

**IN THE UNITED STATES DISTRICT COURT  
EASTERN DISTRICT OF TEXAS  
MARSHALL DIVISION**

<b>MOTOROLA, INC.,</b>	§	
	§	
Plaintiff,	§	Civil Action No. 2:08-cv-69(TJW)
	§	
v.	§	
	§	<b>JURY</b>
<b>RESEARCH IN MOTION LIMITED AND RESEARCH IN MOTION CORPORATION,</b>	§	
	§	
	§	
Defendants.	§	
	§	

**FIRST AMENDED COMPLAINT FOR PATENT INFRINGEMENT**

Plaintiff, Motorola, Inc. (“Plaintiff”), for its complaint against defendants Research in Motion Limited and Research in Motion Corporation (collectively “Defendants”), avers as follows:

**JURISDICTION AND VENUE**

1. This is an action for patent infringement arising under the patent laws of the United States, 35 U.S.C. §§ 101 *et seq.* This Court has subject matter jurisdiction over this action under 28 U.S.C. §§ 1331 and 1338(a).
2. Venue is proper in this Judicial District under 28 U.S.C. §§ 1391(b), (c), (d), and 1400(b).
3. Upon information and belief, this Court has personal jurisdiction over Defendants because Defendants regularly conduct business in this district and have committed acts of patent infringement in this district. Defendant, Research in Motion Limited, although required to designate or maintain a resident agent for service of process, has not so designated or maintained a resident agent. The Secretary of State of the State of Texas is an agent for service of process

on defendant Research in Motion Limited, who has engaged in business in the State of Texas. Since said non-resident defendant does not maintain a regular place of business in Texas, has not designated an agent for service of process, and this lawsuit arises out of this non-resident defendant's transaction of business in Texas, service of Summons upon defendant Research in Motion Limited may be made through the Secretary of State.

#### **THE PARTIES**

4. Plaintiff Motorola, Inc., is a corporation organized and existing under the laws of the State of Delaware and having a principal place of business at 1303 East Algonquin Road, Schaumburg, Illinois 60196.

5. Upon information and belief, Defendant Research in Motion Limited is a corporation organized under the laws of Canada and has its principal place of business at 295 Phillip Street, Waterloo, Ontario, Canada N2L 3WB. Upon information and belief, defendant Research in Motion Limited directly or indirectly through its subsidiaries and affiliated companies, distributes, markets, sells and/or offers to sell throughout the United States (including in this Judicial District), and/or imports into the United States consumer products, including wireless communication devices, associated equipment and software.

6. Defendant Research in Motion Corporation is a corporation organized under the laws of the State of Delaware and has its principal place of business at 122 West John Carpenter Parkway, Suite 430, Irving, Texas 75039. Upon information and belief, defendant Research in Motion Corporation directly or indirectly through its subsidiaries and affiliated companies, distributes, markets, sells and/or offers to sell throughout the United States (including in this Judicial District), and/or imports into the United States consumer products, including wireless communication devices, associated equipment and software.

**BACKGROUND**  
**Asserted Patents**

7. United States Patent No. 5,075,684, titled “SELECTIVE CALL MESSAGE MANAGEMENT” (“the ‘684 patent”), was duly and legally issued on December 24, 1991, to Inventor Michael J. DeLuca. Plaintiff is the owner by assignment of all right, title and interest in and to the ‘684 patent, including the right to sue and recover for past infringement thereof. A true and correct copy of the ‘684 patent is attached hereto as Exhibit A.

8. United States Patent No. 5,157,391, titled “APPARATUS AND METHOD FOR DISPLAYING A PLURALITY OF FUNCTION INDICATORS IN A SELECTIVE CALL RECEIVER” (“the ‘391 patent”), was duly and legally issued on October 20, 1992, to Inventor Randi F. Weitzen. Plaintiff is the owner by assignment of all right, title and interest in and to the ‘391 patent, including the right to sue and recover for past infringement thereof. A true and correct copy of the ‘391 patent is attached hereto as Exhibit B.

9. United States Patent No. 5,359,317, titled “METHOD AND APPARATUS FOR SELECTIVELY STORING A PORTION OF A RECEIVED MESSAGE IN A SELECTIVE CALL RECEIVER” (“the ‘317 patent”), was duly and legally issued on October 25, 1994, to Inventors Fernando A. Gomez and Mark T. Stair. Plaintiff is the owner by assignment of all right, title and interest in and to the ‘317 patent, including the right to sue and recover for past infringement thereof. A true and correct copy of the ‘317 patent is attached hereto as Exhibit C.

10. United States Patent No. 5,394,140, titled “METHOD AND APPARATUS FOR PRE-PROGRAMMED CALL-BACK-NUMBER-DETERMINED ALERT” (“the ‘140 patent”), was duly and legally issued on February 28, 1995, to Inventors Poh-T’in Wong, Allen J. Weidler and William J. Burke. Plaintiff is the owner by assignment of all right, title and interest in and to the

'140 patent, including the right to sue for past infringement thereof. A true and correct copy of the '140 patent is attached hereto as Exhibit D.

11. United States Patent No. 5,612,682, titled "METHOD AND APPARATUS FOR CONTROLLING UTILIZATION OF A PROCESS ADDED TO A PORTABLE COMMUNICATION DEVICE" ("the '682 patent"), was duly and legally issued on March 18, 1997, to Inventors Michael J. DeLuca, George W. Smoot and Douglas R. Kraul. Plaintiff is the owner by assignment of all right, title and interest in and to the '682 patent, including the right to sue for past infringement thereof. A true and correct copy of the '682 patent is attached hereto as Exhibit E.

12. United States Patent No. 5,706,211, titled "MESSAGE COMMUNICATION SYSTEM" ("the '211 patent"), was duly and legally issued on January 6, 1998, to Inventors John D. Beletic, Vick T. Cox and John A. Davis. Plaintiff is the owner by assignment of all right, title and interest in and to the '211 patent, including the right to sue for past infringement thereof. A true and correct copy of the '211 patent is attached hereto as Exhibit F.

13. United States Patent No. 5,764,899, titled "METHOD AND APPARATUS FOR COMMUNICATING AN OPTIMIZED REPLY" ("the '899 patent"), was duly and legally issued on June 9, 1998, to Inventors Gene Eggleston, Mitch Hansen and Anthony Rzany. Plaintiff is the owner by assignment of all right, title and interest in and to the '899 patent, including the right to sue and recover for past infringement thereof. A true and correct copy of the '899 patent is attached hereto as Exhibit G.

14. United States Patent No. 5,771,353, titled "SYSTEM HAVING VIRTUAL SESSION MANAGER USED SESSIONLESS-ORIENTED PROTOCOL TO COMMUNICATE WITH USER DEVICE VIA WIRELESS CHANNEL AND SESSION-ORIENTED PROTOCOL TO COMMUNICATE WITH HOST SERVER" ("the '353 patent"), was duly and legally issued on

June 23, 1998, to Inventors Gene Eggleston and Mitch Hansen. Plaintiff is the owner by assignment of all right, title and interest in and to the '353 patent, including the right to sue and recover for past infringement thereof. A true and correct copy of the '353 patent is attached hereto as Exhibit H.

15. United States Patent No. 5,958,006, titled "METHOD AND APPARATUS FOR COMMUNICATING SUMMARIZED DATA" ("the '006 patent"), was duly and legally issued on September 28, 1999, to Inventors Gene Eggleston, Mitch Hansen and Anthony Rzany. Plaintiff is the owner by all right, title and interest in and to the '006 patent, including the right to sue and recover for past infringement thereof. A true and correct copy of the '006 patent is attached hereto as Exhibit I.

16. United States Patent No. 5,974,447, titled "METHOD AND SYSTEM FOR COUPLING A SELECTIVE CALL RECEIVER TO WIDELY DISTRIBUTED INFORMATION SOURCES" ("the '447 patent"), was duly and legally issued on October 26, 1999, to Inventors Gregory L. Cannon, David P. Kilp and Nick P. Lagen. Plaintiff is the owner by assignment of all right, title and interest in and to the '447 patent, including the right to sue and recover for past infringement thereof. A true and correct copy of the '447 patent is attached hereto as Exhibit J.

17. United States Patent No. 6,101,531, titled "SYSTEM FOR COMMUNICATING USER-SELECTED CRITERIA FILTER PREPARED AT WIRELESS CLIENT TO COMMUNICATION SERVER FOR FILTERING DATA TRANSFERRED FROM HOST TO SAID WIRELESS CLIENT" ("the '531 patent"), was duly and legally issued on August 8, 2000, to Inventors Gene Eggleston and Mitch Hansen. Plaintiff is the owner by assignment of all right, title and interest in and to the '531 patent, including the right to sue and recover for past infringement thereof. A true and correct copy of the '531 patent is attached hereto as Exhibit K.

