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• **Weiss, Louis H.**
New York, New York 10022 (US)

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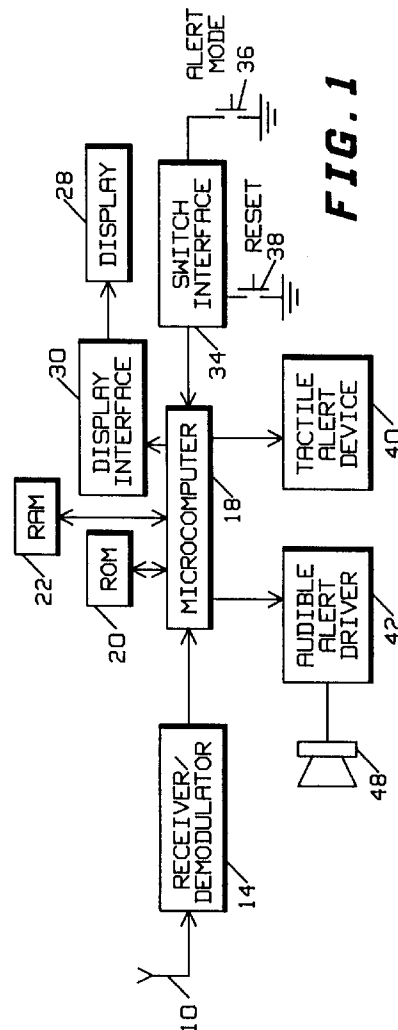
(74) Representative: **Cotter, Ivan John et al**
D. YOUNG & CO.
21 New Fetter Lane
London EC4A 1DA (GB)

(71) Applicant: **SONY ELECTRONICS INC.**
Park Ridge, New Jersey 07656-8003 (US)

(72) Inventors:
• **Lang, Michael S.**
Ridgewood, New Jersey 07450 (US)

(54) Selective call receivers

(57) A selective call receiver, such as a pager, has multiple alert modes. The alert mode is manually selectable by the user, but can be overridden remotely in order to produce an audible and visual alert to facilitate location of a lost pager.



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Description

This invention relates to the field of selective call radio receivers.

Radio pagers which provide multiple alert modes are commonly available in the market place. For example, a familiar audible alert is used to notify the user of an incoming message. However, in many instances it is undesirable for the user to be notified by an audible alert. For example, if the user is in church or a courtroom setting or in a setting where the audible alert will not be loud enough to be heard over ambient noise a tactile alert is more desirable. Such tactile alerts are commonly generated by a vibrating device which is set into motion upon receipt of an appropriate selective call signal. Other alert modes, such as chirps, are also common.

Commonly such pagers include a switch which is used to manually select the type of alert mode desired by the user. There may be times when a user would find the ability to select the alert mode remotely to be advantageous. For example, consider the situation where the user has misplaced his paging device. If the paging device is set in the audible alert mode, the user has but to page himself in order to activate the audible alert and possibly locate the lost pager. However, if the pager is in the tactile alert mode he is unlikely to find the pager by simply paging himself.

Respective different aspects of the invention are set out in claims 1, 11 and 21 hereof.

According to a further aspect of the invention a selective call receiver such as a pager has multiple alert modes. The alert mode is manually selectable by the user but can be overridden remotely in order to produce an audible and visual alert to facilitate location of a lost pager.

According to another aspect of the invention, a selective call receiver includes a receiver/demodulator for receiving and decoding selective call radio signals. A switch is provided for manually selecting between an audible alert mode and a tactile alert mode. When an alert mode override code is detected as a part of the selective call radio signal the manually selected alert mode is overridden. An alert is then generated in response to receipt of the alert mode override code. Preferably, but not necessarily, the pager includes a display, and a "lost pager" message is displayed on the display in response to detecting the alert mode override code.

In another embodiment, an alert selected by the override includes a repeating alert sequence of a first alert for a first period of time followed by a second alert for a second period of time. The first alert includes an audible alert operating at a high audio level and the second alert includes an audible alert at a lower audio level. Alternatively, the first alert includes an audible alert operating at a high audio level and the second alert includes audible chirp alert. The first predetermined time period preferably is short compared with the second predetermined time period.

According to another aspect of the invention, a selective call receiver includes a receiver/demodulator for receiving and decoding selective call radio signals. Responsive to an alert mode override code as a part of the selective call radio signal, the device selects an alert mode to override the manually selected alert mode.

A method for operation of a selective call radio receiver according to an aspect of the invention includes the steps of: detecting a selective call signal including a predetermined address; detecting an alert mode override code; and overriding a manually selected alert mode in response to the alert mode override code.

