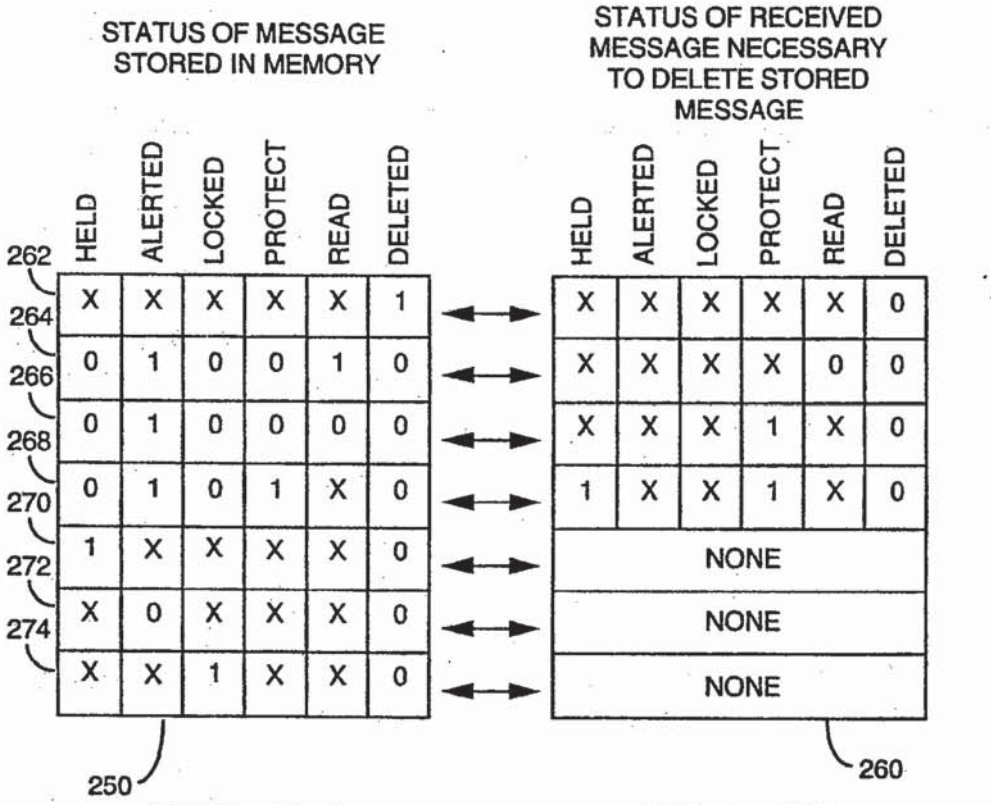

FIG. 12A

FIG. 12B

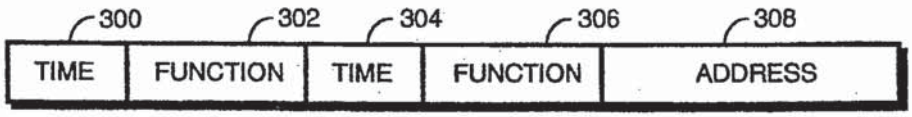

FIG. 13

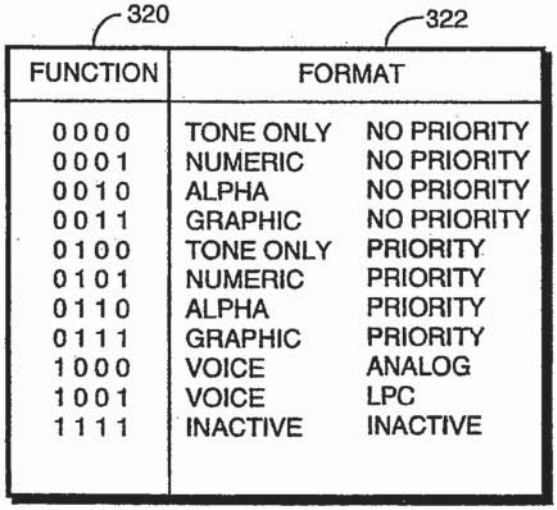

FIG. 14

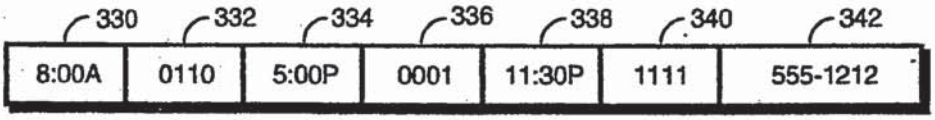

FIG. 15

VARIABLE STATUS RECEIVER

This is a continuation of application Ser. No. 07/402,936 filed on Sep. 5, 1989, now abandoned.

BACKGROUND OF THE INVENTION

This invention relates to a selective call receiver, such as a pager, which has the ability to store and respond to different messages, either at the time of receipt of such messages or at a subsequent time, in accordance with a status associated with that message. The invention also relates to a method of operation of such a selective call receiver.

SUMMARY OF THE PRIOR ART

Today, paging services offered to customers are becoming more and more sophisticated. To keep track with these services, more sophisticated page handling features and page types are required in the pagers of users subscribing to such services.

Existing pagers assign a predetermined status to a received message and store the received message in memory. The status of the message determines the manner in which the pager is to respond to that message, either at the time of receipt of the message, or at some future event time, such as when the user reads the message onto the screen, or when another message is received. The message status is a digital word including bits indicative of the following conditions: alerted/unalerted, protected/unprotected, read/unread and present/deleted. A pager with such an operation is shown in U.S. Pat. No. 4,851,829 to DeLuca et al, which is assigned to the assignee of the present invention and which is hereby incorporated by reference. An unalerted message is a message which has been received and needs to have an alert signal generated to indicate to the user that the message has been received. Upon generating an alert associated with the message the status changes to alerted. An unread message is one which has not yet been displayed on the pager display. Upon reading the unread message, the status is changed to the read status. When a message has a protected status, this can indicate that it is not to be overwritten by new incoming messages. Alternatively, the protected/unprotected status of a message may determine under what circumstances the message can be deleted by the user. For each of the aforementioned aspects of a message status, the response of the receiver to the message is controlled in accordance with the status.

It is known to provide a pager having a time of day clock, the pager being capable of reminding a user of an important message event, such as a pager in which an alert signal is issued at a time determined by the time of day clock. Such a pager is described in U.S. Pat. No. 4,872,005 to DeLuca et al. and assigned to Motorola Inc., said patent hereby incorporated by reference.

It is also known to control power-on times and power-off times of a pager in accordance with a time of day clock. Such a pager is described in U.S. Pat. No. 4,860,005, to DeLuca et al. and assigned to Motorola Inc., said patent also hereby incorporated by reference.

As pagers and paging systems become more widely used, and the throughput of messages increases very rapidly, an increasingly greater burden is placed on the pager user in such respects as remembering what messages are stored in the pager and the efficient management of the messages stored within the pager memory.

It is often important that a stored message should not be overlooked, but as the rate of receipt of messages increases, a user is increasingly less encouraged to keep track of the received messages. On the other hand, for most messages, there comes a point where the message is so out of date that the message merely clutters up the memory and makes the user's task more difficult. Additionally, it is desirable to provide a means for not receiving messages which are not important to the user. Furthermore it is important to keep message management a relatively simple task for the pager user in view of increasing message throughput.

It is therefore an object of the present invention to provide an improved pager, which alleviates some or all of the aforementioned problems.

SUMMARY OF THE INVENTION

In carrying out the objects of the invention in one form, there is provided a selective call receiver comprising means for receiving a selective call message at a first time. The selective call message comprises an address, a message and message status information. The selective call receiver also comprises means for storing the messages and a message status associated therewith and means for handling the message in accordance with the message status. The selective call receiver further comprises means for automatically changing the message status to one of a plurality of predetermined message statuses, the one of the plurality of predetermined message statuses determined in response to the message status information. After the automatic changing means automatically changes the message status to the one of the plurality of predetermined message statuses, the message handling means thereafter handles the message in accordance with the one of the plurality of predetermined message statuses.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates the block diagram of a paging receiver operating in accordance with the present invention.

FIG. **2** shows an example of a message signal having various status signals and message information.

FIG. **3** shows another example of a message signal.

FIG. **4** shows a flowchart for assigning a default status to a message received by the pager and setting a time for changing the status of the message.

FIG. **5** shows a flowchart for changing the status of a message in response to signals within the message.

FIG. **6** shows a flowchart for setting the predetermined default status of a message used in step **104** of FIG. **4**.

FIG. **7** shows a table generated by the flowchart of FIG. **6**.

FIG. **8** shows a flowchart for changing the default status used in FIG. **4** in response to the time of day.

FIG. **9** shows manually changing the status of messages received and stored in the message memory in response to the characteristic of the message.

FIG. **10** shows a table of times generated by the flowchart of FIG. **9** for changing the status of messages stored in the message memory.

FIG. **11** shows a flowchart for changing the status of a message in response to the table of FIG. **10**.

FIGS. **12A** and **12B** show truth tables illustrating the status of a received message necessary to delete messages of various statuses from the message memory.

FIG. 13 shows a address signal stored in the code plug with corresponding functions time and function signals.

FIG. 14 shows a table relating the function signal to the type of message received by the pager.

FIG. 15 shows an example of the changing functions of an address with respect to time.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

In order to best illustrate the utility of the present invention, it is described in conjunction with a communication receiver, such as a paging receiver, capable of receiving and decoding selective call signals, the selective call signals including at least one data message. While the present invention is described hereinafter with particular reference to a paging receiver, it is to be understood at the outset of the description which follows, it is contemplated that the apparatus and method, in accordance with the present invention, may be used with numerous other communication receivers.

The paging receiver herein is associated with a paging system having a base station terminal. The receiver responds to control and data information from the base station terminal, and in turn stores and provides data messages to a user during operation.

FIG. 1 illustrates the block diagram of a paging receiver 10 operating in accordance with the present invention. Radio frequency modulated selective call paging signals are received on antenna 20 demodulated by receiver 22 and decoded by decoder 24. Decoder 24 compares address signals within the selective call signal with at least one predetermined address signal stored within code plug 26. In response to detecting an address assigned to the pager, a message signal following the address is processed. Status decoder 28 determines if the message signal includes status and timing information and stores said information in a status area 32 within message storage memory 30. If no initial status information is included, a default status is assigned to the message. The message information is stored in a message area 34 within message memory where each message has a corresponding status signal. The pager also has a display 36 for displaying message information as well as time of day information as determined by a time of day clock 38. Time of day clock 38 may also provide day and date information and is capable of generating alarms in response to the time of day being equal to a time set by various functions of the pager. The status of messages stored in message memory may be changed by characteristic analyzer and status control means 40 in response to the time of day clock 38 or under manual control from manual inputs 42 which may include a plurality of buttons for manually operating various functions of the pager. Decoder 24 further analyzes the status assigned to a received message and the statuses of messages stored in the message memory 30 and determines which messages if any are to be deleted in order to store the message, or if the received message will be stored.

An enabling description of the invention may be realized with the aforementioned incorporated references and the figures describing the operation of the invention.

FIG. 2 shows an example of a message signal having various status signals and message information. The message signal is preceded by an address 60. The message signal consists of a first message status signal 62 which indicates a default status, followed by a time signal 64 and a corresponding second status signal 66, followed by a time signal 68 and a corresponding third message status 70 and followed by a message 72. The message 72 is "DEPARTMENT MANAGER'S MEETING IN 5 MINUTES, RED ROOM, 12:30". The message signal provides for establishing a default status for the message and changing the status of the message at two times during the day.

The message status as indicated by the status signals 62, 66, and 70 comprise six bits indicating a state of a corresponding status. The first status "HELD" indicates if the message is available for alerting and reading. A "0" for this status indicates the message is not held and a "1" for this status indicates the message is held. The held message provides no indication to the user that the message resides within the pager (except that a message received with the held status may delete messages of a lower status), thus the user may not read a message with a held status.

The "ALERTED" status indicates if an alert is to be generated for the message. Purposes for the alert include indicating the reception of the message and indicating a status change of the message. A "0" indicates that an alert is to be generated and a "1" indicates than an alert is not to be generated. In the normal operation of the pager having a multi-tasking microcomputer (as described in the aforementioned patents), the status of each message is periodically scanned and if a message has a "0" status for held (not held) and a "0" status for alerted, an alert is generated for the message. After completion of the alert, the alerted status is changed to a "1".

The "LOCKED" status indicates the message may not be deleted by an incoming message, or by a time executed status change. This provides the user with a way to insure that a message is never erased from memory by an automatic operation and that only a manual deletion may remove the message from memory. A "0" indicates the message is not locked while a "1" indicates the message is locked.

The "PROTECT" status indicates the message is protected from deletion by an incoming message, but may be deleted by a time executed status change. This insures that a message is not erased by an incoming message having a lower status but may be erased by an automatic operation or manual deletion. A "0" indicates the message is not protected while a "1" indicates the message is protected.

The "READ" status indicates if the message has been read by the user of the pager. A "0" indicates the user has not read the message. After reading a message, the status is set to a "1". This status is used for determining deletion priority of a message in response to an incoming message or to generate an "unread message alert" if the pager is switched off with unread messages.

The "DELETED" status indicates if the message is present in the pager. A "0" indicates the message is present and a "1" indicates the message is deleted.

The aforementioned statuses control the way a message is handled by the pager. The message of FIG. 2 is received with a default status indicating the message is held, status signal 62. Thus the message is stored in memory and no indication is given to the user that the message has been received. For example, the message of FIG. 2 may have been sent at 8:30 in the morning. Time signal 64 indicates that at 12:25 PM the message status is to be changed to correspond to status signal 66 which

releases the message from the held state. Consequently an alert is generated in response to which the pager user reads the message indicating a meeting will occur at 12:30 PM. The message remains in the pager until 1:30 PM when time signal **68** causes the message to be deleted as indicated by status signal **70**. Thus the message was sent to the pager substantially prior to the meeting, an alert was generated only prior to the meeting, and the message was deleted substantially after the beginning of the meeting. The message did not clutter the user operations of the pager until just prior to the meeting. The sequence management by the pager user.

FIG. **3** shows another example of a message signal. Following the address **80** is a time signal **82**. The absence of a status signal after the address, as in address signal **62**, indicates a predetermined default status is to be assigned to the message. However, at 9:05 PM, as determined by time signal **82**, the message status is changed to "HELD", thereby making the message inaccessible to the user. Following message status **84** is a repeat signal indicating that the status change of signal **84** is to be executed every time the time of day clock equals time signal **82**. Time signal **88** indicates that at 8:55 PM the message status is to be changed to correspond to message status signal **90**. The message status is changed to "UNHELD" and "UNALERTED" thereby causing the pager to generate an alert. In response to the alert, the user would read the message **94**, "SEARCH ROOM CLOSES AT 9:00 PM". Repeat signal **92** indicates that every time the time of day clock **38** equals time **88**, the status of the message is changed to correspond to message status signal **90**.

Thus the message signal of FIG. **3** is first received and alerted using a default priority. Thereafter, the message is alerted every day at 8:55 PM and held every day at 9:05 PM. The message appears in the user memory for ten minutes and is held the rest of the day thereby uncluttering the message from the user selection process and simplifying the operation of the pager.

It should be appreciated that the time signals of FIGS. **2** and **3** may also include day of week and date information thereby causing the status of messages to be changed additionally in response to this information. It should be further appreciated that message status and time signals of FIGS. **2** and **3** may be distinguished from the message by the use of predetermined control characters. Alternately, the status and time signals may be placed anywhere after the address signal. The messages status signal of FIGS. **2** and **3**, **60–70** and **82–86** along with a signal corresponding to a addresses **60** and **80** are stored in status area **32** of the message memory and the messages **72** and **94** are stored in message area **34** within the message memory.

FIG. **4** shows a flowchart for assigning a default status to a message received by the pager and setting a time for changing the status of the message. In step **100**, a new message is received. Step **102** checks if the message was received with an initial status. If no initial status was received (the signal of FIG. **3**), a predetermined default status is assigned to the message in step **104**. The predetermined default status may be permanently stored in code plug **26** or selected by means **42** in combination with time of day signals. The default status may further be dependent upon the address received with the message signal. If in step **102**, an initial status signal is received (signal **62** of FIG. **2**), step **106** sets the default status. In the preferred embodiment, step **106** performs the logical "OR" of the received initial status with the default status associated with the address preceding the message signal. Thus if the default status of messages associated with an address are "HELD", the received status would not clear the "HELD" status. The initial status is then deleted from the message signal. It should be appreciated that in an alternate embodiment, the message status of step **106** could be always set to correspond to the status received in the message signal. Furthermore, default status dependency based upon the address in steps **104** and **106** could be eliminated, thereby assigning a default status to all addresses. From either step **104** or **106**, step **108** checks if the message was received with a time signal. If true, step **110** sets an alarm in time of day clock **38** to correspond to the time signal. Finally, step **112** exits to the other operations of the pager.

FIG. **5** shows a flowchart for changing the status of a message in response to signals within the message. In step **120**, a message status alarm is generated by time of day clock **38**, as set by step **110** of FIG. **4**. In step **122**, the message corresponding to the alarm is determined and the new status corresponding to the alarm is read from the message memory. Step **124** determines if the message has been locked, thereby prohibiting the automatic changing of the status of the message. If true, step **126** exits to other operations of the pager. If unlocked, step **128** checks if a new status causes the message to be deleted. If true step **130** checks if the current status corresponds to held, unalerted or locked. If false, the message is deleted in step **132** and in step **126** other operations of the pager are executed. If true, step **126** is directly executed. Thus a message may not be deleted if it is either unread, held or locked. If in step **128** the result was false, step **134** changes the status of the message to correspond to the new message status. Then in step **136**, a repeat signal is checked to be associated with the time and status signal. If not found, the time and status are deleted. Then in step **140**, the message is checked for the next time signal subsequent to the time of day clock, and if found, step **142** sets the alarm to correspond to the time signal and step **126** returns to other pager functions. Subsequently, step **120** is again executed in response to the time of day clock being equal to the alarm set in step **142**. Thus the pager may modify the status of a message having time and status signal as shown by FIGS. **2** and **3**. It should be appreciated, that in view of this disclosure, many permutations and combinations may be made in modifying the status of a message while remaining within the scope of the invention.

FIG. **6** shows a flowchart for setting the predetermined default status of a message used in step **104** of FIG. **4**. The flowchart is entered at step **150** which may be made in response to a manual input from means **42**. In step **152**, the default status is selected from the available message statuses. The selection would also be made in response to manual inputs from means **42**. After selecting the status, an address corresponding to the status is selected at step **154**. Either a single address, or any combination of addresses, or all addresses stored in the code plug may be selected to correspond to the default status of step **152**. Then in step **156** a time for implementing the status is selected. The time selected in step **156** is programmed into the alarm of the time of day clock. In an alternate embodiment, this step may be eliminated thereby making the default status effective immediately. Furthermore, if a default status is not selected by FIG. **6**, it may be stored in the codeplug

thereby allowing selection at the time of programming the pager addresses.

FIG. 7 shows a table generated by the flowchart of FIG. 6. The table may be stored in memory within characteristic analyzer and status control means 40. Table entry 162 shows that at 8:00 AM the default status associated with address "A" and "C" stored in the code plug correspond to the held status. Entry 164 shows that 10:00 AM the default status of "A" and "C" changes to the protected status. Table entry 166 has no associated time and is thereby always in effect for address "D". This status causes any message received on address "D" to be deleted upon reception.

FIG. 8 shows a flowchart for changing the default status used in step 104 of FIG. 4 in response to the time of day. In response to an alarm programmed in step 156, step 170 is entered. Step 172 determines an address associated with the alarm and step 174 changes the default status associated with the address. Then step 176 checks if all addresses selected by step 154 have had their default statuses changed. If false, step 172 is again executed. If true, step 178 exits to other pager functions.

The pager operating in accordance with FIGS. 6–8 will hold messages received on address "A" and "C" between 8:00 AM and 10:00 AM. This time may correspond to the pager user being in an important meeting, and thus not wanting to be disturbed by the reception of the messages on these addresses. Messages received after 10:00 AM will be alerted upon reception and automatically protected from deletion by an incoming message. Messages received on address "D" will be arbitrarily deleted upon reception and no alert generated. Such messages may be received from one who the pager user has an adversarial relationship. The default status of messages received on address "D" may be manually changed at a later date if desired. The pager may also have a "B" address stored in the code plug. The default status could be either predetermined or stored in the codeplug. If the default status corresponded to all "0"s in the corresponding status states, messages received on this address would always be alerted upon reception, even in the aforementioned time between 8:00 AM and 10:00 AM where messages associated with address "A" and "C" were held, thereby unalerted.

FIG. 9 shows manually changing the status of messages received and stored in the message memory in response to the characteristic of the message. The characteristic of the messages may include the status of the message, the message number, and the address on which the message was received. In step 200, the manual status change mode is entered in response to manual input from means 42. In step 202, a conditional status is selected, this status indicates the status of messages necessary before the status may be changed. Then in step 204, the new status is selected. In step 206 messages for status change are selected. In step 210 a time for the status change is selected and programmed into an alarm within the time of day clock. Then step 212 exits to other paging functions. As in the flowchart of FIG. 6, the selections of steps 202, 204 and 206 may be made in response to manual inputs made on means 42 of FIG. 1. Steps 206 and 210 may be eliminated thereby providing convenient operations on a plurality of messages. For example, the conditional status of step 202 may include all messages having the read status and the new status may cause all messages having the read status to be deleted from the pager memory. In this example, protected, locked, unalerted or held messages may not be deleted. This frees the user from the task of individually deleting read messages. Alternately the conditional status may include all messages having the held status and the new status would change the held messages to unalerted messages. In the example of FIGS. 6 through 8, this could be used between 8:00 AM and 10:00 PM to determine if any messages were received on address "A" or "B". Furthermore, held messages could be changed to an unheld and alerted status, thereby forgoing the alert sequence and making the messages available for reading by the user. It should be further appreciated that step 206 may be executed and only held messages received on address "A" would be changed to an unheld status, thereby keeping messages received on address "C" in a held status.