18. Upon information and belief, Defendants have had knowledge of the '684 patent, the '391 patent, the '317 patent, the '140 patent, the '211 patent, the '899 patent, the '353 patent, the '006 patent, the '447 patent, and the '531 patent since at least January 1, 2008.

**CLAIM ONE**  
**(Infringement of U.S. Patent No. 5,075,684)**

19. Upon information and belief, Defendants have been and still are infringing, contributorily infringing or inducing infringement of at least claim 1 of the '684 patent, pursuant to 35 U.S.C. § 271(a), (b), (c), and/or (g), in this district and elsewhere, by their activities, including making, using, offering to sell, importing, or selling certain wireless communication devices and related equipment, including at least the BlackBerry 8100, 8130, 8300, 8320, 8800, 8820, and/or 8830 device(s).

20. Defendants' infringing activities have caused and will continue to cause Plaintiff irreparable harm for which it has no adequate remedy at law, unless such infringing activities are enjoined by this Court pursuant to 35 U.S.C. § 283.

21. Defendants, with actual knowledge of the '684 patent, with knowledge of their infringement, and without lawful justification, have willfully infringed the '684 patent, entitling Plaintiff to damages and treble damages pursuant to 35 U.S.C. § 284.

**CLAIM TWO**  
**(Infringement of U.S. Patent No. 5,157,391)**

22. Upon information and belief, Defendants have been and still are infringing, contributorily infringing or inducing infringement of at least claims 1, 8 and 9 of the '391 patent, pursuant to 35 U.S.C. § 271(a), (b), (c), and/or (g), in this district and elsewhere, by their activities, including making, using, offering to sell, importing, or selling certain wireless communication devices and related equipment, including at least the BlackBerry 8100, 8130, 8300, 8320, 8800, 8820, and/or 8830 device(s).

23. Defendants' infringing activities have caused and will continue to cause Plaintiff irreparable harm for which it has no adequate remedy at law, unless such infringing activities are enjoined by this Court pursuant to 35 U.S.C. § 283.

24. Defendants, with actual knowledge of the '391 patent, with knowledge of their infringement, and without lawful justification, have willfully infringed the '391 patent, entitling Plaintiff to damages and treble damages pursuant to 35 U.S.C. § 284.

**CLAIM THREE**  
**(Infringement of U.S. Patent No. 5,359,317)**

25. Upon information and belief, Defendants have been and still are infringing, contributorily infringing, or inducing infringement of at least claim 1 of the '317 patent, pursuant to 35 U.S.C. § 271(a), (b), (c), and/or (g), in this district and elsewhere, by their activities, including making, using, offering to sell, importing, or selling certain wireless communication devices and related equipment, including at least the BlackBerry 8100, 8130, 8300, 8320, 8800, 8820, and/or 8830 device(s).

26. Defendants' infringing activities have caused and will continue to cause Plaintiff irreparable harm for which it has no adequate remedy at law, unless such infringing activities are enjoined by this Court pursuant to 35 U.S.C. § 283.

27. Defendants, with actual knowledge of the '317 patent, with knowledge of their infringement, and without lawful justification, have willfully infringed the '317 patent, entitling Plaintiff to damages and treble damages pursuant to 35 U.S.C. § 284.

**CLAIM FOUR**  
**(Infringement of U.S. Patent No. 5,394,140)**

28. Upon information and belief, Defendants have been and still are infringing, contributorily infringing, or inducing infringement of at least claims 1 and 15 of the '140 patent, pursuant to 35 U.S.C. § 271(a), (b), (c), and/or (g), in this district and elsewhere, by their activities, including

making, using, offering to sell, importing, or selling certain wireless communication devices and related equipment, including at least the BlackBerry 8100, 8130, 8300, 8320, 8800, 8820, and/or 8830 device(s).

29. Defendants' infringing activities have caused and will continue to cause Plaintiff irreparable harm for which it has no adequate remedy at law, unless such infringing activities are enjoined by this Court pursuant to 35 U.S.C. § 283.

30. Defendants, with actual knowledge of the '140 patent, with knowledge of their infringement, and without lawful justification, have willfully infringed the '140 patent, entitling Plaintiff to damages and treble damages pursuant to 35 U.S.C. § 284.

**CLAIM FIVE**  
**(Infringement of U.S. Patent No. 5,612,682)**

31. Upon information and belief, Defendants have been and still are infringing, contributorily infringing, or inducing infringement of at least claim 1 of the '682 patent, pursuant to 35 U.S.C. § 271(a), (b), (c), and/or (g), in this district and elsewhere, by their activities, including making, using, offering to sell, importing, or selling certain wireless communication devices and related equipment, including at least the BlackBerry 8100, 8130, 8300, 8320, 8800, 8820, and/or 8830 device(s).

32. Defendants' infringing activities have caused and will continue to cause Plaintiff irreparable harm for which it has no adequate remedy at law, unless such infringing activities are enjoined by this Court pursuant to 35 U.S.C. § 283.

**CLAIM SIX**  
**(Infringement of U.S. Patent No. 5,706,211)**

33. Upon information and belief, Defendants have been and still are infringing, contributorily infringing or inducing infringement of at least claims 1 and 4 of the '211 patent, pursuant to 35 U.S.C. § 271(a), (b), (c), and/or (g), in this district and elsewhere, by their activities, including



making, using, offering to sell, importing, or selling certain wireless communication devices and related equipment, including at least the BlackBerry 8100, 8130, 8300, 8320, 8800, 8820, and/or 8830 device(s); and the BlackBerry Exchange Server software.

34. Defendants' infringing activities have caused and will continue to cause Plaintiff irreparable harm for which it has no adequate remedy at law, unless such infringing activities are enjoined by this Court pursuant to 35 U.S.C. § 283.

35. Defendants, with actual knowledge of the '211 patent, with knowledge of their infringement, and without lawful justification, have willfully infringed the '211 patent, entitling Plaintiff to damages and treble damages pursuant to 35 U.S.C. § 284.

**CLAIM SEVEN**  
**(Infringement of U.S. Patent No. 5,764,899)**

36. Upon information and belief, Defendants have been and still are infringing, contributorily infringing, or inducing infringement of at least claim 1 of the '899 patent, pursuant to 35 U.S.C. § 271(a), (b), (c), and/or (g), in this district and elsewhere, by their activities, including making, using, offering to sell, importing, or selling certain wireless communication devices and related equipment, including at least the BlackBerry 8100, 8130, 8300, 8320, 8800, 8820, and/or 8830 device(s); and the BlackBerry Exchange Server software.

37. Defendants' infringing activities have caused and will continue to cause Plaintiff irreparable harm for which it has no adequate remedy at law, unless such infringing activities are enjoined by this Court pursuant to 35 U.S.C. § 283.

38. Defendants, with actual knowledge of the '899 patent, with knowledge of their infringement, and without lawful justification, have willfully infringed the '899 patent, entitling Plaintiff to damages and treble damages pursuant to 35 U.S.C. § 284.

**CLAIM EIGHT**  
**(Infringement of U.S. Patent No. 5,771,353)**

39. Upon information and belief, Defendants have been and still are infringing, contributorily infringing, or inducing infringement of at least claim 9 of the '353 patent, pursuant to 35 U.S.C. § 271(a), (b), (c), and/or (g), in this district and elsewhere, by their activities, including making, using, offering to sell, importing, or selling certain wireless communication devices and related equipment, including at least the BlackBerry 8100, 8130, 8300, 8320, 8800, 8820, and/or 8830 device(s); and the BlackBerry Exchange Server software.

40. Defendants' infringing activities have caused and will continue to cause Plaintiff irreparable harm for which they have no adequate remedy at law, unless such infringing activities are enjoined by this Court pursuant to 35 U.S.C. § 283.

41. Defendants, with actual knowledge of the '353 patent, with knowledge of their infringement, and without lawful justification, have willfully infringed the '353 patent, entitling Plaintiff to damages and treble damages pursuant to 35 U.S.C. § 284.

**CLAIM NINE**  
**(Infringement of U.S. Patent No. 5,958,006)**

42. Upon information and belief, Defendants have been and still are infringing, contributorily infringing, or inducing infringement of at least claims 24, 26 and 27 of the '006 patent, pursuant to 35 U.S.C. § 271(a), (b), (c), and/or (g), in this district and elsewhere, by their activities, including making, using, offering to sell, importing, or selling certain wireless communication devices and related equipment, including at least the BlackBerry 8100, 8130, 8300, 8320, 8800, 8820, and/or 8830 device(s); and the BlackBerry Exchange Server software.

