

PATENT SPECIFICATION

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(54) DIGITAL WRIST WATCH

(71) We, KABUSHIKI KAISHA SUWA SEIKOSHA, a Japanese body corporate, of 3-4, 4-chome, Ginza, Chuo-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 wrist watches.

Generally, in digital wrist watches push button switches are used to correct the time indication. This correction cannot be accomplished only by a pull-and-turn operation of a winding crown as in a conventional mechanical wrist watch. Thus, to simplify correction of the time indication in a digital wrist watch a relatively large number of push button switches must be provided, for example, one push button switch being provided for each column of the time indication. The result of providing all these push button switches is that it is difficult to make the digital wrist watch compact. Moreover, if it is desired that the digital wrist watch also performs a timer function, the push button switches in the conventional digital wrist watch must be duplicated to enable a predetermined time to be set.

According to the present invention, there is provided a digital wrist watch comprising: an electronic circuit for producing signals corresponding to a time of day; an electronic display means for displaying the time of day; memory circuit means for memorising signals related to a predetermined time when an alarm device is to be operated; and selection means for determining whether the display means displays the time of day or an indication of the predetermined time.

The digital wrist watch may include switch means for correcting or setting the time indication. The switch means preferably enables also either signals corresponding to the length of a predetermined period of time or signals corresponding to the predetermined time, to be set into and memorized by the memory circuit.

In a preferred embodiment the electronic circuit includes a quartz oscillator for producing a relatively high frequency standard time signal, a plurality of frequency divider circuits for producing lower frequency output signals from the standard time signal, and distributing means which reserve the said output signals to cause the display means to display the time of day.

Preferably the selection means includes a changeover switch.

The switch means may comprise a plurality of push button switches. The display means may comprise a plurality of liquid crystal elements or light emitting diodes.

The invention is illustrated, merely by way of example, in the accompanying drawings, in which:

Figure 1 is a general view of a digital wrist watch according to the present invention; and

Figure 2 is a block diagram of a digital wrist watch according to the present invention.

Referring to Figure 1 there is shown a general view of a digital wrist watch. The digital wrist watch has a push button switch 1 for correcting an hours indication, a push button switch 2 for correcting a minutes indication, a push button reset switch 4 for resetting or zeroising the time indication; a start/stop switch 5; a sliding-type changeover switch 3 for selecting whether the digital wrist watch indicates time of day or a predetermined time when an alarm device is to operate, a display panel 6 consisting of a plurality of liquid crystal elements or a plurality of light emitting diodes for displaying the time, a watch case 7 and a watch band 8.

Figure 2 is a block diagram of a digital wrist watch according to the present invention. A quartz oscillator 11 produces a stabilised time standard signal which is fed to the input of a frequency divider circuit 12. The frequency divider circuit 12, by counting cycles of the time standard signal, produces at its output a seconds signal, that

is to say a signal having a frequency of 1 Hz. The seconds signal is fed to the input of a frequency divider circuit 13 which produces at its output a minutes signal, that is to say a signal having a frequency of 1/60 Hz. The minutes signal is fed to the input of a frequency divider circuit 14 which produces at its output an hours signal, that is to say a signal having a frequency of 1/3600 Hz. The hours signal is fed to the input of a frequency divider circuit 15 which produces at its output a day signal, that is to say a signal having a frequency of 1/86400 Hz. In this embodiment the day signal is not used because the display panel is not constructed to display day or date. The frequency divider circuits 13, 14, 15 also send BCD codes corresponding to the seconds signal, minutes signal and hours signal respectively to the input of a selecting circuit 19 and to the input of a coincidence circuit 18. The selecting circuit 19 and the coincidence circuit 18 also simultaneously receive further BCD codes from a memory circuit 16 and a memory circuit 17 which memorise the predetermined time when a given time period ends. The memory circuit 16 memorises the minutes digit of the predetermined time and the memory circuit 17 memorises the hours digit of the predetermined time.

