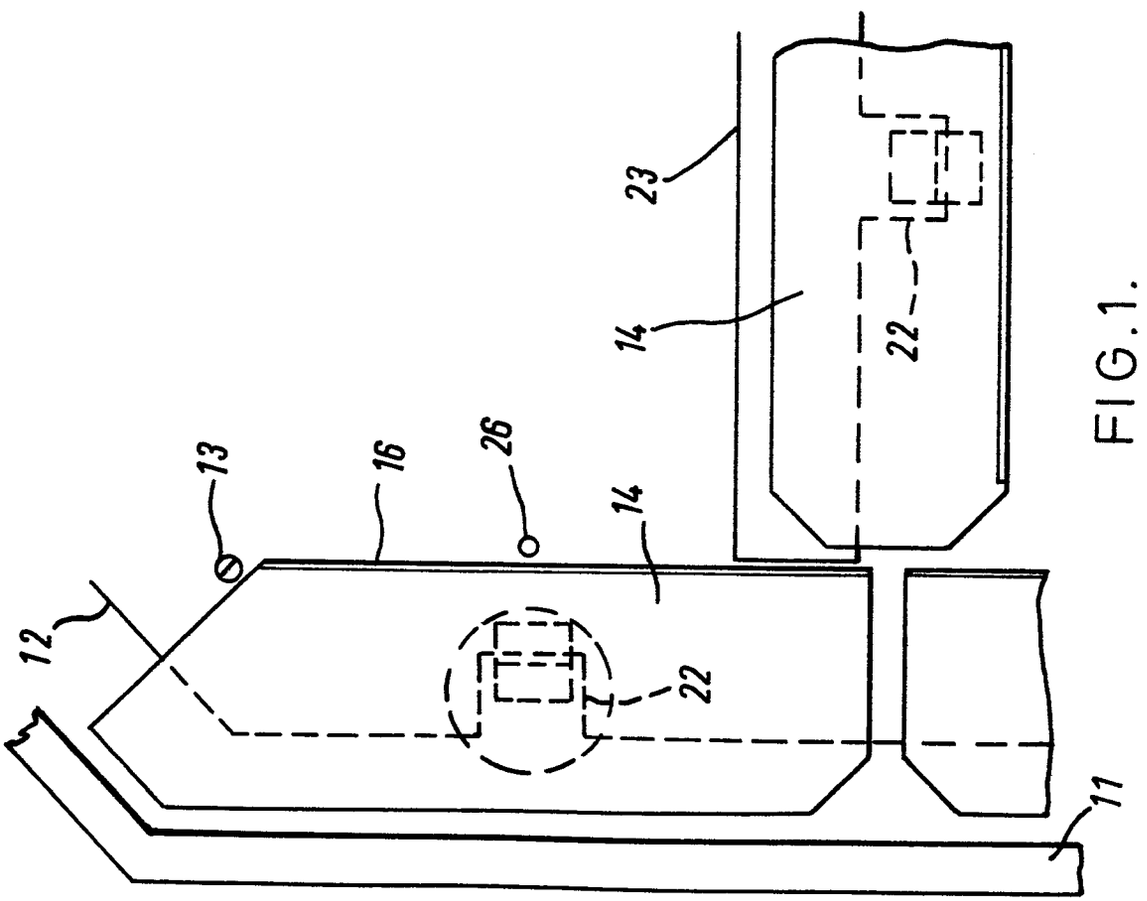


FIG.1.

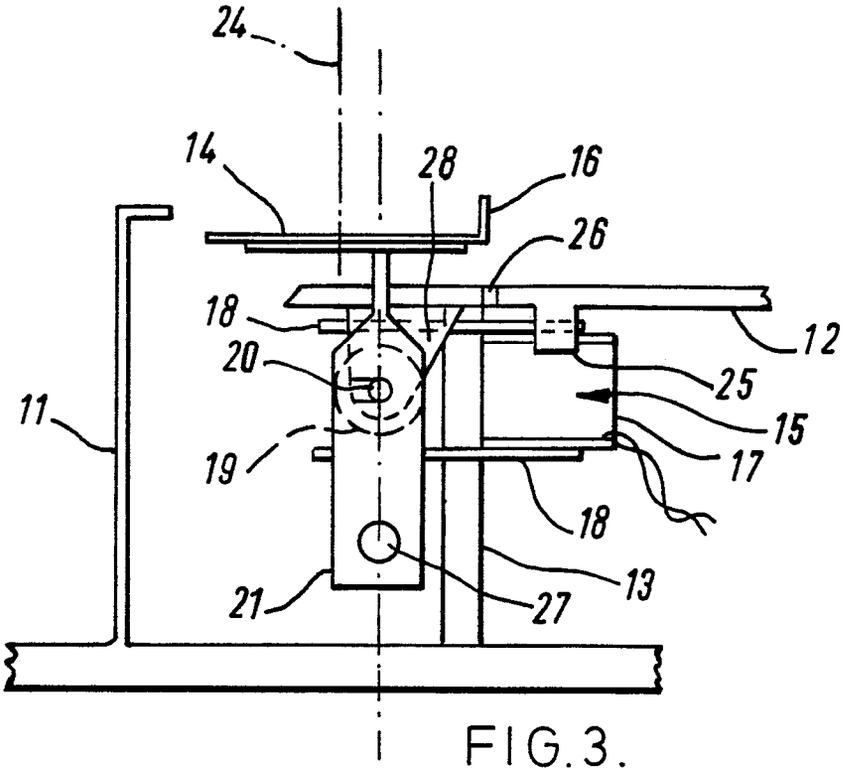
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FIG.3.

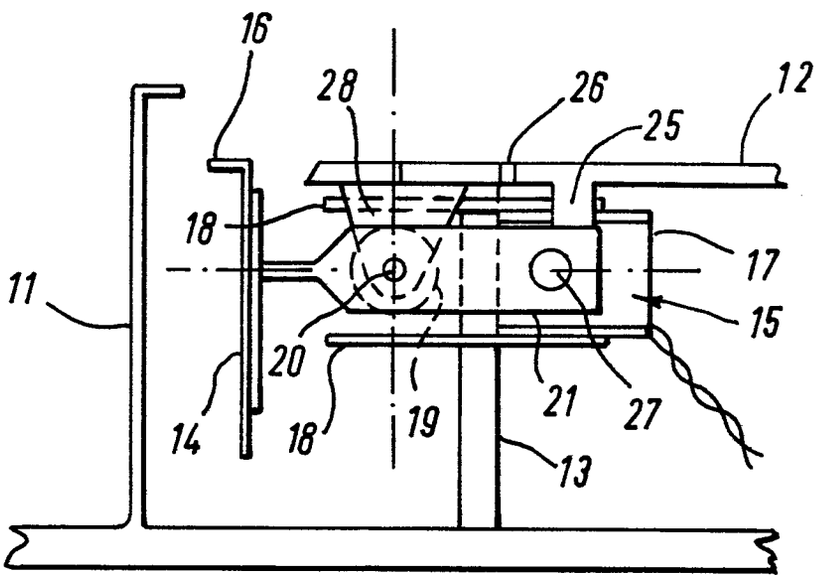
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FIG.4.