Preferred embodiments of the invention described below provide:

- a paging device which can be remotely controlled in order to override the manually selected tactile alert;
- an improved selective call receiver with the ability to remotely override the default or user selected alert mode;
- a multiple alert mode pager which can be more easily found if lost by remote override of the alert mode to produce an audible and visual alert which might assist in locating the lost pager;
- a pager that is more easily located if lost; and
- a select call radio receiver such as a radio pager device which has multiple alert modes which can be manually selected and overridden by an appropriate alert mode override signal received as part of a selective call message.

The invention will now be further described, by way of illustrative and non-limiting example, with reference to the accompanying drawings, in which:

- FIGURE 1 is a block diagram of an embodiment of a selective call receiver according to the present invention;
- FIGURE 2 is a diagram of a selective call message format;
- FIGURE 3 is a diagram showing the use of a "lost pager code" in the selective call message format;
- FIGURE 4 is an illustration of an embodiment of a display of the selective call receiver of FIGURE 1;
- FIGURE 5 is a flow chart describing one embodiment of the operation of the selective call receiver of the present invention; and
- FIGURE 6 is a flow chart describing a second embodiment of the operation of the present invention.

While this invention is susceptible of embodiment in many different forms, there is shown in the drawings and will herein be described in detail specific embodiments, with the understanding that the present disclosure is to be considered as an example of the principles of the invention and not intended to limit the invention to the specific embodiments shown and described. In

the description below, like reference numerals are used to describe the same, similar or corresponding parts in the several views of the drawing.

Turning now to FIGURE 1, a paging device according to a preferred embodiment of the present invention is shown to include an antenna 10 which responds to radio frequency signals such as those formatted in the POCSAG format or other common paging format. Such signals are provided by the antenna to a receiver/demodulator 14 which amplifies, converts the signal to a demodulated signal and provides such demodulated signal to a microcomputer 18 for processing. Microcomputer 18 includes a read only memory reprint (ROM 20) and a random access memory (RAM) 22. ROM 20 includes an operational program for controlling the function of the pager with RAM 22 serving, for example, as operating memory for carrying out various paging processes which might include digital signal processing, code comparison and the like.

Such radio pagers are commonly provided with a display 28 which is coupled to microcomputer 18 via a display interface 30 which provides appropriate drivers for the display. Display 28 may, for example, be a liquid crystal display (LCD) or light emitting diode display or other suitable display device. Of course, those skilled in the art will appreciate that a display is not required for operation of the present invention. In the present embodiment, a switch interface 34 provides debouncing and latching functions and other interface functions for one or more switches such as an alert mode switch 36 and a reset switch 38 so that appropriate switch signals are provided by the switch interface 34 to microcomputer 18.

Microcomputer 18 provides control signals to a tactile alert device 40 such as a vibrator when the pagers alert mode is set to provide a tactile alert. When the pagers alert mode is set to provide an audible alert microcomputer 18 provides a control signal to an audible alert driver 42 which generates an audible alert and drives a loudspeaker 48 to produce an audible alert tone, chirp, beep or other suitable alert sound. In other embodiments, a buzzer or other audible alert device may be used to provide the audible alert function.

In operation, selective call radio signals are received by antenna 10 and receiver/demodulator 14 which provide such signals to microcomputer 18. Several common formats are in use in various paging systems. Many systems typically include an address field 52 and a message field 54 as illustrated in FIGURE 2. When the pager receives the demodulated selective call signal, microcomputer 18 compares the address in field 52 with an address stored in memory 20 (or in a code plug or the like.) When a match is found between the address 52 and the address stored in the pager, an alert is typically generated and message 54 is stored in RAM 22 and displayed on display 28. The type of alert which is generated depends upon an alert mode which is selected by the user or a default alert mode which is en-

coded at the time of manufacture of the pager.

In an embodiment of the present invention, a predetermined lost pager code (or approximately synonymous alert mode override code) (LPC) 58 as illustrated in FIGURE 3 is inserted in the message field of the selective call signal. It is desirable that such message 58 be a message which is known only to the user to avoid override of the alert mode by others when the user desires that the tactile alert mode be used. For this reason, it is desirable that the message 58 be encoded either by the user or be a unique code associated with each individual paging device and provided by the manufacturer. Those skilled in the art will appreciate many variations on such a message 58 may be possible.

Referring to FIGURE 4, upon receipt of the alert mode override message 58, the alert mode for the pager is converted to audible as indicated by an indicator 62 forming a part of the pager display 28. It is also desirable that a predetermined message be generated for display on display 28. Such message may be simply "lost pager." However, it may be beneficial to provide a more informative display such as "lost pager call Mike at 555-1234" or similar message which permits someone who finds the pager to contact the owner or paging service provider in order to return it. Such a message can be scrolled or segmented as required to fit in a pager's limited display area.