FIG. 10 shows a table of times generated by the flowchart of FIG. 9 for changing the status of messages stored in the message memory. The table may be stored in memory within means 40 of FIG. 1. Table entry 220 shows that at 10:10 AM the status of messages received on addresses "A" and "C" may be changed. The conditional status corresponds to the "HELD" state equaling a "1" and all other status states are "don't care" states. The new status corresponds to the "HELD" state being cleared, and not changing the state of the remaining statuses, thus making any held messages received on addresses "A" or "C" received prior to 10:00 AM available for alerting. When combined with the example of FIGS. 6–8, entry 220 changes the held state of messages received between 8:00 AM and 10:00 AM at 10:10 AM. Entry 222 shows that at 5:05 PM message 2 (which corresponds to the order in which the message was received) has no conditional status required in order to change to a deleted status. Thus entry 222 provides for deleting message number 2 at 5:05 PM. Entry 224 shows that at 11:00 PM all messages having alerted and read statuses set and other states clear will have a status of deleted, thereby removing the message from the pager memory. And entry 226 shows that at 11:30 PM all messages having the alerted protect, and read statuses set will have the protect status cleared thereby providing for deletion of the message by an incoming message.

FIG. 11 shows a flowchart for changing the status of a message in response to the table of FIG. 10. Step 230 is entered in response to the time selected in step 210. In step 232 a message is selected in response to the address/message requirement of FIG. 10. Then step 234 checks if the message is locked. If not, step 236 checks if the status of the message corresponds to the conditional status of FIG. 10. If true, step 238 changes the status of the message to correspond to the new status of FIG. 10. From either steps 234, 236 or 238, step 240 checks if all messages have been selected. If not, step 232 selects the next message in the message memory. If true, other paging functions are exited to by step 242.

It should be appreciated that the times specified in steps 156 and 210 may either be repeating times, or times executed once and removed.

FIG. 12 shows truth tables illustrating the status of a received message necessary to delete messages of various statuses already stored in the message memory. Paging receivers have limited memory, and at times received messages may have to delete messages stored in the memory in order to be stored. Table 250 shows possible statuses of messages stored in message memory at the time of reception of a new message. Table 260 shows the status necessary to delete a message having a

status corresponding to table 250. The status of table 260 is set by either steps 104 or 106 of FIG. 4. An "X" entry in either table 250 or 260 indicates a don't care state. Line 262 indicates a message with the delete status set (a deleted message) may be replaced with any received message having the delete status cleared. Line 264 shows that a stored message having the alerted status and the read status set (a read message) may be deleted by a received message having the read status and deleted status cleared (an unread message). Line 266 indicates that a stored message having the alerted status set and all other statuses cleared (an unread message) may be deleted by a received message having the protect status set and the delete status clear (a protected message). Line 268 indicates that a message having the alerted and protect statuses set and the held, locked and deleted statuses cleared (a protected message) may only be deleted by a received message having the held and protect statuses set and the delete status cleared (a held protected message). Lines 270, 272 and 274 indicate that messages that are held, unalerted or locked may not be deleted by a received message of any status.

In operation, a received message will be stored by first checking message storage statuses specified by line 262 then 264 then 266 and finally 268. If a received message does not have a status corresponding to table 260, it will not be stored in the message memory. Thus by setting or clearing the read, protect and held statuses of a received message, several message storage priorities for deletion of messages already stored in the memory result. Any of the bits of the status signal of the received message, either included in the message signal or set at the pager may be set or cleared by this invention. For example, a very low priority message could have a received status where the read status is set and all other statuses are clear. Such a message can not delete any messages stored in the pager but may only be stored in memory having already deleted messages, which corresponds to empty memory. If no empty memory were available, the message would not be stored. Alternately, a higher priority may be assigned to a message by clearing the all status bits in the received message (unread message), the received message may only be stored in empty memory or may delete read and alerted messages from the memory. Still higher priority may be realized by setting the protect status of a received message which provides for the deletion of unread and unprotected messages. Setting the hold and protect statuses provides for an even higher priority of message deletion in order to store the received message.

Thus a means for determining one of a plurality of priorities for a received message has been shown. The priority indicating which messages may be deleted in order to store the received message. The status shown in FIG. 12 may be converted to a numerical priority value for determining if a message may be deleted from memory. Thus a received message would have to have a higher priority value in order to delete a message from memory. For example the status of line 262 table 250 could have a priority of 0 while the status of line 262 table 260 could have a priority of 1. Similarly, priorities 2, 4 and 6 could correspond to the statuses of lines 264–268 of table 250 and priorities 3, 5 and 7 could correspond to the statuses of lines 264–268 of table 260. The highest priority in this example could be 8 and assigned to the statuses of lines 270–274 of table 250. In an alternate embodiment, the priority signal may be independent of the status signal and comprise a numerical value. Thus a received message having a first numerical priority may only delete a stored message having a second numerical priority less than the first numerical priority independent of the status of either message. Similar to the received message status, the priority of a received message may be included with the message or set at the receiver in response to the time of day and the address associated with the message. Furthermore, the priority of messages stored in the memory may be varied in response to the time of day and status of the message.

FIG. 13 shows am address signal stored in the code plug with corresponding function times and function signals. This aspect of the invention provides for the changing of the function of an address in response to the time of day. Time signal 300 indicates that the function described by function signal 302 is to be associated with the address at that time. At time 304 the function of the address is to be changed to that of function signal 306. The address is shown by signal 308.

FIG. 14 shows a table relating the function signal to the type of message received by the pager. Column 320 shows a four bit function signal and column 322 shows the corresponding pager format. The formats include tone numeric, alpha numeric and graphic messaging with and without priority, as well as analog and Linear Predictive Coding (LPC) voice messaging. Finally an inactivation function (1111) inhibits the address decoder of the pager from identifying the address from signals within the received paging signal. Additional functions may be added to the table of FIG. 14 as required by the paging system.

FIG. 15 shows an example of the changing functions of an address with respect to time. Signal 330 and 332 indicate that beginning at 8:00 AM, messages will be decoded as priority alpha messages. The priority indicates that an audio alert will be generated in response to the reception of the message even if the pager is set into a silent alerting mode. The alpha function indicates that the message signal after the address is to be decoded as alpha (ASCII) data. Signals 334 and 336 indicate that at 5:00 PM messages will be decoded as numeric messages having no alerting priority. Thus if the pager is set to a silent alert mode, no audio alert will be generated in response to the reception of the message, and the message signal following the address will be decoded as numeric (BCD) information. Finally, Signals 338 and 340 indicate that at 11:30 PM the address is deactivated, thereby not being recognized by the pager. In operation, function signal 332 is reactivated at 8:00 AM the next day. Address signal 342 indicates that the aforementioned functions are assigned to an address corresponding to the telephone number 555–1212.

Any number of time and functions signals may be associated with an address and a code plug may have a plurality of addresses each with associated time and function signals. The paging terminal which transmits the paging message must also be aware of the time of day and the function of an address of the pager in order to properly communicate messages to the pager. Furthermore, the time and function signals 300–306 may either be predetermined, stored in the code plug at the time of programming the address, or within a message received by the pager. Receiving time and function signals from the base station allows the paging system to more efficiently regulate the type of information transmitted to a pager, for example numeric information may be transmitted in busy hours and alpha or graphic infor-

mation transmitted when the transmitter is not busy, thereby having more time for transmitting longer alpha or graphic messages. Additionally, a transmitter may send the pager a new address with an initial function followed by a time and a deactivation function. This allows the paging system to provide a new service associated with the new address to a pager user for a limited time in order for the user to evaluate the service.

Although the invention has been shown by way of example, numerous modifications may be made to the invention while remaining with in the scope of invention which is defined by the following claims.

We claim:

1. A selective call receiver comprising:

means for receiving a selective call message, the selective call message comprising an address, a message and message status information and received at a first time;

means for storing the message and a message status associated therewith;

means for handling the message in accordance with the message status; and

means for automatically changing the message status to one of a plurality of predetermined message statuses, the one of the plurality of predetermined message statuses determined in response to the message status information,

wherein the message handling means handles the message in accordance with the one of the plurality of predetermined message statuses after the automatic changing means automatically changes the message status to the one of the plurality of predetermined message statuses.

2. The selective call receiver according to claim 1 further comprising:

indicating means coupled to the message handling means for producing an indication of the reception and storage of the message,

wherein the message handling means provides a signal to the indicating means to produce the indication if the message status corresponds to a first one of the plurality of predetermined message statuses, and

wherein the message handling means does not provide a signal to the indicating means to produce the indication if the message status corresponds to a second one of the plurality of predetermined message statuses different from the first message status.

3. The selective call receiver according to claim 1 further comprising:

display means coupled to the message handling means for displaying the stored message,

wherein the message handling means provides the message to the display means for display thereby in response to the message having a message status corresponding to a first one of the plurality of predetermined message statuses, and

wherein the message handling means does not provide the message to the display means in response to a second one of the plurality of predetermined message statuses.

4. The selective call receiver according to claim 1 further comprising user selection means for manually selecting the message status to be associated with the message prior to reception of the selective call message.

5. The selective call receiver according to claim 1 further comprising time keeping means for generating a time of day signal and wherein said means for automatically changing the message status is coupled to said time keeping means for changing the message status of the received message at a second time subsequent to the first time, the second time determined in response to the time of day signal.

6. The selective call receiver according to claim 1 wherein said receiving means includes a means for determining if the address of the selective call message matches a predetermined address; and wherein said mans for automatically changing the message status changes the message status in response to the message status information and the address of the message.

7. The selective call receiver according to claim 6 wherein the message handling means is coupled to the storing means, and wherein the message handling means stores the message if the one of the plurality of predetermined message statuses is a first message status and does not store the message if the one of the plurality of predetermined message statuses is a second message status.

8. The selective call receiver according to claim 1 wherein the means for storing stores a plurality of messages each having message status information associated therewith, and wherein the message handling means comprises deleting means coupled to the receiving means and the storing means for deleting one of the plurality of messages from this storing means in response to the receiving means receiving a selective call message having message status information corresponding to a message status having a value greater than a value of the message status associated with the one of the plurality of messages.

9. A method of assigning a status to a message received by a selective call receiver comprising the steps of:

receiving a selective call message comprising an address, message status information, and the message; and

automatically assigning one of a plurality of message statuses to the message for determining how the message will be handled, the one of the plurality of message statuses determined in response to the message status information.

10. The method according to claim 9 further comprising the steps of:

providing an indication signal indicating reception of the message if the one of the plurality of message statuses is determined to be a first predetermined message status; and

inhibiting said indication signal if the one of the plurality of message statuses is determined not to be the first predetermined message status.

11. The method according to claim 9 further comprising the step of:

determining a default message status from the plurality of message statuses in response to a manual input at the selective call receiver; and wherein

said step of assigning assigns the default message status to the message.

12. The method according to claim 9 wherein the step of assigning assigns a first one of the plurality of message statuses in response to the address corresponding to a first predetermined address and assigns a second one of the plurality of message statuses in response to the address corresponding to a second predetermined address.

13. The method according to claim 9 wherein said step of automatically assigning is made in response to a manual input at the selective call receiver.

14. The method according to claim 9 wherein the selective call receiver further includes a time keeping means for producing a signal indicative of the time of day, the method further comprising the step of:

determining a first default message status, a second default message status and a first time; and wherein

said step of assigning assigns the first default message status in response to the time of day signal being before the first time and assigns the second default message status in response to the time of day signal being after the first time.

15. The method according to claim 9 wherein the plurality of message statuses includes a message status indicating the message may not be deleted by a subsequent message.

16. The method according to claim 9 wherein the plurality of message statuses includes a message status indicating the message may not be stored upon reception of the message.

17. A selective call receiver comprising:

means for storing a message and a plurality of characteristics associated with the message including a current message status;

means for handling the message in accordance with the current message status; and

means for automatically changing the current message status associated with the message from a first message status to a second message status if a characteristic of the message substantially equals a predetermined characteristic.

18. The selective call receiver according to claim 17 further comprising:

clock means for generating a time signal, wherein

said changing means changes the current message status of the message in response to the time signal equaling a predetermined time.

19. The selective call receiver according to claim 18 wherein said predetermined time and said second message status are included within time and message status signals, respectively, within a selective call message comprising the message, and the selective call receiver further comprises means for decoding the time and message status signal from the selective call message for use by said changing means, whereby the plurality of characteristics of the message comprise the time and message status signals.

20. The selective call receiver according to claim 17 wherein said storing means stores a plurality of messages, the characteristic of each message having a unique signal indicative to the message associated therewith, and the predetermined characteristic includes the unique signal indicative of the message.

21. The selective call receiver according to claim 17 wherein the message includes an address signal indicative of the selective call receiver, the selective call receiver having a plurality of addresses assigned thereto, and the plurality of characteristics includes signals corresponding to the plurality of addresses and said predetermined characteristic corresponds to one of the plurality of addresses.

22. A method for changing a current message status of a message stored within a selective call receiver wherein the message is handled in accordance with the current message status thereof, the method comprising the steps of:

comparing a characteristic associated with stored messages to a first characteristic; and

automatically changing the current message status of those stored messages having an associated characteristic substantially equal to the first characteristic.

23. The method according to claim 22 further comprising the step of storing a plurality of messages having the characteristic associated therewith and a message status corresponding to each of the plurality of messages; and wherein

said step of comparing further comprises comparing the message status of the plurality of messages to a first message status; and wherein

said step of changing automatically changes the message status of messages within the plurality of messages which have the first message status corresponding thereto.

24. The method according to claim 23 wherein the first message status corresponds to a message having been read by an operator of the selective call receiver and a second message status corresponds to the message being deleted from the selective call receiver.

25. The method according to claim 23 wherein the first message status corresponds to inhibiting an indication that a message has been received an stored and a second message status enables said indication.

26. The method according to claim 22 wherein the selective call receiver has a plurality of predetermined address signals assigned thereto and the message has an address signal associated therewith matching one of the plurality of address signals, and wherein the characteristic associated with the message corresponds to said address signal.

27. The method according to claim 22 wherein said step of comparing is performed in response to a manual input made at the selective call receiver.

28. The method according to claim 22 wherein the selective call receiver further includes a time keeping means for producing a signal indicative of the time of day, further wherein said step of comparing is performed in response to the time of day signal being equal to a predetermined time.

29. A selective call receiver comprising:

means for storing a first message having a first hierarchical message priority;

means for receiving a selective call message comprising a second message;

means for automatically selecting from a plurality of hierarchical message priorities, a second hierarchical message priority for the second message;

means for generating a time of day signal;

means for changing the first hierarchical message priority in response to the time of day signal; and

means for selectively automatically deleting the first message in response to the second message having the second hierarchical message priority.

30. The selective call receiver according to claim 29 further comprising:

clock means for generating a time of day signal; and

means for changing the first hierarchical message priority in response to the time of day signal;

31. The selective call receiver according to claim 29 wherein selective call message includes the second message and a signal indicative of the hierarchical message priority of the second message and said selecting means assigns the second hierarchical message priority in response to the signal.

32. The selective call receiver according to claim 31 wherein the signal further indicates the status of the

second message and the selecting means selects the second hierarchical message priority in response to the hierarchical message priority and the status of the second message.

33. The selective call receiver according to claim 29 further comprising input means for manually inputting a user selection signal into the selective call receiver; wherein the selecting means selects the second hierarchical message priority in response to the user selection signal.

34. The selective call receiver according to claim 29 further comprising a clock means for generating a time of day signal; wherein said assigning means assigns the second hierarchical message priority in response to the time of day signal.

35. The selective call receiver according to claim 34 further comprising means for changing the first hierarchical message priority in response to the time of day signal.

36. A receiver for receiving an information signal, said information signal being formatted in one of a plurality of formats, the receiver comprising:

clock means for producing a time signal;

format selecting means for selecting a format from the plurality of formats in response to the time signal; and

means for decoding the information signal in the format selected by said format selecting means.

37. The selective call receiver according to claim 36 wherein said plurality of formats includes an alpha format and a numeric format wherein the information is formatted in ASCII and BCD formats, respectively.

38. The receiver according to claim 36 wherein an address signal precedes the information signal, the address signal selectively identifying the receiver for receiving the information signal, the receiver further comprising:

memory means for storing a predetermined address identifying the receiver;

comparison means for comparing the address signal with the predetermined address and for generating a detect signal in response to the address signal being substantially equal to the predetermined address; and wherein

said means for decoding decodes the information signal in response to the detect signal.

39. The receiver according to claim 36 further comprising:

memory means for storing a plurality of event signals and a corresponding plurality of function signals; wherein

said format selecting means comprises:

determining means for comparing the time signal with the plurality of event signals to determine if the time signal correlates with any of the plurality of event signals; and

selecting means for selecting the format in response to one of the plurality of function signals corresponding to one of the plurality of event signals correlating with the time signal.

40. The receiver according to claim 39 wherein the one of the plurality of function signals inhibits said decoding means from decoding the message.

41. The receiver according to claim 39 wherein the information includes at least one event signal and a corresponding function signal and the receiver further comprises a means for detecting the at least one event signal and corresponding function signal and for storing the at least one event signal and corresponding function signal in said memory means.

42. A selective call receiver for receiving a paging signal having an address signal, the selective call receiver comprising:

clock means for producing a time of day signal;;

memory means for storing a predetermined address and an enable time and a disable time;

receiving means for receiving and demodulating the paging signal; and

decoding means for detecting an address signal equal to the predetermined address in response to the time of day signal having a value between the enable and disable times, and for not detecting the address signal in response to the time of day signal having a value not between the disable and enable times.

43. The receiver according to claim 42 wherein said memory means stores a second predetermined address, and said decoding means further detects an address signal equal to the second predetermined address independent of the enable and disable times.

44. A selective call receiver, comprising:

means for receiving messages;

means for storing received messages and a message status associated with each received message;

means for handling stored messages in accordance with the message status associated therewith; and

means for automatically changing the message status of certain stored messages to another message status identified by a manual input means,

wherein the handling means handles the certain stored messages in accordance with the another message status after the automatic changing means automatically changes the message status thereof to the another message status.

45. A selective call receiver, comprising:

means for receiving messages and initial current message statuses associated therewith;

means for storing received messages and a current message status associated with each received message, wherein initially the current message status of received messages are the associated initial current message statuses received therewith;

means for automatically changing the current message status of certain stored messages having a characteristic identified by a manual input means; and

means for handling stored messages in accordance with the current message statuses stored therewith.

* * * * *

AB

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United States Patent [19]

Marrs et al.

[11] **Patent Number: 5,504,476**

[45] **Date of Patent: Apr. 2, 1996**

[54] **METHOD AND APPARATUS FOR GENERATING ALERTS BASED UPON CONTENT OF MESSAGES RECEIVED BY A RADIO RECEIVER**

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[73] Assignee: **Motorola, Inc.**, Schaumburg, Ill.

[21] Appl. No.: **282,112**

[22] Filed: **Jul. 28, 1994**

[51] **Int. Cl.**[6] **G08B 5/22**; H04Q 7/00

[52] **U.S. Cl.** **340/825.44**; 340/825.47; 340/311.1; 455/38.2

[58] **Field of Search** 340/825.44, 825.45, 340/825.46, 825.47, 825.48, 311.1; 455/38.2, 38.4, 38.5; 379/57

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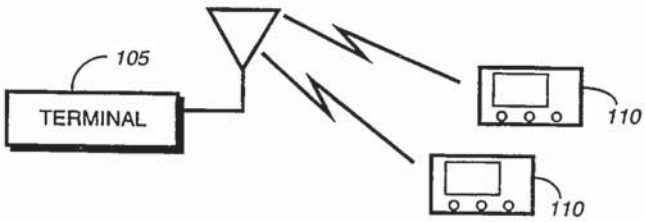
Primary Examiner—Donald J. Yusko
Assistant Examiner—Edward Merz
Attorney, Agent, or Firm—Kelly A. Gardner

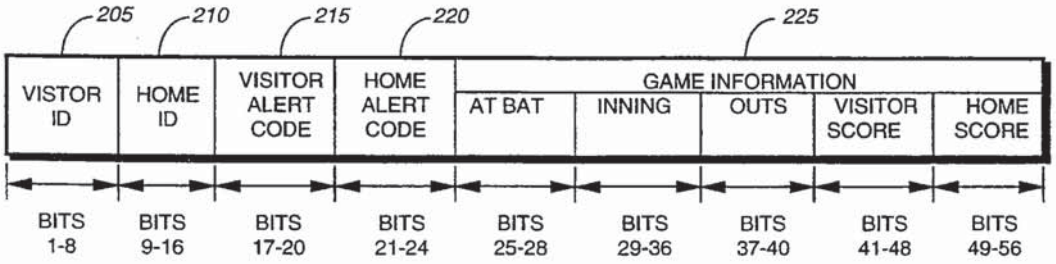
[57] **ABSTRACT**

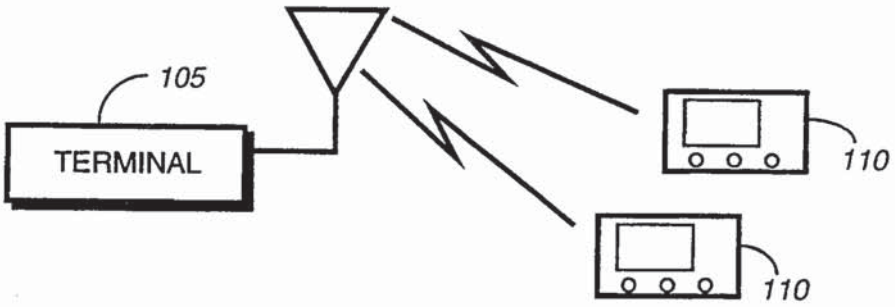
A communication system (**100**) for alerting a user based upon content of messages transmitted to the user includes a terminal (**105**) for generating and transmitting a message having first and second recipient identifications (IDs) and first and second alert codes. A radio receiver (**110**) receives the message and determines whether the first recipient ID is equivalent to an ID associated with the radio receiver (**110**). When the first recipient ID is equivalent to an ID associated with the radio receiver (**110**), the radio receiver (**110**) selects one of the at least first and second alert codes based upon a location of the first recipient ID within the message and generates an alert associated with the one of the at least first and second alert codes.

