

- [54] **DIGITAL DISPLAY APPARATUS**
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 378 M, 378 W, 379, 336, 324 B, 324 S, 339;
 58/125 R, 125 C, 126 R, 126 A, 126 E

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[57] **ABSTRACT**

In a digital display apparatus of the type wherein a plurality of display drums are loosely mounted on a shaft and the rotation of a display drum of a lower order of magnitude is transmitted to another display drum of an upper order of magnitude through shift pinions interposed between adjacent display drums, the display letters on each display drum are inclined in the same direction and by the same angle with respect to the axis of the shaft such that the lower portion of one display letter and the upper portion of an adjacent display letter overlap with each other in the axial direction of the shaft. Further, a front plate formed with a plurality of read windows is provided in front of the display drums. Each window is proportioned to expose only one display letter of each display drum.

2 Claims, 3 Drawing Figures

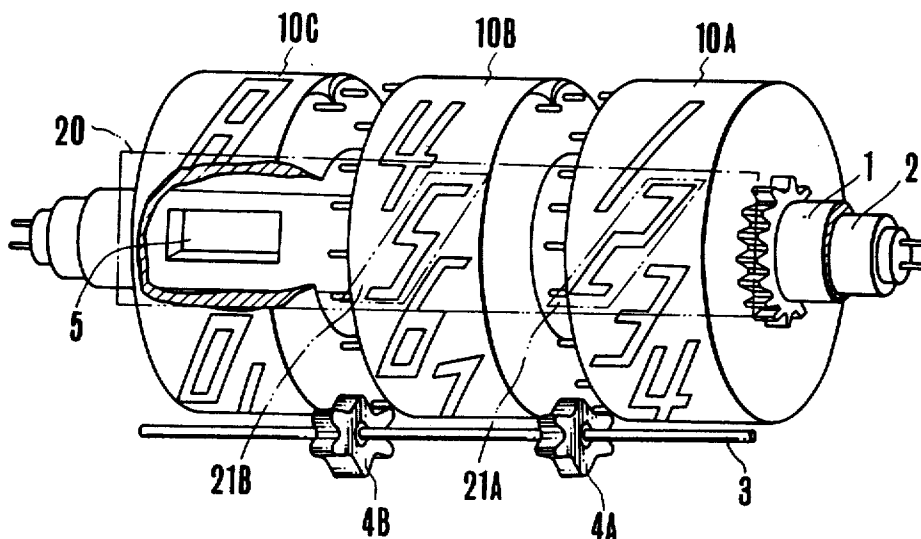


FIG. 1

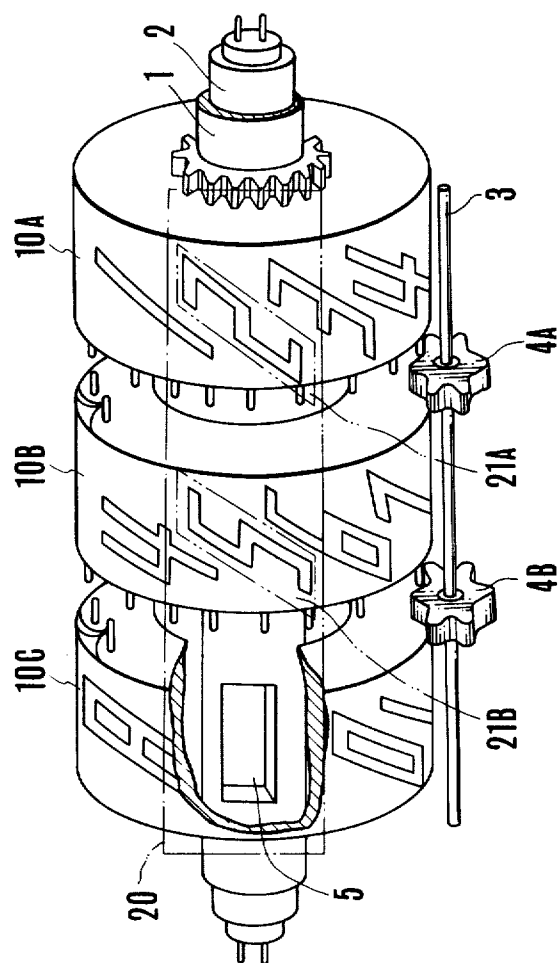
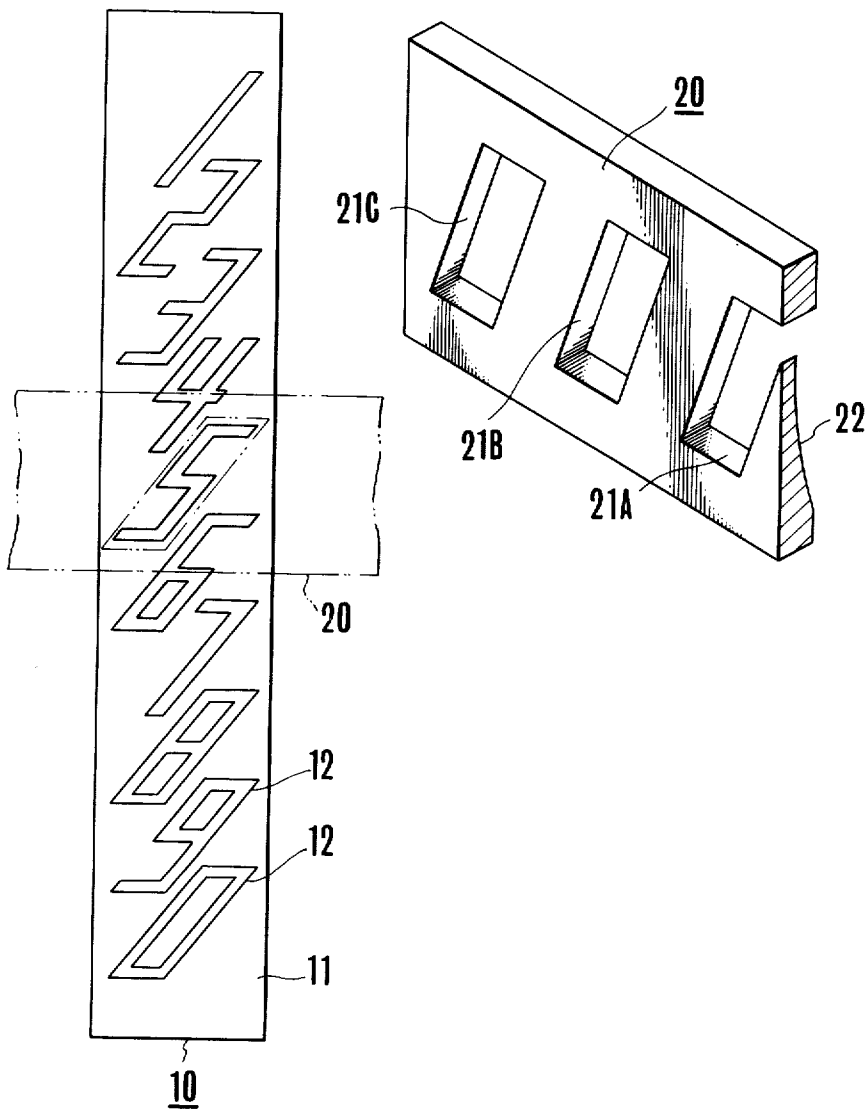


FIG. 2

FIG. 3



DIGITAL DISPLAY APPARATUS

BACKGROUND OF THE INVENTION

This invention relates to an improvement of a drum type digital display apparatus of the type wherein a plurality of display drums, each provided with display characters or digits on the peripheral surface thereof, are loosely mounted on a supporting shaft and wherein the rotation of a display drum of a lower order of magnitude is transmitted to a display drum of an upper order of magnitude.