Referring to FIGURE 5, a first embodiment of operation of the paging device embodying the invention illustrating the overall concept is shown in the form of a flow chart. When the pager is turned on and initialized in a known manner, the process starts at step 100 where microcomputer 18 compares received addresses with the pager's stored address at step 104. If no match is found, the pager waits for the next address. Various processes which are known in the art are used during this process for battery conservation and are not relevant to this discussion.

When a match is found at step 104, the microcomputer 18 examines the message at step 108 for a special "alert mode override code" or "lost pager code" (LPC) which can be placed in the message area of a selective call packet as shown in FIGURE 3, or alternatively can be provided for by the paging protocol. If the LPC is placed in the message area of the packet, the message should be a message which one would not normally expect to encounter in conventional messages. Also, such a message should be secret and individually assigned to the user so that others cannot remotely change the user's alert mode without the user's consent. If the LPC is not detected at step 108, the operation of the pager proceeds in a conventional fashion including use of the alert selected manually by the user, for example by operation of the alert mode switch 36. Control then returns to step 104 and the pager operates in a conventional manner.

In the event that the LPC is detected at step 108, the alert mode is set to audible alert, overriding any se-

lection made by the user, at step 114. The pager alert is then activated at step 118 to provide an audible alert to facilitate locating the lost pager at step 118. In this embodiment, a simple alert is initiated, but other variations are possible as will be discussed. In addition, the "lost pager" message is displayed on display 28 at step 124. The display continues to display the "lost pager message" until someone presses the reset switch (or otherwise resets the pager) at step 130. In other embodiments, the pager may be reset by another encoded transmission received by the pager. Those skilled in the art will readily appreciate that other reset mechanisms may be suitable without departing from the present invention. Once the reset switch is pressed, the alert is terminated (if still in progress), the pager returns to the previously selected alert mode at 134 and the display is cleared of the "lost pager" message. Control then returns to step 104.

Turning now to FIGURE 6, a variation of the above embodiment is shown which substitutes for steps 114 through 130 in the process of FIGURE 5. In this process, the "lost pager" message is displayed on display 28 at step 124. A counter N is initialized to N=0 at step 150 and a timer T is initialized to T=0 at 152. In the current embodiment, several alert modes are available and a loud (preferably the loudest) audible alert is selected at step 156 and the alert is initiated at step 158 along with the timer T. This loud alert is maintained for a first predetermined period of time, e.g. 10 seconds, to assist in locating the pager. It is, however, undesirable to maintain this alert mode for extended periods of time since it produces substantial battery drain.

At step 162, the timer T is inspected to determine how much time has lapsed since initiating the alert at step 158. If the first predetermined time (10 seconds) has not elapsed, control passes to step 166 where the reset switch 38 is inspected. If the reset switch has not been actuated at step 166, control returns to step 162 until either the time T reaches the first predetermined time (10 seconds) or the reset switch is actuated.

Once T reaches the first predetermined time (10 seconds), the alert is ended at 168 and the timer is reset at 172. The alert mode is then set to produce a periodic "chirp" sound (e.g. every one or two seconds) at step 176. The alert is then initiated again at step 180 and the timer is initiated. At step 184 the timer T is inspected to determine if a second predetermined time (e.g. 60 seconds) has been reached. If not, the reset switch is inspected at 186 to determine if someone has reset the pager. If not, control shuffles between switch inspection and timer inspection until either the reset switch is activated or the timer expires.

When the timer T reaches the second predetermined time (60 seconds) at step 184, the alert is stopped at step 190 and the counter N is incremented at step 192. In the example shown, the counter N is inspected at 196 to determine if N=3. That is, the above sequence of alerts is repeated three times in the current embodi-

ment. Of course, any suitable number of sequences could be used. If N is not equal to 3 (or other suitable number) at 196, control returns to step 152 where the timer T is reset to 0 and the alert sequence repeats.

Once the alert sequence has been repeated for the desired number of times, control passes to step 198 where the status of the reset switch is monitored. Whenever the reset switch is properly actuated at either of steps 166, 186 or 198, control passes to step 134 of FIGURE 5 where the alert is ended (if necessary) the original alert mode which was manually selected by the user is restored and the display is cleared of the "lost pager" message.