24 Claims, 6 Drawing Sheets



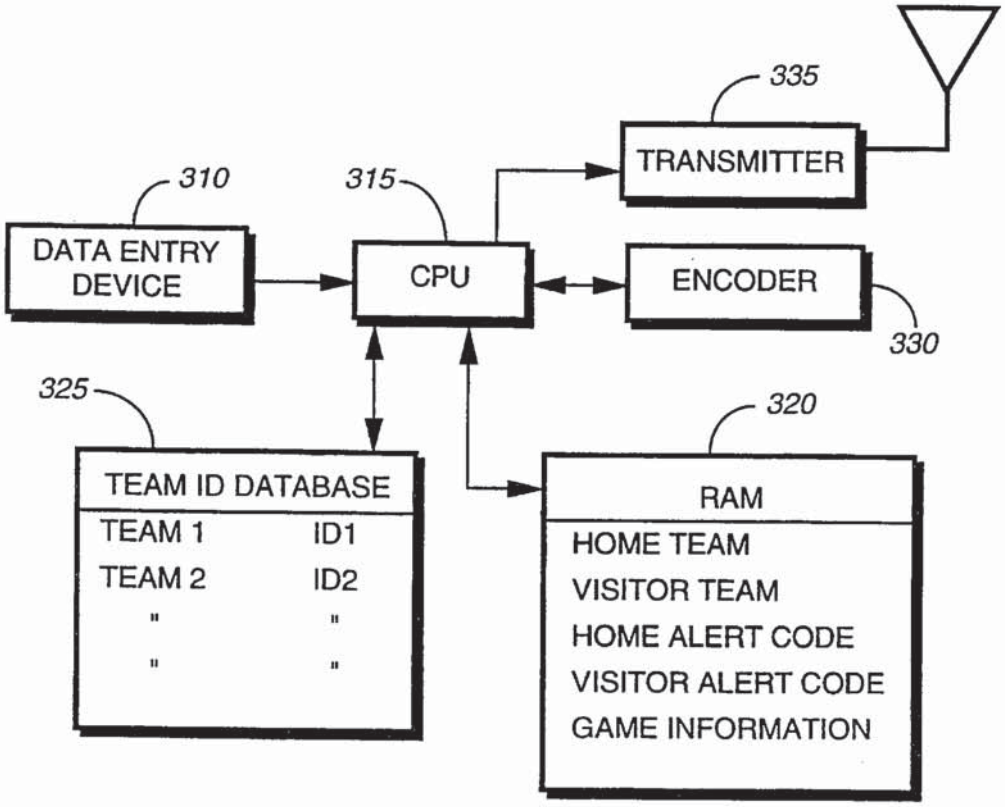
100





100

FIG. 1



105

FIG. 3

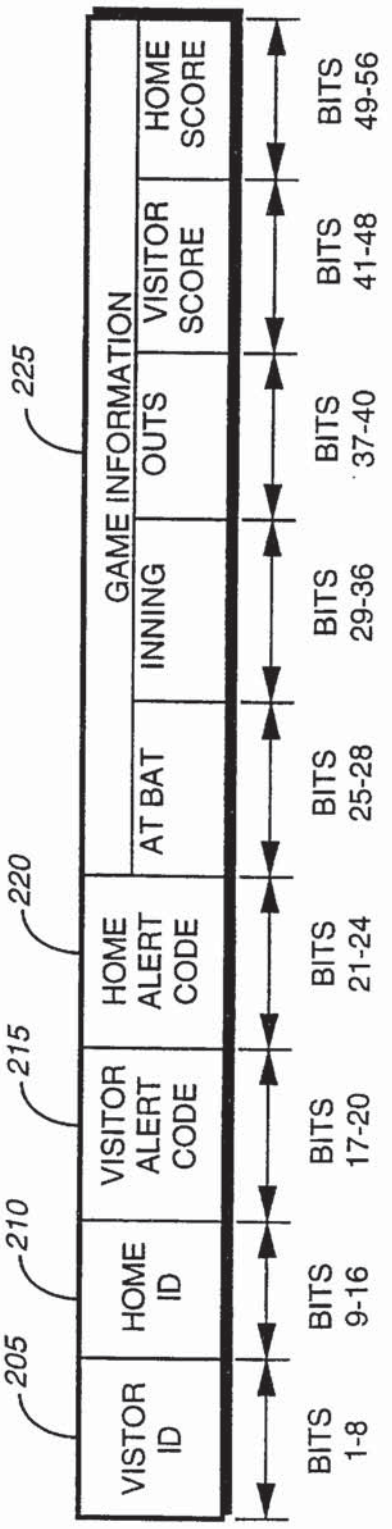

205
VISTOR ID
BITS 1-8
210
HOME ID
BITS 9-16
215
VISITOR ALERT CODE
BITS 17-20
220
HOME ALERT CODE
BITS 21-24
225
GAME INFORMATION
AT BAT
BITS 25-28
INNING
BITS 29-36
OUTS
BITS 37-40
VISITOR SCORE
BITS 41-48
HOME SCORE
BITS 49-56

FIG. 2

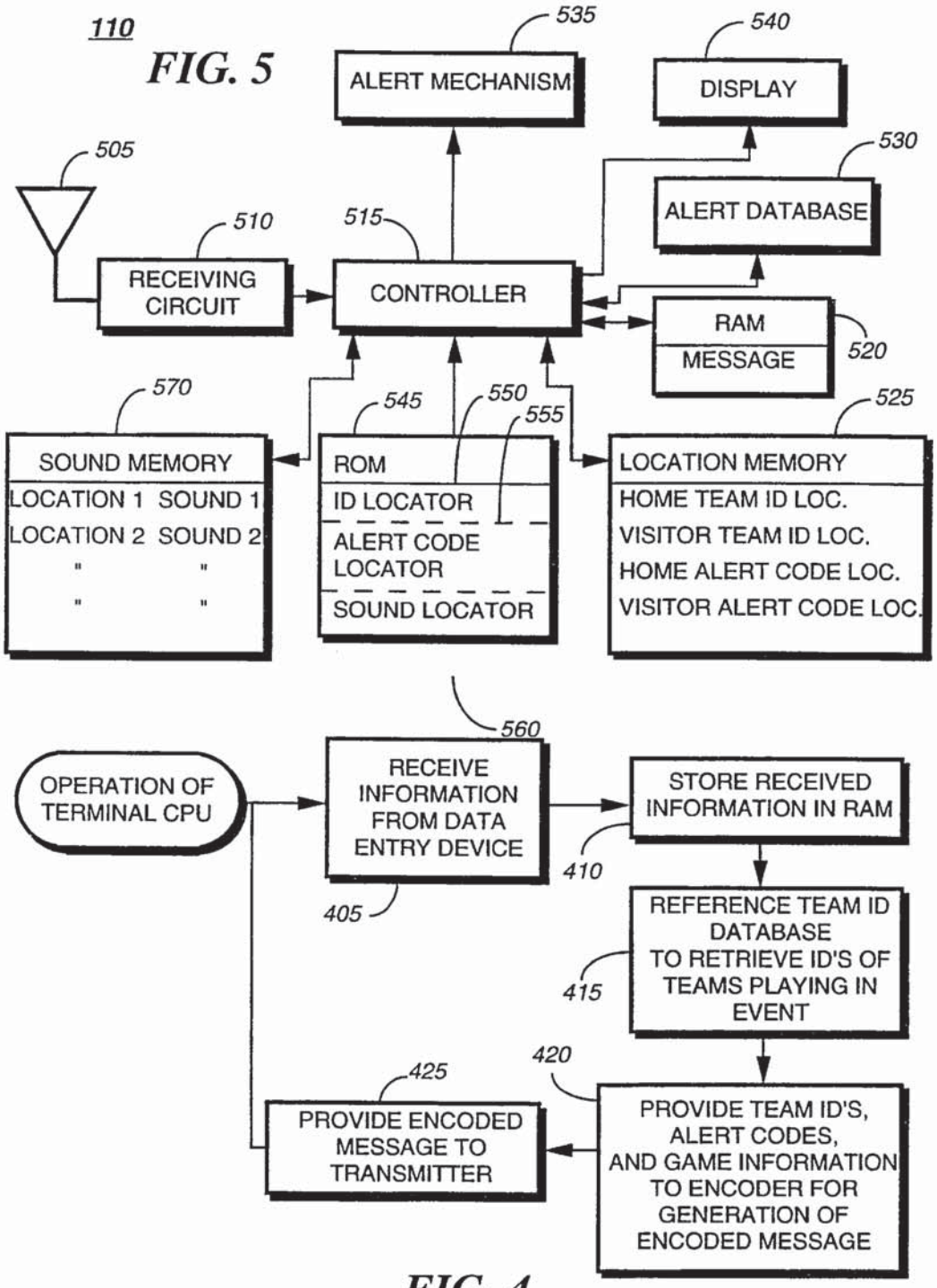

110
505
510
515
535
540
530
520
570
545
550
555
525
ALERT MECHANISM
DISPLAY
ALERT DATABASE
RECEIVING CIRCUIT
CONTROLLER
RAM
MESSAGE
SOUND MEMORY
LOCATION 1 SOUND 1
LOCATION 2 SOUND 2
ROM
ID LOCATOR
ALERT CODE LOCATOR
SOUND LOCATOR
LOCATION MEMORY
HOME TEAM ID LOC.
VISITOR TEAM ID LOC.
HOME ALERT CODE LOC.
VISITOR ALERT CODE LOC.
560
OPERATION OF TERMINAL CPU
RECEIVE INFORMATION FROM DATA ENTRY DEVICE
405
STORE RECEIVED INFORMATION IN RAM
410
REFERENCE TEAM ID DATABASE TO RETRIEVE ID'S OF TEAMS PLAYING IN EVENT
415
420
PROVIDE TEAM ID'S, ALERT CODES, AND GAME INFORMATION TO ENCODER FOR GENERATION OF ENCODED MESSAGE
425
PROVIDE ENCODED MESSAGE TO TRANSMITTER

FIG. 5

FIG. 4

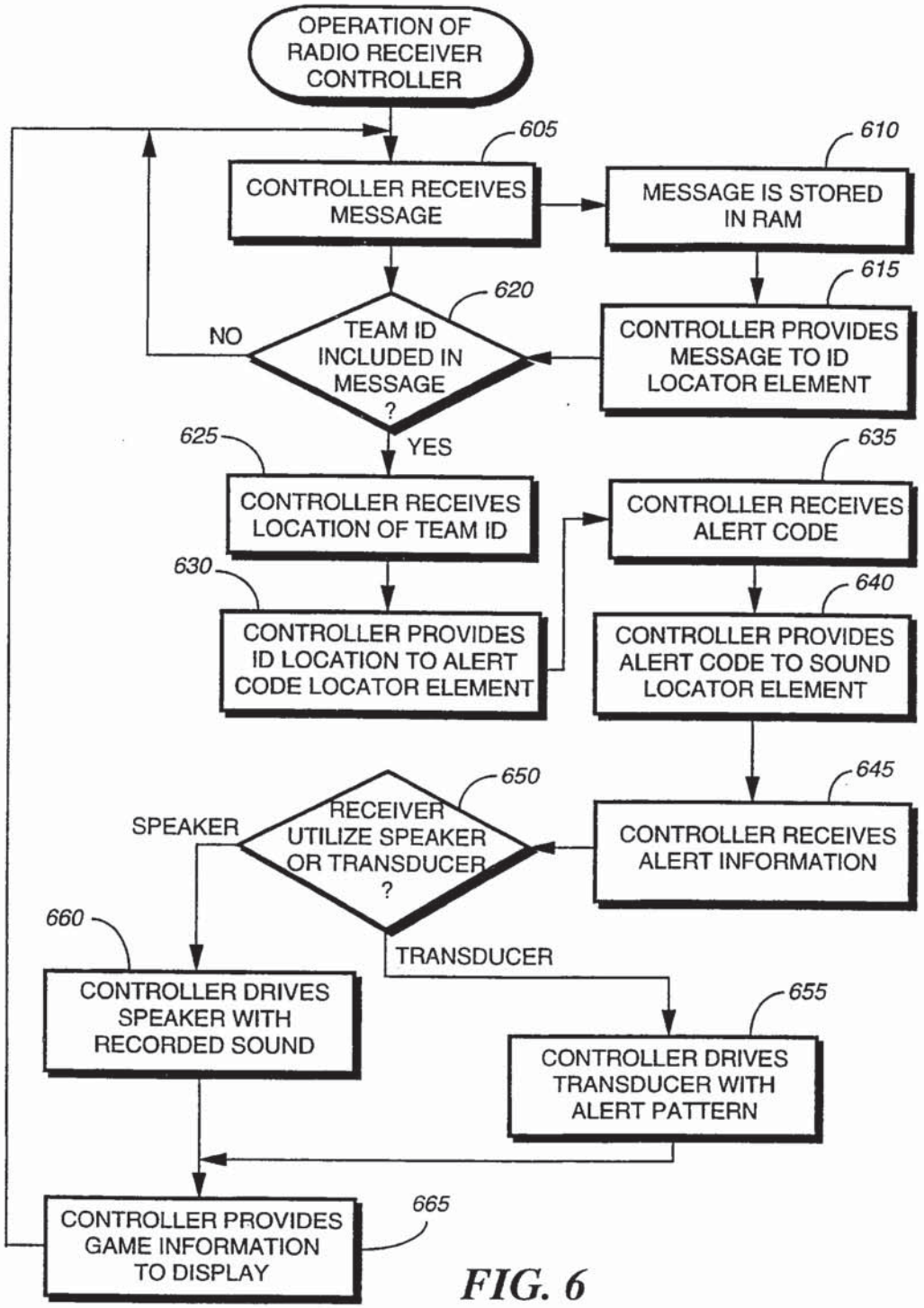

OPERATION OF RADIO RECEIVER CONTROLLER
605
CONTROLLER RECEIVES MESSAGE
610
MESSAGE IS STORED IN RAM
615
CONTROLLER PROVIDES MESSAGE TO ID LOCATOR ELEMENT
620
TEAM ID INCLUDED IN MESSAGE ?
NO
YES
625
CONTROLLER RECEIVES LOCATION OF TEAM ID
630
CONTROLLER PROVIDES ID LOCATION TO ALERT CODE LOCATOR ELEMENT
635
CONTROLLER RECEIVES ALERT CODE
640
CONTROLLER PROVIDES ALERT CODE TO SOUND LOCATOR ELEMENT
645
CONTROLLER RECEIVES ALERT INFORMATION
650
RECEIVER UTILIZE SPEAKER OR TRANSDUCER ?
SPEAKER
TRANSDUCER
660
CONTROLLER DRIVES SPEAKER WITH RECORDED SOUND
655
CONTROLLER DRIVES TRANSDUCER WITH ALERT PATTERN
665
CONTROLLER PROVIDES GAME INFORMATION TO DISPLAY

FIG. 6

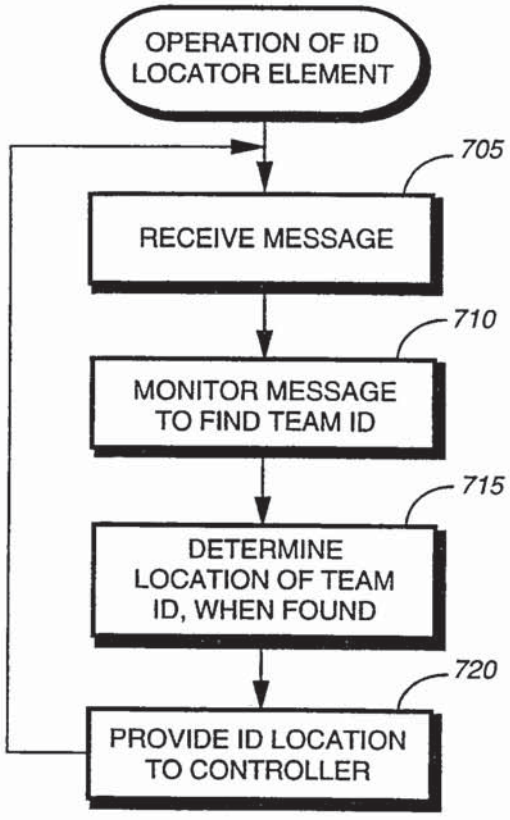

OPERATION OF ID LOCATOR ELEMENT
705
RECEIVE MESSAGE
710
MONITOR MESSAGE TO FIND TEAM ID
715
DETERMINE LOCATION OF TEAM ID, WHEN FOUND
720
PROVIDE ID LOCATION TO CONTROLLER

FIG. 7

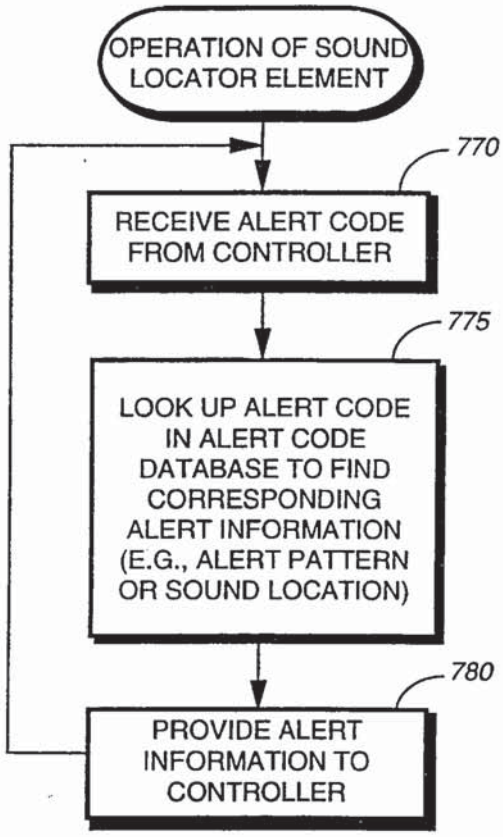

OPERATION OF SOUND LOCATOR ELEMENT
770
RECEIVE ALERT CODE FROM CONTROLLER
775
LOOK UP ALERT CODE IN ALERT CODE DATABASE TO FIND CORRESPONDING ALERT INFORMATION (E.G., ALERT PATTERN OR SOUND LOCATION)
780
PROVIDE ALERT INFORMATION TO CONTROLLER

FIG. 9

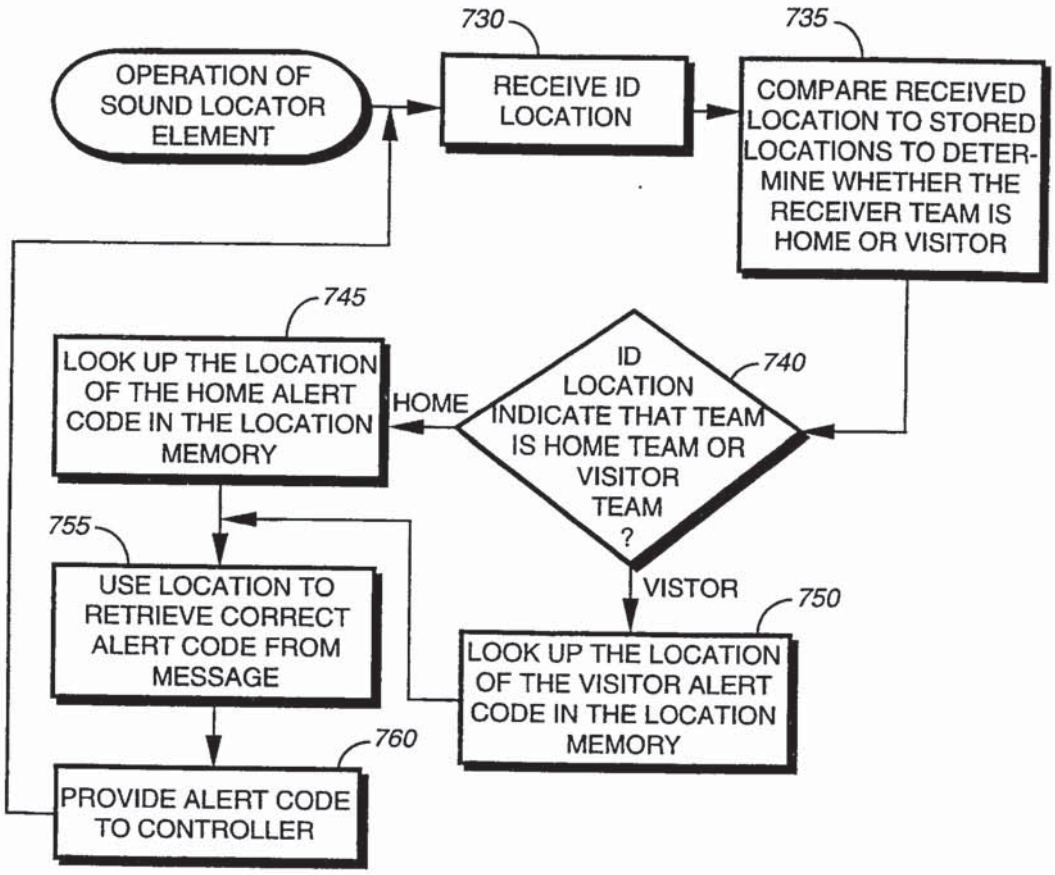

730
735
OPERATION OF SOUND LOCATOR ELEMENT
RECEIVE ID LOCATION
COMPARE RECEIVED LOCATION TO STORED LOCATIONS TO DETERMINE WHETHER THE RECEIVER TEAM IS HOME OR VISITOR
745
740
LOOK UP THE LOCATION OF THE HOME ALERT CODE IN THE LOCATION MEMORY
HOME
ID LOCATION INDICATE THAT TEAM IS HOME TEAM OR VISITOR TEAM ?
755
VISTOR
750
USE LOCATION TO RETRIEVE CORRECT ALERT CODE FROM MESSAGE
LOOK UP THE LOCATION OF THE VISITOR ALERT CODE IN THE LOCATION MEMORY
760
PROVIDE ALERT CODE TO CONTROLLER

FIG. 8

METHOD AND APPARATUS FOR GENERATING ALERTS BASED UPON CONTENT OF MESSAGES RECEIVED BY A RADIO RECEIVER

FIELD OF THE INVENTION

This invention relates in general to radio receivers having alerts, and more specifically to a radio receiver for generating an alert based upon message content.