Depending upon the position of a change-over switch S_3 , (corresponding to the change-over switch 3 of Figure 1), selecting circuit 19 enables either a correction of the time of day or a selection of the predetermined time to be performed. To this end correcting or setting switches S_1 and S_2 are provided.

When the changeover switch S_3 is in the position in which the digital wrist watch indicates a predetermined time when an alarm is to sound the switches S_1 , S_2 may be used to set this predetermined time.

In this position of the changeover switch S_3 the selecting circuit 19 passes BCD code signals from the memory circuit 16, 17 to a distributing circuit 20 which transforms them into display driving signals for driving a display panel (not shown), such as the display panel 6 of Figure 1. Thus the display panel will display the predetermined time. The coincidence circuit 18, when there is coincidence between the BCD code signals from the memory circuits 16, 17 and the BCD code signals from the frequency divider circuits 14, 15, sends a signal to an amplifier A so that the latter drives an alarm device SP such as, for example, a speaker or a buzzer.

On the other hand, when the switch S_3 is in the position in which the digital wrist watch indicates the time of day the switches S_1 , S_2 may be used to correct this time indication. In this position of the changeover switch S_3 the selecting circuit passes the BCD code signals from the frequency divider

circuits 13, 14, 15 to the distributing circuit 20 which transforms them into display driving signals so that the display panel will display the time of day.

A switch S_4 is a reset switch for zeroising the display of the display panel and a switch S_5 is provided to start or stop counting by the counting circuit 12 thus enabling correction of the seconds indication.

In an alternative embodiment (not shown) the memory circuits may be constructed so that instead of memorising the minutes digits and hours digits respectively of the predetermined time, they memorise the minutes digit and hours digit of a predetermined period of time after which an alarm is to operate. In this case the memory circuits will have to include subtracting means for subtracting from the predetermined period of time the passage of time. In this embodiment the coincidence circuit 18 will, when it detects zero time from the memory circuits 16, 17 send a signal to the amplifier A to operate the alarm device SP.

It will be appreciated that although the digital wrist watch can perform a watch function or a timer function, the number of switches required is not duplicated. This is especially true in the case in which the digital wrist watch provides both a day and a date indication.

WHAT WE CLAIM IS:—

1. A digital wrist watch comprising: an electronic circuit for producing signals corresponding to a time of day; an electronic display means for displaying the time of day; memory circuit means for memorising signals related to a predetermined time when an alarm device is to be operated; and selection means for determining whether the display means displays the time of day or an indication of the predetermined time.

2. A digital wrist watch as claimed in claim 1 including switch means for correcting or setting the time indication.

3. A digital wrist watch as claimed in claim 2 in which the switch means also enables either signals corresponding to the length of a predetermined period of time or signals corresponding to the predetermined time, to be set into and memorised by the memory circuit.

4. A digital wrist watch as claimed in any preceding claim in which the electronic circuit includes a quartz oscillator for producing a relatively high frequency standard time signal, a plurality of frequency divider circuits for producing lower frequency output signals from the standard time signal and distributing means which receive the said output signals to cause the display means to display the time of day.

5. A digital wrist watch as claimed in any

is to say a signal having a frequency of 1 Hz. The seconds signal is fed to the input of a frequency divider circuit 13 which produces at its output a minutes signal, that is to say a signal having a frequency of 1/60 Hz. The minutes signal is fed to the input of a frequency divider circuit 14 which produces at its output an hours signal, that is to say a signal having a frequency of 1/3600 Hz. The hours signal is fed to the input of a frequency divider circuit 15 which produces at its output a day signal, that is to say a signal having a frequency of 1/86400 Hz. In this embodiment the day signal is not used because the display panel is not constructed to display day or date. The frequency divider circuits 13, 14, 15 also send BCD codes corresponding to the seconds signal, minutes signal and hours signal respectively to the input of a selecting circuit 19 and to the input of a coincidence circuit 18. The selecting circuit 19 and the coincidence circuit 18 also simultaneously receive further BCD codes from a memory circuit 16 and a memory circuit 17 which memorise the predetermined time when a given time period ends. The memory circuit 16 memorises the minutes digit of the predetermined time and the memory circuit 17 memorises the hours digit of the predetermined time.

