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Specification

The invention relates to a table clock with an electronically controlled display device, having a clock case and at least one display window serving for the output of alphanumeric characters (digits and/or letters). The representation of different alphanumeric characters is effected by emphasizing certain elements from a set of display elements provided on each display window.

Clocks with such display devices have already been known for years as so-called digital clocks, as for example from DE-A1-29 22 621 which describes an electronically controlled clock with digital indication of the time and alarm device, which comprises a display window for the output of the time and one for the set alarm time, each inside a clock case. The representation of different digits on the two display windows is effected by means of so-called seven-segment displays, the display elements of which consist of light-emitting segments such as fluorescent tubes or light-emitting diodes (LEDs) for example, or of passive electro-optical segments such as liquid crystal cells (LCD) for example.

One disadvantage of the clocks hitherto known with an electronically controlled alphanumeric display device consists in that the display device is either fitted inside the clock case and covered by a translucent plate or is at least rigidly connected to the case of the clock. The consequence of this is that a replacement or conversion

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of the display device is only possible for the user of the clock with unreasonable expense.

A module construction is also known for an electronic wrist watch (DE-A1-2 501 234) wherein a case directly enclosing the watch modules is to be dispensed with for these but wherein the watch strap is constructed, in the region where the modules are to be inserted, in the form of a case largely surrounding the modules, through which case alone the mechanical connection of the modules is effected.

It was the object of the invention to provide a table clock with an electronically controlled digital display, the display device of which would be convertible or replaceable.

The solution of this problem is effected by the means mentioned in Patent Claim 1.

The advantages of this invention lie in that it is possible for the user of the clock, without much technical knowledge, to exchange the display device of the clock for another display device in a simple manner and in a short time, or to convert the former display device so that the sides of the display device originally adjacent to and remote from the observer respectively, are interchanged.

Advantageous further developments of the invention can be seen from the dependent claims.

One example of embodiment of the invention will be described below with reference to Figures 1 to 3.

Figure 1 shows a front view of the clock according to the invention,

Figure 2 shows a side view, partially broken away, of the clock according to Figure 1 and

Figure 3 shows a detail from Figure 1, partially broken away.

Figure 1 shows a clock 1 comprising an electronically controlled display and having a display panel 6 and an input panel 5 which comprises a plurality of input keys not numbered here. At the front 7 of the display panel 6, which is surrounded by a frame 8 of electrically insulating

material, for example plastics material, there are provided five display windows 11 to 15. The time (here 20 hours) is given in hours and minutes, separated by a colon on the display window 11 by means of four seven-segment displays. The date (here the 10th October) is given on the display window 12 and an adjustable alarm time (here 3 o'clock in the morning) on the display window 13; when the latter coincides with the time by the clock 1, a waking or alarm signal is given on certain days of the week. Those days of the week (here Monday, Tuesday and Friday) on which the set alarm is active, that is to say on which an alarm signal is actually given by the clock 1, are given on the display window 14 while the present day of the week (here Saturday) is indicated on the display window 15.

According to the invention, the display panel 6 can, on the one hand, be pivoted about a horizontal axis A situated below its lower end face and on the other hand it can be lifted off the clock case 2 in the direction designated by B in Figure 2, since the display panel 6 is not rigidly connected to the clock 1 but is mechanically and electrically connected by means of a plug connection 16.

Details of the pivoting device and of the above-mentioned plug connection 16 can be seen from Figure 3. This shows a detail, partially broken away, from the region of the right-hand side wall 3 of the clock case 2 of Figure 1.

The housing-like part of the plug connection 16 consists of a moulding 17 of electrically insulating material in which there are embedded a plurality of electrical contact devices, the number of which depends on the number of connections needed to operate the display windows 11 to 15. The moulding is preferably produced from plastics material by the injection moulding process while the contact devices consisting essentially of a partially slit metal socket are incorporated in the same operation. Figure 3 shows such a metal socket 18 which is connected, via a connecting wire 19 soldered to its lower end, to a display driver circuit

not illustrated here but situated inside the clock case 2.

At the display panel 6 side, the plug connection 16 consists of metal pins fitted at its lower end face (see metal pin 20 in Figure 3). With appropriate matching of the diameters of metal pins and metal sockets, on the one hand a satisfactory electrical contact and on the other hand a sufficiently firm mechanical connection between the display panel 6 and the clock case 2 is achieved. As a result of two U-section rails 9 and 10 which are formed on the moulding 16 and engage round the frame 8 of the display panel 6 acting as guide rails, the display panel 6 can be plugged in easily and quickly because of the definite spatial correlation between metal pin and associated metal socket which then exists.

