

PATENT SPECIFICATION

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(54) DIGITAL ALARM ELECTRONIC TIMEPIECE

(71) We, KABUSHIKI KAISHA DAINI SEIKOSHA, a Japanese company of 31-1, 6-chome, Kameido, Koto-ku, Tokyo, Japan, 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:—

This invention relates to digital alarm electronic timepieces.

In a conventional mechanical alarm timepiece, an alarm is set by a mechanical recording hands system. However, an alarm time cannot be set very accurately by such a system and, moreover, an alarm will sound twice every 24 hours, i.e. once in the A.M., and once in the P.M.

Conventional digital alarm electronic timepieces which have been developed so far, generally display a time indication on a 24-hour basis, a display being provided to distinguish between A.M. and P.M. However, there is a tendency for a user to fail to distinguish A.M. and P.M. because the display provided to enable A.M. to be distinguished from P.M. is small and difficult to read.

In a conventional digital alarm electronic timepiece which displays a time indication of a 12-hour basis, if it is desired that an alarm should sound at 10:00 a.m. but the alarm is set to sound at 10:00 p.m., by mistake, the alarm will not sound at 10:00 a.m., when it is required and, what is worse, it will sound at 10:00 p.m. when it is not required.

According to the present invention there is provided a digital alarm electronic timepiece including display means for selectively displaying an actual time of day indication and a preset alarm time on a 24-hour basis, storing means for storing the preset alarm time on a 24-hour basis, and setting means for setting an alarm time in the storing means.

The logic means may be controlled by a change-over switch.

The timepiece preferably includes co-incidence means for producing an output signal when the actual time of day indication is the same as the preset alarm time stored in the storing means. The timepiece may also include a buzzer means for producing an alarm in response to the output signal from the co-incidence means.

The invention is illustrated, merely by way of example, in the accompanying drawing which is a block diagram of an embodiment of a digital alarm electronic timepiece according to the present invention.

A quartz vibrator 1 produces a time standard signal which is frequency divided by a frequency divider 2 whose output has a frequency of 1Hz. A seconds counter 3 receives the output signal from the divider 2 and causes a seconds display portion 28 to display a seconds indication and passes a signal having a frequency of 1/60Hz to a minutes counter 5. The minutes counter 5 causes a minutes display portion 33 to display a minutes indication and passes a signal having a frequency of 1/3600Hz to an hours counter 7 which causes an hours display portion 38 to display an hours indication on a 24-hour basis. An alarm minutes counter 14 stores or memorises the minutes of a preset alarm time and an alarm hours counter 16 stores or memorises the hours of the preset alarm time also on a 24-hour basis.

When a changeover switch 24 is in contact with a terminal W an actual time of day indication is displayed as follows. The terminal W is at a relatively high potential (+) so that a high level signal causes (a) and AND gate 26 to pass the contents of the seconds counter 3 to the seconds display portion 28 via a seconds display driver 27 (b) and AND gate 29 to pass the contents of the minutes counter 5 to the minutes display portion 33 via a minutes display driver 32, and (c) an AND gate 34 to pass the contents of the hours counter 7 to the hours display portion 38 via an hours

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display driver 37. On the other hand, an AND gate 30 and an AND gate 35 receive a low level signal (—) generated from the high level signal by an inverter 25 to block the output signals from the alarm minutes counter 14 and the alarm hours counter 16.

When the switch 24 is in contact with a terminal A a preset alarm time is displayed as follows. The terminal A is at a relatively low potential (—) so that a low level signal causes the AND gates 26, 29, 34 to block the signals from the seconds counter 3, minutes counter 5 and hours counter 7. The low level signal is inverted by the inverter 25 into a high level signal which causes the gates 30, 35 to pass the output signals from the alarm minutes counter 14 and the alarm hours counter 16 respectively to the minutes display portion 33 and the hours display portion 38. In this condition, a desired alarm time can be set by an alarm hours setting switch (not shown) connected to a terminal 8 and an alarm minutes setting switch (not shown) connected to a terminal 9 and the preset alarm time will be displayed by the hours display portion 38 and the minutes display portion 33.

When the contents of the hours counter 7 corresponds with that of the alarm hours counter 16 and the contents of the minutes counter 5 corresponds with that of the alarm minutes counter 14, an hours coincidence circuit 20 and a minutes coincidence circuit 19 both produce a high level signal. These high level signals are fed to an AND gate 21 which thus causes a buzzer driver circuit 22 to energise a buzzer 23 with the result that an alarm sounds.