Depending upon the position of a changeover switch S_3 , (corresponding to the changeover switch 3 of Figure 1), selecting circuit 19 enables either a correction of the time of day or a selection of the predetermined time to be performed. To this end correcting or setting switches S_1 and S_2 are provided.

When the changeover switch S_3 is in the position in which the digital wrist watch indicates a predetermined time when an alarm is to sound the switches S_1 , S_2 may be used to set this predetermined time.

In this position of the changeover switch S_3 the selecting circuit 19 passes BCD code signals from the memory circuit 16, 17 to a distributing circuit 20 which transforms them into display driving signals for driving a display panel (not shown), such as the display panel 6 of Figure 1. Thus the display panel will display the predetermined time. The coincidence circuit 18, when there is coincidence between the BCD code signals from the memory circuits 16, 17 and the BCD code signals from the frequency divider circuits 14, 15, sends a signal to an amplifier A so that the latter drives an alarm device SP such as, for example, a speaker or a buzzer.

On the other hand, when the switch S_3 is in the position in which the digital wrist watch indicates the time of day the switches S_1 , S_2 may be used to correct this time indication. In this position of the changeover switch S_3 the selecting circuit passes the BCD code signals from the frequency divider

circuits 13, 14, 15 to the distributing circuit 20 which transforms them into display driving signals so that the display panel will display the time of day.

A switch S_4 is a reset switch for zeroising the display of the display panel and a switch S_5 is provided to start or stop counting by the counting circuit 12 thus enabling correction of the seconds indication.

In an alternative embodiment (not shown) the memory circuits may be constructed so that instead of memorising the minutes digits and hours digits respectively of the predetermined time, they memorise the minutes digit and hours digit of a predetermined period of time after which an alarm is to operate. In this case the memory circuits will have to include subtracting means for subtracting from the predetermined period of time the passage of time. In this embodiment the coincidence circuit 18 will, when it detects zero time from the memory circuits 16, 17 send a signal to the amplifier A to operate the alarm device SP.

It will be appreciated that although the digital wrist watch can perform a watch function or a timer function, the number of switches required is not duplicated. This is especially true in the case in which the digital wrist watch provides both a day and a date indication.

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1. A digital wrist watch comprising: an electronic circuit for producing signals corresponding to a time of day; an electronic display means for displaying the time of day; memory circuit means for memorising signals related to a predetermined time when an alarm device is to be operated; and selection means for determining whether the display means displays the time of day or an indication of the predetermined time.

2. A digital wrist watch as claimed in claim 1 including switch means for correcting or setting the time indication.

3. A digital wrist watch as claimed in claim 2 in which the switch means also enables either signals corresponding to the length of a predetermined period of time or signals corresponding to the predetermined time, to be set into and memorised by the memory circuit.

4. A digital wrist watch as claimed in any preceding claim in which the electronic circuit includes a quartz oscillator for producing a relatively high frequency standard time signal, a plurality of frequency divider circuits for producing lower frequency output signals from the standard time signal and distributing means which receive the said output signals to cause the display means to display the time of day.

5. A digital wrist watch as claimed in any



preceding claim in which the selection means includes a changeover switch.

- 5 6. A digital wrist watch as claimed in claim 2 or any of claims 3 to 5 when dependent thereon in which the switch means comprises a plurality of push button switches.
7. A digital wrist watch as claimed in any preceding claim in which the display means comprises a plurality of liquid crystal elements or light emitting diodes.
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8. A digital wrist watch substantially as herein described with reference to and as shown in the accompanying drawings.

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