DISPLAY DEVICES

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ABSTRACT OF THE DISCLOSURE

Device comprises a drum rotatable on a central axis and defined by a plurality of display elements each being rotatable about an axis parallel to central axis. Each display element has plurality of display-bearing faces, and each element is rotated during each full rotation of drum to bring new faces into view. Second drum arranged beside first, and two drums are mounted on mutually coaxial shafts. Shafts rotated in stepwise fashion, one being rotated one step for each whole number of complete revolutions of the other.

This invention relates to display devices of the type adapted to display in cyclic succession a plurality of display configurations. The invention is applicable to apparatus for displaying time indications in digital form, but is no concern with such apparatus exclusively. Various time indicating devices are known, which have neither dials nor indicating hands, the hours and minutes being indicated digitally at one or more display windows. Such devices permit a more precise and clear reading of the time than do conventional clocks, because of the size of the numerals displayed and the absence of parallax. Such digital indicating techniques are sometimes used in railway stations and airports for signalling the names of towns served, in waiting rooms of banks, offices and shops for addressing clients, and also in impulse or digital counters.

Such devices fall into two main types. In the first type the numerals are displayed on cards which are arranged in the manner of an open book, one numeral being displayed on each card face presented. One card is displaced to provide each change in reading. One such device for the display of the minute reading in a time indicator is illustrated schematically in FIGURE 1 of the accompanying drawings. This device comprises a series of cards V which are retained in the upper position by a retaining finger D; the finger D releases the cards one at a time so that they fall in the direction of the arrows f to provide a succession of different indications.

This type of apparatus is relatively costly because of the large number of cards necessary—sixty cards are necessary for the device indicated in FIGURE 1—and because of the sensitive nature of the actuating mechanism for turning the cards. Moreover, on account of the large number of cards, the apparatus is quite cumbersome. It is possible to reduce the total number of cards by providing two series for the tens and units respectively, but in such an arrangement the actuating mechanism is more complicated because it is necessary to change the tens digits abruptly as the units digits pass from 9 to 0.

The second type of apparatus, which is illustrated schematically in FIGURE 2, comprises a plurality of rotatable display drums. In the apparatus shown in FIGURE 2 a frame structure C having a display window P carries two rotatable display drums T1 and T2 which have coplanar tangents with respect to the window. The drum T1 carries six cyphers 0 to 5 indicating tens of minutes, and the drum T2 carries ten cyphers of the same size 0 to 9 indicating units of minutes. Because of the different members of cyphers carried by the drums the two drums must be of different size. The same disadvantage applies to display drums carrying hour indications with numerals going from 0 to 11 or from 0 to 23, and consequently all apparatus of this type is inevitably cumbersome.

It is an object of the present invention to provide a display or indicating apparatus having one or more rotatable display drums and in which the above mentioned disadvantages are overcome, and this is achieved by employing at least one drum in which the number of possible display configurations is a multiple of that which can be provided by a conventional drum of the same dimensions and having the same size of cypher.

According to the present invention in a display device for displaying in cyclic succession a plurality of display configurations and comprising a stationary frame structure and a display drum mounted therein for rotation about a central axis, the drum comprises a plurality of display elements and is rotatable about the central axis to bring the elements successively into an operative display position, each element having a plurality of display faces and being itself rotatable about an axis parallel to the central axis for bringing the display faces each in turn into an operative position, the drum providing a total number of display configurations equal to the product of the number of elements and the number of display faces on each element. In a preferred form of the invention, each display element has two display faces constituted by a front surface and a reverse surface of the element, the element having two operative positions.

Apparatus preferably includes at least one further drum mounted coaxially with the first display drum and having a plurality of display elements, the further drum being rotatable stepwise about the central axis to bring each display element in turn to an operative display position, and coupling means interconnecting said drums for causing the further drum to rotate from one display position to the next in accordance with a complete revolution of the first drum.

Embodiments of the invention will now be described, by way of example, with reference to the accompanying drawings in which:

FIGURE 3 is a schematic side view of one device according to the invention;
FIGURE 4 is a perspective view of a time display device for displaying a number of minutes;
FIGURE 5 is a view similar to that of FIGURE 4, certain parts of the device being omitted to illustrate certain details of construction more clearly;
FIGURE 6 illustrates diagrammatically a modified form of display element, and
FIGURE 7 is a fragmentary view of a two-drum display device for displaying the number of hours.