43. Defendants' infringing activities have caused and will continue to cause Plaintiff irreparable harm for which they have no adequate remedy at law, unless such infringing activities are enjoined by this Court pursuant to 35 U.S.C. § 283.

44. Defendants, with actual knowledge of the '006 patent, with knowledge of their infringement, and without lawful justification, have willfully infringed the '006 patent, entitling Plaintiff to damages and treble damages pursuant to 35 U.S.C. § 284.

**CLAIM TEN**  
**(Infringement of U.S. Patent No. 5,974,447)**

45. Upon information and belief, Defendants have been and still are infringing, contributorily infringing, or inducing infringement of at least claim 8 of the '447 patent, pursuant to 35 U.S.C. § 271(a), (b), (c), and/or (g), in this district and elsewhere, by their activities, including making, using, offering to sell, importing, or selling certain wireless communication devices and related equipment, including at least the BlackBerry 8100, 8130, 8300, 8320, 8800, 8820, and/or 8830 device(s); and the BlackBerry Exchange Server software.

46. Defendants' infringing activities have caused and will continue to cause Plaintiff irreparable harm for which they have no adequate remedy at law, unless such infringing activities are enjoined by this Court pursuant to 35 U.S.C. § 283.

47. Defendants, with actual knowledge of the '447 patent, with knowledge of their infringement, and without lawful justification, have willfully infringed the '447 patent, entitling Plaintiff to damages and treble damages pursuant to 35 U.S.C. § 284.

**CLAIM ELEVEN**  
**(Infringement of U.S. Patent No. 6,101,531)**

48. Upon information and belief, Defendants have been and still are infringing, contributorily infringing, or inducing infringement of at least claim 1 of the '531 patent, pursuant to 35 U.S.C. § 271(a), (b), (c), and/or (g), in this district and elsewhere, by their activities, including making, using, offering to sell, importing, or selling certain wireless communication devices and related equipment, including at least the BlackBerry 8100, 8130, 8300, 8320, 8800, 8820, and/or 8830 device(s); and the BlackBerry Exchange Server software.

49. Defendants' infringing activities have caused and will continue to cause Plaintiff irreparable harm for which they have no adequate remedy at law, unless such infringing activities are enjoined by this Court pursuant to 35 U.S.C. § 283.

50. Defendants, with actual knowledge of the '531 patent, with knowledge of their infringement, and without lawful justification, have willfully infringed the '531 patent, entitling Plaintiff to damages and treble damages pursuant to 35 U.S.C. § 284.

### **PRAYER FOR RELIEF**

WHEREFORE, Plaintiff prays that the Court enter a judgment:

a. Adjudging that Defendants have infringed at least the asserted claims of the '684 patent, the '391 patent, the '317 patent, the '140 patent, the '682 patent, the '211 patent, the '899 patent, the '353 patent, the '006 patent, the '447 patent, and the '531 patent;

b. Permanently enjoining Defendants and its directors, officers, employees, attorneys, agents, and all persons in active concert or participation with any of the foregoing from further acts of infringement, contributory infringement or inducement of infringement of the asserted patents unless and until licensed under the asserted patents by Plaintiff;

c. Awarding to Plaintiff damages sufficient to compensate Plaintiff for the infringement by Defendants, together with both pre-judgment and post-judgment interest;

d. Trebling the damages awarded for infringement claims one through four and six through eleven, as provided by 35 U.S.C. § 284;

e. Finding this action constitutes an exceptional case under 35 U.S.C. § 285;

f. Awarding to Plaintiff its costs and attorney fees; and

g. Awarding to Plaintiff such other and further relief as this Court deems proper and just.

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By: /s/ John M. Pickett

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Dated: February 20, 2008

**DEMAND FOR TRIAL BY JURY**

Pursuant to Rule 38(b), Fed. R. Civ. P., and the Seventh Amendment to the Constitution of the United States, Plaintiff demands a trial by jury of all claims and all issues triable as of right by jury in this action.

**CERTIFICATE OF SERVICE**

I hereby certify that a copy of the foregoing document was filed electronically in compliance with Local Rule CV-5(a). Pursuant to Fed.R.Civ.P. Rule 5(a) and (b)(2) service of the foregoing document will be made by hand-delivery of same to the Registered Agents of Defendants named herein by a duly authorized process server on or about the 21<sup>st</sup> day of February 2008.

Dated: February 20, 2008

/s/ John M. Pickett  
John M. Pickett

[54] SELECTIVE CALL MESSAGE MANAGEMENT

4,755,816 7/1988 DeLuca ..... 340/825.44  
 4,786,901 11/1988 Matai et al. .... 340/825.44  
 4,851,829 7/1989 DeLuca et al. .... 340/825.44

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

Primary Examiner—Donald J. Yusko  
 Assistant Examiner—Peter S. Weissman  
 Attorney, Agent, or Firm—Daniel R. Collopy; Vincent B. Ingrassia; William E. Koch

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

[21] Appl. No.: 418,055

[22] Filed: Oct. 6, 1989

[57] ABSTRACT

[51] Int. Cl.<sup>5</sup> ..... H04Q 7/00

Messages received by a selective call receiver are stored in source files with a user allocated number of message storage slots in response to a message source signal indicating the source of the message. Messages are retrieved utilizing the source files facilitating message location in large memories. Source files are retrieved on a priority basis which is a function of a predetermined priority associated with each source file and the status of messages stored therein.

[52] U.S. Cl. .... 340/825.44; 340/825.26; 340/825.47

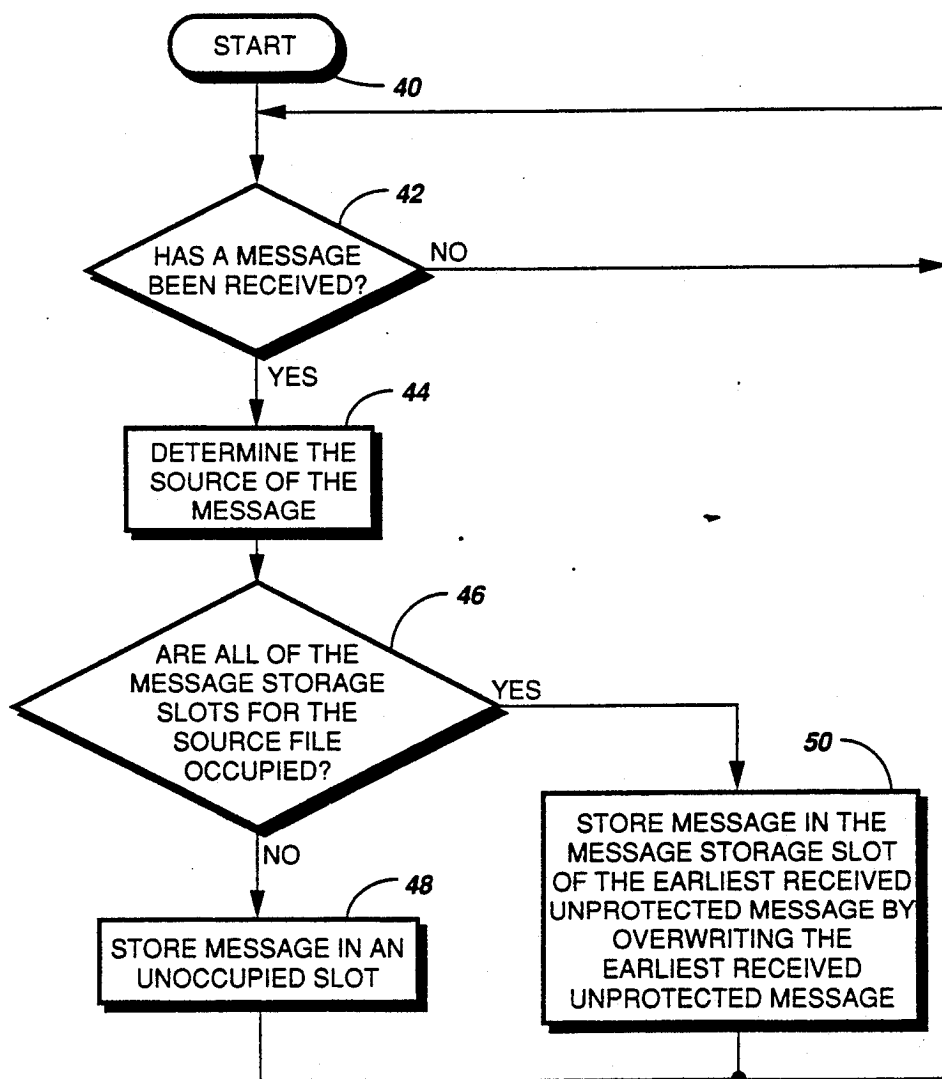
[58] Field of Search ..... 340/825.44, 311.1, 825.27, 340/825.26, 825.47; 369/25, 29; 379/56, 57, 88

