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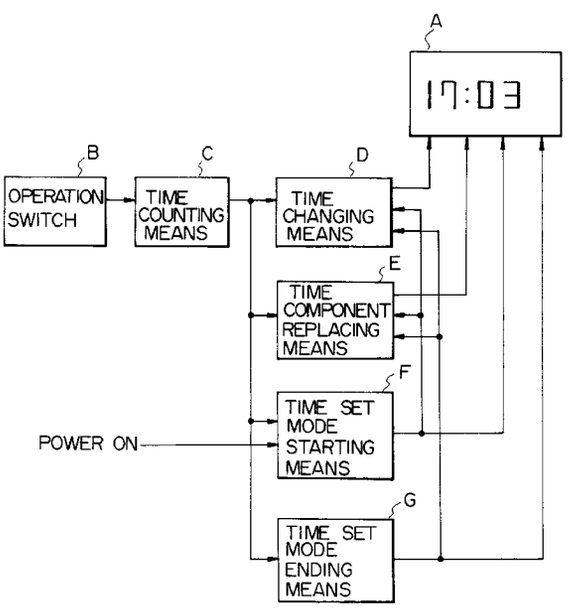
(54) Data display radio pager with a timepiece function.

(57) A data display radio pager having a timepiece function and allowing the user of the pager to perform various kinds of time setting operations on a single operation switch (B). The pager has a single switch, time counting means (C), time changing means (D), time component replacing means (E), time set mode starting means (C), and time set mode ending means (G). The radio pager, therefore, can replace a component of time to be changed, increase or decrease the component of interest, and set up and end a time set mode, by the single switch (B).

Fig. 1



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BACKGROUND OF THE INVENTION

The present invention relates to a radio pager having a timepiece function and, more particularly, to a data display radio pager having a timepiece function and allowing the user of the pager to perform various kinds of time setting operations on a single operation switch.

It is a common practice with a data display radio pager to alert, on receiving a call signal including an address assigned to the pager, the user to the call by causing an LED (Light Emitting Diode) to flash, causing a louspeaker to produce an alert tone, or causing a vibrator to vibrate. At the same time, this kind of pager displays a message also included in the call signal on a display. An advanced type of data display radio pager additionally has a timepiece function for displaying time on the display. Such an advanced pager has to have the time thereof set and, therefore, usually has two operation switches. Specifically, one operation switch is used to set up a time set mode, to replace the numerical value to be changed, e. g., one representative of hours with the numerical value representative of minutes, and to end the time set mode and replace it with the ordinary timepiece mode. The other switch is used to increment or decrement the numerical value of interest by each unit time until it coincides with correct current time. However, such two operation switches are contradictory to the increasing demand for a miniature radio pager.

SUMMARY OF THE INVENTION

It is, therefore, an object of the present invention to provide a data display radio pager with a timepiece function which allows the user to switch over the numerical value to be changed, and decrement or decrement it on a single operation switch.

It is another object of the present invention to provide a data display radio pager with a timepiece function which sets up a time set mode with the single operation switch.

It is another object of the present invention to provide a dat display radio pager with a timepiece function which ends the time set mode with the single switch.

A data display radio pager having a timepiece function of the present invention comprises a single operation switch having a first and a second state, a counter for counting the period of time during which the operation switch remains in the second state, a time changing section for changing, when the period of time counted by the counter in a time set mode is shorter than a first predetermined period of time, a numerical value representative of a component of time to be changed and appearing on a display by a unit amount, and a time component replacing section for replacing, when the period of time counted by the counting means in the time set mode is equal to or longer than the first period of time, replacing the numerical value to be changed with another numerical value representative of another component of time.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features and advantages of the present invention will become more apparent from the following detailed description taken with the accompanying drawings in which:

FIG. 1 is a block diagram schematically showing a data display radio pager with a timepiece function embodying the present invention;

FIG. 2 is a block diagram schematically showing a specific hardware construction of the embodiment;

FIG. 3-5 are flowcharts demonstrating a specific time setting procedure particular to the embodiment; and

FIGS. 6A and 6B each shows specific time appearing on a display included in the embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1 of the drawings, a data display radio pager with a timepiece embodying the present invention is shown. As shown, the pager includes a display A for displaying time, a single operation switch B having a first and a second state, and counting means C for counting the period of time for which the switch B remains in the second state. When the duration of the second state of the operation switch B determined by the counting means C is shorter than a first period of time, time changing means changes a numerical value representative of the component of current time appearing on a display A and to be changed. Component replacing means E replaces the numerical value representative of the component to be changed with another numerical value when the duration of the second state counted by the counting means in the time set mode is equal to or longer than the first period of time. Time set mode starting means F sets up a time set mode when the operation switch B is brought to the second state within a second period of time after the turn-on of the power source and the duration of the second state is equal to or longer than a third period of time. Further, time set mode ending means G sets time and ends the time set mode when the duration of the second state is equal to or longer than the first period of time and the the component of time to be changed is the last component.