In the above scenario, an extended alert sequence is provided which enables the user to have a search time of about 3 minutes and 30 seconds for finding the lost pager. Initially, a loud pager alert is sounded for a relatively short period of time to facilitate gross location of the pager. This should be the loudest alert possible in the preferred embodiment. This is helpful if the pager is in another room or has fallen under furniture, etc. Then, the pager enters a second alert mode which can be a comparatively lower audio level or a chirp for a much longer time period (i.e. 5 to 10 times as long) which should allow the user to home in on the pager without an excessive penalty in terms of battery life. By repeating the sequence, a user is provided with an opportunity to search, e.g. different rooms or floors of a house or office, without having to repeatedly stop to dial the pager number. Moreover, the pager's alert mode is overridden to select audible alert modes in the event the pager is manually in a silent mode.

While the present invention has been described in terms of a selective call receiver such as a pager in which the alert mode can be remotely modified for purposes of locating a lost pager, the present invention can also be used for other purposes where a remote override of the alert mode is useful. For example, in the event of an emergency, it may be desirable to override a pager alert to create an alert which signals such an emergency. In other cases, it may be desirable to allow the person who is placing the page call to select the page alert mode to account for the pager user's environment. For example, in a high noise environment, it may be useful to provide a caller with the option of trying several alert modes, for example, each of which would be associated with a different code residing in the message field of the paging protocol.

Those skilled in the art will understand that many pager alert mechanisms are available in current pagers and more will no doubt emerge in the future. Battery consumption is of concern since live battery is needed to display the "lost pager" message for the longest possible time. For example, if the pager is lost in a parking lot or other public place, the audible alert may or may not draw attention to the pager. If not, any hope of recovering the pager may rest with the presence of the "lost pager" message in the display. Thus, it may be de-

sirable to provide battery saving features to the maximize the time that the message is displayed. If, however, the pager is lost in the home or office environment, the audible alert will likely result in recovery of the pager. In the alert mode described in connection with FIGURE 6, the objective is to permit adequate time during the audible alert to locate the pager while optimizing battery drain in the event that the pager is lost outside of audible range. Numerous variations of alert modes may be used to provide maximal opportunity to recover a lost or stolen pager using the concepts outlined herein while optimizing battery consumption without departing from the present invention.

It may be desirable to require that the reset switch 38 be held in position for an extended period of time, e.g. 5 seconds, in order to reset the pager from a lost pager event in order to assure that a person finding the pager does not inadvertently remove the lost pager message without writing down instructions. Other reset mechanisms, e.g. turning off the pager, may also be used for this purpose.

While the embodiments described above contemplate use of a lost pager code imbedded within the message area of a conventional pager protocol, those skilled in the art will recognize numerous variations on this theme. The above-described embodiments utilize the above technique in order to maintain complete compatibility with existing paging systems. However, by suitable modification or generation of paging protocols, a specific provision could be made for generation of such a lost pager operational mode. By providing such feature within the pager protocol, greater security could be obtained in prevention of unauthorized use of this function by others.

While the invention has been described in conjunction with specific embodiments, it is evident that many alternatives, modifications, permutations and variations will become apparent to those skilled in the art in light of the foregoing description. Accordingly, it is intended that the present invention embrace all such alternatives, modifications and variations as fall within the scope of the appended claims.

Claims

1. A selective call receiver, comprising in combination:

a receiver/demodulator for receiving and decoding selective call radio signals;
means for manually selecting between an audible alert mode and a tactile alert mode;
override means for detecting an alert mode override code as a part of said selective call radio signal and for overriding said manually selected alert mode in response thereto; and
means for generating an alert in response to receipt of said alert mode override code.

2. The apparatus of claim 1, wherein said override means selects an audible alert mode in response to detecting said alert mode override code.

3. The apparatus of claim 1, further comprising a display, and wherein a "lost pager" message is displayed on said display in response to detecting said alert mode override code.

4. The apparatus of claim 1, wherein said means for generating an alert includes means for generating an alert sequence comprising repeating sequence of a first alert for a first time period followed by a second alert for a second time period.

5. The apparatus of claim 4, wherein said first alert includes an audible alert operating at a high audio level and wherein said second alert includes an audible alert at a lower audio level.

6. The apparatus of claim 4, wherein said first alert includes an audible alert operating at a high audio level and wherein said second alert includes audible chirp alert.

7. The apparatus of claim 4, wherein said first time period is short compared with said second time period.

8. The apparatus of claim 1, wherein said tactile alert includes a vibrator.

9. The apparatus of claim 1, further comprising resetting means for restoring said alert mode to said manually selected mode after receipt of said alert mode override code.

10. The apparatus of claim 9, wherein said resetting means includes a reset switch.

11. A selective call receiver, comprising in combination:
a receiver/demodulator for receiving and decoding selective call radio signals;
selecting means, responsive to an alert mode override code as a part of said selective call radio signal, for selecting an alert mode in response thereto.

