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(54) IMPROVEMENTS IN BATTERY OPERATED ELECTRIC CLOCKS

(71) We, VDO ADOLF SCHINDLING AG, of 103 Grafstrasse, Frankfurt/Main, Germany, a body corporate organized according to the laws of Germany, 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:-

The present invention relates to a battery operated electric clock, in particular but not exclusively a quartz crystal clock, having a housing provided with a transparent element behind which a dial is located, the housing serving for receiving a time-piece movement comprising an electrical portion and a mechanical portion having a setting element for hands, one or more batteries and, optionally, an alarm device.

Electric clocks are already known, wherein the electrical and mechanical portions of the time-piece movement are arranged in a two-part housing made from a plastics material and provided with a projection for receiving a battery. The housing is formed with two apertures out of which project the setting elements for the time and the alarm. This housing containing the time-piece movement is arranged in a further two-part clock housing also made from a plastics material and to the front portion of which the dial is secured. Located in the front portion of the clock housing is the buzzer of the alarm and also the switch for cutting the buzzer in or out. The rear portion of the clock housing is formed with two apertures for the time and alarm setting elements and also with an aperture (closeable with a cover or lid) for the battery. These two housing elements are latchinglly interconnected. These known electric clocks have the disadvantage that they include a large number of components and they are therefore costly to manufacture.

In a further known type of electric clock,

the mechanical portion of the time-piece movement is secured on the printed circuit board of the electrical portion. The printed circuit board carries, on its side having the printed circuits, a plate on which the dial is arranged whereas there are provided on its rear side retaining elements for a battery. The printed circuit board is secured by means of four screws in the front element of a two-part housing. The setting elements for the time and the alarm are located inside the housing, so that for setting the time or the alarm it is necessary to remove the rear portion of the housing. It is true that the design of such an electric clock is more advantageous from the manufacturing aspect, since it requires fewer components and has a smaller size than the clock previously described, but nevertheless it has other substantial disadvantages. Thus, the electrical and mechanical elements of the time-piece movement are completely unprotected so that, on setting the time or the alarm, the electronic system or the drive means may be accidentally damaged. Since the printed circuits on the printed circuit board are no longer accessible after installation of the printed circuit board in the housing, electrical testing of the individual circuits of the electric clock subsequent to installation thereof is no longer possible or is possible only with considerable difficulty. It is a further substantial disadvantage of this electric clock that the time-piece movement cannot, without supplementary components, be assembled with other housing forms and types.

It is an object of the present invention to overcome the above disadvantages in the known electric clocks.

According to the present invention there is provided a battery operated electric clock including: a time-piece movement comprising an electrical portion and a mechanical portion having a setting element for hands; a three part housing comprising a front ele-

ment having an aperture, a central element and a rear element; a partition wall located in the central element and carrying the time-piece movement on its rear side; a dial located on the front side of the partition wall; a compartment for a battery or batteries contained within a part of the central element; and releaseable latching means for holding the three elements of the housing together.

Due to the subdivision of the housing into three parts, easy access is possible to the individual elements of the electric clock and this has an advantageous effect on assembly of the latter. Additionally, testing of the electric clock, whether subsequent to manufacture, during final monitoring, or during repair is greatly simplified. The repair can, additionally, be simplified by arranging the printed circuit board carrying the electrical and mechanical portions of the time-piece in the central element with the side having the printed circuits adjacent the rear element.

Further supplementary protection of the time-piece movement can be achieved in designing the housing to be rectangular and arranging the battery or batteries rearwardly of the partition of the central element adjacent the time-piece movement, and furthermore locating a wall between the battery or batteries and the time-piece movement, which is designed to protect the time-piece movement against liquid which might flow out of a battery. As a result, damage to the individual components of the time-piece movement on replacing the battery is prevented.

Where the electric clock is provided with an alarm device, it has been found to be desirable to secure the latter on the front side of the partition wall opposite the battery or batteries. For the same reason, it is recommended to latchingly secure the alarm device to the partition wall. In one preferred form the alarm device comprises an electrical buzzer and manually actuated switch, these elements being combined in a one-piece structural unit.

The front element and the rear element may be designed in the form of flat hoods. This makes it possible to design the central element to have relatively small structural height, whereby an improvement is achieved in respect of accessibility to the electronic components.

The dial may be clamped between the front element and the central element. Additionally, it has been found to be expedient to attach a transparent element of the aperture to the front element by latches.

With a view to achieving simple and uncomplicated operation, the setting element for setting the hands and also in the case where an alarm is provided, a setting element for setting the alarm hand is in the form of a wheel, part of the periphery of

which projects out of the housing. It has been found to be expedient to arrange the setting wheel in the zone of partition between the central element and the rear element. Thereby, ready assembly of time-piece movement and housing is facilitated. The setting wheel may be arranged in a corner of the housing.

In order to prevent dust and dirt from penetrating through the aperture for the setting element, into the interior of the housing, it is advantageous to shield or screen inwardly the aperture formed for the setting wheel in the housing by a wall forming part of at least one housing element and formed inwardly with respect to the setting wheel.

The setting element in a first axial position may be coupled with the hands of the time-piece movement and in a second axial position may be coupled with the alarm hand.

The present invention will now be described in greater detail by way of example with reference to the accompanying drawings wherein:-

Figure 1 shows a perspective view of one preferred form of electric clock;

Figure 2 is a front elevation of the clock shown in Figure 1, with the front element removed;

Figure 3 shows a plan view of the clock shown in Figure 1, with the front and rear elements removed;

Figure 4 shows a rear elevation of the clock shown in Figure 1 with the rear element removed; and

Figure 5 shows a corner of the rear element in greater detail.