FIG. 2 shows a specific hardware construction of the embodiment. As shown, the pager has an antenna 1, an RF (Radio Frequency) section 2, a waveform

shaper 3, a decoder 4, an ID (Identification) memory 5, a CPU (Central Processing Unit) 6, a memory 7, a driver 8, an LED (Light Emitting Diode) 9, a loudspeaker 10, an LCD (Liquid Crystal Display) driver 11, an LCD 12, a slide type main switch 13, and a push type operation switch 14. On receiving a call signal, the pager alerts the user to the call in response to an address signal included in the call signal, while displaying a message in response to a message signal also included in the call signal. In addition, the pager has a function of displaying current time on the LCD 12. Such a function is incorporated in the decoder 4. Specifically, the CPU 6 receives time information from the decoder 4 and displays it on the LCD 12 by controlling the LCD driver 11.

FIGS. 3-5 demonstrate a specific time setting operation to be executed by the embodiment, mainly by the decoder 4, FIG. 2. FIGS. 6A and 6B each shows a specific condition of the LCD 12 occurring when the time setting operation is under way. The operation of the pager shown in FIG. 2 will be described with reference to FIGS. 3, 4, 5, 6A and 6B.

As the main switch 13, FIG. 2, is slid from an OFF position to an ON position, a power source included in the pager is turned on (step S1, FIG. 3). On the turn-on of the power source, i.e. triggered thereby, the decoder 4 starts a counter, not shown, incorporated therein (S2). The decoder 4 determines whether or not the operation switch 14 has been pushed before the counter counts two seconds (S3 and S6). If the answer of the step S6 is positive, YES, the program advances to a step S7. On the other hand, if the answer of the step S3 is positive, YES, The decoder 4 stops the counter (S4), and the operation mode is restored to ordinary one (S5).

The ordinary mode operation, S5, will be described with reference to FIG. 2. The pager awaits a call signal. A call signal coming in through the antenna 1 is amplified and then demodulated by the RF section 2. The modulated signal from the RF section 2 is converted to a digital signal by the waveform shaper 3 and then applied to the decoder 4. In response, the decoder 4 compares an address included in the digital signal with the address stored in the ID memory 5 and assigned to the pager. If the two addresses are coincident, the decoder 4 informs the CPU 6 of the coincidence. At the same time, if the call signal includes a message, the decoder 4 transfers it to the CPU 6. In response, the CPU 6 feeds a control signal to the driver 8 to cause the LED 9 to flash or to cause the loudspeaker 10 to produce an alert tone. On receiving the message, the CPU 6 displays it on the LCD 12 by delivering a control signal to the LCD driver 11. Furthe, the CPU 6 stores the received message in the memory 7 so that it may be displayed again in the future, as desired. The operation switch 14 may be pressed to stop the alerting operation while the latter is under way. The main switch 13 is slidable toward the higher side or the lower side to adjust the loudness of the alert tone to come out from the loudspeaker 10. The message stored in the memory 7 will appear on the LCD 12 again as the user presses the operation switch 14 later.

Assume that the operation switch 14 has been pushed before two seconds expires after the turn-on of the power source, i.e., after the trigger by the latter. Then, the decoder 4 once resets the counter and then starts it again (S7). Subsequently, as soon as the operation switch 14 is released or turned off (S8), the decoder 4 stops the counter (S9) to thereby determine the period of time for which the switch 14 has been pushed. The decoder 4 determines whether or not the time counted by the counter is two seconds or longer (S10) and, if the answer is positive, executes a step S11, FIG. 4, for allowing the user to set time. If the answer of the step S10 is negative, NO, the operation is transferred to the step S5.

In the step S11, the decoder 4 sets up an hours set mode. Specifically, the decoder 4 transfers information relating to current time to the CPU 6. Then, the CPU 6 displays current time on the LCD 12. At the same time, the CPU 6 causes, among the numerical values each showing a particular time component, the numeral value representative of hours to flash on the LCD 12, thereby informing the user of the fact that the hours set mode has been set up. FIG. 6A shows specific time appearing on the LCD 12 in the hours set mode; the numerical value "21" (indicative of sixteen hours) is flashing. It should be noted that arrows shown in FIG. 6A simply indicate that the numeral 21 is flashing and do not appear in practice.

In the hours set mode, as the user presses the operation switch 14 (YES, S12), the decoder 4 starts the counter (S13) and then stops it (15) when the switch 14 is turned off (S14), thereby determining the period of time for which the switch 14 has been pushed (S16). If the determined period of time is shorter than 2 seconds, (NO, S16), the numerical value representative of hours is incremented by one hour (S17). Specifically, when the switch 14 is pushed once for a short period of time in the condition shown in FIG. 6A, the numerical value "16" indicative of hours is incremented by one to "17". The user may repeat such a procedure until a numerical value representative of desired hours appears on the display LCD 12.