BACKGROUND OF THE INVENTION

Portable radio receivers, such as pagers, are typically carried by users for the purpose of receiving messages when away from a computer or telephone. Generally, a portable receiver includes an alert mechanism for generating an alert to announce reception of a message to the user. In response to receiving the message, the receiver may then display the message to the user automatically, or the message may be displayed in response to manipulation of controls by the user. In some situations, the user could be inconvenienced by having to read the message immediately in order to determine its content. Therefore, some portable receivers generate different alerts to announce reception of different types of messages such that the user can determine the message type from hearing the alert.

In many communication systems, common messages are often transmitted to multiple portable receivers. Some communication systems, for instance, transmit sports information to service subscribers who carry portable receivers so that the subscribers can receive current information about a sport or even a particular event. Using conventional paging technology, a portable receiver carried by such a subscriber could, for example, be alerted to the message type, e.g., "sports", of the received message. Although the user could determine the message type from the alert, he could not, however, determine message content from the alert. As a result, the user would have to read each received message to determine whether the current message was of interest to him.

Thus, what is needed is a method and apparatus for generating alerts based upon message content.

SUMMARY OF THE INVENTION

A method, in a radio receiver, for generating alerts based upon message content including the step of receiving a common message comprising at least first and second recipient identifications (IDs) and at least first and second alert codes, wherein the common message is received by other system receivers having addresses equivalent to an address associated with the radio receiver, and wherein the at least first and second recipient IDs and the at least first and second alert codes are separate and distinct from the address. The method further includes the steps of determining which of the at least first and second recipient IDs included in the common message is a recipient ID associated with the radio receiver and selecting one of the at least first and second alert codes indicated by the recipient ID associated with the radio receiver, wherein the one of the at least first and second alert codes selected by the radio receiver can be different from an alert code, included in the at least first and second alert codes, that is selected by others of the other system receivers. An alert associated with the one of the at least first and second alert codes is then generated.

A radio receiver for generating alerts based upon content of received messages includes a receiving circuit for receiving an address and a message common to all system receivers. The address indicates that the message is intended for reception by the system receivers, and the message includes at least first and second alert codes that are separate and distinct from the address and that are each indicative of an alert pattern. The message further includes at least first and second recipient identifications (IDs) that are separate and distinct from the address and that direct each of the system receivers to one of the at least first and second alert codes within the message. An ID locator element is included in the radio receiver for monitoring, after determining from the address that the message is intended for reception by the radio receiver, the message to determine whether an ID associated with the radio receiver is equivalent to one of the at least first and second recipient IDs. When the ID associated with the radio receiver is equivalent to one of the at least first and second recipient IDs, the ID locator element determines a location of the one of the at least first and second recipient. IDs within the message. An alert code locator element coupled to the ID locator element utilizes the location of the one of the at least first and second recipient IDs to look up a location associated with one of the at least first and second alert codes provided in the message, and a sound locator element coupled to the alert code locator element utilizes the one of the at least first and second alert codes to look up alert information associated therewith.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is an electrical block diagram of a communication system in accordance with the present invention.

FIG. **2** is a signal diagram of a message transmitted by a terminal included within the communication system of FIG. **1** to a radio receiver included within the communication system of FIG. **1** in accordance with the present invention.

FIG. **3** is an electrical block diagram of the terminal included within the communication system of FIG. **1** in accordance with the present invention.

FIG. **4** is a flowchart of the operation of a processing unit included within the terminal of FIG. **3** in accordance with the present invention.

FIG. **5** is an electrical block diagram of the radio receiver included within the communication system of FIG. **1** in accordance with the present invention.

FIG. **6** is a flowchart of the operation of a controller included within the radio receiver of FIG. **5** in accordance with the present invention.

FIG. **7** is a flowchart illustrating the operation of an identification locator element included within the radio receiver of FIG. **5** in accordance with the present invention.

FIG. **8** is a flowchart depicting the operation of an alert code locator element included within the radio receiver of FIG. **5** in accordance with the present invention.

FIG. **9** is a flowchart of the operation of a sound locator element included within the radio receiver of FIG. **5** in accordance with the present invention.

DESCRIPTION OF A PREFERRED EMBODIMENT

FIG. **1** is an electrical block diagram of a communication system **100** comprising a terminal **105** for transmitting messages to a plurality of radio receivers **110**, such as portable pagers or transceivers, over the air. The messages

received by the radio receivers **110** preferably include message information for display to the user in addition to alert codes from which a receiver **110** can determine which of several predetermined alerts should be generated to announce reception of the message.

According to the present invention, the radio receivers **110** receive common messages about events, such as sports events, on the same paging address. By way of example, when the radio receivers **110** are to receive information about baseball or football, each radio receiver **110** is associated with a particular sports team by means of a stored recipient identification (ID) indicative of that team. A radio receiver **110** preferably receives a sports message and scans the message to determine whether or not its "team ID" is included in that message to indicate that the message is of interest to the user. It will be appreciated that, when the communication system **100** provides information messages of other types, the receiver **110** would scan a received message to locate another type of unit ID. In sports-specific situations, when the team ID associated with the radio receiver **110** is included in the message, the radio receiver **110** proceeds to locate an alert code included within the message to determine which of the predetermined alerts is to be generated. When, for instance, the message information indicates that the sports team associated with the receiver **110** has scored a run or a touchdown, an alert code within the message can prompt the receiver **110** to generate a "cheer" or "yea" noise to inform the user of a favorable occurrence. As mentioned, the same message is provided to all of the receivers **110**. When the same message is received by a receiver **110** associated with the opposing team, a different alert code within the message can result in the generation of a "boo", "sigh", or other unfavorable noise by that receiver **110**.

In this manner, a common message can be sent to different groups of receivers **110**, and each group can conveniently extract different sets of data from the common message based upon a subaddress, e.g., the recipient IDs. Additionally, the common message can include common data that is intended for reception by all of the different groups of receivers **110**. Therefore, a single transmitted message can conveniently include common data for reception by all of the receivers **110** and at least two different sets of data, each intended for reception by a different receiver group. Conventionally, in order to provide different information to two different paging groups, two different messages, each sent with a unique paging address, are transmitted over the air. As a result, in a conventional sports service context, each group of pagers associated with a different sports team would have a unique address. Messages conventionally transmitted to home team pagers would include the home team address and message information, e.g., alert code, intended therefor, and separate messages transmitted to visitor team pagers would include the visitor team address and the message information intended for reception by the visitor team pagers. According to the present invention, however, only half as many messages are required be transmitted because the receivers **110** for each different group can advantageously determine from the common message which of the information is intended for reception and which is not and can further recover common information intended for all receivers **110**. As a result, paging channels are utilized more efficiently in the communication system **100**.

FIG. **2** illustrates an example of a message that can be transmitted from the terminal **105** to the receivers **110** to update users of the receivers **110** on a particular sporting event, such as baseball. Preferably, the message comprises recipient, or team, IDs **205**, **210** located in predetermined locations within the message to indicate which two baseball teams are currently playing a baseball game that is the subject of the message. The team IDs **205**, **210** can, for example, each consume eight bits of the message. According to the present invention, the team IDs **205**, **210** indicate by their locations which of the two teams is the home team and which of the two teams is the visitor team. In this example, the ID **205** for the visitor team is included first in the message and is followed by the home team ID **210**. The message further comprises a visitor alert code **215** and a home alert code **220**, each located in different predetermined locations. Additionally, the message can include game information **225** to inform the user of the current game status. Such game information **225** can, for example, include details about which team is at bat, the inning of the game, the number of outs for the team at bat, and the score of the game.

In accordance with the present invention, a radio receiver **110** associated with one of the team IDs **205**, **210** can determine, from the location of its ID within the message, whether its team is the home team or the visitor team. Thereafter, the radio receiver **110** can advantageously determine the location of the appropriate alert code within the message such that an alert is generated to indicate whether the latest game event is favorable or unfavorable to the team associated with the receiver **110**.

It will be appreciated that the message of FIG. **2** is depicted for example purposes only and that the placement of the team IDs **205**, **210** and the alert codes **215**, **220** can vary as long as the placement is predetermined and recognizable by the receiver **110**. It will be further appreciated that the number of team IDs and alert codes can vary depending upon the sport with which the radio receiver **110** is associated. If, for example, information about a horse race is to be transmitted to the receivers **110**, the number of team IDs and alert codes would be equal to the number of entries in the race.

Referring next to FIG. **3**, an electrical block diagram of the terminal **105** is depicted. The terminal **105** preferably comprises a data entry device **310**, such as a keyboard, for entering the game information, the alert codes for the different teams, and information about which teams are involved in the sports event. Additionally, at the beginning of a sporting event, the data entry device **310** can be utilized to enter information indicative of which team is the home team and which team is the visitor team. The information provided by the data entry device **310** is received by a central processing unit (CPU) **315** coupled thereto for controlling the operation of the terminal **105**. The CPU **315** stores the information provided by the data entry device **310** in a memory, such as a random access memory (RAM) **320**. The terminal **105** further comprises a database **325** for storing a list of all of the teams and the team IDs associated therewith. The team ID can be, if sufficient space is available within the message, the name of the team. Alternatively, the team ID could be an abbreviated form of the team name or any other information by which the team can be identified.

The terminal **105** also includes an encoder **330** coupled to the CPU **315** for encoding the team IDs, the alert codes, and the game information into a message in a conventional manner. By way of example, the message could be encoded using the POCSAG (Post Office Code Standardization Advisory Group) signalling format or the GSC (Golay Sequential Code) signalling format. The encoded message is provided to a transmitter **335** for transmitting the message as a radio frequency signal.

FIG. **4** is a flowchart illustrating the operation of the terminal CPU **315** in accordance with the present invention.

Preferably, the CPU **315** receives, at step **405**, the information, e.g., the game information, alert codes, and visitor and home team information, from the data entry device **310** and stores, at step **410**, the information in the RAM **320**. Thereafter, the CPU **315** references, at step **415**, the team ID database **325** to determine the team IDs for the visitor and home teams involved in the current event. The team IDs, alert codes, and game information are then, at step **420**, provided to the encoder **330** for encoding into a message having the appropriate signalling format. According to the present invention, the message includes the team IDs and alert codes in the appropriate predetermined locations. By way of example, the CPU **315** can provide the visitor team ID to the encoder **330** as the first eight bits of the message when the first eight bits of the message are the predetermined location for the visitor team ID. When bits nine through sixteen are the predetermined location for the home team ID, the CPU **315** can provide the home team ID to the encoder **330** as the next eight bits of the message. This procedure is preferably also followed for placement of the visitor and home team alert codes in predetermined locations of the message. After the message is encoded, it is provided, at step **425**, to the transmitter **335** for transmission to the receivers **110**.

As described above, the alert codes are entered into the terminal **105** via the data entry device **310**. It will be appreciated, however, that other methods for determining the alert codes to be sent to the home and visitor team receivers **110** could be utilized as well. For instance, the data entry device **310** could simply be used for entering the game information and information by which the teams are identified. A subroutine within the terminal **105** could be followed to determine how the current game information differs from previous game information and then whether the latest event in the game is favorable or unfavorable for each of the teams. If, for example, the current game information indicates that the home team has scored a run since reception of the previous game information, the terminal **105** could reference a database (not shown) to determine which alert code should be provided in that instance for the home team and which alert code should be provided for the visitor team. In this alternate embodiment of the present invention, each alert code still requires placement in a predetermined location within the message.

Referring next to FIG. **5**, an electrical block diagram of the radio receiver **110** is shown. The radio receiver **110** preferably includes an antenna **505** for receiving a radio frequency signal transmitted by the terminal **105** (FIG. **1**). A receiving circuit **510** coupled to the antenna **505** recovers the message from the radio frequency signal in a manner well known to one of ordinary skill in the art and provides the message to a controller **515**, which controls the operation of the radio receiver **110**. The radio receiver **110** further comprises a memory, such as a RAM **520**, for storing the message and a location memory **525** for storing parameters including the predetermined locations within each message for the visitor team ID, home team ID, visitor alert code, and home alert code. An alert database **530** preferably stores a listing of alert codes that can be received in the messages transmitted by the terminal **105** and a listing of alert information corresponding thereto.

The radio receiver **110** further comprises an alert mechanism **535** for generating an alert based upon the alert information stored in the alert database **530** and a display **540** for displaying the game information included in the message to the user. A memory, such as a read only memory (ROM) **545**, stores firmware elements used in processing a received message. According to the present invention, such firmware elements include an ID locator element **550** for monitoring the message to find a team ID associated with the receiver **110** and determining the location thereof within the message. An alert code locator element **555** utilizes the team ID location to locate the appropriate alert code in the message, and a sound locator element **560** looks up the alert code in the alert database **530** to find alert information used in generating an alert to be heard by the user.

The alert information can be, for example, an alert pattern used to drive the alert mechanism **535** when the alert mechanism **535** comprises a transducer. Alternatively, the alert information can comprise location information indicating where a recorded sound is located in a sound memory **570**. This recorded sound can be used to drive the alert mechanism **535** when the alert mechanism **535** comprises a speaker. In some embodiments of the present invention, both a transducer and a speaker could be included to provide for the generation of a large variety of sounds and recorded messages. For instance, the recorded sounds could include messages such as "way to go!" or "oops". In embodiments that include recorded sounds, it is envisioned that such sounds could be customized by the user to provide for greater personalization of alerts.

According to the present invention, the radio receiver **110** can advantageously determine which of several alert codes within a message is an alert code intended for use by that receiver **110**. Therefore, different receivers **110** can receive an identical message and select different alert codes from the identical message to generate different sounds. Air space is more efficiently utilized, as a result, because the terminal **105** can send out the same message for transmission to receivers **110** associated with both the home team and the visitor team. In prior art communication systems, on the other hand, different messages must be transmitted to each receiver **110** according to the alert code to be provided thereto. As a result, a different message would have to be provided to the home team receivers **110** than that provided to the visitor team receivers **110**, and twice as many messages would have to be transmitted over the air, thereby clogging the airwaves.

FIG. **6** is a flowchart depicting the operation of the radio receiver controller **515** (FIG. **5**) in accordance with the present invention. At steps **605**, **610**, the controller **515** receives the message from the receiving circuit **510** and stores the message in the RAM **520**. Thereafter, the controller **515** provides, at step **615**, the message to the ID locator element **550**. When, at step **620**, the team ID associated with the receiver **110** is included within the message, the location of the ID is provided by the ID locator element **550** to the controller **515**, at step **625**. Next, at step **630**, the ID location is provided to the alert code locator element **555**, which determines which of the alert codes included in the message is the alert code to be used by the receiver **110**. When, at step **635**, the controller **515** receives the alert code from the alert code locator element **555**, the alert code is provided, at step **640**, to the sound locator element **560** for looking up alert information associated with the alert code. The alert information is received, at step **645**, by the controller **515**.

As mentioned above, the alert information can comprise an alert pattern or a location of a recorded sound, depending upon the type of alert mechanism **535** (FIG. **5**), e.g., transducer or speaker, utilized by the receiver **110**. At step **650**, when the alert mechanism **535** is a transducer, the controller **515** utilizes, at step **655**, the alert pattern provided by the sound locator element **560** to drive the transducer. When, at

step **650**, the alert mechanism **535** is a speaker, the controller **515** drives the speaker with the recorded sound located by the sound locator element **560**, at step **660**. Additionally, at step **665**, the controller **515** provides the game information to the display **540** for presentation to the user.

FIG. **7** is a flowchart of the operation of the ID locator element **550** (FIG. **5**) in accordance with the present invention. At step **705**, the ID locator element **550** receives the message from the controller **515**. Thereafter, the message is monitored, at step **710**, to determine whether the team ID associated with the receiver **110** is included in the message. When the team ID is found, the location of the team ID is determined, at step **715**. Next, the ID location is provided, at step **720**, to the controller **515**. This location can be, for example, indicated by the numbers of the message bits, e.g., bits nine through sixteen, in which the team ID is included.

FIG. **8** is a flowchart of the operation of the alert code locator element **555** (FIG. **5**). According to the present invention, the alert code locator element **555** receives, at step **730**, the ID location from the controller **515**. The alert code locator element **555** compares, at step **735**, the received location to team ID locations stored in the location memory **525** to determine whether the team ID location is indicative of the home team or the visitor team. By way of example, the location memory **525** can indicate that bits nine through sixteen store the ID for the home team, in which situation the alert code locator element **555** can determine that the team associated with the receiver is currently the home team if the ID location specifies bits nine through sixteen of the message as including the team ID.

When, at step **740**, the receiver **110** is associated with the home team, the location for the home team alert code is looked up, at step **745**, in the location memory **525**. For example, the home team alert code location could be specified as bits twenty-one through twenty-four of the message. When the receiver **110** is associated with the visitor team, the location for the visitor team alert code is determined, at step **750**. Thereafter, the location indicated in the location memory **525** is utilized, at step **755**, to retrieve from the message the alert code having that location in the message. When, for instance, the receiver **110** is currently associated with the home team and the home team alert code location is specified as bits twenty-one through twenty-four, the alert code locator element **555** retrieves the information included in those bits of the message to retrieve the appropriate alert code. The alert code selected from the message is provided, at step **760**, to the controller **515**.

Referring next to FIG. **9**, the operation of the sound locator element **560** (FIG. **5**) is depicted. At step **770**, the sound locator element **560** receives the alert code from the controller **515**. The sound locator element **560**, at step **775**, looks up the alert code in the alert database **530** to find the corresponding alert information. As described above, the alert information can be, for example, an alert pattern for driving a transducer or a location in which a recorded sound is stored. Next, at step **780**, the sound locator element **560** provides the alert information to the controller **515**.

It will be appreciated that, although the messages transmitted within the communication system **100** have been primarily described as sports messages concerning sports events, other types of messages can be transmitted as well. By way of example, the radio receiver **110** can be affiliated with a geographic area, rather than a sports team, and the unit IDs provided within the message can be associated with different geographic areas. In such a system, the messages can further include traffic information or other information pertinent to the areas along with alert codes that are content-specific for different unit IDs included within the message. To reiterate, other embodiments of the present invention are envisioned in which the messages transmitted to the radio receivers **110** include unit IDs specific to a group of receivers **110**, alert codes intended for use by the different groups as specified by the unit IDs, and message information, the content of which is determinative of the alert codes provided within the messages.

In summary, the communication system as described above includes a terminal for transmitting identifications (IDs) for both home and visitor teams in predetermined locations within a message. Additionally, the terminal transmits an alert code for use by receivers associated with the home team and an alert code for use by receivers associated with the visitor team, each in a predetermined location. A receiver included in the communication system receives the message and, when one of the recipient IDs is equivalent to a team ID associated with the receiver, determines the location of the recipient ID in the message. This location is, in accordance with the present invention, utilized by the receiver to look up a location in which one of the alert codes is located.

In this manner, the receiver can advantageously choose the correct alert code for generating an alert from two or more transmitted alert codes included in the same message. As a result, the same message can be provided to receivers associated with opposing teams, and the receivers can, after selection of the appropriate alert code, generate different alerts indicating to the user whether his team has performed favorably or unfavorably. Therefore, the airwaves are utilized efficiently because, according to the present invention, a single message is provided to inform all users interested in a sports event of updates to the event. In conventional communication systems, on the other hand, receivers are unable to determine from message content which of several alerts should be generated. As a result, in conventional systems, a different message would have to be sent to fans of one team than that sent to fans of the opposing team in order to indicate different alerts for receivers carried by the different fans. Sending two messages would increase not only the time in which messages could be transmitted, but also less efficiently utilize the airwaves over which the messages are transmitted.

It will be appreciated by now that there has been provided a method and apparatus for generating alerts based upon message content.

What is claimed is:

1. A method, in a radio receiver, for generating alerts based upon message content, the method comprising the steps of:

receiving a common message comprising at least first and second recipient identifications (IDs) and at least first and second alert codes, wherein the common message is received by other system receivers having addresses equivalent to an address associated with the radio receiver, and wherein the at least first and second recipient IDs and the at least first and second alert codes are separate and distinct from the address:

determining which of the at least first and second recipient IDs included in the common message is a recipient ID associated with the radio receiver;

selecting one of the at least first and second alert codes indicated by the recipient ID associated with the radio receiver, wherein the one of the at least first and second alert codes selected by the radio receiver can be dif-

ferent from an alert code, included in the at least first and second alert codes, that is selected by others of the other system receivers; and

generating an alert associated with the one of the at least first and second alert codes.