The above described digital alarm electronic timepiece overcomes the disadvantages of the conventional alarm timepieces described above because it displays a time indication of a 24-hour basis and an alarm time can be set also on a 24-hour basis. Moreover, a display to distinguish between A.M. and P.M. is unnecessary so that the space within the timepiece can be employed more efficiently. Moreover, a train or aeroplane time, a radio or TV programme time, for

example, which time may be given on a 24-hour basis, can be directly set and no conversion of the time to a 12-hour basis is required.

WHAT WE CLAIM IS:—

1. A digital alarm electronic timepiece including display means for selectively displaying an actual time of day indication and a preset alarm time on a 24-hour basis, storing means for storing the preset alarm time on a 24-hour basis, and setting means for setting an alarm time in the storing means.

2. A timepiece as claimed in claim 1 including time keeping means output signals from which cause the display means to display the actual time of day indication, and logic means for blocking the output signals from the time keeping means when the preset alarm time is displayed by the display means and for blocking output signals from the storing means when the actual time of day indication is displayed by the display means.

3. A timepiece as claimed in claim 1 or 2 in which the logic means are controlled by a change-over switch.

4. A timepiece as claimed in any preceding claim including co-incidence means for producing an output signal when the actual time of day indication is the same as the preset alarm time stored in the storing means.

5. A timepiece as claimed in claim 4 including buzzer means for producing an alarm in response to the output signal from the co-incidence means.

6. A digital alarm electronic timepiece substantially as herein described with reference to and as shown in the accompanying drawing.

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display driver 37. On the other hand, an AND gate 30 and an AND gate 35 receive a low level signal (—) generated from the high level signal by an inverter 25 to block the output signals from the alarm minutes counter 14 and the alarm hours counter 16.

When the switch 24 is in contact with a terminal A a preset alarm time is displayed as follows. The terminal A is at a relatively low potential (—) so that a low level signal causes the AND gates 26, 29, 34 to block the signals from the seconds counter 3, minutes counter 5 and hours counter 7. The low level signal is inverted by the inverter 25 into a high level signal which causes the gates 30, 35 to pass the output signals from the alarm minutes counter 14 and the alarm hours counter 16 respectively to the minutes display portion 33 and the hours display portion 38. In this condition, a desired alarm time can be set by an alarm hours setting switch (not shown) connected to a terminal 8 and an alarm minutes setting switch (not shown) connected to a terminal 9 and the preset alarm time will be displayed by the hours display portion 38 and the minutes display portion 33.

When the contents of the hours counter 7 corresponds with that of the alarm hours counter 16 and the contents of the minutes counter 5 corresponds with that of the alarm minutes counter 14, an hours co-incidence circuit 20 and a minutes co-incidence circuit 19 both produce a high level signal. These high level signals are fed to an AND gate 21 which thus causes a buzzer driver circuit 22 to energise a buzzer 23 with the result that an alarm sounds.

The above described digital alarm electronic timepiece overcomes the disadvantages of the conventional alarm timepieces described above because it displays a time indication of a 24-hour basis and an alarm time can be set also on a 24-hour basis. Moreover, a display to distinguish between A.M and P.M. is unnecessary so that the space within the timepiece can be employed more efficiently. Moreover, a train or aeroplane time, a radio or TV programme time, for

example, which time may be given on a 24-hour basis, can be directly set and no conversion of the time to a 12-hour basis is required.

WHAT WE CLAIM IS:—

1. A digital alarm electronic timepiece including display means for selectively displaying an actual time of day indication and a preset alarm time on a 24-hour basis, storing means for storing the preset alarm time on a 24-hour basis, and setting means for setting an alarm time in the storing means.

2. A timepiece as claimed in claim 1 including time keeping means output signals from which cause the display means to display the actual time of day indication, and logic means for blocking the output signals from the time keeping means when the preset alarm time is displayed by the display means and for blocking output signals from the storing means when the actual time of day indication is displayed by the display means.

3. A timepiece as claimed in claim 1 or 2 in which the logic means are controlled by a change-over switch.

4. A timepiece as claimed in any preceding claim including co-incidence means for producing an output signal when the actual time of day indication is the same as the preset alarm time stored in the storing means.

5. A timepiece as claimed in claim 4 including buzzer means for producing an alarm in response to the output signal from the co-incidence means.

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