When the decoder 4 determines that the operation switch 14 has been continuously pressed for two seconds or more, it executes a step S18, FIG. 5, for setting up a minutes set mode. Then, as shown in FIG. 6B specifically, the numerical value 22 (indicative of three seconds) flashes to show the user that the minutes set mode has been set up. As the user presses the operation switch 14 (YES, S19), the decoder 4 starts the counter (S20) and then stops it (S22) when the switch 14 is released or turned off

(S21), thereby determining the duration of the pushed state of the switch 14. If the determined duration is short of two seconds (NO, S23), the decoder 4 increments the numerical value 22 by one minute (S24). Again, the user may repetitively push the switch 14 until a numerical value representative of desired minutes appears on the LCD 12. If the duration of the pushed state of the switch 14 is two seconds or longer as determined in the step S23, the decoder 24 sets the timepiece function thereof to the time having been set (i.e. time appearing on the LCD 12) (S25). Thereafter, the decoder 4 ends the time setting operation (S26) and then resumes the ordinary mode operation, S5.

In summary, it will be seen that the present invention provides a data display radio pager having a single operation switch, time counting means, time changing means, time component replacing means, time set state starting means, and time set state ending means. The radio pager, therefore, can replace the time of current time to be changed, increase or decrease the time component of interest, and start and end the time setting state, by the single switch. This is successful in further reducing the size and cost of the above-described type of pager which has customarily been provided with at least two switches.

Various modifications will become possible for those skilled in the art after receiving the teachings of the present disclosure without departing from the scope thereof.

Claims

1. A data display radio pager having a timepiece function, comprising:

   a single operation switch having a first and a second state;

   counting means for counting a period of time during which said operation switch remains in said second state;

   time changing means for changing, when said period of time counted by said counting means in a time set mode is shorter than a first predetermined period of time, a numerical value representative of a component of time to be changed and appearing on a display by a unit amount; and

   time component replacing means for replacing, when said period of time counted by said counting means in said time set mode is equal to or longer than said first period of time, replacing said numerical value to be changed with another numerical value representative of another component of time.

2. A pager as claimed in claim 1, further comprising time set mode starting means for setting up said time set mode when said operation switch is brought to said second state within a second predetermined period of time after the turn-on of a power source of said pager and is held in said second state for more than a thid predetermined period of time as counted by said counting means.

3. A pager as claimed in claim 2, further comprising time set mode ending means for setting time and ending said time set mode when said second state is held for said first period of time as counted by said counting means while the component of time represented by said numerical value to be changed is the last component.

4. A pager as claimed in claim 3, wherein said first, second and third periods of time are identical.

5. A pager as claimed in claim 3, wherein said time set mode starting means sets up said time set mode by selecting a numerical value representative of hours as said numerical value representative of said component to be changed;

   said time component replacing means replacing said numerical value representative of hours and to be changed with a numerical value representative of minutes when the duration of said second state counted by said counting means is equal to or longer than said first period of time;

   said time set mode ending means setting time and ending said time set mode when the duration of said second state counted by said counting means exceeds said first period of time while said numerical value representative of minutes is to be changed.