Such removal and re-insertion of the display panel 6 may be of interest to the user of the clock 1 for example if the display panel has passive electro-optical display elements on one side, for example on its front 7, and identically arranged light-emitting display elements on the other side, here its back 21, both of which are adapted to give out the same information offered by the display driver circuit. By removing the display panel 6, turning it through 180 degrees about the axis C (see Figure 2) and re-inserting the display panel, the user of the clock 1 can select the type of display elements facing him. By means of the wiring of an additional metal pin provided on the display panel 6 and two associated additional metal sockets, care can be taken to ensure that only the particular side of the display panel 6 which is at the front is ever in operation. In the case of clocks which can only be operated by batteries and do not have any mains supply circuit, the user of the clock 1 would only change over from the passive electro-optical display, which takes significantly less power, to the light-emitting electro-optical display, by reversing the display panel 6, when the illumination

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in the vicinity of the clock 1 was no longer sufficient. The power consumption of the clock 1 is therefore kept low in this manner despite the presence of light-emitting display elements.

As has already been mentioned above, the display panel 6 can not only be easily separated from the clock case 2 but also is made pivotable, namely by turning the moulding 17 about the axis A (see Figures 1 and 3). Various angles between the front 22 of the clock case 2 and the front 7 of the display panel 6 (angle α in Figure 2) result from different positions between a disc 23 formed on the moulding 17 and a piston 25 which is axially displaceable in a bore 24 in the right-hand side 3 of the case (See Figure 3). Both the disc 23 and the piston 25 have, on their adjacent surfaces, spur-gear teeth which interengage. The piston 25 is secured against turning about its longitudinal axis by means of two projections 26 and 31 which are formed on it and engage in corresponding grooves 27 and 28 in the bore 24. Furthermore, the piston 25 is pressed against the disc 23 by means of a helical spring 29 and a pressure plate 30. When the display panel 6 is pivoted, therefore, various stable click-stop positions appear, the angular difference between which depends on the spacing of the spur-gear teeth on the piston 25 and the disc 23 respectively. In order to adjust the contact pressure between piston 25 and disc 23, a grub screw 32 is formed on the piston, which screw runs in a tapped hole in the wall 3 of the case and can be turned by means of a screwdriver or by a coin or the like.

With the device described above, the display panel 6 of the clock 1 can be engaged, by the user, in various angular positions which appeal to him. Provided the input panel 5 is appropriately set back in relation to the contour of the front 22 of the clock case 2, the display panel 6 can be pivoted so far that it comes to lie parallel to the

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input panel 5 and also completely covers this at the same time, while its back 21 comes to lie inside the contour of the front 22 of the clock case 2 (see position 6' in Figure 2). This angular position is particularly suitable for packing the clock for dispatch or when travelling.

The construction of a display panel according to the invention, which is mechanically and electrically connected to a clock case by means of a plug connection, is not restricted to the example of embodiment described above.

Thus it is not only possible to reverse the display panel by means of a plug connection between clock and display panel, in order to operate different electro-optical displays according to the prevailing light conditions. There is also the possibility of exchanging the display panel of the clock for another display panel which is provided with display elements on one side only. In this case, the set of metal pins and metal sockets, present in duplicate in the example of embodiment previously described, can be used to actuate a considerably larger number of display elements. Thus the display panel of Figure 1 can be exchanged for a display panel which, apart from the output of alphanumeric characters, also renders possible the quasi-analogue display of one or more quantities. This can be done by means of electro-optical display elements which consist on the one hand of strip-shaped electrodes arranged radially and the corresponding arrangement of counter electrodes and on the other hand of the display elements of a seven-segment display.

Such a display panel displaying the hours and minutes in a quasi-analogue manner and the date digitally can be controlled with relatively few connections (for example with 35 connections according to DE-A1-28 05 646).

According to a further example of embodiment of the invention, the display panel of Figure 1 can also be exchanged for a display panel, the display elements of which are

arranged in the form of a dot matrix in which case the set of metal pins and metal sockets present in duplicate can again be used as in the above example of embodiment. With such dot-matrix display elements, simple games similar to the screen games on television sets can then be played on the display panel. The change in the mode of display and the start of such games can be effected by actuating devices which are provided on the input panel.

Another example of embodiment of the invention relating to the nature of the plug connection between display panel and clock case consists in connecting the display panel mechanically to the clock case and electrically to a circuit contained therein merely by a jack plug and an associated socket at the moulding side, such as are used, for example, for connecting headphones to Hi-Fi equipment. In this case, the clock case then only contains the current supply for the clock while the input panel can be provided on the back of the display panel, the front of which comprises one or more display windows. Such an arrangement has the advantage that the display panel can not only be plugged in and pivoted about the axis A but is also rotatable about the axis C (see Figures 1 and 2).