Referring to FIGURE 3, one display device according to a basic form of the invention comprises a drum 1 of regular prismatic shape mounted for rotation about a central axis 1a. The sides of the drum are defined by five display element V1 . . . V5 each in the form of a board having a front surface and a reverse surface constituting two display faces bearing cyphers. Each display element can pivot about a respective axis a1 . . . a5 extending parallel to the axis 1a so as to bring the front and reverse display faces alternately into an operative position. A circular guide system 2 is provided for maintaining the boards substantially tangential to a cylindrical surface defined by the axes a1 . . . a5. The guide system 2 has a cut-away portion 2a and carries a fixed abutment 3 in the form of a curved peg which projects inwardly
so as to engage each board as it passes the portion 2a during rotation of the drum. Thus each display element is turned to its alternative operative position once during each revolution of the drum 1. An observer looking towards the display position sees a cyclic succession of ten display faces bearing the cyphers to be displayed.

A drum with five two-sided display elements is thus capable of providing ten different indications. Similarly, a board with N display elements each having a display face is capable of providing N x n different indications, each display element being caused to rotate by 1/nth of a rotation during one revolution of the drum 1.

The display device shown in FIGURES 4 and 5 comprises a frame structure consisting of side plates 10, which are interconnected by cross-bars 10a. The frame structure carries a pair of rotatable drums 11 and 12, each of which is of regular prismatic shape and is rotatable to bring each display element or face to an operative display position. The drum 11 is a six-sided drum of conventional form, the six display faces bearing the cyphers 0 to 5. The drum 12 is of the form described with reference to FIGURE 3, being a five-sided drum having ten display faces bearing the cyphers 0 to 9. The frame structure includes a guide plate 13 having a cut-away portion 13a, and a fixed abutment 14 is mounted on the guide plate for turning the display elements of the drum 12 in succession as described above. The drums 11 and 12, coaxial, the drum 11 being integral with a shaft 15 and the drum 12 being fixed on a sleeve 16 which is freely rotatable about the shaft 15.

The drums 11 and 12 are driven stepwise by means of a mechanism comprising a pivoted lever 17 mounted on a pivot 17a carried by the frame structure; the lever 17 is displaced against the action of a return spring 17b, once per minute, by a time control mechanism. A spring-loaded pawl 18 carried by the lever 17 engages a ten-toothed ratchet wheel 19 rotatable with a shaft 20. Mounted on the shaft 20 is a pinion 21 which engages a plurality of ratchet wheels 22 mounted on the sleeve 16 and provides a 2:1 step-up gear ratio. A radial finger 19a is carried by the ratchet wheel 19, and this finger engages a six-position star wheel 23 mounted on the shaft 15, once during each revolution of the ratchet wheel 19.

At every minute, when the lever 17 is displaced, the ratchet wheel 19 is rotated by one tenth of a turn and the drum 12 is rotated by one fifth of a turn to bring the next display element into a display position. The drum 12 is thus rotated once during every ten minutes. The finger 19a is positioned so that once every ten minutes, as the displayed cypher on drum 12 passes from 9 to 0, it engages the star wheel 23 and rotates it through one sixth of a revolution and changes its indication by one digit. The display device thus provides a cyclic succession of digital indications ranging from 00 to 59. It will be noted that the five-sided drum 12 is barely more cumbersome than the drum 11, which is of a conventional form. FIGURE 6 is a fragmentary sectional view of a modified display drum, in which the individual display elements 30 are constituted by pairs of part-cylindrical surfaces 30a arranged back to back, the curvature of the surfaces 30a corresponding to that of the drum so that the drum always remains cylindrical instead of prismatic in form. In other respects the construction of the display drum 12 is the same as that of the drum 1 of FIGURE 3 or the drum 12 of FIGURES 4 and 5.

