

PATENT SPECIFICATION

(11) 1 523 948

1 523 948

- (21) Application No. 42173/76 (22) Filed 11 Oct. 1976 (19)
 (31) Convention Application No. 50/123006 (32) Filed 13 Oct. 1975 in
 (33) Japan (JP)
 (44) Complete Specification published 6 Sep. 1978
 (51) INT CL² G04C 23/12 // 21/16
 (52) Index at acceptance
 G3T 604 608 609 610 611 S1



(54) IMPROVEMENTS IN OR RELATING TO ALARM ELECTRONIC TIMEPIECES

(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 alarm electronic timepieces, that is to say to electronic timepieces fitted with alarm means for operation automatically when a particular set alarm time is reached. The object of the invention is to provide an improved and simple alarm electronic timepiece which can be set at will to give, when a set alarm time is reached, either a self terminating alarm (which may or may not be of an interrupted nature) which automatically ceases after a pre-determined time, or a continuing alarm (which again may or may not be of an interrupted nature) which continues until manually switched off.

It is often desired to be able to choose at will between having a self-terminating alarm or having a continuing alarm once a set alarm time is reached. However, known alarm electronic timepieces with this facility have been undesirably complicated, and therefore expensive, in their circuitry. Moreover, operation by the user of known timepieces with this facility has been undesirably complicated. These disadvantages arise, with such known timepieces, because separate memory circuits have been used in the self-terminating alarm circuitry and in the continuing alarm circuitry so that the provision of this facility has involved doubling the number of memory counters. This adds substantially to the cost and also, from the user's point of view, to the complications of operating, since there are two memories, one or other of which has to be pre-set.

According to one aspect of the invention there is provided an alarm electronic

timepiece which can be set at will to give, when a set alarm time is reached, either a self-terminating or a continuing alarm, wherein one and the same memory counting means is used for initiating both alarms and wherein means are provided for automatically resetting said memory counting means when a pre-set alarm time for a self-terminating alarm is reached, means, operable at will, being provided for rendering said automatic resetting means inoperable so that when pre-set alarm time is reached, a continuing alarm is given.

According to another aspect of the invention there is provided an alarm electronic timepiece including in combination time counting means; memory counting means pre-settable to a chosen time at which an alarm is required to be given; alarm means; means for automatically resetting said memory counting means when the pre-set time is reached; and manually actuatable selection means actuatable either to leave said automatic resetting means operable so that a self-terminating alarm is given when said pre-set time is reached, or to prevent automatic resetting so that a continuing alarm is given when said time is reached.

The timepiece may include a display, means for normally causing display of time thereby, and means, operable at will, for causing display of a pre-set alarm time thereby.

The timepiece preferably includes indicating means for indicating whether self-terminating alarm or continuing alarm operation has been selected. Such indicating means may be constituted by a light indicator comprising two selectable input electrodes and a common electrode, means for applying in-phase signals between one input electrode and said common electrode and signals in phase opposition between the other input electrode and said common electrode, and means, operable by the means for

50

55

60

65

70

75

80

85

90

selecting between self-terminating alarm operation and continuing alarm operation, for selecting between which of the input electrodes receive an in-phase input, whereby a light indication is produced by the selected input electrode and the common electrode only, said signals being derived from the normally provided time counting circuitry of the time piece.

Where the timepiece is a watch the means for selecting between self-terminating alarm operation and continuing alarm operation preferably include manually operated switch means operated by a button on the external case of the watch.

Although the invention is applicable to electronic alarm timepieces generally it is, owing to its circuit simplicity, of great advantage for, and primarily intended for, application to wrist watches.

The invention is illustrated in the accompanying drawings in which:-

Figure 1 is a block diagram of one embodiment; and

Figure 2 shows in more detail the circuitry used in the embodiment of Figure 1.

Referring to Figure 1, block 1 represents a time standard relatively high frequency quartz controlled oscillator the output of which is fed to a frequency divider 2 which produces a 1Hz output. This is passed to a seconds counter 3 followed by a minutes counter 4 which is in turn followed by an hours counter 5.