12. The apparatus of claim 11, further comprising an alert mode switch which select between an audible alert mode and a tactile alert mode.

13. The apparatus of claim 11, further comprising means for generating an alert in response to receipt of said alert mode override code.

14. The apparatus of claim 11, wherein said selecting means selects an audible alert mode in response

to detecting said alert mode override code.

15. The apparatus of claim 11, further comprising a display, and wherein a predetermined message is displayed on said display in response to detecting said alert mode override code.

16. The apparatus of claim 13, wherein said means for generating an alert includes means for generating an alert sequence comprising a repeating sequence of a first alert for a first time period followed by a second alert for a second time period.

17. The apparatus of claim 16, wherein said first alert includes an audible alert operating at a high audio level and wherein said second alert includes an audible alert at a lower audio level.

18. The apparatus of claim 16, wherein said first alert includes an audible alert operating at a high audio level and wherein said second alert includes audible chirp alert.

19. The apparatus of claim 16, wherein said first time period is short compared with said second time period.

20. The apparatus of claim 11, further comprising a tactile alert including a vibrator.

21. A method for operation of a selective call radio receiver, comprising the steps of:

detecting a selective call signal including a predetermined address;
detecting an alert mode override code; and
overriding a manually selected alert mode in response to said alert mode override code.

22. The method of claim 21, wherein said overriding step includes selecting an audible alert mode.

23. The method of claim 21, further comprising the step of displaying a "lost pager" message on said display in response to detecting said alert mode override code.

24. The method of claim 21, further comprising the step of generating an alert in response to receipt of said alert mode override code.

25. The apparatus of claim 21, further comprising the step of displaying a predetermined message on said display in response to detecting said alert mode override code.

26. The method of claim 22, wherein said step of generating an alert includes generating an alert se-

quence comprising a repeating sequence of a first alert for a first period of time followed by a second alert for a second period of time.

27. The apparatus of claim 26, wherein said first alert includes an audible alert operating at a high audio level and wherein said second alert includes an audible alert at a lower audio level.

28. The apparatus of claim 26, wherein said first alert includes an audible alert operating at a high audio level and wherein said second alert includes audible chirp alert.

29. The method of claim 26, wherein said first period of time is short compared with said second period of time.

30. The method of claim 21, wherein said manually selected alert mode includes a tactile alert mode.

31. The method of claim 21, further comprising the step of restoring said manually selected alert mode after receipt of said alert mode override code.