Fig. 1

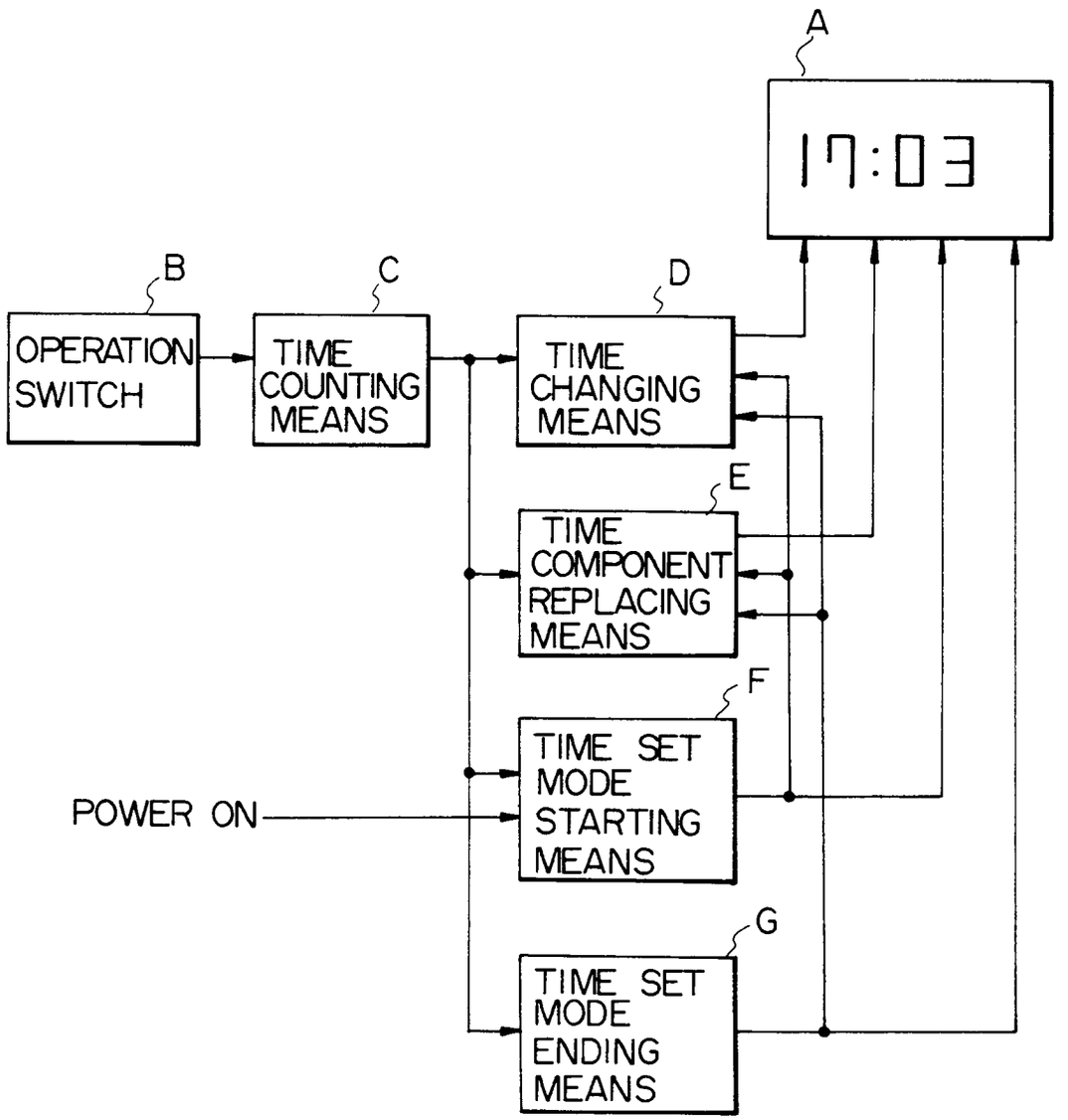

A
17:03
B
OPERATION SWITCH
C
TIME COUNTING MEANS
D
TIME CHANGING MEANS
E
TIME COMPONENT REPLACING MEANS
F
TIME SET MODE STARTING MEANS
POWER ON
G
TIME SET MODE ENDING MEANS