Such display apparatus provided with display drums as a digit wheel type counter, a digital clock, etc. are now used extensively because they have many advantages of inexpensive price and simple construction. However, when compared with a display tube type display apparatus such display apparatus is disadvantageous in that the size of the displayed characters is small and the size of the apparatus is much larger than the display character or display section because the desired display is provided by one of the display characters of a predetermined number which are provided on the periphery of the display drum.

SUMMARY OF THE INVENTION

Accordingly, it is an object of this invention to provide an improved drum type display apparatus capable of reducing the diameter of the display drum or increasing the number of display letters that can be displayed by a display drum of the same diameter.

According to this invention, there is provided a digital display apparatus of the type wherein a plurality of display drums, each provided with a plurality of display letters on the peripheral surface thereof, are loosely mounted on a shaft, and the rotation of a display drum of a lower order of magnitude is transmitted to another display drum of an upper order of magnitude through shift pinions interposed between adjacent display drums, characterized in that the display letters of each display drum are inclined in the same direction and by the same angle with respect to the axis of the shaft such that the lower portion of one display letter and the upper portion of an adjacent display letter overlap with each other in the axial direction of the shaft, that a front plate is provided in front of the display drums, that the front plate is provided with read windows, and that each window is proportioned to expose only one display letter of each display drum.

Preferably the shaft is made hollow to accommodate a source of light and is provided with a plurality of radial perforations at portions corresponding to the display drums. The peripheral surface of the display drum is made opaque except the display letters so that only a selected letter is illuminated from inside.