[56] References Cited

U.S. PATENT DOCUMENTS

4,438,433 3/1984 Smoot et al. .... 340/825.44  
 4,518,961 5/1985 Davis et al. .... 179/2 EC  
 4,649,538 3/1987 DeLuca et al. .... 371/25  
 4,688,034 8/1987 De Graaf ..... 340/825.27

19 Claims, 5 Drawing Sheets



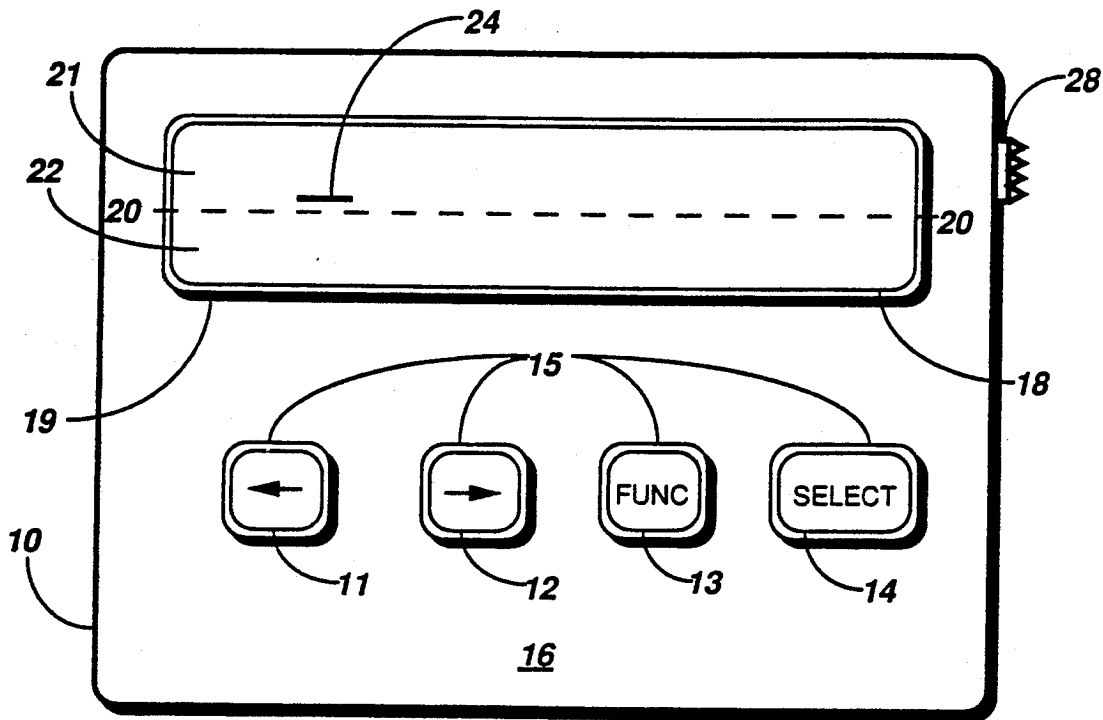