2. The method of claim 1, wherein the at least first and second recipient IDs are located in a first set of predetermined locations within the common message, and wherein the selecting step comprises the steps of:

determining a first predetermined location included within the first set of predetermined locations of the common message in which the recipient ID associated with the radio receiver is located; and

utilizing the first predetermined location to look up a second predetermined location included within a second set of predetermined locations included in the common message, wherein the one of the at least first and second alert codes is located in the second predetermined location.

3. The method of claim 1, further comprising the step of:

utilizing the one of the at least first and second alert codes provided in the common message to locate an alert pattern.

4. The method of claim 3, wherein the generating step comprises the step of:

driving a transducer with the alert pattern to generate the alert.

5. The method of claim 1, further comprising the step of:

utilizing the one of the at least first and second alert codes provided in the common message to locate a recorded sound.

6. The method of claim 5, wherein the generating step comprises the step of:

driving a speaker with the recorded sound to generate the alert.

7. The method of claim 1, wherein the radio receiver and the other system receivers are associated with one of opposing sports teams, the common message includes information about a sports event in which the opposing sports teams are participating, the at least first and second alert codes are associated with positive and negative alerts, and the generating step comprises the step of:

generating the positive alert when the recipient ID associated with the radio receiver indicates that the information included in the common message is favorable to the sports team with which the radio receiver is associated.

8. A method for generating alerts based on message content in a communication system comprising a terminal which transmits messages to system receivers all having a common address with which the messages are associated, the method comprising the steps of:

the terminal transmitting the common address along with a common message to the system receivers that are all associated with the common address, the common message comprising at least first and second recipient identifications (IDs) and at least first and second alert codes, each associated with one of the at least first and second recipient IDs, wherein the at least first and second recipient IDs and the at least first and second alert codes are separate and distinct from the common address;

a first radio receiver included in the system receivers receiving the common message and determining which of the at least first and second recipient IDs is a recipient ID associated with the first radio receiver;

the first radio receiver selecting the first alert code as that indicated by the recipient ID associated with the first radio receiver;

the first radio receiver generating an alert associated with the first alert code provided in the common message:

a second radio receiver included in the system receivers receiving the common message and determining which of the at least first and second recipient IDs is a recipient ID associated with the second radio receiver;

the second radio receiver selecting the second alert code as that indicated by the recipient ID associated with the second radio receiver; and

the second radio receiver generating an alert associated with the second alert code provided in the common message.

9. The method of claim 8, wherein the at least first and second recipient IDs are located in a first set of predetermined locations within the common message, and wherein the selecting step comprises, in the first radio receiver, the steps of:

determining a first predetermined location included within the first set of predetermined locations in which the recipient ID associated with the first radio receiver is located; and

utilizing the first predetermined location to look up a second predetermined location included within a second set of predetermined locations, wherein the the first alert code is located in the second predetermined location.

10. The method of claim 8, wherein the generating step comprises, in the first radio receiver, the steps of:

utilizing the first alert code to locate an alert pattern; and

driving a transducer with the alert pattern to generate the alert.

11. The method of claim 8, wherein the generating step comprises, in the first radio receiver, the steps of:

utilizing the first alert code provided in the common message to locate a recorded sound; and

driving a speaker with the recorded sound to generate the alert.

12. The method of claim 8, wherein the first and second radio receivers are associated, respectively, with first and second teams participating in a sports event, the common message includes information about the sports event, the first and second alert codes are associated, respectively, with positive and negative alerts, and wherein:

in the first radio receiver, the generating step comprises the step of generating the positive alert associated with the first alert code to indicate that the information included in the common message is favorable to the first team associated with the first radio receiver; and

in the second radio receiver, the generating step comprises the step of generating the negative alert associated with the second alert code to indicate that the information included in the common message is not favorable to the second team associated with the second radio receiver.

13. A radio receiver for generating alerts based upon content of received messages, the radio receiver comprising:

a receiving circuit for receiving an address and a message common to all system receivers, the address indicating that the message is intended for reception by the system receivers, the message comprising at least first and second alert codes that are separate and distinct from the address and that are each indicative of an alert pattern, the message further comprising at least first

and second recipient identifications (IDs) that are separate and distinct from the address and that direct each of the system receivers to one of the at least first and second alert codes within the message;

an ID locator element coupled to the receiving circuit for monitoring, after determining from the address that the message is intended for reception by the radio receiver the message to determine whether an ID associated with the radio receiver is equivalent to one of the at least first and second recipient IDs and, when the ID associated with the radio receiver is equivalent to one of the at least first and second recipient IDs, for determining a location of the one of the at least first and second recipient IDs within the message;

an alert code locator element coupled to the ID locator element for utilizing the location of the one of the at least first and second recipient IDs to look up a location associated with one of the at least first and second alert codes provided in the message; and

a sound locator element coupled to the alert code locator element for utilizing the one of the at least first and second alert codes to look up alert information associated therewith.

14. The radio receiver of claim **13**, further comprising:

an alert mechanism for generating an alert based upon the alert information looked up by the sound locator element.

15. The radio receiver of claim **14**, wherein the alert mechanism comprises a transducer and the alert information comprises an alert pattern applied to the transducer to generate the alert.

16. The radio receiver of claim **14**, wherein the alert mechanism comprises a speaker and the alert information comprises location information specifying a location in which a recorded sound is stored, wherein the recorded sound is utilized to drive the speaker to generate the alert.

17. The radio receiver of claim **13**, wherein the radio receiver is associated with a team participating in a sports event, the information common to the system receivers is about the sports event, the one of the at least first and second alert codes selected by the radio receiver is indicative of positive alert information when the information is favorable to the team, and the one of the at least first an second alert codes selected by the radio receiver is indicative of negative alert information when the information is not favorable to the team.

18. A communication system for alerting a user of message content, the communication system comprising:

a terminal for generating and transmitting an address common to all system receivers and a message associated with the address and intended for reception by the system receivers, the message comprising at least first and second alert codes that are separate and distinct from the address and that are each indicative of an alert pattern, the message further comprising at least first and second recipient identifications (IDs) that are separate and distinct from the address and that direct each of the system receivers to one of the at least first and second alert codes within the message;

a radio receiver for receiving the address and the message, for determining from the address that the message is intended for reception by the radio receiver, for determining that the first recipient ID is equivalent to an ID associated with the radio receiver, for selecting one of the at least first and second alert codes based upon a location of the first recipient ID within the message, and for generating an alert associated with the one of the at least first and second alert codes.

19. The communication system of claim **18**, wherein the radio receiver comprises:

a receiving circuit for receiving the address and the message;

a controller coupled to the receiving circuit for determining, from the address, that the message is intended for reception by the radio receiver;

an ID locator element coupled to the receiving circuit for monitoring the message to determine whether the ID associated with the radio receiver is equivalent to the first recipient ID and for determining, when the ID associated with the radio receiver is equivalent to the first recipient ID, the location of the first recipient ID within the message;

an alert code locator element coupled to the ID locator element for utilizing the location of the first recipient ID to look up a location associated with the one of the at least first and second alert codes; and

a sound locator element coupled to the alert code locator element for utilizing the one of the at least first and second alert codes to look up alert information associated therewith, wherein the alert information is utilized by the radio receiver to generate the alert.

20. The communication system of claim **19**, wherein the radio receiver further comprises a transducer, and wherein the alert information comprises an alert pattern applied to the transducer to generated the alert.

21. The communication system of claim **19**, wherein the radio receiver further comprises a speaker, and wherein the alert information comprises a location in which is stored a recorded sound for driving the speaker.

22. The communication system of claim **18**, wherein the terminal further comprises:

a data entry device for providing the terminal with the at least first and second alert codes to be included in the message and information indicative of the at least first and second recipient IDs to be included in the message;

an encoder coupled to the data entry device for encoding the at least first and second recipient IDs and the at least first and second alert codes into the message in locations that are separate and distinct from the address associated with the message; and

a transmitter coupled to the encoder for transmitting the address and the message.

23. The communication system of claim **22**, wherein the terminal further comprises:

a database for storing a plurality of recipient IDs; and

a controller coupled to the database, the data entry device, and the encoder for using the information provided by the data entry device to look up the at least first and second recipient IDs for transmission to the encoder.

24. The communication system of claim **18**, wherein the system receivers are associated with teams participating in a sports event, the message includes information about the sports event, the recipient IDs indicate to the radio receiver whether a team associated therewith is playing in the sports event, and the at least first and second alert codes are indicative, respectively, of a positive alert for presentation when the information is favorable to the team and a negative alert for presentation when the information is not favorable to the team.

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United States Patent [19]

DeLuca

[11] Patent Number: 5,254,986

[45] Date of Patent: Oct. 19, 1993

[54] **NATION-WIDE PAGING WITH LOCAL MODES OF OPERATION**

[75] Inventor: **Michael J. DeLuca**, Boca Raton, Fla.

[73] Assignee: **Motorola, Inc.**, Schaumburg, Ill.

[21] Appl. No.: **646,483**

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Related U.S. Application Data

[63] Continuation of Ser. No. 425,658, Oct. 23, 1989, abandoned.

[51] **Int. Cl.**[5] **H04B 7/00**

[52] **U.S. Cl.** **340/825.44**; 340/311.1; 340/825.47

[58] **Field of Search** 340/825.44, 825.47, 340/825.49, 311.1; 379/57, 59, 63; 455/33, 34

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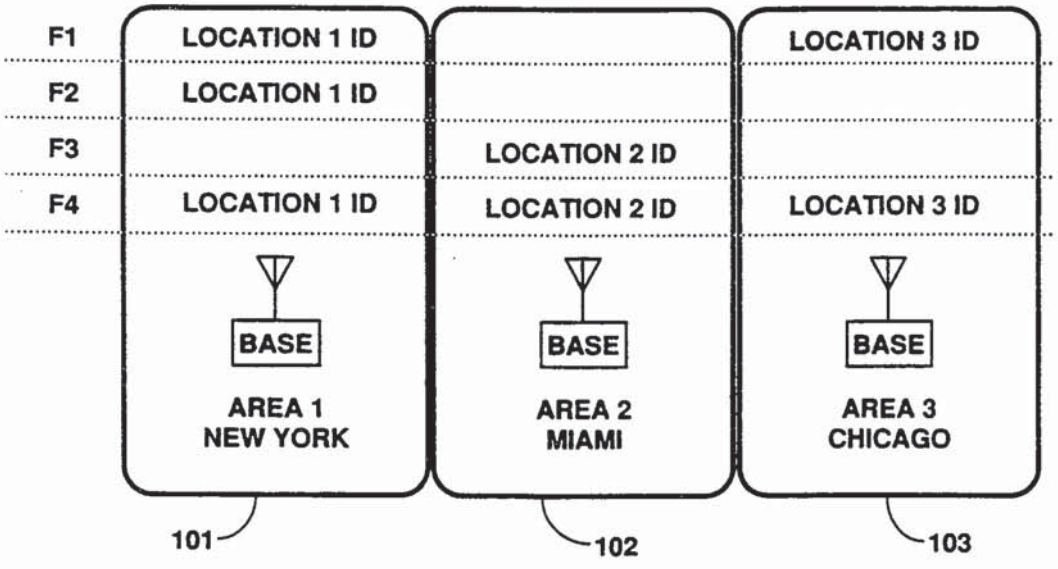
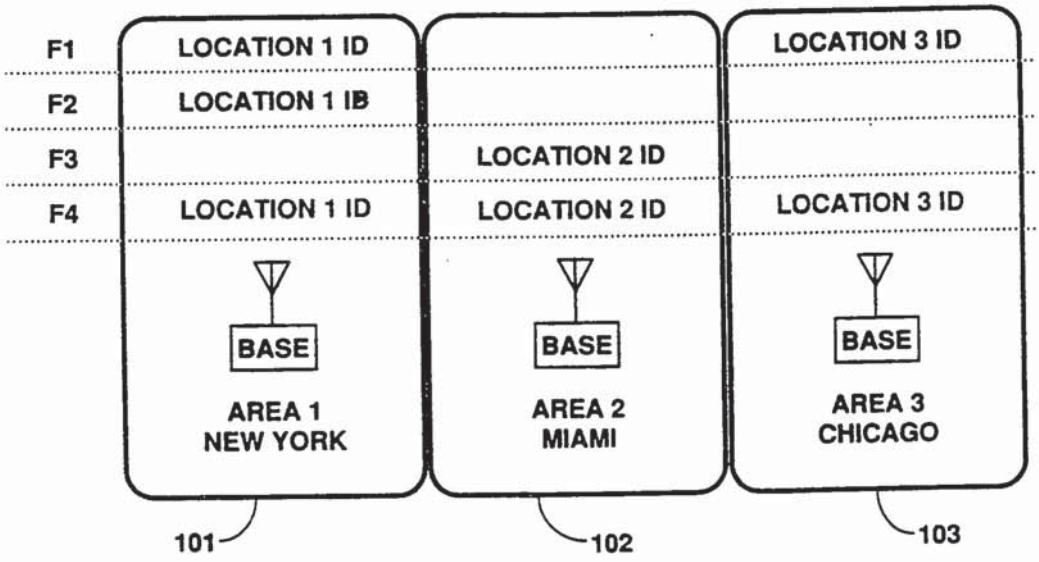
[57] **ABSTRACT**

An improved selective call addressing scheme provides local mode paging capability in a wide area paging network. A selective call receiver used in this system will configure its operating parameters by selecting one of a plurality of operational personalities in response to the presence or absence of a specific received signal having a signal indicative of the area in which the pager is operating.

14 Claims, 4 Drawing Sheets




F1
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LOCATION 1 ID
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BASE
AREA 1
NEW YORK
AREA 2
MIAMI
AREA 3
CHICAGO
101
102
103

FIG. 1

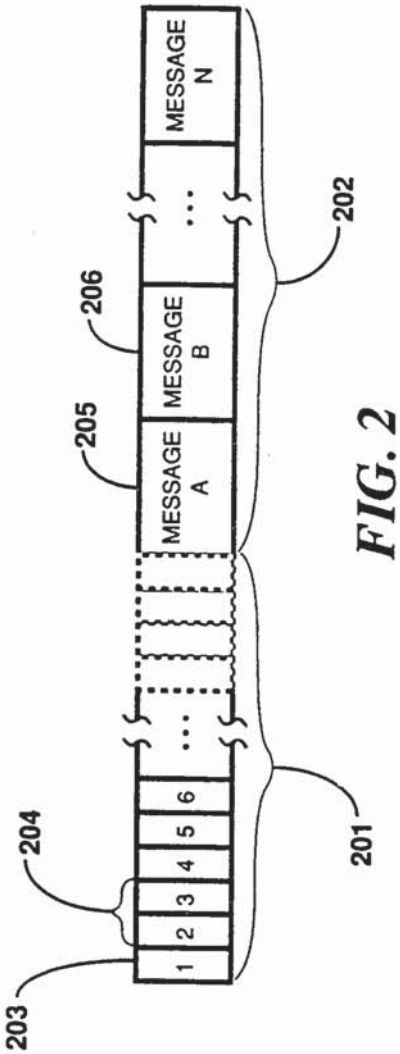
MESSAGE N
MESSAGE B
MESSAGE A
1
2
3
4
5
6
203
204
205
206
201
202

FIG. 2

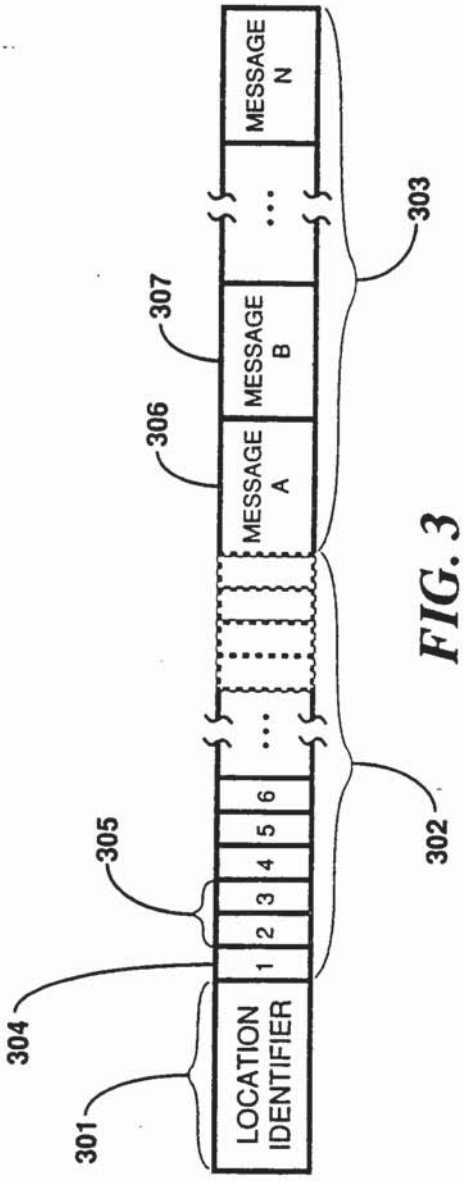
MESSAGE N
MESSAGE B
MESSAGE A
LOCATION IDENTIFIER
1
2
3
4
5
6
301
302
303
304
305
306
307

FIG. 3

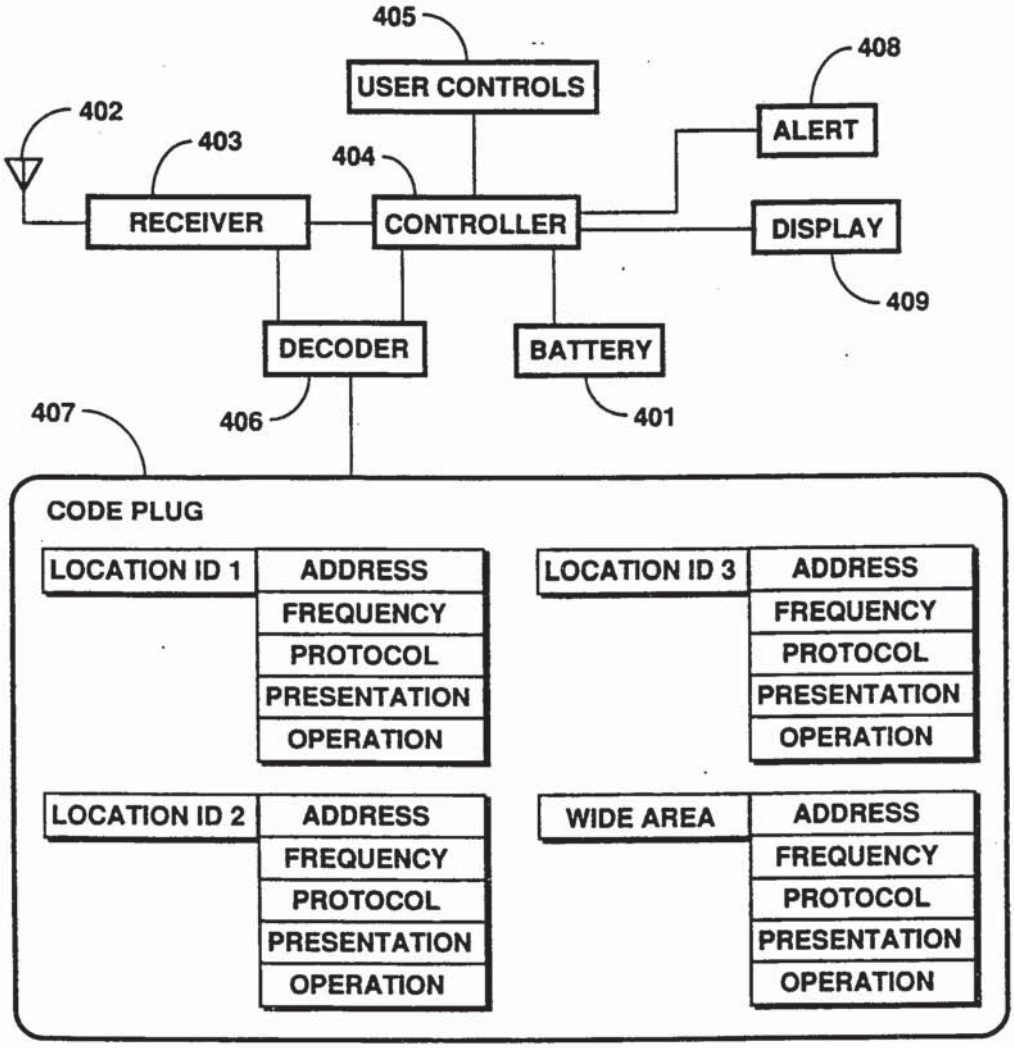
405
USER CONTROLS
408
ALERT
402
403
404
RECEIVER
CONTROLLER
DISPLAY
409
DECODER
BATTERY
407
406
401
CODE PLUG
LOCATION ID 1
ADDRESS
FREQUENCY
PROTOCOL
PRESENTATION
OPERATION
LOCATION ID 3
ADDRESS
FREQUENCY
PROTOCOL
PRESENTATION
OPERATION
LOCATION ID 2
ADDRESS
FREQUENCY
PROTOCOL
PRESENTATION
OPERATION
WIDE AREA
ADDRESS
FREQUENCY
PROTOCOL
PRESENTATION
OPERATION