BRIEF DESCRIPTION OF THE DRAWINGS

Further objects and advantages of the invention can be more fully understood from the following detailed description taken in conjunction with the accompanying drawings in which:

FIG. 1 is a perspective view of certain essential element of the digital display apparatus embodying the invention;

FIG. 2 is a developmental view of the display drum utilized in the display apparatus shown in FIG. 1; and

FIG. 3 is a perspective view showing a portion of a front plate.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A preferred embodiment of the novel digital display apparatus illustrated in FIG. 1 is of the internally illuminated type and includes a hollow supporting shaft supported by a supporting frame, not shown, and contains an elongated light source such as a fluorescent lamp 2. A plurality of display drums 10A, 10B and 10C of a number equal to a number of orders of magnitude to be displayed are rotatably mounted on the supporting shaft 1 to be driven by shift pinions 4A and 4B mounted on a pinion shaft 3 driven by an electric motor, not shown, such that display drums of the upper orders of magnitude are driven by the display drums of the lower orders of magnitude.

The hollow shaft 1 is provided with a plurality of radial perforations at positions at which the display drums are mounted for transmitting the light emanated by the light source 2 into the interior of respective display drums. A front plate 20 to be described later in detail is positioned in front of the display drums to face the perforations 5 for reading the characters displayed by respective drums.

As shown in the developmental view shown in FIG. 2, each display drum 10 is made of a transparent or translucent material such as a synthetic resin and its surface 11 is coloured black as by printing except display characters 12 digits in this example. Accordingly, a character at a position corresponding to the perforation 5 will be illuminated from inside by the light transmitting through the perforation 5.

Each display digit formed on the periphery of the display drum 10 is inclined toward right upper so that the lower portion of an upper digit and the upper portion of adjacent lower digit overlap each other in the longitudinal direction of the shaft 1. Thus, for example, when a digit 5 assumes the read position or is contained in the width of the front plate 20 as shown in FIG. 2, the lower portion of digit 4 and the upper portion of digit 6 of the same display drum are also at the read position.

FIG. 3 is a perspective view of a portion of the front plate 20. The opposite ends of the front plate 20 are mounted on a frame, not shown, and the front plate 20 is provided with read windows 21A, 21B and 21C at positions corresponding to the read positions of respective display drums. The read windows are also inclined toward right upper in the same manner as the display digits. The rear surface 22 of plate 20 is curved in concentric with the peripheral surfaces of the display drums.

In operation, the digits of the respective display drums at portions corresponding to the read windows of the front plate 20 or at the read positions are illuminated. More particularly, in the condition shown in FIG. 2, although the entire portions of digit 5, the lower portion of digit 4 and the upper portion of digit 6 assume the read position, due to the action of the read window, for example a read window 21A, only digit 5 is selectively displayed. As this digit is illuminated by the light source 2 through the radial perforation 5 of shaft 1 this digit can be readily read even at night as if it lumines.

When the display drum 10 is rotated one step the lower portion of digit 5, the entire portions of digit 6 and the upper portion of the digit 7 will assume the

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read positions thereby selectively displaying digit 6 alone by the action of the read window of the front plate 20.

In this embodiment when lens are fitted in the read windows it is possible to provide magnified display of the digit.

According to this invention, with a display drum of the same diameter as that of prior art design it is possible to mount about twice number of digits on the periphery. In other words, it is possible to reduce the diameter of the drum by 1/2 for accommodating the same number of display digits.

While the invention has been shown and described in terms of a preferred embodiment thereof many changes and modifications will be obvious to one skilled in the art without departing from the spirit and scope of the invention or defined in the appended claims.

What is claimed is:

1. In a digital display apparatus of the type having a plurality of display drums, each of said display drums being provided with a plurality of display digits impressed one below the other around the peripheral surface thereof, said drums being loosely mounted on a shaft, means whereby the rotation of a display drum of a lower order of magnitude is transmitted to another

display drum of an upper order of magnitude through shift pinions interposed between adjacent display drums, the improvement wherein the display digits on each display drum are substantially equal sized, discrete and inclined in the same direction and by the same angle from a plane perpendicular to the central axis of said shaft such that a substantial portion of the lower portion of one display digit and a substantial portion of the upper portion of a sub-adjacent display digit are adjacent to each other along the axial direction of said shaft and wherein a front plate is provided in front of said display drums, said front plate being provided with a plurality of apertures or read windows equal in number to said plurality of display drums, each of said windows being so shaped as to expose only one display digit of its associated display drum, whereby the drum diameter can be reduced without a corresponding reduction in display digit size.

2. The digital display apparatus according to claim 1 wherein said shaft is hollow to contain a source of light, said shaft is provided with a plurality of radial openings for transmitting the light emanated by said light source at portions corresponding to said display drums, and wherein the peripheral surface of each display drum is opaque except said display digits.

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