FIG. 1

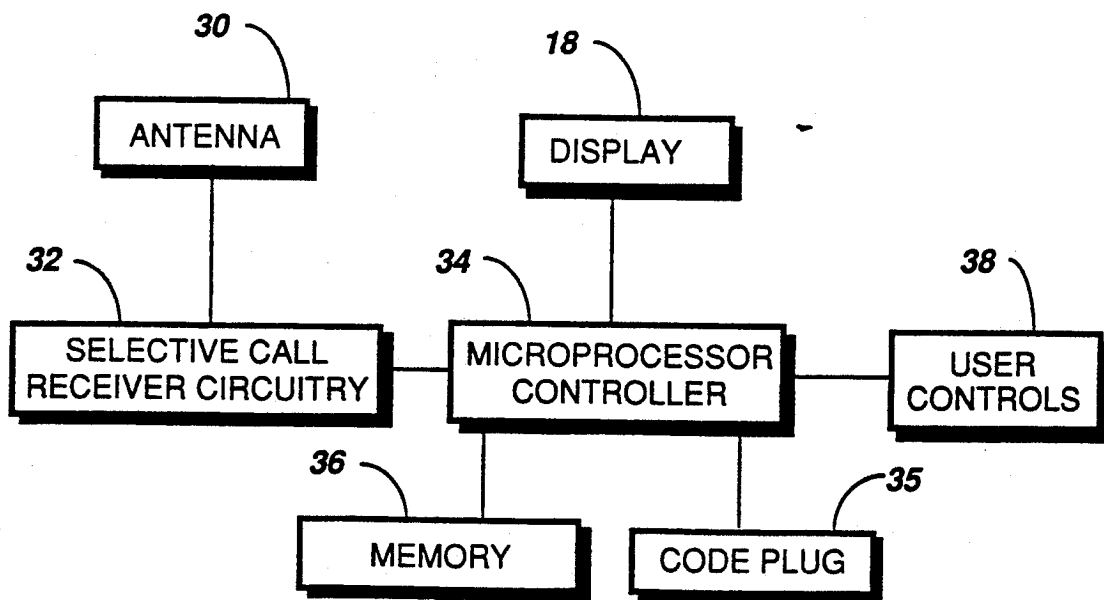


FIG. 2



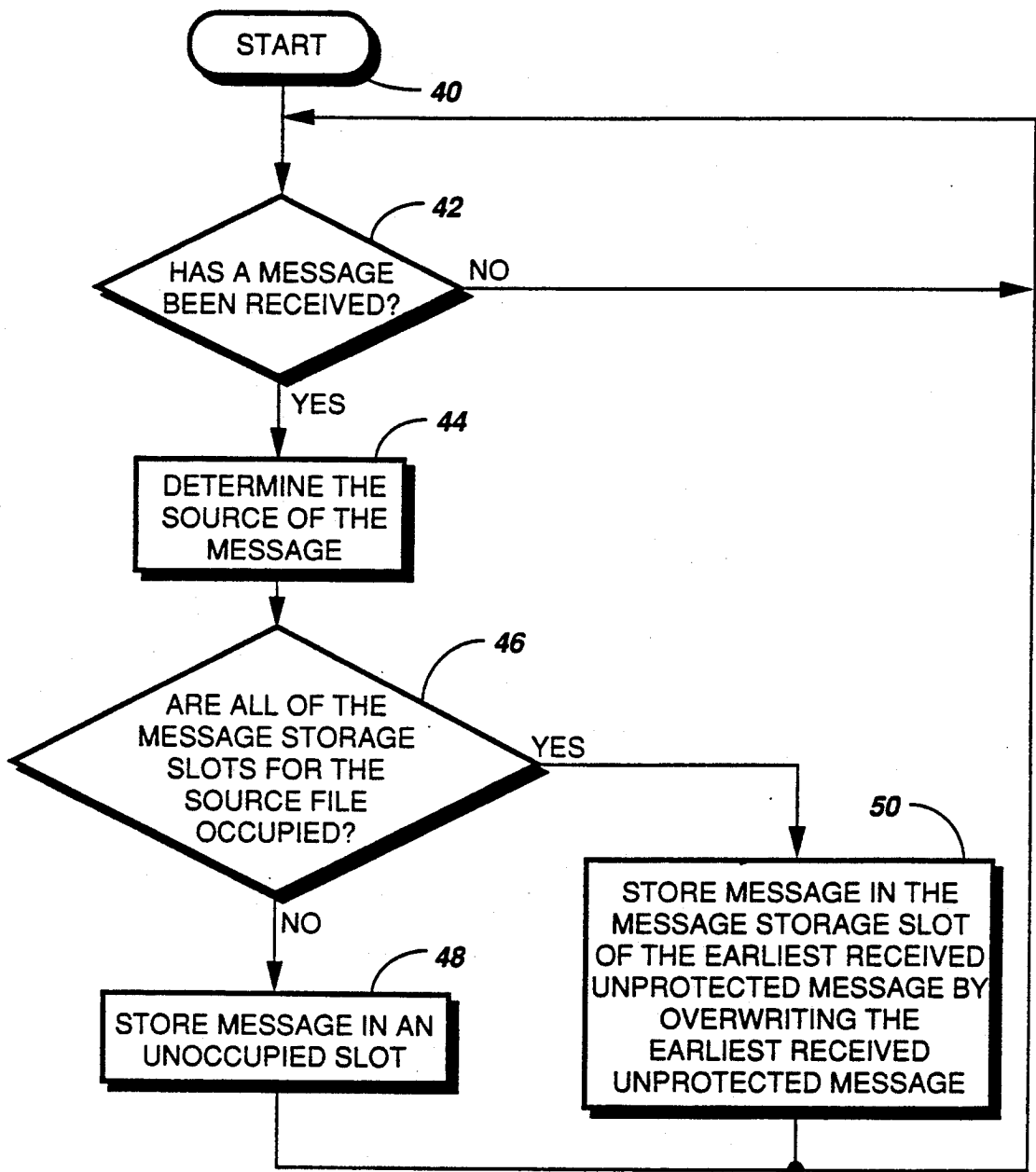
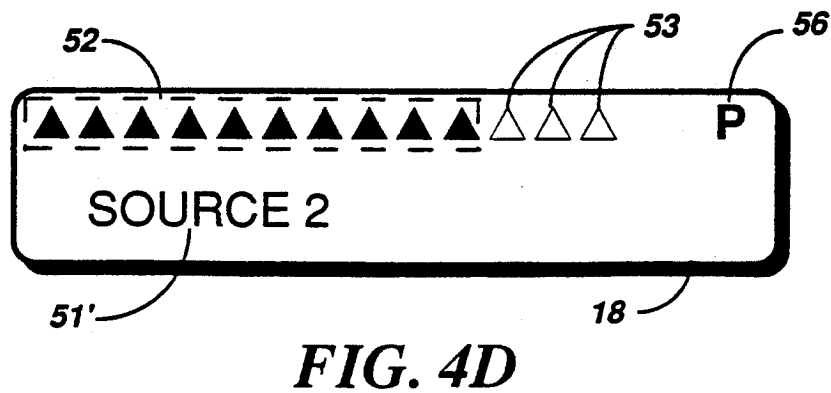
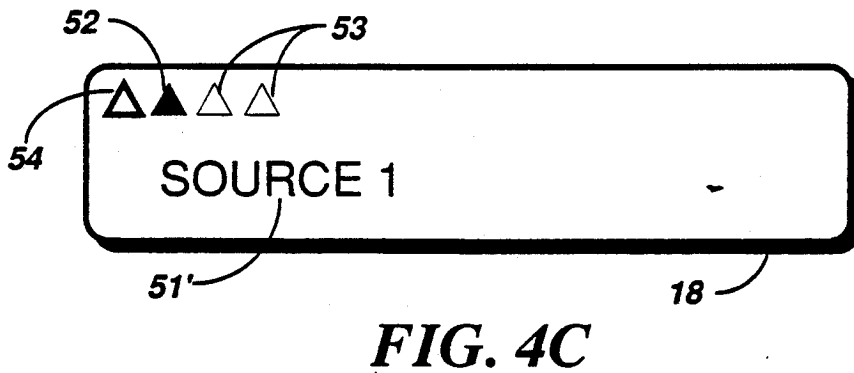
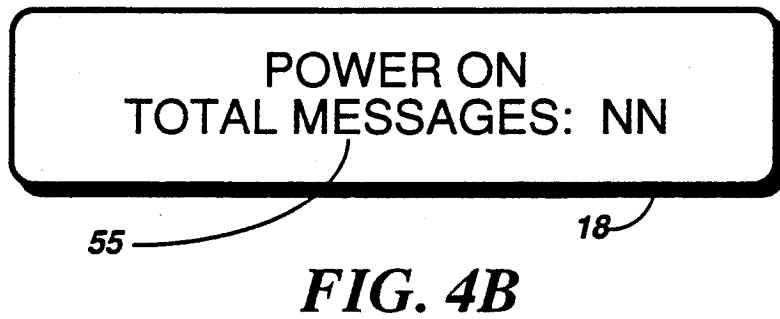
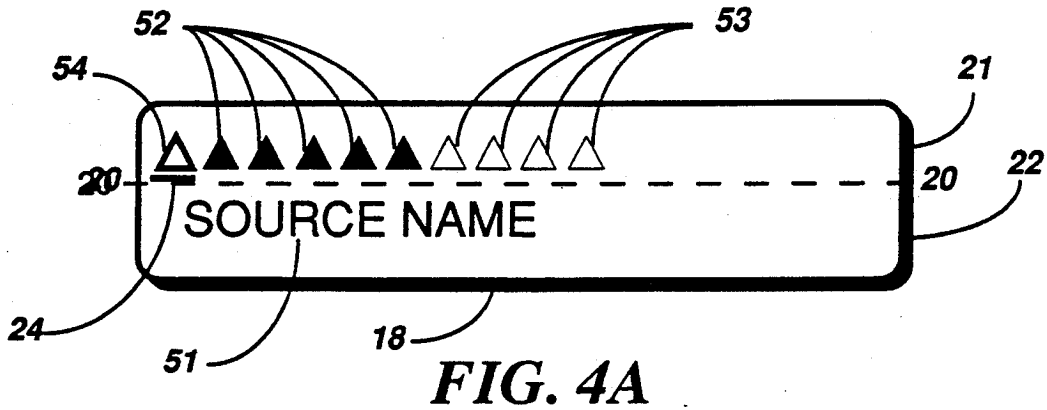