FIG. 4

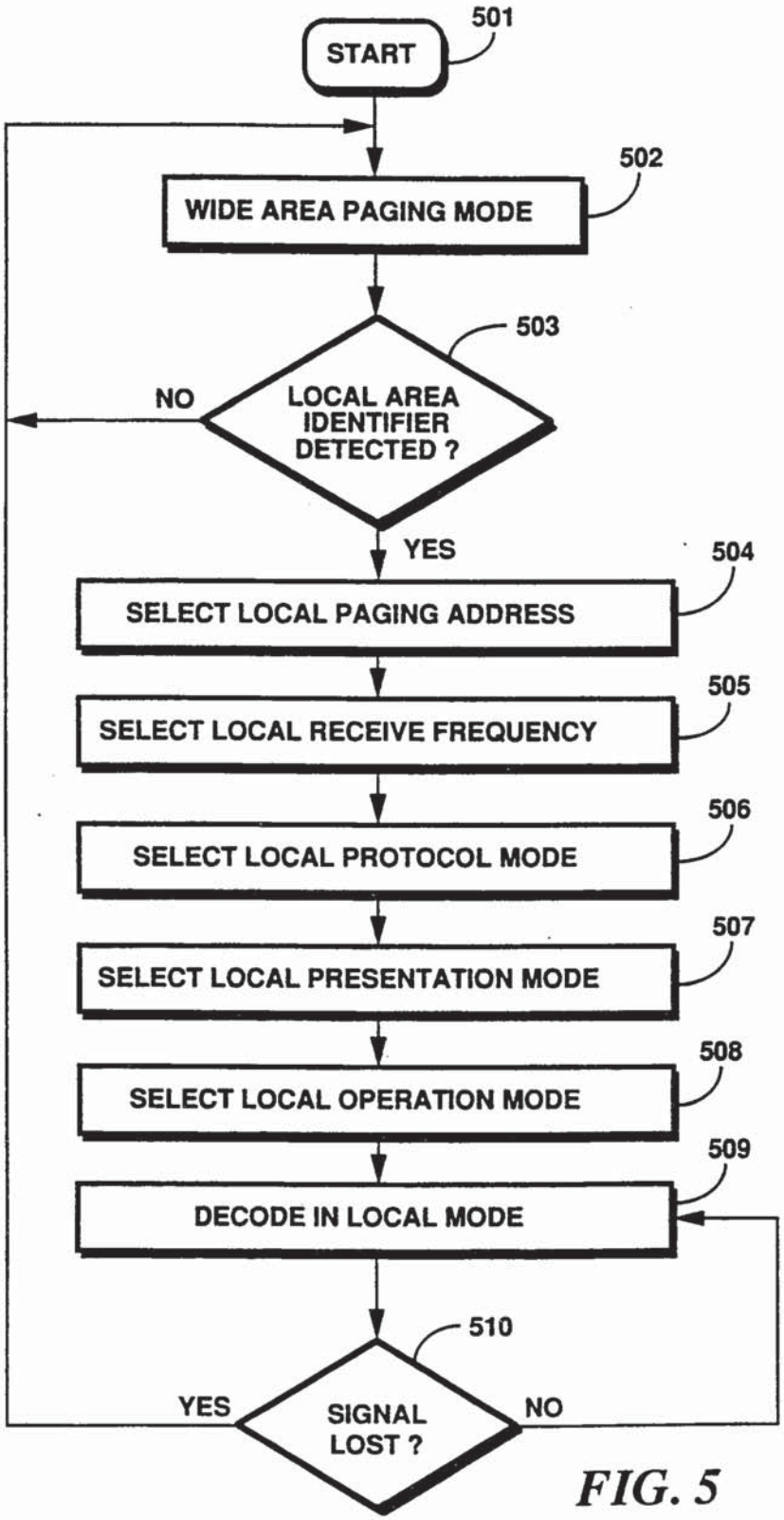
501
START
502
WIDE AREA PAGING MODE
503
LOCAL AREA IDENTIFIER DETECTED ?
NO
YES
504
SELECT LOCAL PAGING ADDRESS
505
SELECT LOCAL RECEIVE FREQUENCY
506
SELECT LOCAL PROTOCOL MODE
507
SELECT LOCAL PRESENTATION MODE
508
SELECT LOCAL OPERATION MODE
509
DECODE IN LOCAL MODE
510
SIGNAL LOST ?
YES
NO

FIG. 5

NATION-WIDE PAGING WITH LOCAL MODES OF OPERATION

This is a continuation of application Ser. No. 07/425,658, filed Oct. 23, 1989, now abandoned.

FIELD OF THE INVENTION

This invention relates in general to radio paging systems and more particularly to a nation-wide paging system with multiple local modes of operation.

BACKGROUND OF THE INVENTION

Paging systems typically use a receiver that has at least one unique selective call address associated therewith. This receiver is commonly referred to as a selective call receiver or pager. When a pager receives and decodes its address, the pager typically alerts the user to the presence of incoming information and operates to present this information. The receiving, decoding, alerting, and presenting sequence as well as other functional aspects associated with the pager are commonly referred to as the pager's personality. A unique operational personality is programmed in the pager by the service provider before delivery, and generally cannot be modified by the user or provider without returning the pager to a service depot.

Wide area paging systems for the transmission and reception of radio frequency information are well known to those skilled in the art. In the United States, wide area paging systems are licensed for operation on radio frequency carriers that are restricted to a maximum effective radiated power output of 200 watts. This power limitation and the radio frequency attenuation associated with the physical characteristics of the surrounding environment, limits the ground path propagation of radio frequency energy. A typical paging signal that is transmitted from a ground based antenna system will effectively cover an average metropolitan area of approximately 400 square miles.

Alternative approaches have been tried to increase the area of coverage for a wide area paging system. One method is the use of multiple distributed transmission sites that simulcast (simultaneously broadcast) the information signal on the same radio frequency carrier. Geographic coverage is improved using this method, but due to a critical shortage of available land-mobile channel assignments in the VHF (very high frequency) band and governmental restrictions, a service provider cannot implement this system on anything other than a in the recently approved 900 MHz nation wide paging services The nation wide paging concept uses a block of channels specifically allocated for nation wide paging services. In this system, the service provider supplies the user with a pager that uses a common receive frequency for the areas in which the person will be travelling. The user's pager will then be able to receive the correct radio frequency carrier and address information, but because of the sheer volume of information associated with a network of this kind, the message may take an hour before broadcast to the user. If the user happens to travel to a location where a different service provider has a paging system on the user's assigned radio frequency carrier, chances are that the user's pager will not function.

The aforementioned scenarios are generally not acceptable to a business user that needs their information as soon as possible. A real time messaging system is required to effectively relay information to a paging subscriber.

Thus, what is needed is an method that provides a selective call receiver with dynamic personality and local address configuration.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide an improved selective call addressing method that enables local mode paging in a nation wide paging network.

In carrying out the above and other objects of the invention in one form, there is provided a method for receiving a signal indicative of a location and operating a selective call receiver in one of a plurality of predetermined personalities which is selected in response to the received signal.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a system infrastructure diagram in accordance with the preferred embodiment.

FIG. 2 is a diagram of prior art wide area selective call signalling format.

FIG. 3 is a diagram of the improved wide area selective call signalling format in accordance with the preferred embodiment.

FIG. 4 is a block diagram of the selective call receiver system in accordance with the preferred embodiment.

FIG. 5 is a flow diagram of the selective call receiver's personality selection algorithm in accordance with the preferred embodiment.

DETAILED DESCRIPTION OF THE INVENTION

In addressing the problem of a nation-wide (wide area) paging system from the service provider's point of view, the most important criteria is the raw throughput available as a function of the system loading (the number of users attempting to access the system at any point in time as compared to the number of messages pending transmission), baud rate (the number of data units transmitted per second), and the efficiency of the addressing scheme. Using a digital selective call addressing scheme such as POCSAG (developed by Great Britain's Post Office Code Advisory Group) or Golay Sequential Code, the number of selective call addresses available in a digitally coded system is limited only by the effective length of the addressing word.

In a nation-wide system, it is desirable for the number of available addresses to be around one billion. This can be represented by a digital address code word that has a minimum of 30 address bits ($2^{30} \approx 1$ billion). When parity is added, a nation-wide address can occupy two 32,21 code words. The notation 32,21 denotes a 32 bit code word comprising 21 information bits and 11 parity bits for error detection and correction. Using conventional techniques, the increase in transmitted address bits to address one billion pagers will cause a nation-wide paging system to "bog down." To improve throughput of a wide area signalling system, a user's selective call receiver (pager) can be registered as a local user in a participating area of a wide area paging system. This gives a user the advantages associated with a local paging system such as low-latency messaging using a single 32,21 code word address. By using the local mode with a single 32,21 code word address, the service provider will effectively double the addressing

throughput and significantly improve the overall system efficiency.

Referring to FIG. 1, the preferred embodiment of a wide area selective call signalling system comprises networked base stations that are accessed via data entry devices (eg. computers, telephones). Each base has its own selective call signalling encoder and transmitter. The transmitters may have more than one frequency (denoted on FIG. 1 by F1, F2, F3, F4) depending on the channel loading in a particular area. As shown in FIG. 1, the New York area 101 uses three frequencies, F1, F2, and F4. If the user requires a pager that will function in all three areas 101, 102, 103, but the user rarely being "primary" (meaning the user is most likely to be in this area) in New York 101 on frequency F4 and Chicago 103 on frequency Fl. Local addresses are assigned to the pager for each registered service area. These assigned addresses need not be unique in different service areas. In this configuration, the user can travel to any of the three areas 101, 102, 103, and receive pages.

When the user travels to New York 101 or Chicago 103, the user's pager will respond to the local area address assigned in the respective areas. This local area address is automatically selected by the user's selective call receiver when the New York 101 or Chicago 103 area location ID is recognized. In Chicago, 103, the pager scans receive frequencies until it receives and decodes the location ID transmitted on frequency F4 (for example) then automatically switches to the predetermined receive frequency Fl and loads the predetermined local area address for Chicago 103. When the pager no longer receives the transmitter signal, the user has left Chicago 103 and the receive frequency automatically reverts to its nation-wide frequency scanning mode. If the user has planned a trip to Miami 102 and would like the pager to be operational in the Miami 102 area, the user would call the service provider and request that the Miami 102 system broadcast messages directed to the user on the pager's nation-wide address. The Miami 102 system would then broadcast messages directed to the user on the pager on all available frequencies using the nation-wide address of the pager. Thus, the pager may receive messages in Miami 102 without causing the system in Miami 102 to "bog down" by sending messages with longer nation-wide addressing on a plurality of frequencies. Note the same messages are transmitted in New York 101 and Chicago 103 on a single frequency with a shorter local address thereby relieving "bog down" in these areas.

Referring to FIG. 2, a selective call signalling format comprises an address field 201 and message field 202. The address field comprises pager addresses of one word 203 and two words 204. In this diagram, the single word pager address 203 and dual word pager address 204 have corresponding information in message A 205 and message B 206, respectively.

Referring to FIG. 3, the preferred embodiment of the improved wide area selective call signalling format comprises a location identifier 301, address field 302, and message field 303. The address field comprises pager addresses of one word 304 and two words 305. In this diagram, the single word pager address 304 and dual word pager address 305 have corresponding information in message A 306 and message B 307, respectively. Interleaving, as used in selective call signalling protocols, is defined as the orderly insertion of a predetermined information word (for example an address or pre-address data word) within a data stream. In the case of a location identifier, it is broadcast in a time window that has minimum and maximum spacings specified between transmissions in order for the pager to properly recognize the location identifier. In the preferred embodiment of the present invention, the improved wide area selective call signalling format transmission is interleaved at a predetermined interval with the selective call signalling format shown in FIG. 2 to provide transmission of the location identifier 301 for reception by active paging receivers. Alternatively, the location identifier 301 may be transmitted in a stand-alone fashion (meaning there is no connection with the actual addressing-messaging data block shown in FIG. 2) while maintaining an acceptable interleave interval for detection by active paging receivers.

Referring to FIG. 4, the block diagram shows the preferred embodiment of a battery 401 powered selective call receiver (pager) which implements the present invention. The transmitted signal is coupled via an antenna 402 to the receiver 403 for recovery of the modulated data. The recovered data is coupled to the controller 404 and decoder 406. The controller 404 manages the operation of the pager's receiver 403, decoder 406, user controls 405, alert 408 presentation means, and display 409 presentation means.

When the pager is activated by the user, the controller 404 commands the decoder 406 to read the default wide area information from the code plug 407. The pager then configures its operational characteristics according to the data read from the code plug 407 associated with the wide area mode. When a signal is decoded by the decoder 406 that contains a valid address for the wide area mode, the decoder notifies the controller to take the appropriate actions to alert the user and present the received information.

In the case where the user is in an area that uses one of the location ID's programmed in the code plug 407, the pager will configure its operational characteristics accordingly and search for the address associated with the active location ID.

Each location ID as well as the wide area default structure has a personality associated with it. These "personalities" are programmed by the service provider and comprise a selective call address, receive frequency, protocol mode, presentation mode, and operation mode. The code plug 407 is shown having 4 personalities. Three of the personalities are dependant upon the pager being in one of three predetermined areas and the fourth personality being dependant on the pager being in an area other than the three predetermined areas. Using the location ID as the determiner, the pager can alter its complete mode of operation when travelling from one area to another. This feature can be very useful if, for example, a user desires a fully functional alphanumeric pager in the area where their home office and local paging service provider has alphanumeric input capability, and a low latency tone-only numeric pager in a rural area where the paging service provider may only have tone-only numeric capability.

Dynamic re-configuration of the pager by selecting different personalities has many advantages. In the previous example, the user had two personalities corresponding to two different areas. The first personality having alphanumeric capability, uses a local address (an address option that lowers the service provider's system overhead), local area frequency F2 (a frequency dedicated for local area addressing), high speed coding (a

protocol mode option for faster information delivery), extended frame data interleaving (a protocol mode option for improved battery life), alphanumeric display (a presentation mode option allowing the display of both numeric and alpha characters), and silent alert capability (an operation mode option enabling a mechanical vibrator when alerted). The second personality having tone-only capability, is set-up as the default wide area personality. The second personality uses a two word wide area address (an address option), wide area frequency Fl (a shared frequency dedicated for wide area addressing and location identification), normal speed coding (a protocol mode option), normal frame data interleaving (a protocol mode option for normal battery life), numeric display (a presentation mode option allowing the display of numeric characters), and audible alert capability (an operation mode option enabling an acoustic transducer when alerted).

The protocol mode selected within a personality functions to control parameters associated with the selective call coding format such as the baud rate (number of information bits per second) and receiver battery saver rate (the on/off strobing of circuitry within the pager to extend battery life).

The presentation mode selected within a personality functions to control parameters associated with the pager's information presentation means. Examples of selections available for information presentation are numeric, alphanumeric, or graphic modes.

The operation mode selected within a personality functions to control parameters associated with the pager's messaging capability and alerting functions. Messaging modes can include tone-only, tone numeric, tone & voice, tone & voice numeric, or alphanumeric to name a few. Alerting modes commonly used include audible tone alert and sensible vibrating alert as well as a selection between various alert tones, patterns, or melodies.

Referring to FIG. **5**, when the pager is activated **501** it loads the default personality that corresponds to the wide area paging mode **502**. When the pager is in the wide area paging mode, it continuously searches each channel (frequency) for received data indicative of a protocol for which the pager receives messages. The data may be in the form of a baud rate or a predetermined synchronization signal. Upon finding such a channel, it searches for its corresponding wide area selective call address and any local area identifier that is broadcast. If a valid local area identifier is detected **503**, the pager then selects the appropriate local parameters that correspond with the detected local area identifier. The selected local area personality is enabled by selecting the local paging address **504**, local receive frequency **505**, local protocol mode **506**, local presentation mode **507**, and local operation mode **508**. When personality configuration is complete, the pager changes from the wide area mode to the local mode **509**. If the signal transmitted from the paging base station is lost **510** for a predetermined period of time, the pager will revert to the wide area paging mode **502**.

I claim:

1. A method of operating a selective call receiver having a non-volatile memory, the method comprising the steps of:

storing a plurality of operational personalities in said non-volatile memory, each of said plurality of operational personalities having one of a plurality of protocol modes associated therewith;

receiving a signal comprising a location identifier identifying a geographic location of the selective call receiver;

automatically selecting one of said plurality of operational personalities in response to said location identifier; and

decoding said signal according to one of said plurality of protocol modes associated with said one of said plurality of operational personalities.

2. The method according to claim **1** wherein said step of storing comprises the step of storing a default personality, the method further comprising the step of:

selecting said default personality when said location identifier does not correspond with any of a plurality of predetermined signals.

3. The method according to claim **1** wherein each of said plurality of operational personalities has one of a plurality of predetermined signals associated therewith and said selecting step comprises the steps of:

comparing said location identifier to each of said plurality of predetermined signals; and

selecting one of said plurality of operational personalities if said location identifier is substantially equivalent to one of said plurality of predetermined signals corresponding to said one of said plurality of operating personalities.

4. The method according to claim **1** wherein said selecting step further comprises the step of selecting a receive frequency in response to said location identifier.

5. The method according to claim **1** wherein said selecting step further comprises the step of selecting a local selective call receiver address in response to said location identifier.

6. The method according to claim **1** wherein said selecting step further comprises the step of selecting a selective call receiver presentation mode in response to said location identifier.

7. The method according to claim **1** wherein said selecting step further comprises the step of selecting a selective call receiver operation mode in response to said location identifier.

8. A selective call receiver comprising:

means for storing a plurality of operational personalities, each of said plurality of operational personalities having one of a plurality of protocol modes associated therewith;

means for receiving a signal comprising a location identifier;

means for automatically selecting one of said plurality of operational personalities in response to said location identifier; and

means for decoding said signal in accordance with one of said plurality of protocol modes associated with said one of said plurality of operational personalities.

9. The selective call receiver according to claim **8** wherein said means for selecting comprises:

means for selecting a default operational personality when said location identifier does not correspond with any of a plurality of predetermined local area identifiers.

10. The selective call receiver according to claim **8** further comprising a receive frequency control means responsive to said selected one of said plurality of operational personalities.

11. The selective call receiver according to claim **9** further comprising programming means for program-

ming a local area selective call receiver address in response to said selected personality.

12. The selective call receiver according to claim 8 further comprising a selective call receiver presentation mode control means responsive to said selected one of said plurality of operational personalities.

13. The selective call receiver according to claim 8 further comprising a selective call receiver operation mode control means responsive to said selected one of said plurality of operational personalities.

14. A multiple area selective call signalling system comprising:

means for broadcasting a first signal comprising a first location identifier in a first area;

means for broadcasting a second signal comprising a second location identifier in a second area; and

at least one selective call receiver comprising:

means for storing a plurality of operational personalities, each of said plurality of operational personalities comprising a corresponding one of a plurality of protocol modes;

means for receiving said first signal in said first area and said second signal in said second area;

means for selecting one of said plurality of operational personalities for said at least one selective call receiver in response to said first location identifier or said second location identifier; and

means for decoding said signal in accordance with one of said plurality of protocol modes corresponding to said one of said plurality of operational personalities.

* * * * *

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United States Patent [19]

DeLuca

[11] Patent Number: 5,254,986

[45] Date of Patent: Oct. 19, 1993

[54] **NATION-WIDE PAGING WITH LOCAL MODES OF OPERATION**

[75] Inventor: **Michael J. DeLuca**, Boca Raton, Fla.

[73] Assignee: **Motorola, Inc.**, Schaumburg, Ill.

[21] Appl. No.: **646,483**

[22] Filed: **Jan. 25, 1991**

Related U.S. Application Data

[63] Continuation of Ser. No. 425,658, Oct. 23, 1989, abandoned.

[51] **Int. Cl.**[5] **H04B 7/00**

[52] **U.S. Cl.** **340/825.44**; 340/311.1; 340/825.47

[58] **Field of Search** 340/825.44, 825.47, 340/825.49, 311.1; 379/57, 59, 63; 455/33, 34

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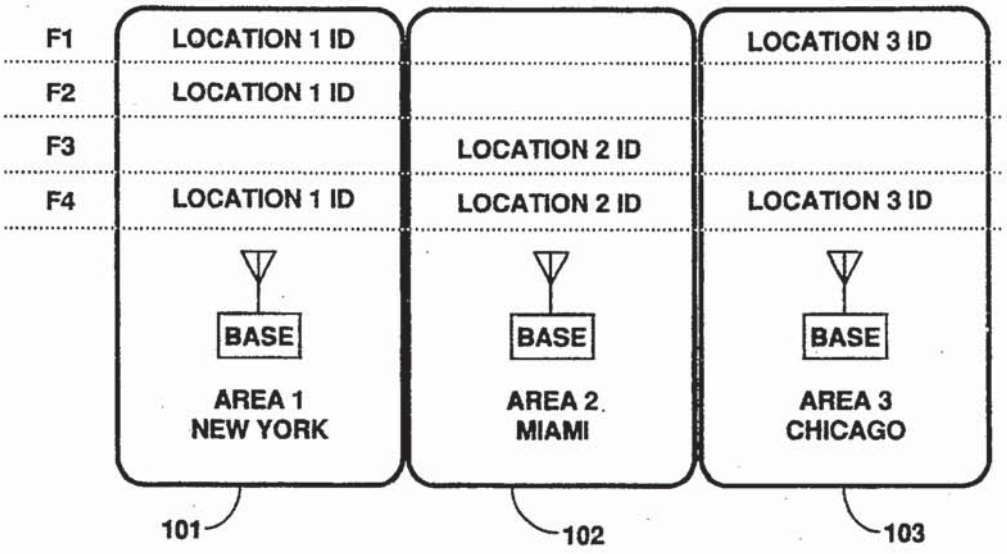
Primary Examiner—Sandra L. O'Shea
Assistant Examiner—Dervis Magistre
Attorney, Agent, or Firm—Daniel R. Collopy; William E. Koch; Thomas G. Berry

[57] **ABSTRACT**

An improved selective call addressing scheme provides local mode paging capability in a wide area paging network. A selective call receiver used in this system will configure its operating parameters by selecting one of a plurality of operational personalities in response to the presence or absence of a specific received signal having a signal indicative of the area in which the pager is operating.