Fig. 2

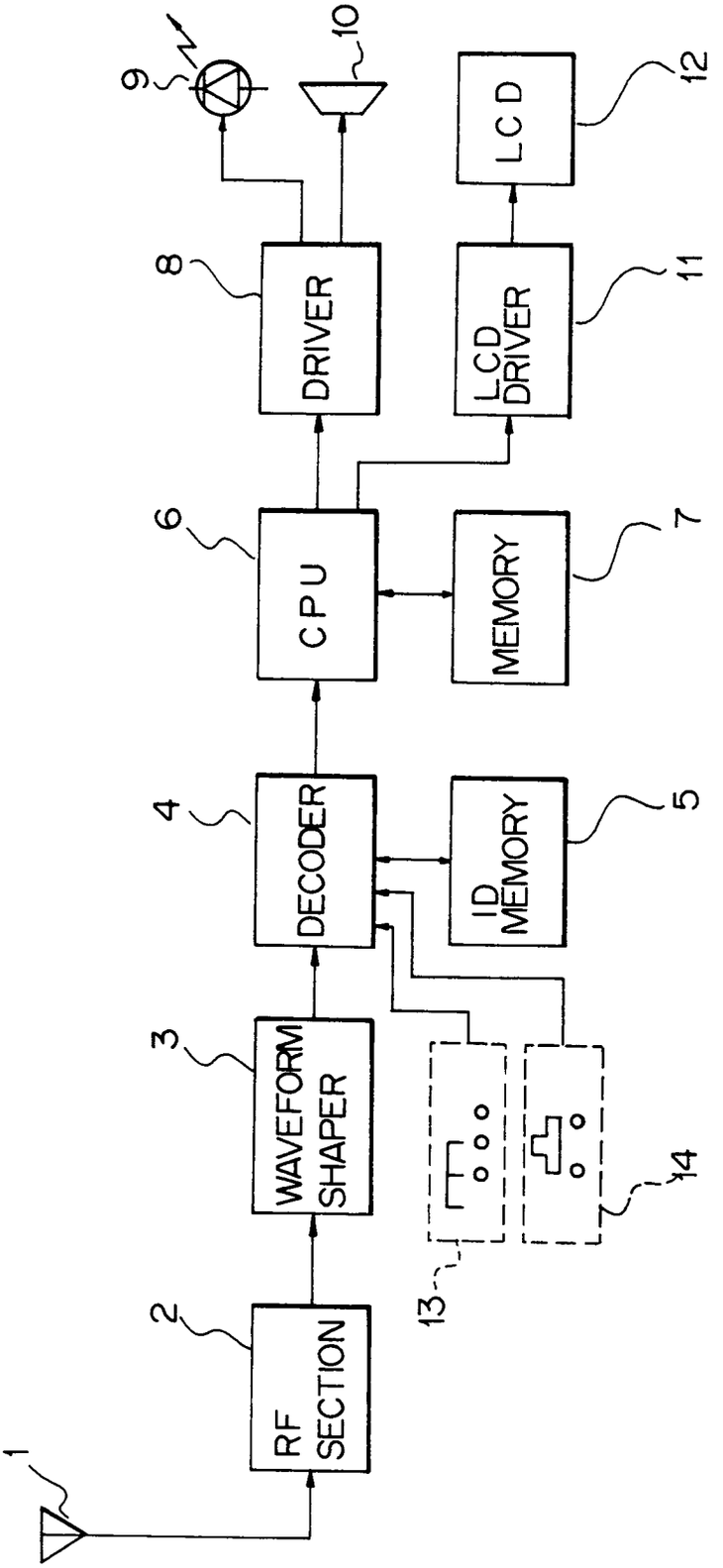

1
RF SECTION
2
WAVEFORM SHAPER
3
DECODER
4
ID MEMORY
5
CPU
6
MEMORY
7
DRIVER
8
9
10
LCD DRIVER
11
LCD
12
13
14

Fig. 3

Fig. 3A
Fig. 3B

Fig. 3A