Referring to the drawings, a battery operated quartz crystal clock comprises a rectangular housing 1 made from a plastics material and which comprises a front element 2, having an aperture provided with a transparent element 3 latchingly inserted therein, a central element 4, and a rear element 5. The three elements may be the same colour, or they may be of different colours. Furthermore, it is possible, by replacing the front element and/or the rear element with an element of different colour, to produce the widest possible range of colour combinations. The front element 2 and the rear element 5, which are both in the form of flat hoods, are releasably and latchingly connected to the central element 4. For this purpose, there are shaped onto the inner sides of the front element 2 and of the rear element 5 in each particular instance latching projections which are located opposite each other and which engage into associated recesses 6 or into associated indentations 7 in the central element 4.

Located rearwardly of the transparent element 3 is a dial 8 clamped between the front element 2 and a partition wall 16 of the central element 4. In front of the dial 8, an

hour hand 9, a minute hand 10 and also a second hand 11 rotate. An alarm time hand 12 is also located in front of the dial 8. Secured adjacent the dial 8 is a structural unit 15 comprising a buzzer 13 and a switch 14, constituting part of an alarm device. The structural unit 15 is latchingly secured to the partition wall 16 of the central element 4 by means of latching projections 17. The actuating knob of the switch 14 projects outwardly through a slot 18 formed in the front element 2. Formed below the slot 18 is a plurality of transverse slots 19 through which the noise of the buzzer 13 is transmitted.

Arranged on and carried by the rear side of the partition wall 16 is a time-piece movement 20 comprising a mechanical portion (not visible) and an electrical portion 21, both located on a printed circuit board 22. The arrangement of the time-piece movement 20 is so selected that the side of the printed circuit board 22 carrying the printed circuits 23 is adjacent the rear element 5. In this manner, the individual circuits can, at any time and without difficulty, be tested with the electric clock completely assembled. In addition to the time-piece movement 20, and rearwardly of the unit 15, there is provided in the central element 4 a compartment for a battery 24. Arranged between the battery 24 and the time-piece movement 20 is a compartment wall 25, so that on replacing the battery 24 the time-piece movement 20 cannot be damaged. Through recesses formed in the wall 25, the electrical connecting terminals 26 and 27 for the battery 24 extend out of the battery chamber into the chamber containing the time-piece movement 20.

At the partition plane between the rear element 5 and the central element 4, a setting wheel 28 is located in a corner of the housing, the setting wheel 28 projecting through the periphery of the housing which is recessed at this location. In the axial position shown the setting wheel is coupled with the alarm hand. Subsequent to axial movement against the force of a spring in the rearward direction (Figure 1), the setting wheel 28 is uncoupled from the alarm hand and coupled to the hands of the time-piece movement, so that the time can be set in the second axial position.

As will be clear from Figure 5, there is shaped onto the rear element 5 a wall 29 formed inwardly with respect to the setting wheel 28 and screening or sheidling an aperture 30 relative to the inner space of the housing. Thereby, dust and dirt are prevented from penetrating into the interior of the housing.

WHAT WE CLAIM IS:-

1. A battery operated electric clock including: a time-piece movement comprising an electrical portion and a mechanical

portion having a setting element for hands; a three part housing comprising a front element having an aperture, a central element and a rear element; a partition wall located in the central element and carrying the time-piece movement on its rear side; a dial located on the front side of the partition wall; a compartment for a battery or batteries contained within a part of the central element; and releaseable latching means for holding the three elements of the housing together.

2. An electric clock according to claim 1, wherein a printed circuit board carrying the electrical and mechanical portions of the time-piece movement is arranged in the central element with its side having the printed circuits adjacent the rear element.

3. An electric clock according to claim 2, wherein the housing is rectangular and the battery or batteries is or are arranged rearwardly of the partition of the central element adjacent the time-piece movement and wherein a wall is provided between the battery or batteries and the time-piece movement, said wall together with the walls of the central element forming said compartment.

4. An electric clock according to claim 3, including an alarm device secured on the front side of the partition opposite the battery or batteries.

5. An electric clock according to claim 4, wherein the alarm device is latchingly secured to the partition wall.

6. An electric clock according to claim 4 or 5, wherein the alarm device comprises an electrical buzzer and a manually actuated switch, these elements being combined in a one-piece structural unit.

7. An electric clock according to any one of the preceding claims, wherein the front element and rear element are designed in the form of flat hoods.

8. An electric clock according to any one of the preceding claims, wherein said aperture includes a transparent element which is inserted latchingly into the front element.

9. An electric clock according to any one of the preceding claims, wherein the dial is clampingly retained between the front element and the partition wall.

10. An electric clock according to claim 4 or any one of the preceding claims 5 to 9 as appendant to claim 4, wherein the setting element for hands of the time-piece movement and the setting element for the alarm is in the form of a wheel, part of the periphery of which projects out of the housing.

11. An electric clock according to claim 10, wherein the setting wheel is arranged between the central element and the rear element.

12. An electric clock according to claim 10 or 11, wherein the housing is rectangular, the setting wheel being arranged in a corner of the housing.

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13. An electric clock according to any one of the preceding claims 10 to 12, wherein the setting wheel in a first axial position is coupled with the hands of the time-piece movement and in a second axial position with the alarm hand.

14. An electric clock according to any one of the preceding claims 10 to 13, wherein an aperture formed for the setting wheel in the housing is shielded towards the interior by a wall forming part of at least one housing element and formed inwardly with respect to the setting wheel.

15. An electric clock constructed substantially as herein described with reference to and as illustrated in the accompanying drawings.

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Fig. 1