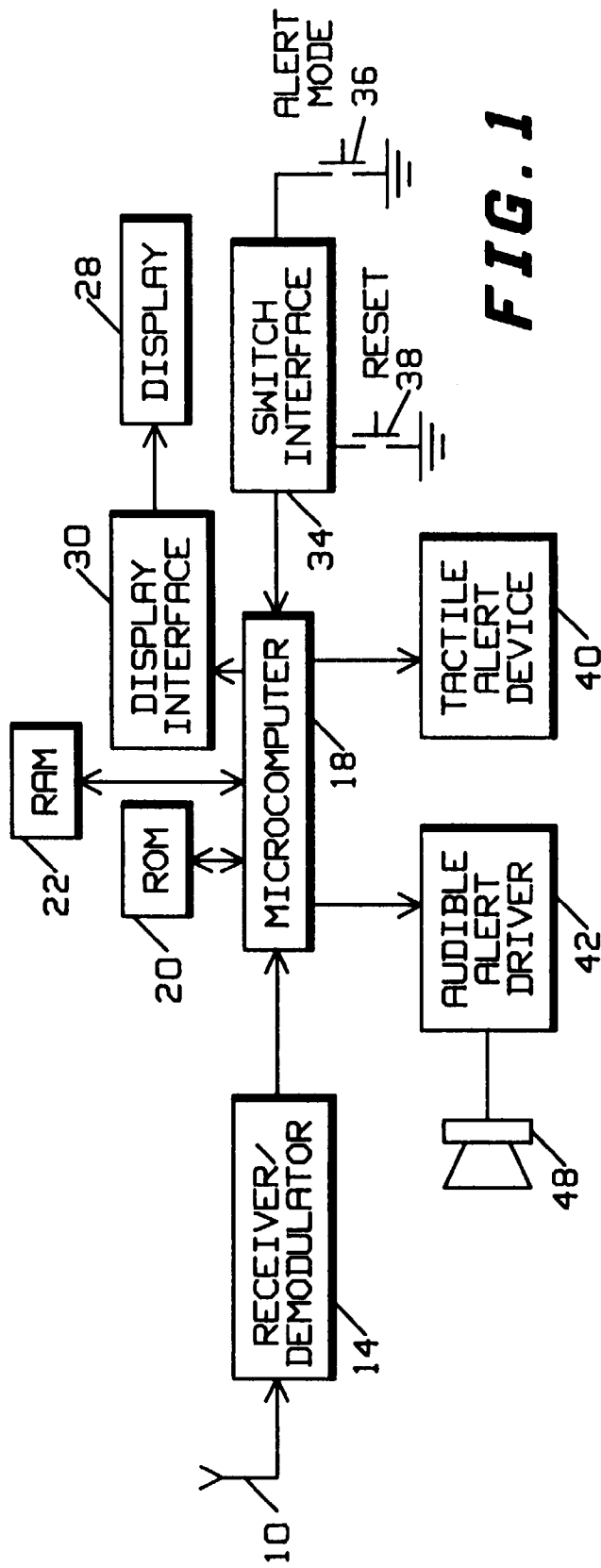


FIG. 1

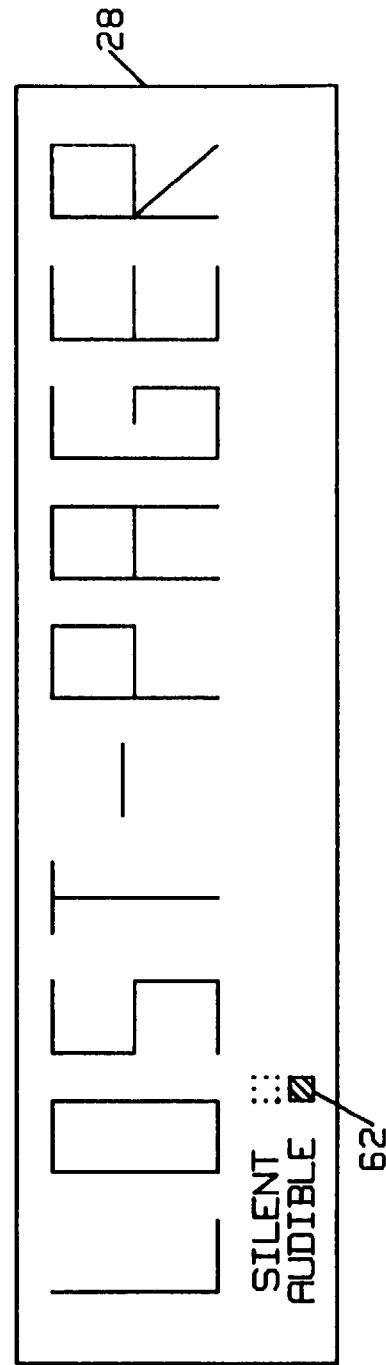


FIG. 4

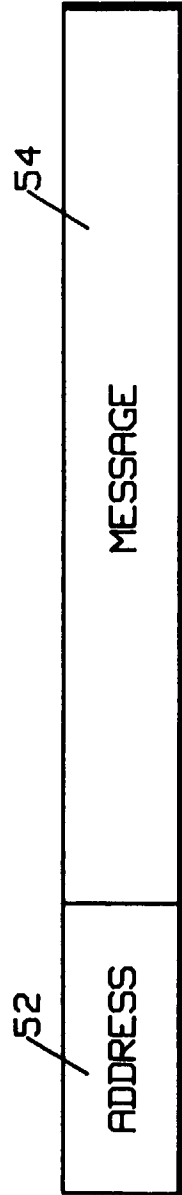