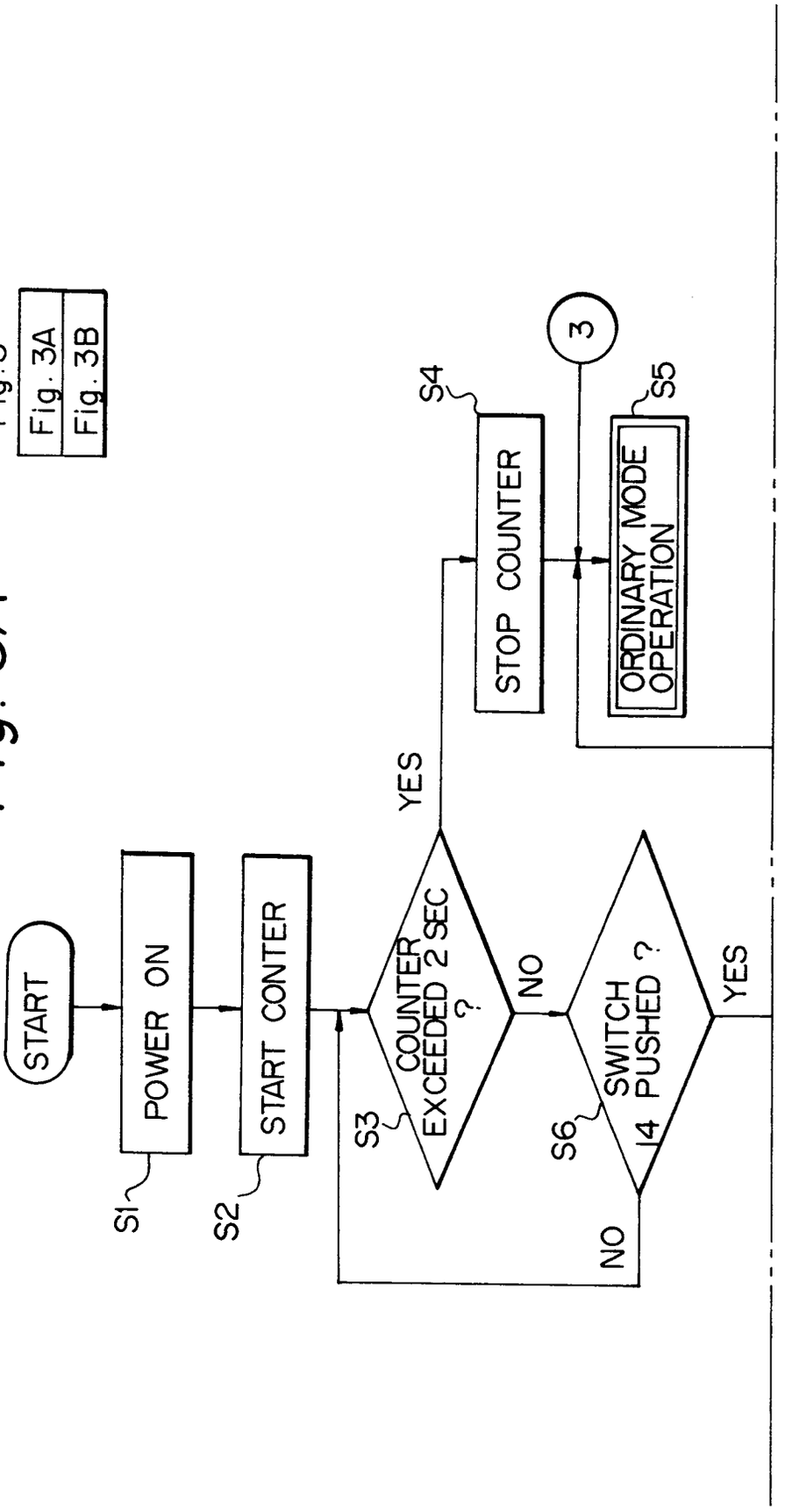


Fig. 3B

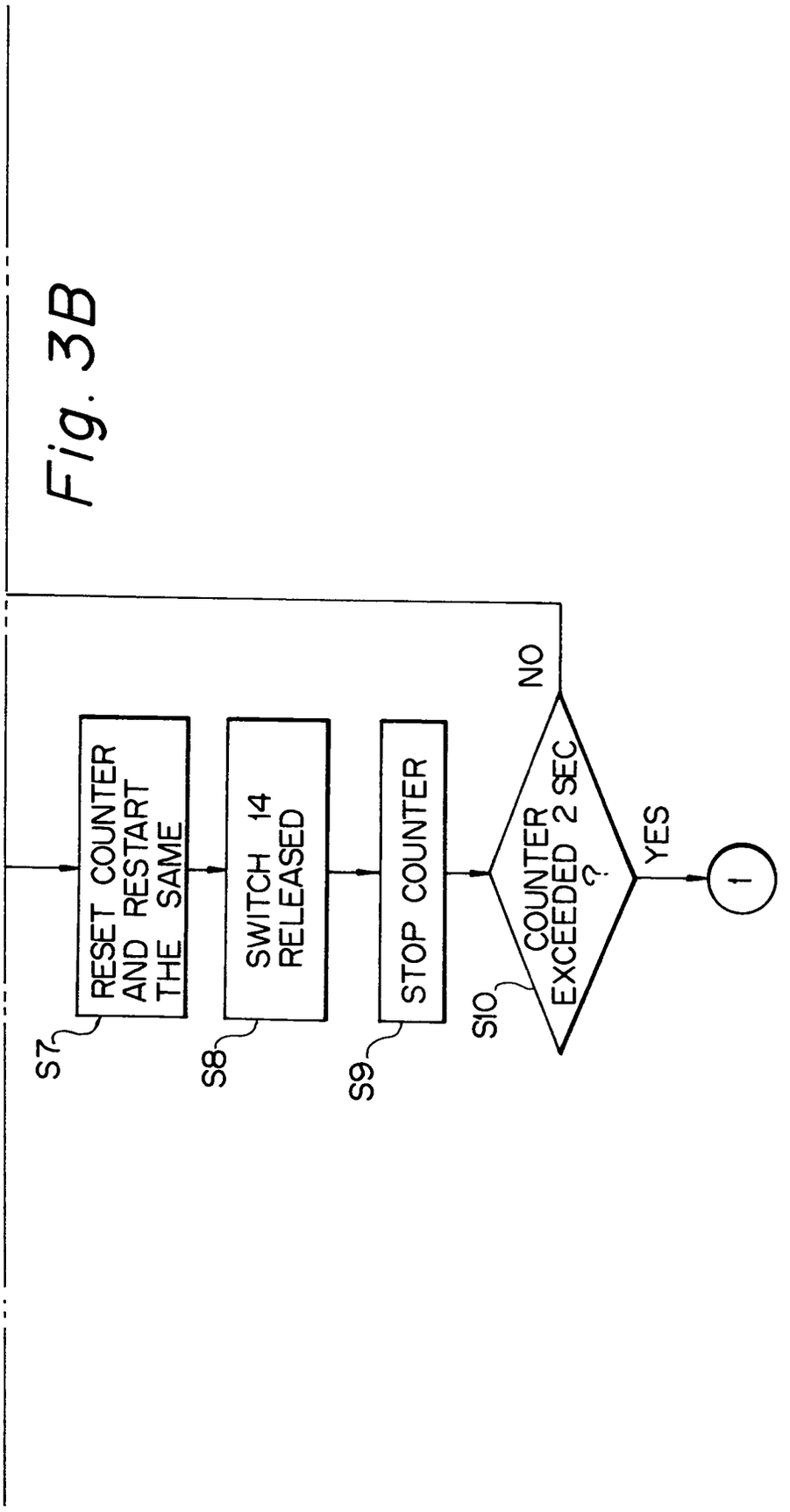

RESET COUNTER AND RESTART THE SAME
S7
SWITCH 14 RELEASED
S8
STOP COUNTER
S9
COUNTER EXCEEDED 2 SEC ?
S10
NO
YES
1

Fig. 4