The output from the seconds counter 3 is fed via an AND gate 20 (when open) to another minutes counter 6 and is similarly fed via an AND gate 21 (when open) to another hours counter 7. These counters 6 and 7 are used to store the alarm time. The second inputs to the AND gates 20 and 21 are constituted by control signals from a controlling and setting circuit 12. The BCD outputs from the two minutes counters 4 and 6 and the BCD outputs from the two hours counters 5 and 7 are applied to a coincidence circuit 8, which detects coincidence between the minutes and hours counts in the counters 6 and 7 (on the other). The coincidence circuit 8 comprises two EXCLUSIVE-OR gates and a NOR gate connected as shown. When coincidence occurs the NOR gate provides an output signal which actuates an alarm circuit 14 driving an alarm sounding device.

The BCD signal from the minutes and hours counters 4 and 6, 5 and 7 are also applied to a switching circuit 9. This switching circuit is controlled by a signal from the controlling and setting circuit 12 and its output, selected by said signal, is applied to a decoder-driver circuit 10, driving a digital display 11. Depending upon the signal received by the switching circuit 9 from the controlling and setting circuit 12, the display

11 will display either the actual time (from signals derived from counters 4 and 5) or the set alarm time (from signals derived from counters 6 and 7).

The coincidence signal from the NOR gate in the coincidence circuit 8 is also applied to a self-terminating alarm continuing alarm selecting circuit 13. This circuit 13 is controlled by a manually operated switch shown connected thereto and selects the type of alarm desired depending on the position of the switch. If the self-terminating type of alarm is selected, the output of the circuit 13 is applied to the reset terminals of the set alarm time memory counters 6 and 7 when an alarm is sounded (due to a coincidence output from the circuit 8) and resets these counters 6 and 7. The manually operated switch shown connected to the selecting circuit 12 determines, by its position, whether actual time or set time is displayed by the display 11.

Figure 2 shows the circuitry of Figure 1 in more detail. Like references denote like parts in both these figures. Referring to Figure 2 the output of the NOR gate 30 in the coincidence circuit 8 becomes '1' when the contents of the counters 4 and 5 coincide respectively with the contents of the counters 6 and 7. This output from 30 is shaped to a short duration pulse by a pulse shaping circuit 15 which is controlled by a 1Hz signal from the counter 3. This shaping circuit is composed of two transmission-gates, three inverters and an AND gate connected as shown. The output from the shaping circuit 15 is fed to one input of an AND gate 31, the other input of which is provided from the Q terminal of a T-type flipflop circuit 16. The state ('1' or '0') of the signal at the said Q terminal can be changed by actuating the self-terminating alarm/continuing alarm selecting switch referenced SW₁ in Figure 2. If this switch is in the self-terminating alarm selecting position, which is that in which the signal at the Q terminal of flip-flop is a '1', a self-terminating alarm is initiated when the set time is reached, the contents of the alarm set time counters 6 and 7 being re-set to zero (0 hrs 00 minutes). If however the switch is set to its other position in which the Q output of flip-flop 16 is a '0', there is no coincidence signal from the AND gate 31 and the counters 6 and 7 are not re-set so that the alarm, which is initiated when the set time is reached, continues until it is manually switched off.

The Q output of the flip-flop 16 is also applied to a driving circuit 17 for operating a display device which indicates whether self-terminating or continuing alarm has been set. This display device is a liquid crystal device. It has a common electrode 34 to which a 32Hz signal derived from the divider 2 is applied. This 32Hz signal is also

applied directly to one input of each of two further AND gates 32 and 36. The gates 32 and 37 receive their second inputs directly from the Q terminal of the flip flop 16 and the gates 34 and 36 receive their second inputs from said Q terminal via an inverter 35. Gates 32 and 34 provide the two inputs to a NOR gate 33 feeding electrode S₁ and gates 36 and 37 provide the two inputs to a NOR gate 38 feeding electrode S₂. When the output at said terminal Q is '1' (the condition for self-terminating alarm) the inverse of the signal on the common electrode 34 is supplied from the output of NOR circuit 33 and a display is given at the electrode S₁ thus indicating 'self terminating alarm'. No display occurs at electrode S₂ because this electrode receives a signal of the same phase as that on the common electrode 34. When the output at terminal Q of flip-flop 16 is '0' the output from the NOR gate 38 produces on electrode S₂ a signal which is the inverse of (i.e. in phase opposition to) that on electrode 34 so that a display occurs at electrode S₂, thus indicating 'continuing alarm'. S₁ and common electrode 34, however, now receive in phase 32Hz waves so that no 'self-terminating alarm' display now occurs at S₁.