FIG. 3



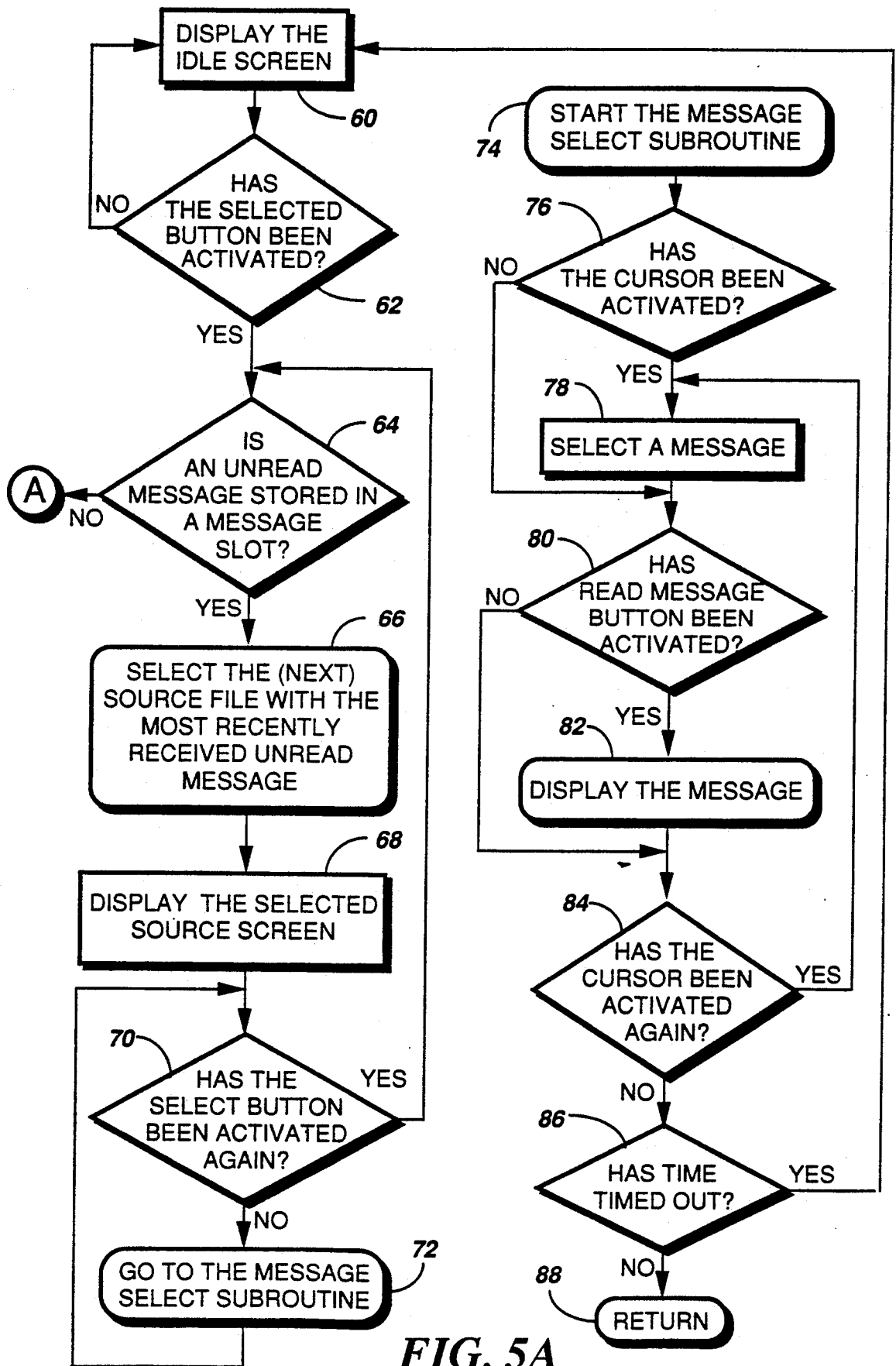


FIG. 5A

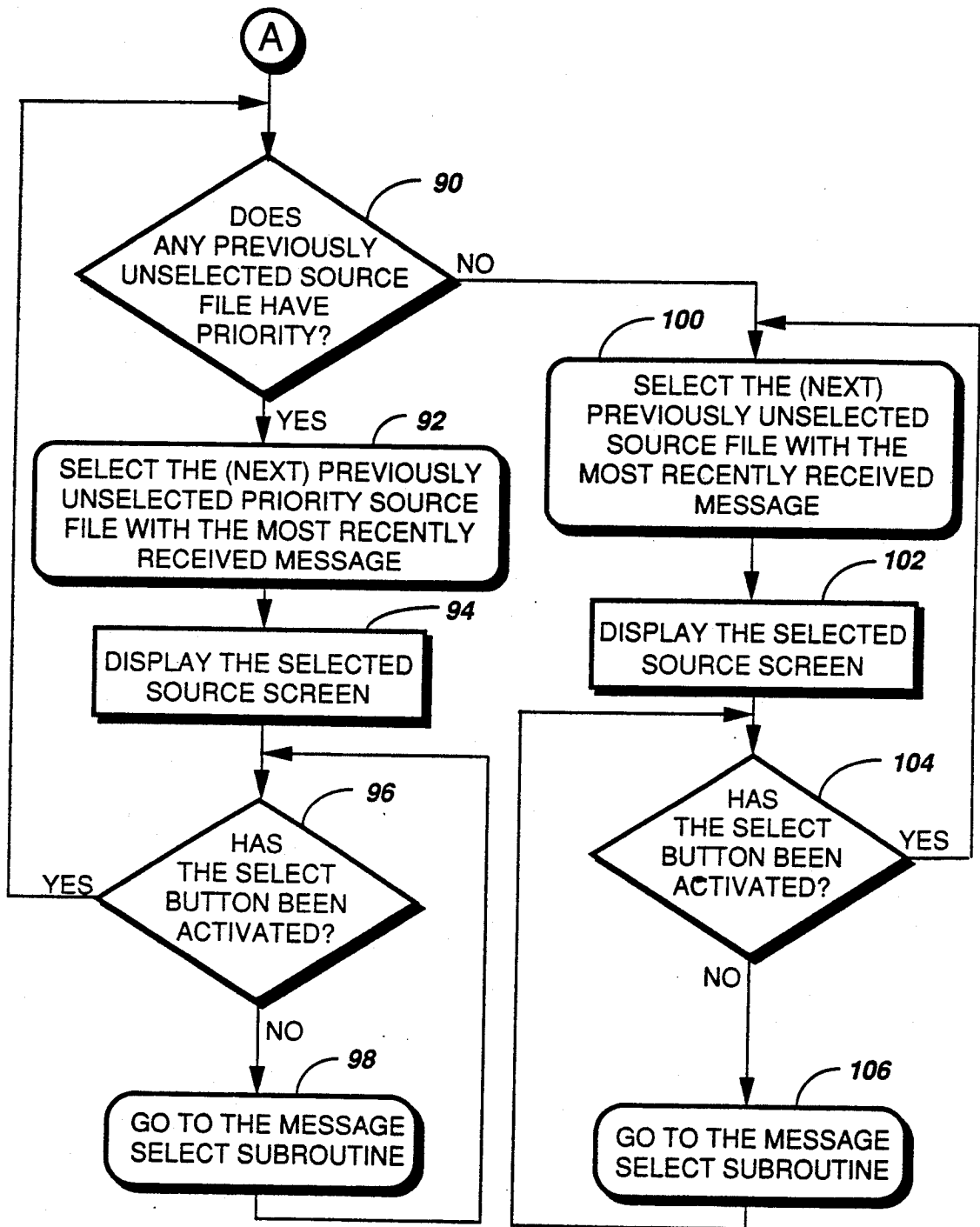


FIG. 5B

## SELECTIVE CALL MESSAGE MANAGEMENT

## FIELD OF THE INVENTION

This invention relates in general to selective call receivers, and in particular to memory management for selective call message storage.

## BACKGROUND OF THE INVENTION

With the improvement in electronic components, the memory capacity of electronic devices such as selective call receivers has increased. Selective call receivers receive selective call messages and store the messages in message storage slots for review at a later time. The number of message storage slots is limited. As new messages arrive, old messages must necessarily be deleted to accommodate the new messages, for example in a first received, first deleted method. If the user wishes to review older messages, they may have been deleted. With improved memory capacity, selective call receivers can store more messages for review at a later time. However, as the number of stored messages increases, the ease of managing the messages so that the user can easily retrieve a specific message decreases.

One approach to handling messages by a selective call receiver was disclosed in U.S. Pat. No. 4,786,901, wherein a method for handling individual messages transmitted for and received by the selective call receiver and common messages transmitted for several selective call receivers and received by the selective call receiver is described. However, the method described does not allow the user to allocate the memory nor does it provide any means for managing a large number of stored individual messages.

Thus, what is needed is a method in a memory with a large capacity for storing messages that allows the user to allocate source files within the memory in a personalized manner and allows the user to easily retrieve a message when desired.

## SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide an improved method for storing and retrieving messages.

In carrying out the above and other objects of the invention in one form, there is provided a method for storing messages in source files with a user allocated number of message storage slots according to the source of the message.

## BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a top view of a selective call receiver according to the present invention.

FIG. 2 is a block diagram of a selective call receiver according to the present invention.

FIG. 3 is a flow chart of the operation of storing messages in a selective call receiver according to the present invention.

FIGS. 4A, 4B, 4C and 4D are views of alphanumeric display screens on a display of a selective call receiver according to the present invention.

FIGS. 5A and 5B are a flowchart of the operation of retrieving messages in a selective call receiver according to the present invention.

## DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. 1, an electronic device comprising message storage means, such as a selective call receiver, comprises a housing 10 including openings 15 in a front plate 16 with user selectable control buttons 11, 12, 13, and 14 accessible therethrough. A display device 18 such as a liquid crystal display (LCD) divided into an upper display portion 21 and a lower display portion 22 at line 20—20 for a two line alphanumeric display is viewable through another opening 19 in the front plate 16. A cursor 24, on display 18 is moved one position to the left for each depression of the user selectable directional button 11. In a like manner, the cursor 24 is shifted one position to the right for each depression of the directional button 12. By depressing the user selectable button 13, a particular function will be performed based upon where the cursor 24 is located. The user selectable button 14 allows the user to select between the various source files when retrieving messages as described below. Alternatively, the operation of the select button 14 could be handled through manipulation of cursor 24 by means of directional buttons 11 and 12 to underscore a select icon on the display 18 and activation of function button 13. An on/off power switch 28 is mounted on the right hand side of the housing 10. Other user selectable controls could be added to the selective call receiver but are not essential to the operation of the present invention.

Referring next to FIG. 2, a block diagram of the circuitry of the selective call receiver depicted in FIG. 1 comprises an antenna 30 for receiving signals coupled to a selective call receiver circuit 32 which demodulates the signals received. A microprocessor controller 34 is coupled to the receiver circuit 32 for processing the signals received. A memory 36 is coupled to the microprocessor controller 34 for storing those messages containing the address of the selective call receiver as determined by the microprocessor controller 34. The microprocessor controller 34 also controls the storing and recalling of those messages as explained below. A code plug 35 is coupled to the microprocessor 34 for providing a set of predetermined information, such as the address of the selective call receiver, to the microprocessor 34 in a manner well known in the art. The display device 18 visually displays a message and is controlled by the microprocessor controller 34. User controls 38 allow the user to command the microprocessor controller 34 to perform the selective call receiver operations well known to those skilled in the art and typically includes control switches such as the on/off control button 28, the cursor controls 11, 12, the function control 13, and the select control 14 (FIG. 1). For a more detailed description of the structure and operation of a selective call radio paging receiver of the type shown in FIG. 4, reference is made to U.S. Pat. No. 4,518,961, U.S. Pat. No. 4,649,538, and U.S. Pat. No. 4,755,816, all commonly assigned to the same assignee as the present invention, and the teachings of which are hereby incorporated by reference.