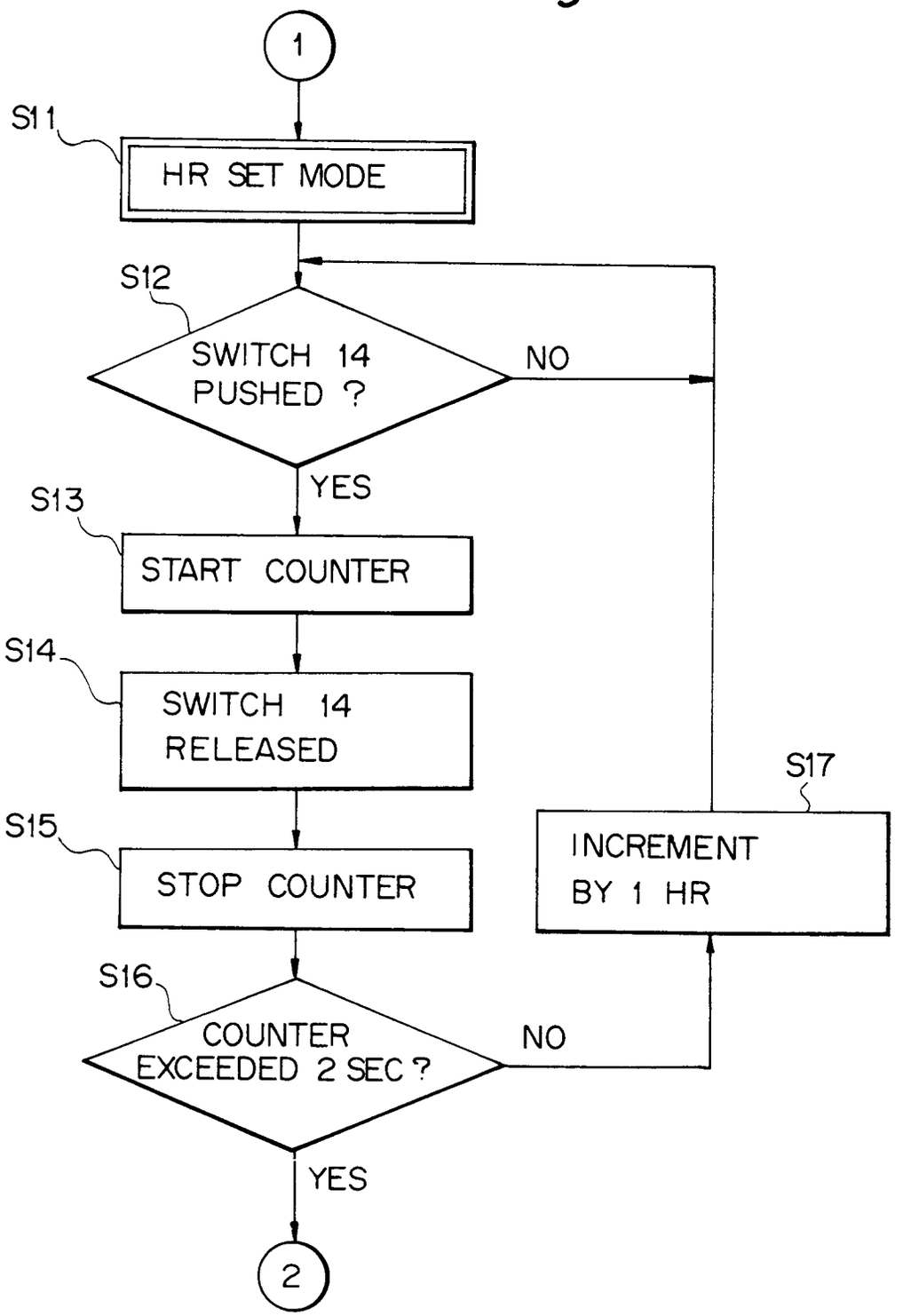

1
S11
HR SET MODE
S12
SWITCH 14 PUSHED ?
NO
YES
S13
START COUNTER
S14
SWITCH 14 RELEASED
S15
STOP COUNTER
S16
COUNTER EXCEEDED 2 SEC ?
NO
YES
2
S17
INCREMENT BY 1 HR