The coincidence signal from circuit 15 is also applied to one input of a flip-flop composed of two cross-connected NOR gates 40, 41 in the alarm circuit 14. The output from this flip-flop supplies one input to a NAND gate 42 the second input to which is a suitable audio frequency taken from the counter 3. The output from flip-flop 40, 41 becomes '1' when a coincidence signal occurs from shaping circuit 15, the gate 42 passes the audio frequency and this, applied to the base of the transistor 43, causes the initiation a self-terminating alarm sound by the alarm sounder, represented in Figure 2 by its coil 15. Ten seconds later a signal applied to the second input of the flip-flop 40, 41 reverses its state and the alarm terminates. The delay of 10 seconds is, of course, only an example. It is obtained by the delay circuit 171.

As will now be appreciated the described embodiment has the advantage of great simplicity inasmuch as it provides a choice, at will, between having a self-terminating alarm (e.g. one which terminates after 10 seconds) or a continuing alarm, by means of a comparatively very small (single channel) addition to the circuitry.

As will now be appreciated, the terms 'self-terminating' and 'continuing' are used in this specification and in the claims which follow to refer respectively to a relatively short alarm which automatically ceases a relatively short time (e.g. ten seconds) after being initiated and an alarm which, once initiated continues until manually switched

off. In either case, of course, the alarm given may or may not be of an interrupted nature.

Although, in the foregoing description, the alarm is an audio alarm, akin to that which would be given by a buzzer, it could be of any other type, e.g. a displayed light or a displayed colour or a flashing light and, if desired, a combination of different types of alarm could be used. In general however audio alarms will be preferred especially if the timepiece is a watch.

WHAT WE CLAIM IS:-

1. An alarm electronic timepiece which can be set at will to give, when a set alarm is reached, either a self-terminating alarm or a continuing alarm wherein one and the same memory counting means is used for initiating both alarms and wherein means are provided for automatically resetting said memory counting means when a pre-set alarm time for a self-terminating alarm is reached, means, operable at will, being provided for rendering said automatic resetting means inoperable so that when a pre-set alarm time is reached, a continuing alarm is given.

2. An alarm electronic timepiece including in combination time counting means; memory counting means pre-settable to a chosen time at which an alarm is required to be given; alarm means; means for automatically resetting said memory counting means when the pre-set time is reached; and manually actuatable selection means actuatable either to leave said automatic resetting means operable so that a self-terminating alarm is given when said pre-set time is reached, or to prevent automatic resetting so that a continuing alarm is given when said time is reached.

3. A timepiece as claimed in claim 1 or 2 and comprising a display, means for normally causing display of time thereby, and means, operable at will, for causing display of a pre-set alarm time thereby.

4. A timepiece as claimed in any of the preceding claims and comprising indicating means for indicating whether self-terminating alarm or continuing alarm operation has been selected.

5. A timepiece as claimed in claim 4 wherein said indicating means are constituted by a light indicator comprising two selectable input electrodes and a common electrode, means for applying in-phase signals between one input electrode and said common electrode and signals in phase opposition between the other input electrode and said common electrode, and means, operable by the means for selecting between self-terminating alarm operation and continuing alarm operation, for selecting between which of the input electrodes receives an in-phase input, whereby a light indication is produced by the selected input electrode and the common electrode only,



applied directly to one input of each of two further AND gates 32 and 36. The gates 32 and 37 receive their second inputs directly from the Q terminal of the flip-flop 16 and the gates 34 and 36 receive their second inputs from said Q terminal via an inverter 35. Gates 32 and 34 provide the two inputs to a NOR gate 33 feeding electrode S₁ and gates 36 and 37 provide the two inputs to a NOR gate 38 feeding electrode S₂. When the output at said terminal Q is '1' (the condition for self-terminating alarm) the inverse of the signal on the common electrode 34 is supplied from the output of NOR circuit 33 and a display is given at the electrode S₁ thus indicating 'self-terminating alarm'. No display occurs at electrode S₂ because this electrode receives a signal of the same phase as that on the common electrode 34. When the output at terminal Q of flip-flop 16 is '0' the output from the NOR gate 38 produces on electrode S₂ a signal which is the inverse of (i.e. in phase opposition to) that on electrode 34 so that a display occurs at electrode S₂, thus indicating 'continuing alarm'. S₁ and common electrode 34, however, now receive in phase 32Hz waves so that no 'self-terminating alarm' display now occurs at S₁.