14 Claims, 4 Drawing Sheets



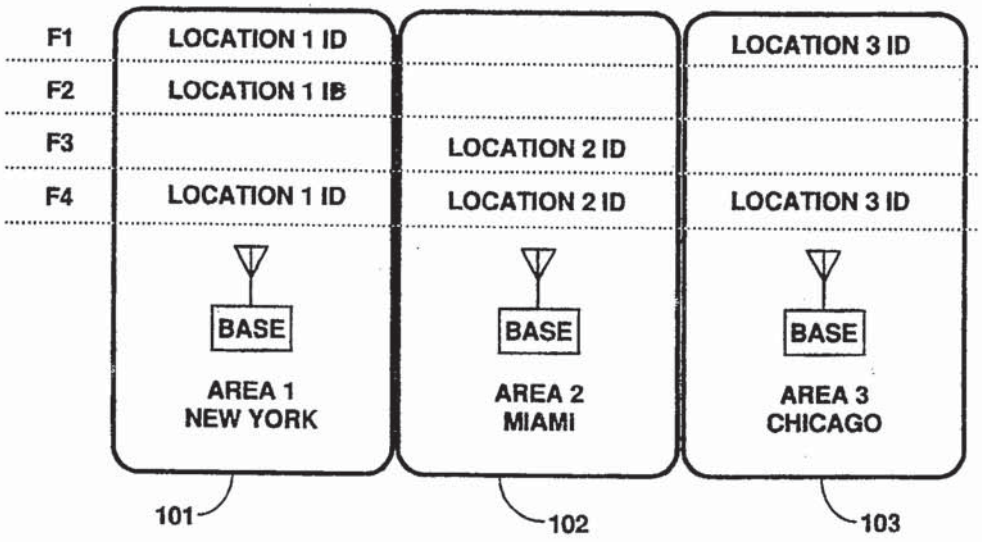

F1
F2
F3
F4
LOCATION 1 ID
LOCATION 1 ID
LOCATION 1 ID
LOCATION 2 ID
LOCATION 2 ID
LOCATION 3 ID
LOCATION 3 ID
BASE
BASE
BASE
AREA 1
NEW YORK
AREA 2
MIAMI
AREA 3
CHICAGO
101
102
103

FIG. 1

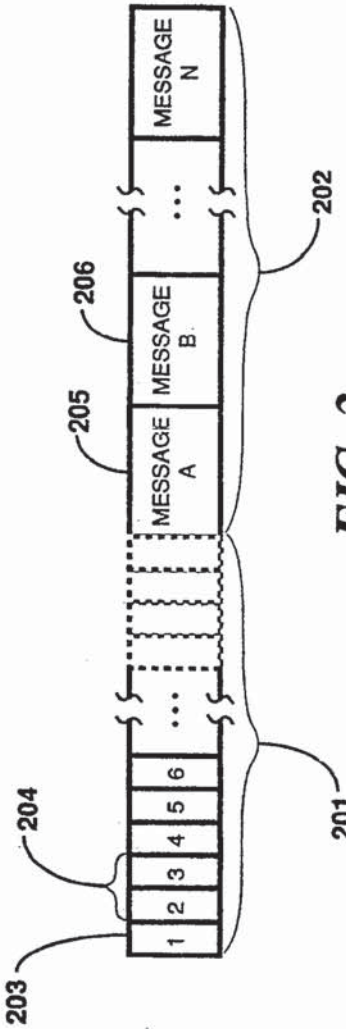

MESSAGE N
MESSAGE B
MESSAGE A
1
2
3
4
5
6
203
204
205
206
201
202

FIG. 2

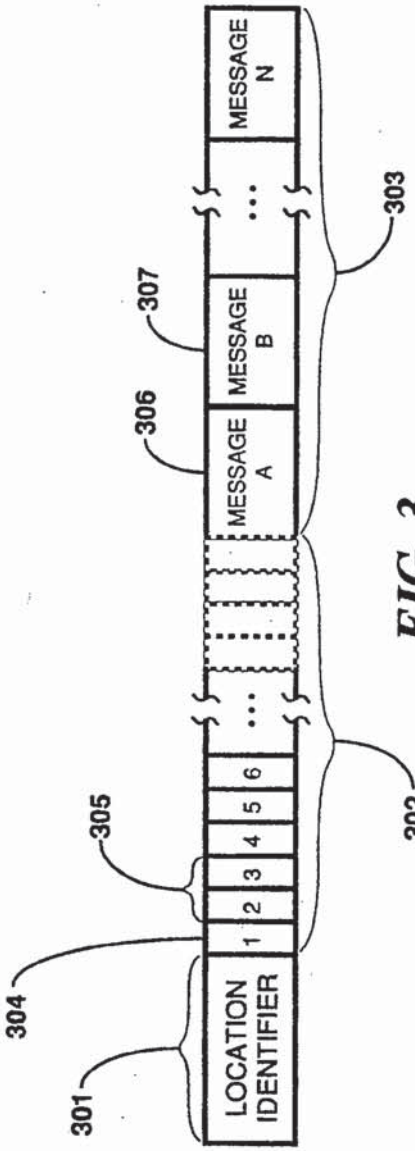

MESSAGE N
MESSAGE B
MESSAGE A
LOCATION IDENTIFIER
1
2
3
4
5
6
301
302
303
304
305
306
307

FIG. 3

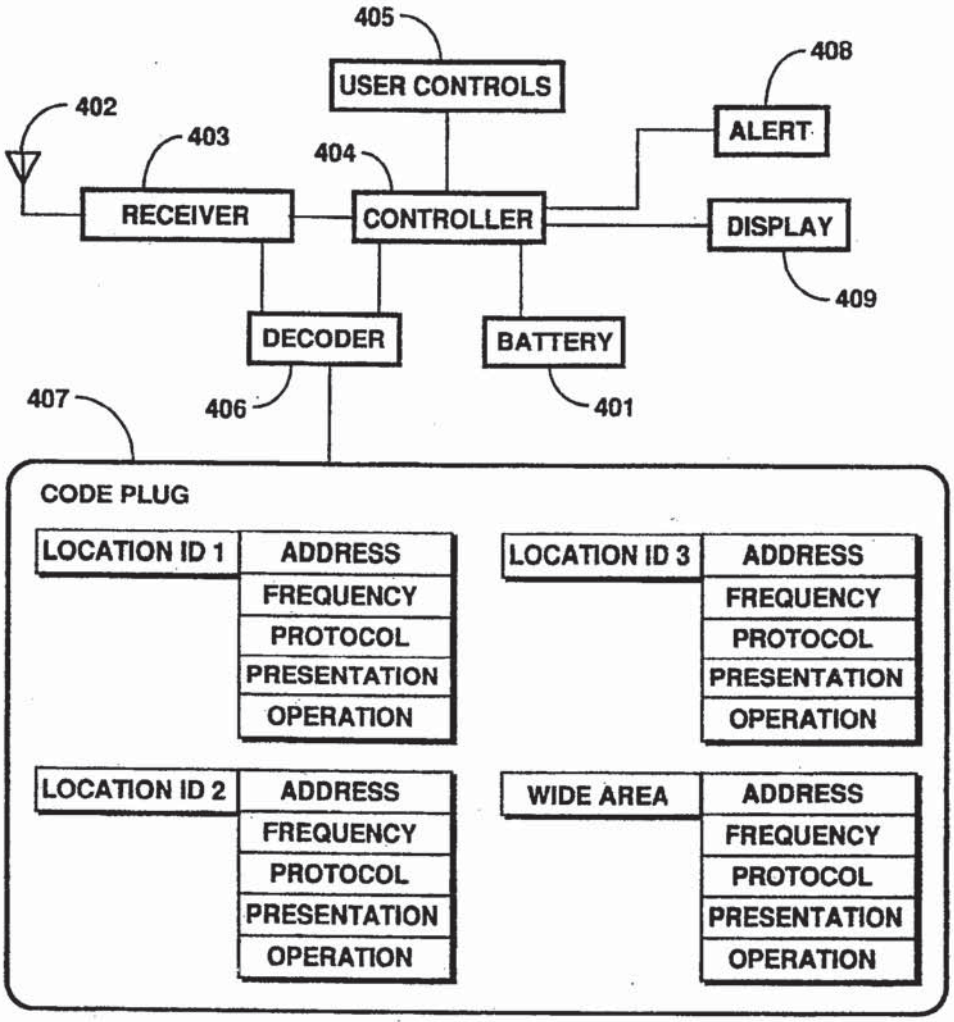

405
USER CONTROLS
408
ALERT
402
403
404
RECEIVER
CONTROLLER
DISPLAY
409
DECODER
BATTERY
407
406
401
CODE PLUG
LOCATION ID 1
ADDRESS
FREQUENCY
PROTOCOL
PRESENTATION
OPERATION
LOCATION ID 3
ADDRESS
FREQUENCY
PROTOCOL
PRESENTATION
OPERATION
LOCATION ID 2
ADDRESS
FREQUENCY
PROTOCOL
PRESENTATION
OPERATION
WIDE AREA
ADDRESS
FREQUENCY
PROTOCOL
PRESENTATION
OPERATION

FIG. 4

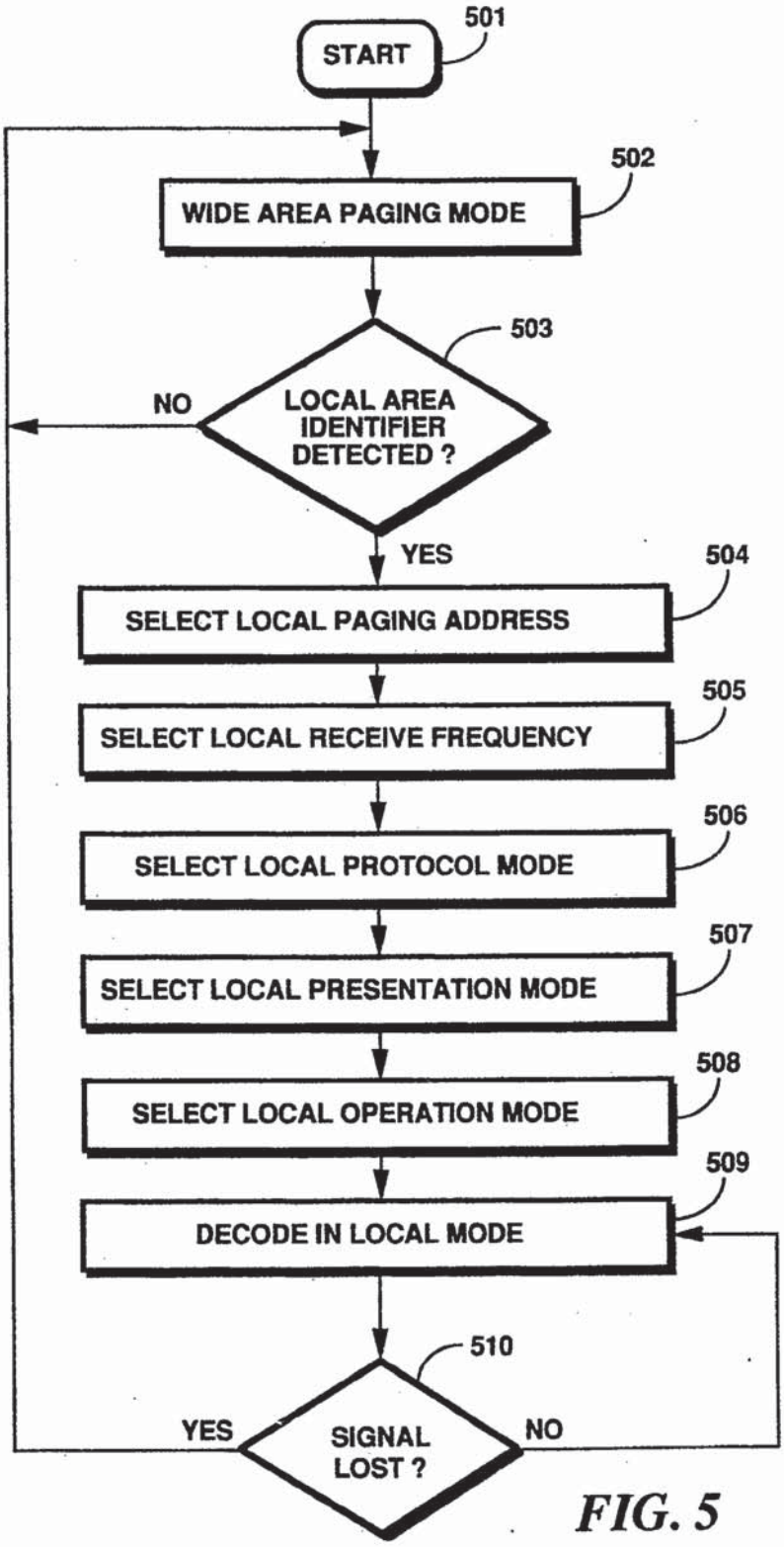

501
START
502
WIDE AREA PAGING MODE
503
LOCAL AREA IDENTIFIER DETECTED ?
NO
YES
504
SELECT LOCAL PAGING ADDRESS
505
SELECT LOCAL RECEIVE FREQUENCY
506
SELECT LOCAL PROTOCOL MODE
507
SELECT LOCAL PRESENTATION MODE
508
SELECT LOCAL OPERATION MODE
509
DECODE IN LOCAL MODE
510
SIGNAL LOST ?
YES
NO

FIG. 5

NATION-WIDE PAGING WITH LOCAL MODES OF OPERATION

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Wide area paging systems for the transmission and reception of radio frequency information are well known to those skilled in the art. In the United States, wide area paging systems are licensed for operation on radio frequency carriers that are restricted to a maximum effective radiated power output of 200 watts. This power limitation and the radio frequency attenuation associated with the physical characteristics of the surrounding environment, limits the ground path propagation of radio frequency energy. A typical paging signal that is transmitted from a ground based antenna system will effectively cover an average metropolitan area of approximately 400 square miles.

Alternative approaches have been tried to increase the area of coverage for a wide area paging system. One method is the use of multiple distributed transmission sites that simulcast (simultaneously broadcast) the information signal on the same radio frequency carrier. Geographic coverage is improved using this method, but due to a critical shortage of available land-mobile channel assignments in the VHF (very high frequency) band and governmental restrictions, a service provider cannot implement this system on anything other than a in the recently approved 900 MHz nation wide paging services The nation wide paging concept uses a block of channels specifically allocated for nation wide paging services. In this system, the service provider supplies the user with a pager that uses a common receive frequency for the areas in which the person will be travelling. The user's pager will then be able to receive the correct radio frequency carrier and address information, but because of the sheer volume of information associated with a network of this kind, the message may take an hour before broadcast to the user. If the user happens to travel to a location where a different service provider has a paging system on the user's assigned radio frequency carrier, chances are that the user's pager will not function.

The aforementioned scenarios are generally not acceptable to a business user that needs their information as soon as possible. A real time messaging system is required to effectively relay information to a paging subscriber.

Thus, what is needed is an method that provides a selective call receiver with dynamic personality and local address configuration.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide an improved selective call addressing method that enables local mode paging in a nation wide paging network.

In carrying out the above and other objects of the invention in one form, there is provided a method for receiving a signal indicative of a location and operating a selective call receiver in one of a plurality of predetermined personalities which is selected in response to the received signal.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a system infrastructure diagram in accordance with the preferred embodiment.

FIG. **2** is a diagram of prior art wide area selective call signalling format.

FIG. **3** is a diagram of the improved wide area selective call signalling format in accordance with the preferred embodiment.

FIG. **4** is a block diagram of the selective call receiver system in accordance with the preferred embodiment.

FIG. **5** is a flow diagram of the selective call receiver's personality selection algorithm in accordance with the preferred embodiment.

DETAILED DESCRIPTION OF THE INVENTION

In addressing the problem of a nation-wide (wide area) paging system from the service provider's point of view, the most important criteria is the raw throughput available as a function of the system loading (the number of users attempting to access the system at any point in time as compared to the number of messages pending transmission), baud rate (the number of data units transmitted per second), and the efficiency of the addressing scheme. Using a digital selective call addressing scheme such as POCSAG (developed by Great Britain's Post Office Code Advisory Group) or Golay Sequential Code, the number of selective call addresses available in a digitally coded system is limited only by the effective length of the addressing word.

In a nation-wide system, it is desirable for the number of available addresses to be around one billion. This can be represented by a digital address code word that has a minimum of 30 address bits ($2^{30} \approx 1$ billion). When parity is added, a nation-wide address can occupy two 32,21 code words. The notation 32,21 denotes a 32 bit code word comprising 21 information bits and 11 parity bits for error detection and correction. Using conventional techniques, the increase in transmitted address bits to address one billion pagers will cause a nation-wide paging system to "bog down." To improve throughput of a wide area signalling system, a user's selective call receiver (pager) can be registered as a local user in a participating area of a wide area paging system. This gives a user the advantages associated with a local paging system such as low-latency messaging using a single 32,21 code word address. By using the local mode with a single 32,21 code word address, the service provider will effectively double the addressing

throughput and significantly improve the overall system efficiency.

Referring to FIG. 1, the preferred embodiment of a wide area selective call signalling system comprises networked base stations that are accessed via data entry devices (eg. computers, telephones). Each base has its own selective call signalling encoder and transmitter. The transmitters may have more than one frequency (denoted on FIG. 1 by F1, F2, F3, F4) depending on the channel loading in a particular area. As shown in FIG. 1, the New York area 101 uses three frequencies, F1, F2, and F4. If the user requires a pager that will function in all three areas 101, 102, 103, but the user rarely being "primary" (meaning the user is most likely to be in this area) in New York 101 on frequency F4 and Chicago 103 on frequency Fl. Local addresses are assigned to the pager for each registered service area. These assigned addresses need not be unique in different service areas. In this configuration, the user can travel to any of the three areas 101, 102, 103, and receive pages.

When the user travels to New York 101 or Chicago 103, the user's pager will respond to the local area address assigned in the respective areas. This local area address is automatically selected by the user's selective call receiver when the New York 101 or Chicago 103 area location ID is recognized. In Chicago, 103, the pager scans receive frequencies until it receives and decodes the location ID transmitted on frequency F4 (for example) then automatically switches to the predetermined receive frequency Fl and loads the predetermined local area address for Chicago 103. When the pager no longer receives the transmitter signal, the user has left Chicago 103 and the receive frequency automatically reverts to its nation-wide frequency scanning mode. If the user has planned a trip to Miami 102 and would like the pager to be operational in the Miami 102 area, the user would call the service provider and request that the Miami 102 system broadcast messages directed to the user on the pager's nation-wide address. The Miami 102 system would then broadcast messages directed to the user on the pager on all available frequencies using the nation-wide address of the pager. Thus, the pager may receive messages in Miami 102 without causing the system in Miami 102 to "bog down" by sending messages with longer nation-wide addressing on a plurality of frequencies. Note the same messages are transmitted in New York 101 and Chicago 103 on a single frequency with a shorter local address thereby relieving "bog down" in these areas.

Referring to FIG. 2, a selective call signalling format comprises an address field 201 and message field 202. The address field comprises pager addresses of one word 203 and two words 204. In this diagram, the single word pager address 203 and dual word pager address 204 have corresponding information in message A 205 and message B 206, respectively.

Referring to FIG. 3, the preferred embodiment of the improved wide area selective call signalling format comprises a location identifier 301, address field 302, and message field 303. The address field comprises pager addresses of one word 304 and two words 305. In this diagram, the single word pager address 304 and dual word pager address 305 have corresponding information in message A 306 and message B 307, respectively. Interleaving, as used in selective call signalling protocols, is defined as the orderly insertion of a predetermined information word (for example an address or pre-address data word) within a data stream. In the case of a location identifier, it is broadcast in a time window that has minimum and maximum spacings specified between transmissions in order for the pager to properly recognize the location identifier. In the preferred embodiment of the present invention, the improved wide area selective call signalling format transmission is interleaved at a predetermined interval with the selective call signalling format shown in FIG. 2 to provide transmission of the location identifier 301 for reception by active paging receivers. Alternatively, the location identifier 301 may be transmitted in a stand-alone fashion (meaning there is no connection with the actual addressing-messaging data block shown in FIG. 2) while maintaining an acceptable interleave interval for detection by active paging receivers.

Referring to FIG. 4, the block diagram shows the preferred embodiment of a battery 401 powered selective call receiver (pager) which implements the present invention. The transmitted signal is coupled via an antenna 402 to the receiver 403 for recovery of the modulated data. The recovered data is coupled to the controller 404 and decoder 406. The controller 404 manages the operation of the pager's receiver 403, decoder 406, user controls 405, alert 408 presentation means, and display 409 presentation means.

When the pager is activated by the user, the controller 404 commands the decoder 406 to read the default wide area information from the code plug 407. The pager then configures its operational characteristics according to the data read from the code plug 407 associated with the wide area mode. When a signal is decoded by the decoder 406 that contains a valid address for the wide area mode, the decoder notifies the controller to take the appropriate actions to alert the user and present the received information.

In the case where the user is in an area that uses one of the location ID's programmed in the code plug 407, the pager will configure its operational characteristics accordingly and search for the address associated with the active location ID.

Each location ID as well as the wide area default structure has a personality associated with it. These "personalities" are programmed by the service provider and comprise a selective call address, receive frequency, protocol mode, presentation mode, and operation mode. The code plug 407 is shown having 4 personalities. Three of the personalities are dependant upon the pager being in one of three predetermined areas and the fourth personality being dependant on the pager being in an area other than the three predetermined areas. Using the location ID as the determiner, the pager can alter its complete mode of operation when travelling from one area to another. This feature can be very useful if, for example, a user desires a fully functional alphanumeric pager in the area where their home office and local paging service provider has alphanumeric input capability, and a low latency tone-only numeric pager in a rural area where the paging service provider may only have tone-only numeric capability.