Fig. 5

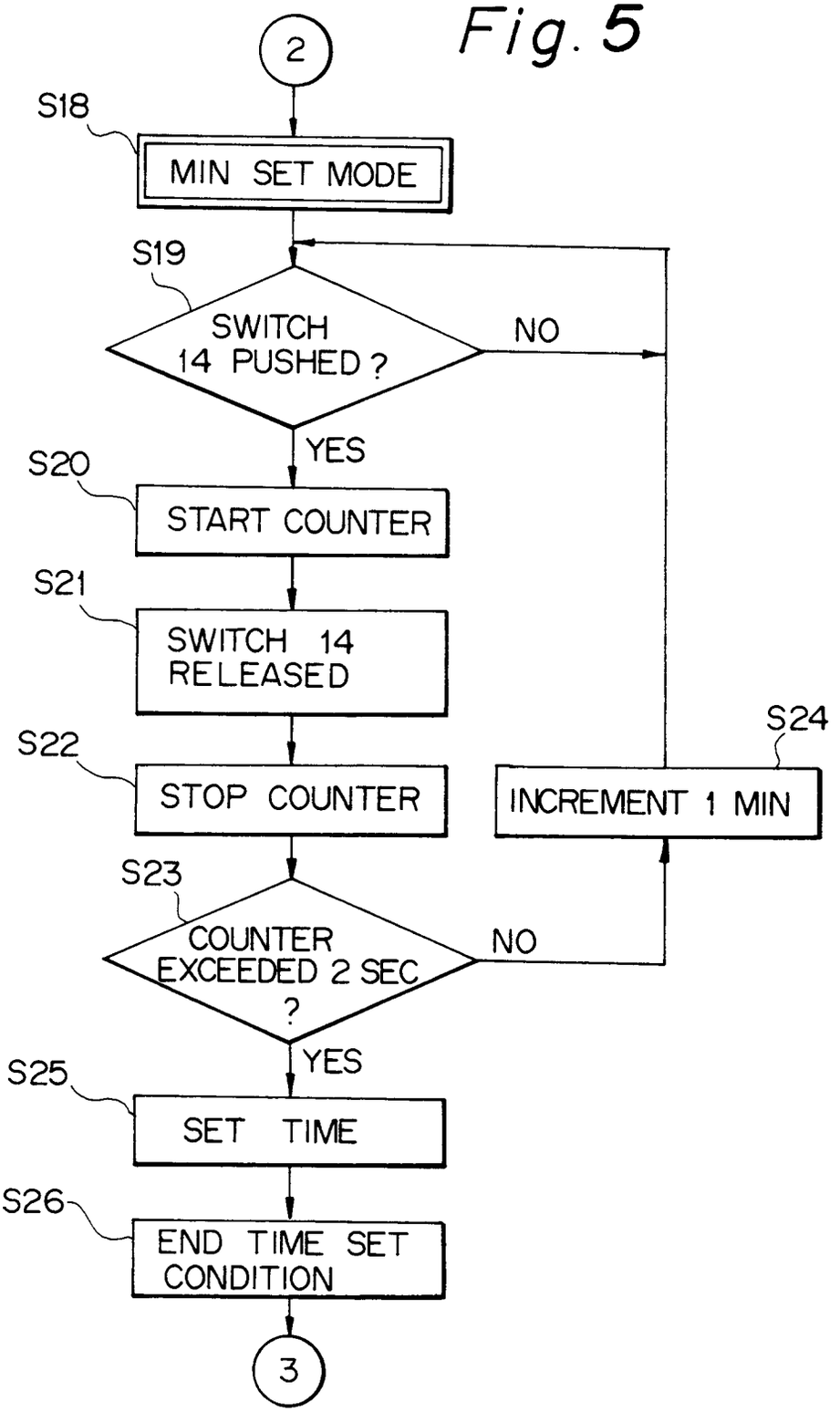

2
S18
MIN SET MODE
S19
SWITCH 14 PUSHED ?
NO
YES
S20
START COUNTER
S21
SWITCH 14 RELEASED
S22
STOP COUNTER
S24
INCREMENT 1 MIN
S23
COUNTER EXCEEDED 2 SEC ?
NO
YES
S25
SET TIME
S26
END TIME SET CONDITION
3

Fig. 6A

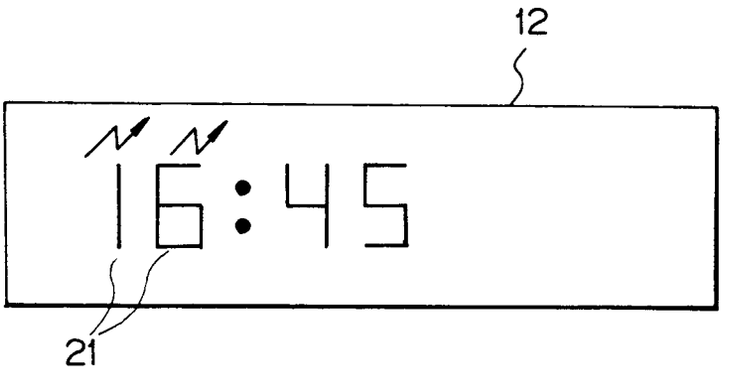
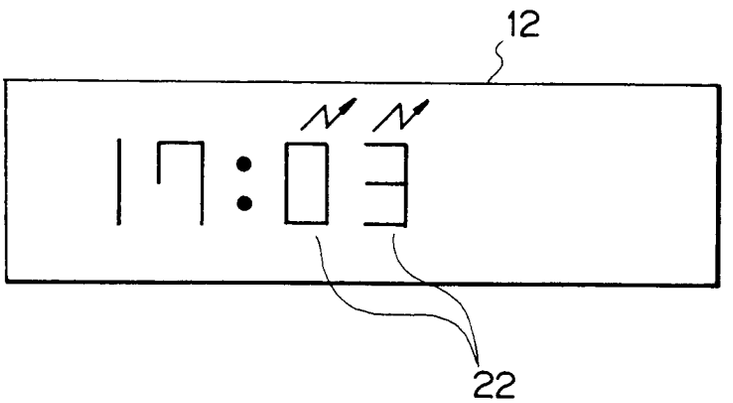


Fig. 6B



European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 30 0356

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	FR-A-2 480 958 (VDO ADOLF SCHINDLING AG.) * page 17, line 24 - line 29 * * page 3, line 22 - line 24; figures 6A,6B * ---	1-5	G08B5/22 G04G5/04
Y	DE-A-2 606 691 (BLüTHGEN) * page 4, line 1 - line 16; figure 2 * ---	1-5	
A	WO-A-8 805 184 (MOTOROLA, INC.) * the whole document * -----		

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

G08B
G04G
H04Q

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	30 MARCH 1992	DANIELIDIS S.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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