Referring next to FIG. 3, a flowchart of the operation of the microprocessor controller 34 in the message storage mode starts 40 by entering an idle loop awaiting the reception of a message to be stored. When a message has been received 42, the source of the message is determined 44 from a signal contained therein. The message source signal could be in the message address portion or

a signal contained within the message itself. For each message source signal, there is a source file with an assigned number of message storage slots. The number of message storage slots assigned to each source file can be predetermined by information stored in the code plug 35 or can be varied by the user through manipulation of user controls 38 (FIG. 2).

If not all of the message storage slots assigned to the source file are occupied 46, the message is stored in one of the unoccupied slots 48. If all of the message storage slots assigned to the source file are occupied 46, the message is stored in the message storage slot occupied by the earliest received message which is unprotected 50, thereby overwriting and deleting the earliest stored unprotected message. Methods for storing a message with information indicating when the message was received by the selective call receiver and for protecting messages from being deleted in normal operation are well known in the art and are described in U.S. Pat. No. 4,851,829 assigned to the assignee of the present invention and the teachings of which are hereby incorporated by reference. After the message is stored, the message storage routine returns to the idle loop to await the reception of another message 42.

Referring to FIGS. 4A, 4B, 4C and 4D, the display 18 is depicted displaying various source screens in the source select mode. Referring first to FIG. 4A, the line of the screen appearing in the lower portion 22 of the display 18 below line 20—20, comprises alphanumeric information 51 indicating the source file selected, for example SOURCE NAME. In the preferred embodiment, the SOURCE NAME indicates the message's originator or source file.

The line of the screen appearing in the upper portion 21 of the display 18 comprises a plurality of message storage slot indicators 52, 53 and 54. In the preferred embodiment, the message storage slot indicators are triangular geometric shapes. In another embodiment, the indicators could be any character, whether an alphanumeric character or a geometric shape, limited only by the constraints of the display. The message storage slot indicators advise the user whether a message storage slot is occupied or unoccupied and whether the message within the message storage slot has been read (i.e., displayed) or is unread. The filled triangular shapes 52 indicate that the message storage slots are occupied (i.e., have messages stored therein) and that the messages stored therein have been read. The open triangular shapes 53 indicate that the message storage slots are unoccupied (i.e., no messages have been stored therein or the messages stored therein have been deleted). The triangular shape 54 is flashing, as depicted by the thicker outline in FIG. 4A, indicating that the message within the message storage slot indicated by indicator 54 has not been read. The cursor 24 can be manipulated by the user as described above to allow the user to select a message to display.

Referring next to FIG. 4B, the idle screen of the preferred invention 55 is shown. When the selective call receiver is initially powered on, the idle screen 55 is displayed on the display 18. The integer NN indicates the number of messages stored in all the message storage slots in the memory 36 (FIG. 2). After source selection and reading of messages, the idle screen 55 will be displayed as described below.

Referring to FIG. 4C, a source screen for a source file comprising four message storage slots 52, 53, 54, including one message storage slot with an unread message 54

is shown. The source file name 51' (SOURCE 1) could, for example, read WIFE and the user has allotted four message storage slots to messages received from his wife.

Referring to FIG. 4D, a source screen for a source file comprising thirteen message storage slots 52, 53, is shown. A "P" 56 in the upper right hand corner of the display 18 indicates that the source file has a priority. The priority of a source file can be user selected or predetermined by information in the code plug 35 (FIG. 2). The source file name 51' (SOURCE 2) could, for example, read EMPLOYER and the user has allotted thirteen message storage slots, ten of which are occupied (i.e., have messages stored therein), for messages received from the user's employer. The names corresponding to the source files, WIFE and EMPLOYER, for example, may be stored in the selective call receiver code plug 35 (FIG. 2), thereby providing individualization of source names for each selective call receiver.

Referring to FIGS. 5A and 5B, a flowchart of a source select routine performed by the microprocessor 34 in response to successive activations of the select button 14 (FIG. 1), begins by displaying the idle screen 60. The idle screen, depicted in FIG. 4B, is displayed when the selective call receiver is powered on and remains displayed until the select button 14 (FIG. 1) has been activated, e.g., pressed, 62. When the select button is activated 62, the routine searches through the message slots to see if a message source file has a message slot with the most recently received or newest message that has not been read 64. Once found, the source file with the newest unread message is selected 66 and a source screen for the source file is displayed 68, as shown in FIG. 4C. If the select button is activated again 70, the routine searches for the next source file with the newest unread message 64.

If the select button is not activated, the routine performs a message select subroutine 72 beginning at start block 74. If the cursor has been activated 76, e.g., moved by activation of directional buttons 11 and 12 (FIG. 1), the message indicated by the stopping point of the cursor is selected 78 and the subroutine awaits activation of the read message button 80. In the preferred embodiment, activation of the read message button is activation of the function button 13 (FIG. 1) when the cursor is positioned under a message storage slot indicator on a source screen. When the read message button is activated 80, the source screen on the display is replaced with an alphanumeric output of the message 82.

If the cursor is not activated 76, and the read message button is again activated 80, the message displayed 82 is a subsequent screen of the message indicated by the initial position of the cursor on the source screen. If the message read button is not activated 80, the message display step 82 is skipped and activation of the cursor is awaited 84. If the cursor has been activated again 84, the message indicated is selected 78 and the subroutine awaits activation of the read message button 80. If the cursor is not activated again, a time counter is examined to see if the predetermined time for message select has timed out 86. If the predetermined time has timed out 86, the idle screen is again displayed 60. If the predetermined time has not timed out 86, processing returns from the subroutine to the source select routine 88. Returning from the processing by the message select subroutine 72, select button activation is awaited 70 and processing continues as described above.

When the select button has been activated 62 and there are no unread messages stored in any message storage slots 64, the source files are examined to see if a priority has been placed upon an unselected source file 90. The user can put a priority classification on a source file to allow that source file to be displayed before non-priority source files. For example, a user may desire to review messages from their employer before messages from their wife. The user could place a priority on the employer source file to accomplish this desire. If there are no source files, previously unselected, with priority 90, the source files are examined to determine which previously unselected source file contains the most recently received message 100. In this manner, a three-step hierarchy for selecting sources in a predetermined order is established whereby source files with unread messages are selected first in the reverse order (last stored, first selected) in which the unread messages were received. Source files having a priority attached which have not been previously selected are selected next in the reverse order in which the most recently received messages in each priority source file was received. Finally, the remaining previously unselected source files are selected in the reverse order of which the newest received message in each source file was received.

If source files not having been selected as having unread messages 64, have priority 90, the priority source file with the most recently received message is selected 92. The source screen for that source file is displayed 94 as shown in FIG. 4D, and, if the select button has not been activated again 96, the message select routine is performed 98. Upon return from the message select subroutine, activation of the select button is again awaited 96. When the select button has been activated 96, the source files are examined to see if a previously unselected priority source file exists 90. In this manner, the priority source files are examined from the priority source file previously unselected with the most recently received message to that with the earliest stored message.

After all source files having unread messages have been selected and all priority source files have been selected, the previously unselected source file with the most recently received message is selected 100. The source screen for that source file is displayed 102. When the select button is activated 104, the previously unselected source file with the next most recently received message is selected 100. If the select button is not activated, the message select subroutine is performed 106 and, when processing by the subroutine is complete, subsequent activation of the select button is awaited 104.

I claim:

1. A method in a communication receiver for saving a message transmitted to the communication receiver individually, said message having transmitted therewith a message source signal indicating an originator of said message and the communication receiver having a plurality of source files, said method comprising the steps of:

receiving said message and said message source signal;  
decoding the message source signal; and  
storing said message in one of said plurality of source files, said one of said plurality of source files determined by the message source signal.

2. The method of claim 1, each of said plurality of source files having at least one message storage slot for storing a message, wherein the step of storing said message comprises the step of storing said message in an unoccupied one of said at least one message storage slot.

3. The method of claim 1 each of said plurality of source files having at least one message storage slot for storing a message, wherein the step of storing said message comprises the step of storing said message in an earliest occupied message storage slot having information stored therein if there are no unoccupied message storage slots in said one of said plurality of source files, thereby overwriting said information stored therein.

4. The method of claim 3 wherein the step of storing said message comprises the step of storing said message in an earliest occupied unprotected message slot.

5. The method of claim 1 further comprising before the step of receiving said message, the steps of:  
designating a source identification signal for each of said plurality of source files; and  
allocating to each of said plurality of source files, at least one message storage slot.

6. The method of claim 5 wherein the step of storing said message further comprises the step of storing said message in one of said plurality of source files having the source identification signal substantially equivalent to said message source signal.

7. The method of claim 6 wherein the step of storing said message comprises the step of storing said message in an unoccupied message storage slot of said at least one message storage slot.