FIG. 2

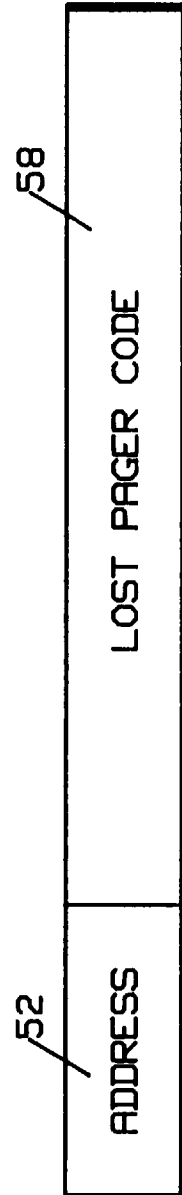
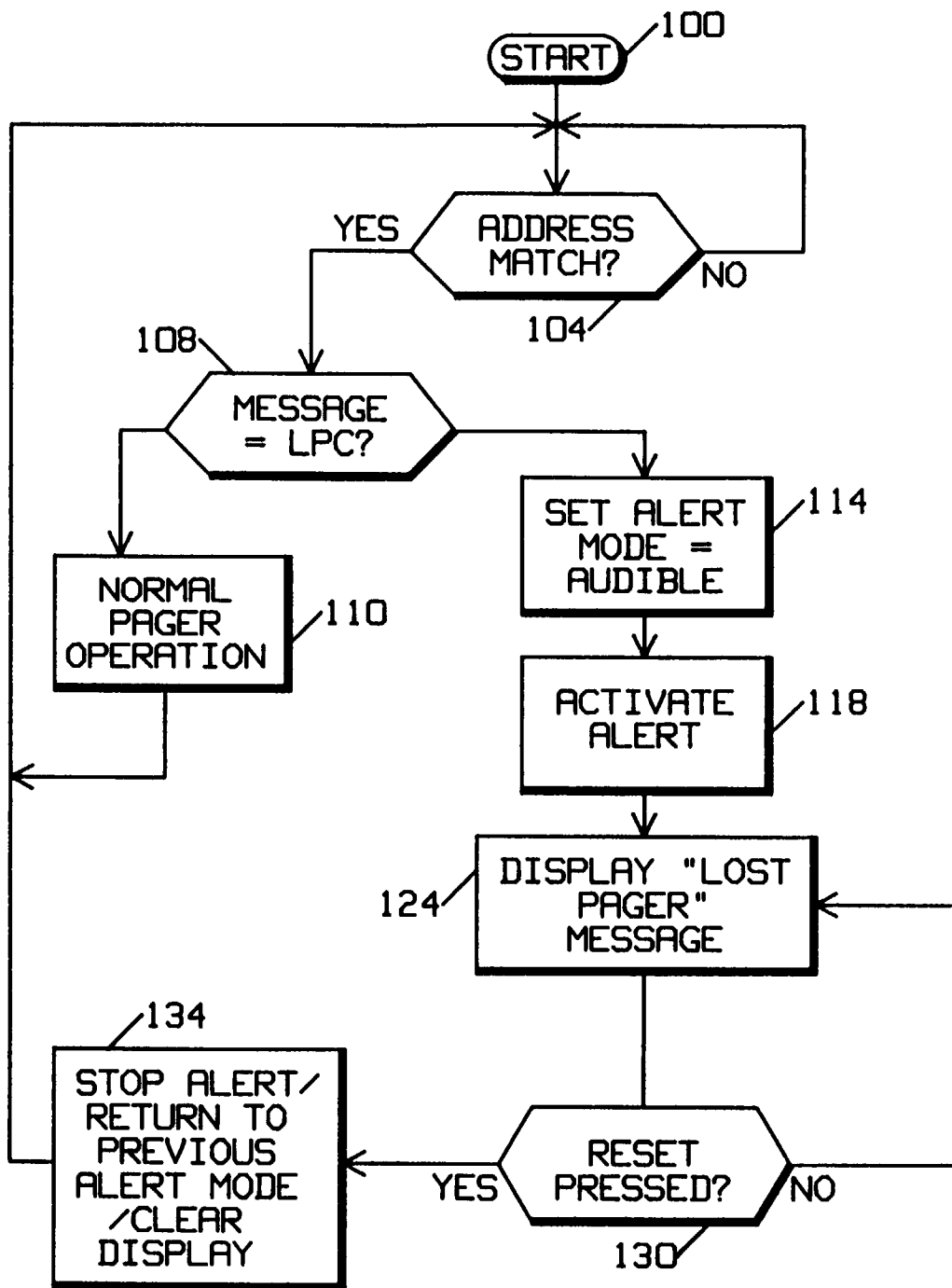
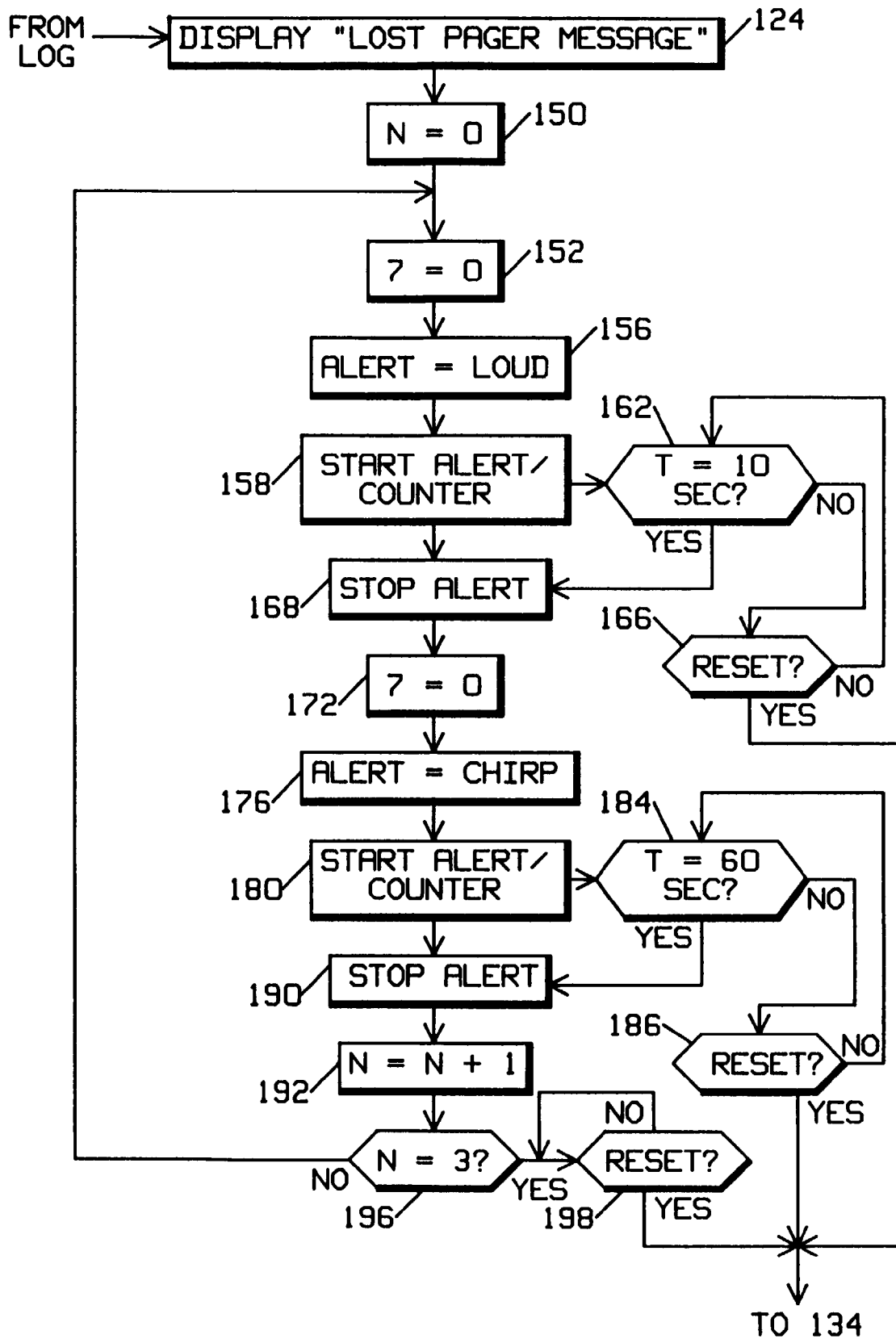