Dynamic re-configuration of the pager by selecting different personalities has many advantages. In the previous example, the user had two personalities corresponding to two different areas. The first personality having alphanumeric capability, uses a local address (an address option that lowers the service provider's system overhead), local area frequency F2 (a frequency dedicated for local area addressing), high speed coding (a

protocol mode option for faster information delivery), extended frame data interleaving (a protocol mode option for improved battery life), alphanumeric display (a presentation mode option allowing the display of both numeric and alpha characters), and silent alert capability (an operation mode option enabling a mechanical vibrator when alerted). The second personality having tone-only capability, is set-up as the default wide area personality. The second personality uses a two word wide area address (an address option), wide area frequency F1 (a shared frequency dedicated for wide area addressing and location identification), normal speed coding (a protocol mode option), normal frame data interleaving (a protocol mode option for normal battery life), numeric display (a presentation mode option allowing the display of numeric characters), and audible alert capability (an operation mode option enabling an acoustic transducer when alerted).

The protocol mode selected within a personality functions to control parameters associated with the selective call coding format such as the baud rate (number of information bits per second) and receiver battery saver rate (the on/off strobing of circuitry within the pager to extend battery life).

The presentation mode selected within a personality functions to control parameters associated with the pager's information presentation means. Examples of selections available for information presentation are numeric, alphanumeric, or graphic modes.

The operation mode selected within a personality functions to control parameters associated with the pager's messaging capability and alerting functions. Messaging modes can include tone-only, tone numeric, tone & voice, tone & voice numeric, or alphanumeric to name a few. Alerting modes commonly used include audible tone alert and sensible vibrating alert as well as a selection between various alert tones, patterns, or melodies.

Referring to FIG. **5**, when the pager is activated **501** it loads the default personality that corresponds to the wide area paging mode **502**. When the pager is in the wide area paging mode, it continuously searches each channel (frequency) for received data indicative of a protocol for which the pager receives messages. The data may be in the form of a baud rate or a predetermined synchronization signal. Upon finding such a channel, it searches for its corresponding wide area selective call address and any local area identifier that is broadcast. If a valid local area identifier is detected **503**, the pager then selects the appropriate local parameters that correspond with the detected local area identifier. The selected local area personality is enabled by selecting the local paging address **504**, local receive frequency **505**, local protocol mode **506**, local presentation mode **507**, and local operation mode **508**. When personality configuration is complete, the pager changes from the wide area mode to the local mode **509**. If the signal transmitted from the paging base station is lost **510** for a predetermined period of time, the pager will revert to the wide area paging mode **502**.

I claim:

1. A method of operating a selective call receiver having a non-volatile memory, the method comprising the steps of:

storing a plurality of operational personalities in said non-volatile memory, each of said plurality of operational personalities having one of a plurality of protocol modes associated therewith;

receiving a signal comprising a location identifier identifying a geographic location of the selective call receiver;

automatically selecting one of said plurality of operational personalities in response to said location identifier; and

decoding said signal according to one of said plurality of protocol modes associated with said one of said plurality of operational personalities.

2. The method according to claim **1** wherein said step of storing comprises the step of storing a default personality, the method further comprising the step of:

selecting said default personality when said location identifier does not correspond with any of a plurality of predetermined signals.

3. The method according to claim **1** wherein each of said plurality of operational personalities has one of a plurality of predetermined signals associated therewith and said selecting step comprises the steps of:

comparing said location identifier to each of said plurality of predetermined signals; and

selecting one of said plurality of operational personalities if said location identifier is substantially equivalent to one of said plurality of predetermined signals corresponding to said one of said plurality of operating personalities.

4. The method according to claim **1** wherein said selecting step further comprises the step of selecting a receive frequency in response to said location identifier.

5. The method according to claim **1** wherein said selecting step further comprises the step of selecting a local selective call receiver address in response to said location identifier.

6. The method according to claim **1** wherein said selecting step further comprises the step of selecting a selective call receiver presentation mode in response to said location identifier.

7. The method according to claim **1** wherein said selecting step further comprises the step of selecting a selective call receiver operation mode in response to said location identifier.

8. A selective call receiver comprising:

means for storing a plurality of operational personalities, each of said plurality of operational personalities having one of a plurality of protocol modes associated therewith;

means for receiving a signal comprising a location identifier;

means for automatically selecting one of said plurality of operational personalities in response to said location identifier; and

means for decoding said signal in accordance with one of said plurality of protocol modes associated with said one of said plurality of operational personalities.

9. The selective call receiver according to claim **8** wherein said means for selecting comprises:

means for selecting a default operational personality when said location identifier does not correspond with any of a plurality of predetermined local area identifiers.

10. The selective call receiver according to claim **8** further comprising a receive frequency control means responsive to said selected one of said plurality of operational personalities.

11. The selective call receiver according to claim **9** further comprising programming means for program-

ming a local area selective call receiver address in response to said selected personality.

12. The selective call receiver according to claim **8** further comprising a selective call receiver presentation mode control means responsive to said selected one of said plurality of operational personalities.

13. The selective call receiver according to claim **8** further comprising a selective call receiver operation mode control means responsive to said selected one of said plurality of operational personalities.

14. A multiple area selective call signalling system comprising:

means for broadcasting a first signal comprising a first location identifier in a first area;

means for broadcasting a second signal comprising a second location identifier in a second area; and

at least one selective call receiver comprising:

means for storing a plurality of operational personalities, each of said plurality of operational personalities comprising a corresponding one of a plurality of protocol modes;

means for receiving said first signal in said first area and said second signal in said second area;

means for selecting one of said plurality of operational personalities for said at least one selective call receiver in response to said first location identifier or said second location identifier; and

means for decoding said signal in accordance with one of said plurality of protocol modes corresponding to said one of said plurality of operational personalities.

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United States Patent [19]

Buss et al.

[11] Patent Number: 5,539,395

[45] Date of Patent: Jul. 23, 1996

[54] **LOCATION DEPENDENT INFORMATION RECEIVING DEVICE AND METHOD**

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[73] Assignee: **Motorola, Inc.**, Schaumburg, Ill.

[21] Appl. No.: **496,865**

[22] Filed: **Jun. 30, 1995**

Related U.S. Application Data

[63] Continuation of Ser. No. 143,966, Nov. 1, 1993, abandoned.

[51] **Int. Cl.**[6] **H04B 3/38**; H04Q 7/00

[52] **U.S. Cl.** **340/827**; 340/825.440; 340/825.470; 455/38.100

[58] **Field of Search** 340/827, 825.26, 340/825.27, 825.44, 825.47, 311.1, 905, 825.36, 825.49; 370/94.1; 379/57; 455/38.1, 18, 66; 369/7; 381/2

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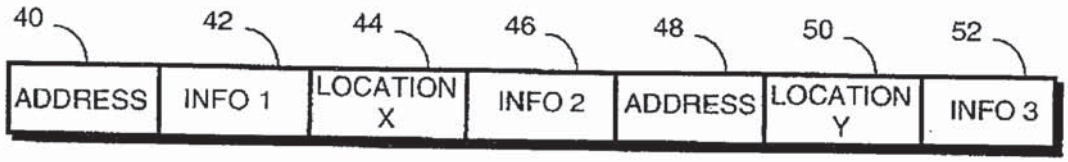
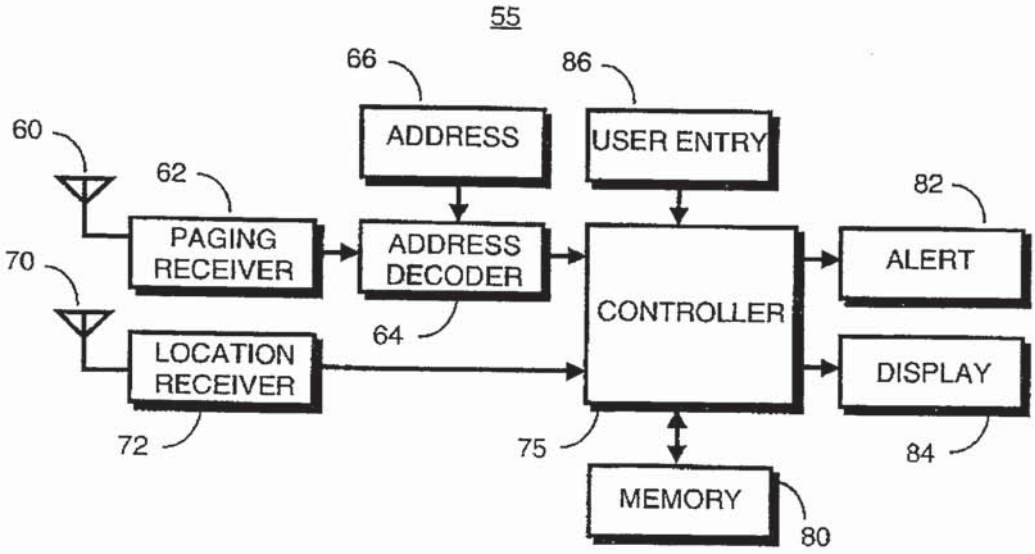
Primary Examiner—Michael Horabik
Assistant Examiner—Edward Merz

[57] **ABSTRACT**

A portable device (**55**) has a first receiver (**62**) for receiving a paging signal (**40–52**) from a paging system (**10**). A second receiver (**72**) receives area identification signals (**20–26**) from a second system. The received paging signals may be stored in a memory (**80**) for later retrieval. A controller (**75**) examines the paging signals (**40–52**) and selects messages having a location signal (**44, 50**) matching a location of the device (**55**). The address of the device (**66**) may also be used to select the messages. Upon selection, an alert is generated by an alert means (**82**) and the message is annunciated on a display (**84**).

19 Claims, 4 Drawing Sheets





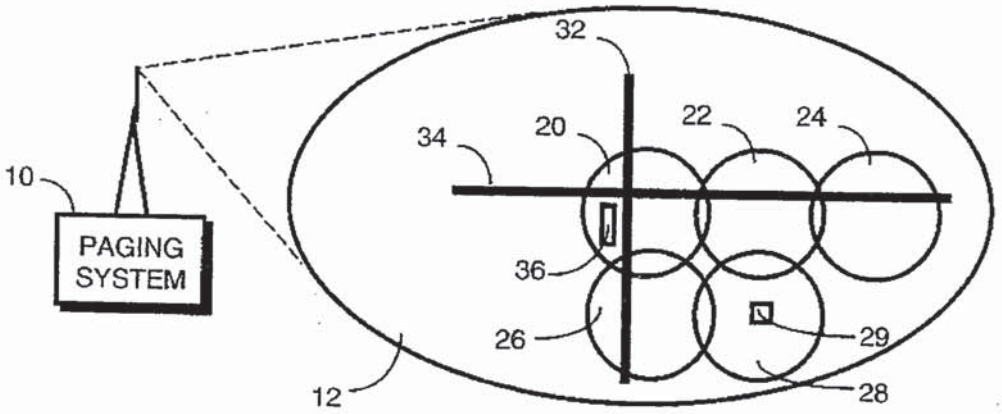


FIG. 1

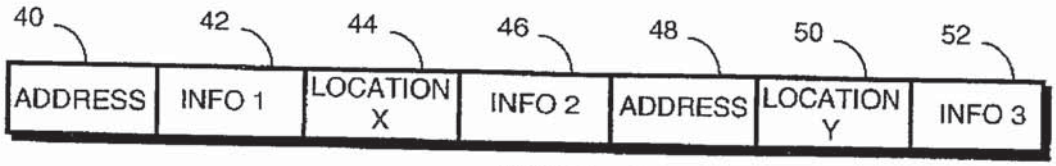


FIG. 2

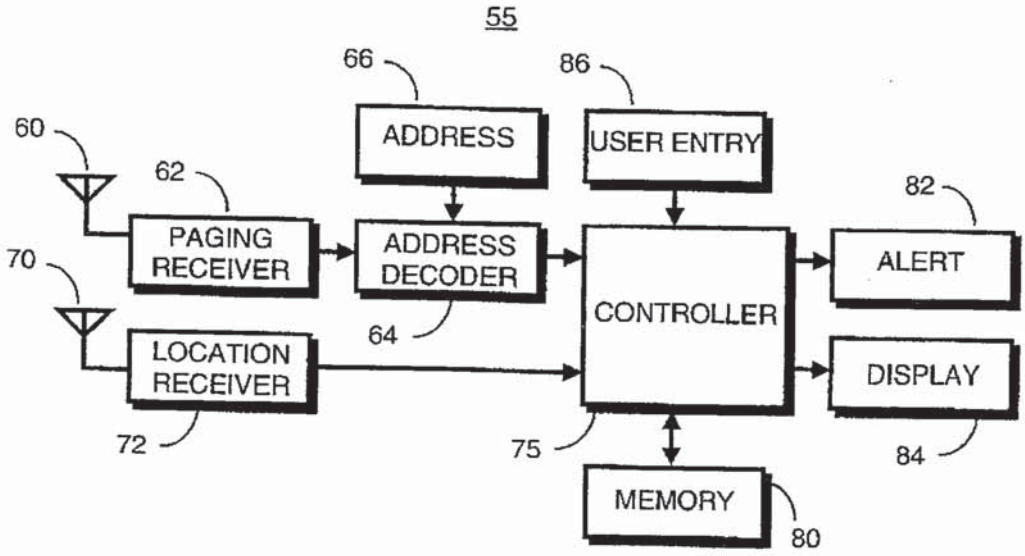


FIG. 3

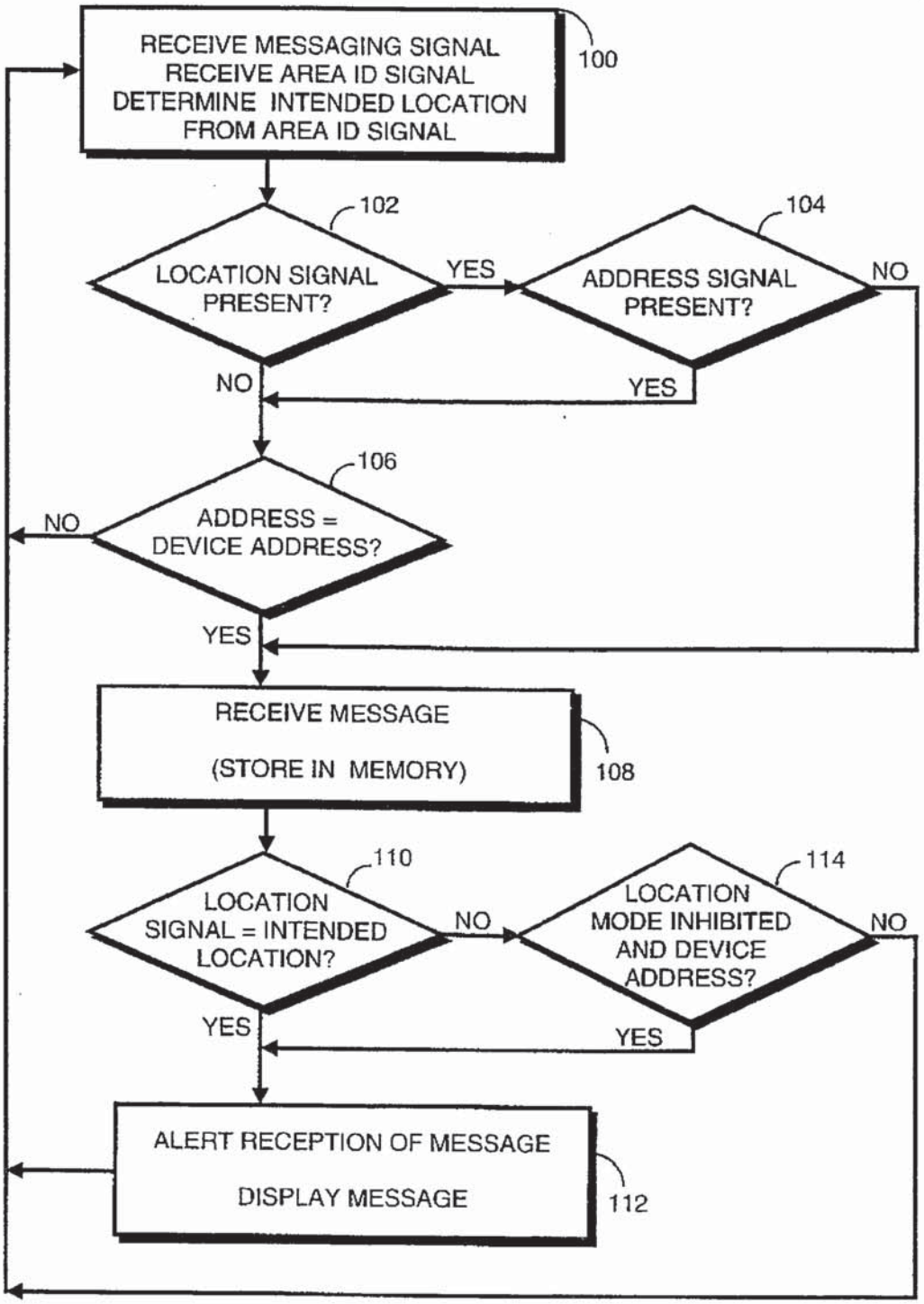

RECEIVE MESSAGING SIGNAL
RECEIVE AREA ID SIGNAL
DETERMINE INTENDED LOCATION
FROM AREA ID SIGNAL
100
102
LOCATION SIGNAL PRESENT?
YES
104
ADDRESS SIGNAL PRESENT?
NO
NO
YES
106
ADDRESS = DEVICE ADDRESS?
NO
YES
RECEIVE MESSAGE
(STORE IN MEMORY)
108
110
LOCATION SIGNAL = INTENDED LOCATION?
NO
114
LOCATION MODE INHIBITED AND DEVICE ADDRESS?
NO
YES
YES
ALERT RECEPTION OF MESSAGE
DISPLAY MESSAGE
112

FIG. 4

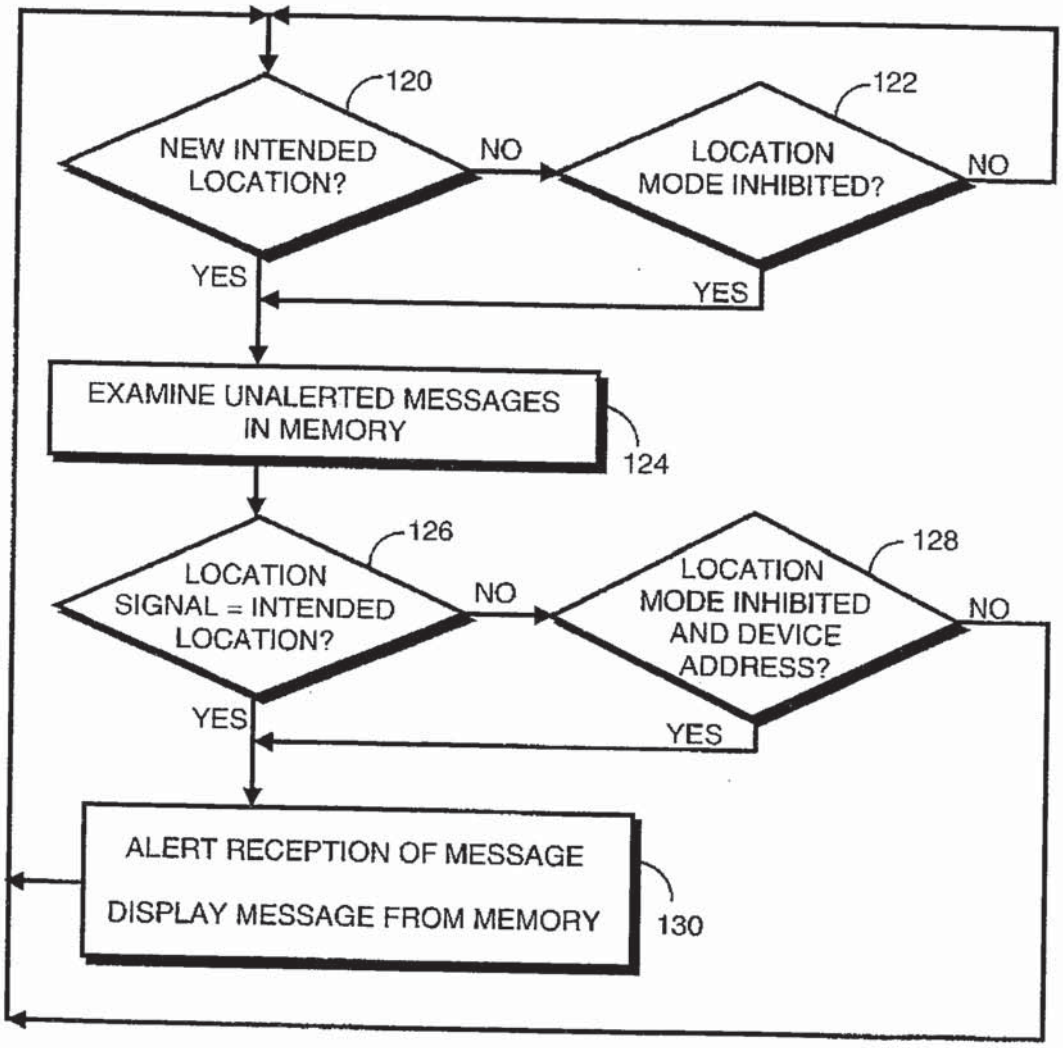

120
NEW INTENDED LOCATION?
NO
122
LOCATION MODE INHIBITED?
NO
YES
YES
EXAMINE UNALERTED MESSAGES IN MEMORY
124
126
LOCATION SIGNAL = INTENDED LOCATION?
NO
128
LOCATION MODE INHIBITED AND DEVICE ADDRESS?
NO
YES
YES
ALERT RECEPTION OF MESSAGE
DISPLAY MESSAGE FROM MEMORY
130

FIG. 5