The coincidence signal from circuit 15 is also applied to one input of a flip-flop composed of two cross-connected NOR gates 40, 41 in the alarm circuit 14. The output from this flip-flop supplies one input to a NAND gate 42 the second input to which is a suitable audio frequency taken from the counter 3. The output from flip-flop 40, 41 becomes '1' when a coincidence signal occurs from shaping circuit 15, the gate 42 passes the audio frequency and this, applied to the base of the transistor 43, causes the initiation a self-terminating alarm sound by the alarm sounder, represented in Figure 2 by its coil 15. Ten seconds later a signal applied to the second input of the flip-flop 40, 41 reverses its state and the alarm terminates. The delay of 10 seconds is, of course, only an example. It is obtained by the delay circuit 171.

As will now be appreciated the described embodiment has the advantage of great simplicity inasmuch as it provides a choice, at will, between having a self-terminating alarm (e.g. one which terminates after 10 seconds) or a continuing alarm, by means of a comparatively very small (single channel) addition to the circuitry.

As will now be appreciated, the terms 'self-terminating' and 'continuing' are used in this specification and in the claims which follow to refer respectively to a relatively short alarm which automatically ceases a relatively short time (e.g. ten seconds) after being initiated and an alarm which, once initiated continues until manually switched

off. In either case, of course, the alarm given may or may not be of an interrupted nature.

Although, in the foregoing description, the alarm is an audio alarm, akin to that which would be given by a buzzer, it could be of any other type, e.g. a displayed light or a displayed colour or a flashing light and, if desired, a combination of different types of alarm could be used. In general however audio alarms will be preferred especially if the timepiece is a watch.

WHAT WE CLAIM IS:-

1. An alarm electronic timepiece which can be set at will to give, when a set alarm is reached, either a self-terminating alarm or a continuing alarm wherein one and the same memory counting means is used for initiating both alarms and wherein means are provided for automatically resetting said memory counting means when a pre-set alarm time for a self-terminating alarm is reached, means, operable at will, being provided for rendering said automatic resetting means inoperable so that when a pre-set alarm time is reached, a continuing alarm is given.

2. An alarm electronic timepiece including in combination time counting means; memory counting means pre-settable to a chosen time at which an alarm is required to be given; alarm means; means for automatically resetting said memory counting means when the pre-set time is reached; and manually actuatable selection means actuatable either to leave said automatic resetting means operable so that a self-terminating alarm is given when said pre-set time is reached, or to prevent automatic resetting so that a continuing alarm is given when said time is reached.

3. A timepiece as claimed in claim 1 or 2 and comprising a display, means for normally causing display of time thereby, and means, operable at will, for causing display of a pre-set alarm time thereby.

4. A timepiece as claimed in any of the preceding claims and comprising indicating means for indicating whether self-terminating alarm or continuing alarm operation has been selected.

5. A timepiece as claimed in claim 4 wherein said indicating means are constituted by a light indicator comprising two selectable input electrodes and a common electrode, means for applying in-phase signals between one input electrode and said common electrode and signals in phase opposition between the other input electrode and said common electrode, and means, operable by the means for selecting between self-terminating alarm operation and continuing alarm operation, for selecting between which of the input electrodes receives an in-phase input, whereby a light indication is produced by the selected input electrode and the common electrode only,

4



1,523,948

4

said signals being derived from the normally provided time counting circuitry of the timepiece.

- 5 6. A timepiece as claimed in any of the preceding claims constituted by an electronic watch wherein the means for selecting between self-terminating alarm operation and continuing alarm operation include manually operated switch means operated
- 10 by a button on the external case of the

watch.

7. Alarm electronic timepieces substantially as herein described and illustrated in the accompanying drawings.

J. MILLER & CO.
Chartered Patent Agents
Lincoln House,
296-302 High Holborn,
LONDON WC1V 7JH
Agents for the Applicants

15

20

Printed for Her Majesty's Stationery Office, by Croydon Printing Company Limited, Croydon, Surrey, 1978.
Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.