A time display apparatus in accordance with the invention would comprise a device of the kind described above for the display of minutes and a further device for the display of hours, the latter device providing indications ranging from 0 to 12 or from 0 to 23. A preferred construction of hour-displaying device will now be described with reference to FIGURE 7.

The device comprises two six-sided drums 40 and 41 of regular prismatic shape, which are rotatable together about a central axis. Each drum comprises six display elements each having two display faces, which elements are rotatable between two operative positions once per revolution of the drum in a manner exactly analogous to the mode of operation of the drum 1. A drum 40 has twelve display faces bearing the indications 00 to 11 and the drum 41 has twelve display faces bearing the indications 12 to 23. The display faces of both drums are brought successively into the operative display position defined by a window 43 in the frame structure once per hour under the control of a timing mechanism. A replaceable mask 42 cooperate with the window 43, and the timing mechanism displaces the mask 42 once every twelve hours, i.e., at noon and at midnight, to mask each drum alternately. In a modification the mask 42 is fixed and the drums 40 and 41 are replaceable relative to the window.

Clearly, the drums 40 and 41 may be replaced by a single drum providing on each of twelve display faces a pair of hour indications, the pairs of indications ranging from 00 to 12, 01 to 13 to 10 to 22, 11 to 23.

In a modification of the invention, not illustrated, the guide system 2 (FIGURE 5) is replaced by an embossed drum having a cut-away portion on its cylindrical surface, an edge of the cut-away portion being turned inwards and forming an abutment corresponding to the abutment 3 (FIGURE 3) for engaging and rotating the display elements of the drum.

Finally, it is to be observed that the invention is not limited in scope to time display apparatus, but is applicable generally to display apparatus for displaying in cyclic succession a plurality of different display configurations. The apparatus may comprise one or more display drums which are individually rotatable to bring an appropriate cypher or indication to a display position and of which at least one drum comprises a number N of individually controllable display elements each providing a number n of display faces.

1. Apparatus for displaying simultaneously a plurality of symbols each of which is individually alterable to provide a predetermined sequence of combinations of symbols, comprising a stationary frame structure, a first display drum mounted within said frame structure for rotation about a central axis, said first display drum comprising a plurality of display elements each having a plurality of symbol-bearing display faces and being rotatable about an axis parallel to said central axis for bringing the display faces each in turn into an operative position, said faces conforming to the peripheral shape of the drum, a first drive shaft operatively connected to said drum for rotating the drum about said central axis to bring the display elements each in turn into an operative display position, abutment means on said frame structure for engaging said display elements successively during rotation of the drum and rotating one element to its next operative position as the drum is rotated by one step from one display position to the next, at least one further drum mounted within said frame structure, for rotation about said central axis, said further drum having a plurality of display elements with symbol-bearing faces, a second drive shaft operatively connected to said further drum for rotating the drum about said central axis to bring the display elements each in turn into an operative display position, said first and second drive shafts being mounted concentrically with respect to each other, and a stepping drive mechanism coupling said drive shafts for effecting rotation of the further drum by one step for a whole number of complete revolutions of the first drum.

2. Apparatus according to claim 1, wherein the stepping drive mechanism comprises a star wheel mounted for rotation with the second drive shaft, a ratchet wheel mounted for rotation with the first drive shaft, and a radial finger on said ratchet wheel engaging with said star wheel, said ratchet wheel engaging a spring-loaded
pawl for driving the ratchet wheel stepwise under the control of a power input device.

3. A time display apparatus in accordance with claim 1, in which said operative display position is defined by a window on the frame structure, and said display drums include a first pair of individually rotatable display drums for displaying minutes, said first pair of display drums each comprising five display elements and providing ten display faces bearing the cyphers 0 to 9, and a second pair of display drums for displaying hours, said second pair of drums each comprising six display elements and providing twelve display faces bearing the cyphers 00 to 11 and 12 to 23 respectively, the apparatus including a displaceable mask co-operating with said window for masking said second pair of drums alternately.

References Cited

UNITED STATES PATENTS

2,603,897  7/1952 Wagoner 40-76 X

FOREIGN PATENTS

15,111  1909 Great Britain.

EUGENE R. CAPOZIO, Primary Examiner.

R. CARTER, Assistant Examiner.