FIG. 3

**FIG. 5**

**FIG. 6**



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EUROPEAN SEARCH REPORT

Application Number
EP 96 30 0554

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.6)
Y	US-A-H1173 (W. L. DAVIS ET AL) * column 3, line 64 - column 5, line 66; figure 2 *	1,2	G08B6/00
Y	EP-A-0 631 262 (NEC CORP.) * column 3, line 37 - column 4, line 51; figure 2 *	1	
Y	MOTOROLA TECHNICAL DEVELOPMENTS, vol. 12, 1 April 1991, page 168 XP000229328 DELUCA M: "LOCAL INFRARED CONTROL OF RECEIVER ALERTS" * the whole document *	1	
Y	EP-A-0 501 282 (NEC CORP.) * column 5, line 46 - column 6, line 30; figure 6 *	2,11,21	
Y	WO-A-92 01352 (S. NEUSTEIN) * page 16, line 3 - line 11; figure 1 *	11,21	
A	US-A-5 319 349 (F. E. SMITH) * abstract; figure 2 *	3	TECHNICAL FIELDS SEARCHED (Int.Cl.6)
A	WO-A-93 15590 (MOTOROLA) * abstract; figure 1 *		G08B
A,P	US-A-5 430 440 (JONG-YOON SHIM) * column 1, line 48 - line 63; figure 2 * * column 5, line 2 - line 15 *		
A	MOTOROLA TECHNICAL DEVELOPMENTS, vol. 23, 1 October 1994, page 5 XP000468358 BESHARAT M ET AL: "AUTO RADIO BY PAGE" * the whole document *		
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
BERLIN		29 April 1996	Breusing, J
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EUROPEAN SEARCH REPORT

Application Number
EP 96 30 0554

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.6)
A	WO-A-82 01780 (UNIVERSITY OF STRATHCLYDE GB) * the whole document * -----		
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
The present search report has been drawn up for all claims			
Place of search BERLIN		Date of completion of the search 29 April 1996	Examiner Breusing, J
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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