8. The method of claim 6 wherein the step of storing said message comprises the step of storing said message in an earliest occupied message storage slot of said at least one message storage slot having information stored therein if there are no unoccupied message storage slots of said at least one message storage slot in said one of said plurality of source files, thereby overwriting said earliest occupied message storage slot.

9. The method of claim 8 wherein the step of storing said message comprises the step of storing said message in an earliest occupied unprotected message storage slot of said at least one message storage slot.

10. The method of claim 5 wherein the step of allocating at least one message storage slot to each of said plurality of source files comprises the step of allocating a user selectable number of message storage slots to each of said plurality of source files.

11. A message storage apparatus for storing information having an information originator indicator indicating an originator of said information, said information received by said message storage apparatus in conjunction with a destination address, said message storage apparatus comprising:

memory means comprising a plurality of source files;  
and

control means for storing said information in a one of said plurality of source files in response to said information originator signal if said destination address corresponds to a predetermined address of said message storage apparatus.

12. The message storage apparatus of claim 11 wherein each of said source files within said memory means comprises a user selectable number of message storage slots.

13. The message storage apparatus of claim 11 wherein the control means includes a source file select means for sequentially selecting one of said plurality of

source files in response to a priority associated with each of said source files.

14. The message storage apparatus of claim 13 further comprising a user selectable control coupled to the control means wherein successive activations of said user selectable control signals said source file select means to sequentially select one of said plurality of source files in the order:

- (a) selecting source files having unread information stored in message storage slots therein in the reverse order of which the unread information was received;
- (b) selecting source files having information stored in message storage slots therein and having a predetermined priority level in the reverse order of which the most recently received information stored in message storage slots therein was received; and
- (c) selecting the remaining source files in the reverse order of which the most recently received information stored within the message storage slots in the remaining source files was received.

15. The message storage apparatus of claim 14 wherein the predetermined priority level of each of said source files is user selectable.

16. A selective call receiver comprising:  
receiving means for receiving selective call messages having selective call addresses and message source signals, said message source signals indicating the originator of said selective call messages;  
storage means for storing at least one predetermined selective call address;  
a plurality of source files, each source file comprising at least one message storage slot, for storing each of the selective call messages comprising selective call addresses substantially equivalent to one of said at least one predetermined selective call address;

display means for displaying the stored selective call messages; and

control means comprising:

address correlation means for determining whether the selective call messages comprise selective call addresses substantially equivalent to one of said at least one predetermined selective call address;

storage control means for storing each of the selective call messages comprising said message source signals in one of said message storage slots of one of said plurality of source files, said one of said plurality of source files determined in response to said message source signals; and

source file selection means for selecting one of said plurality of source files for displaying the selective call messages stored therein by said display means.

17. The selective call receiver of claim 16 wherein said at least one message storage slot comprises a user selectable number of message storage slots.

18. The selective call receiver of claim 16 wherein the source file selection means sequentially selects one of the plurality of source files in the order:

- (a) selecting source files having unread messages stored therein in the reverse order of which the unread messages were received;
- (b) selecting source files having messages stored therein and having a predetermined priority level in the reverse order of which the most recently received messages stored therein were received; and
- (c) selecting the remaining source files in the reverse order of which the most recently received messages stored within the remaining source files were received.

19. The selective call receiver of claim 18 wherein the predetermined priority level of each of said source files is user selectable.

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US005157391A

# United States Patent [19]

[11] Patent Number: **5,157,391**

Weitzen

[45] Date of Patent: **Oct. 20, 1992**

[54] **APPARATUS AND METHOD FOR DISPLAYING A PLURALITY OF FUNCTION INDICATORS IN A SELECTIVE CALL RECEIVER**

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[75] Inventor: **Randi F. Weitzen**, Boynton Beach, Fla.

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*Primary Examiner*—Donald J. Yusko

[21] Appl. No.: **402,740**

*Assistant Examiner*—Dervis Magistre

[22] Filed: **Sep. 5, 1989**

*Attorney, Agent, or Firm*—Gregg E. Rasor; Vincent B. Ingrassia; William E. Koch

[51] Int. Cl.<sup>5</sup> ..... **H04Q 7/00**

[57] **ABSTRACT**

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

[58] Field of Search ..... 340/311.1, 709, 710, 340/711, 765, 815.06, 825.44, 825.31, 825.46, 825.47, 825.48; 341/20, 22; 358/194.1; 368/69, 70, 224; 364/709.12, 709.13, 709.14, 709.15, 709.16; 370/93

In a selective call receiver, an apparatus and method are provided for accessing one or more operational functions via a plurality of displayed function indicators. The function indicators are categorized in sets with a first set representing a selective call receiver status mode that allows alteration of operating characteristics associated with a selective call receiver, and a second set representing a message read mode for controlling the disposition of received messages.

[56] **References Cited**

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**9 Claims, 3 Drawing Sheets**

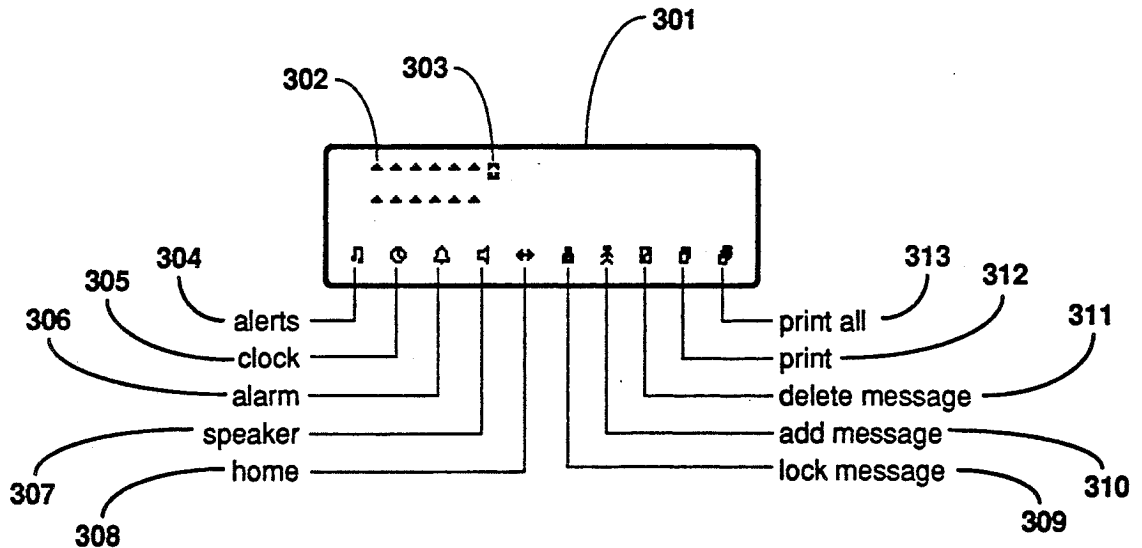


FIG. 1  
Prior Art

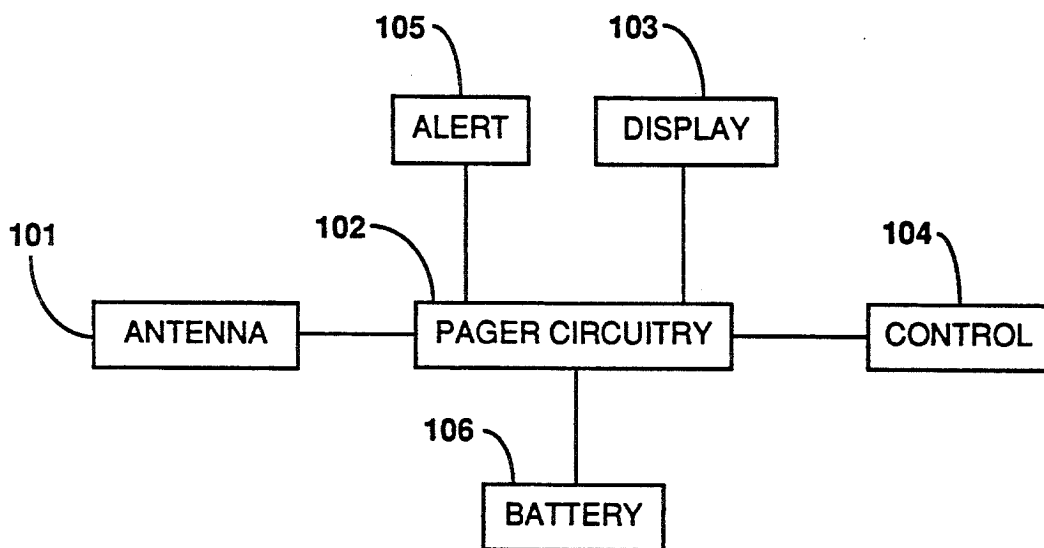


FIG. 2

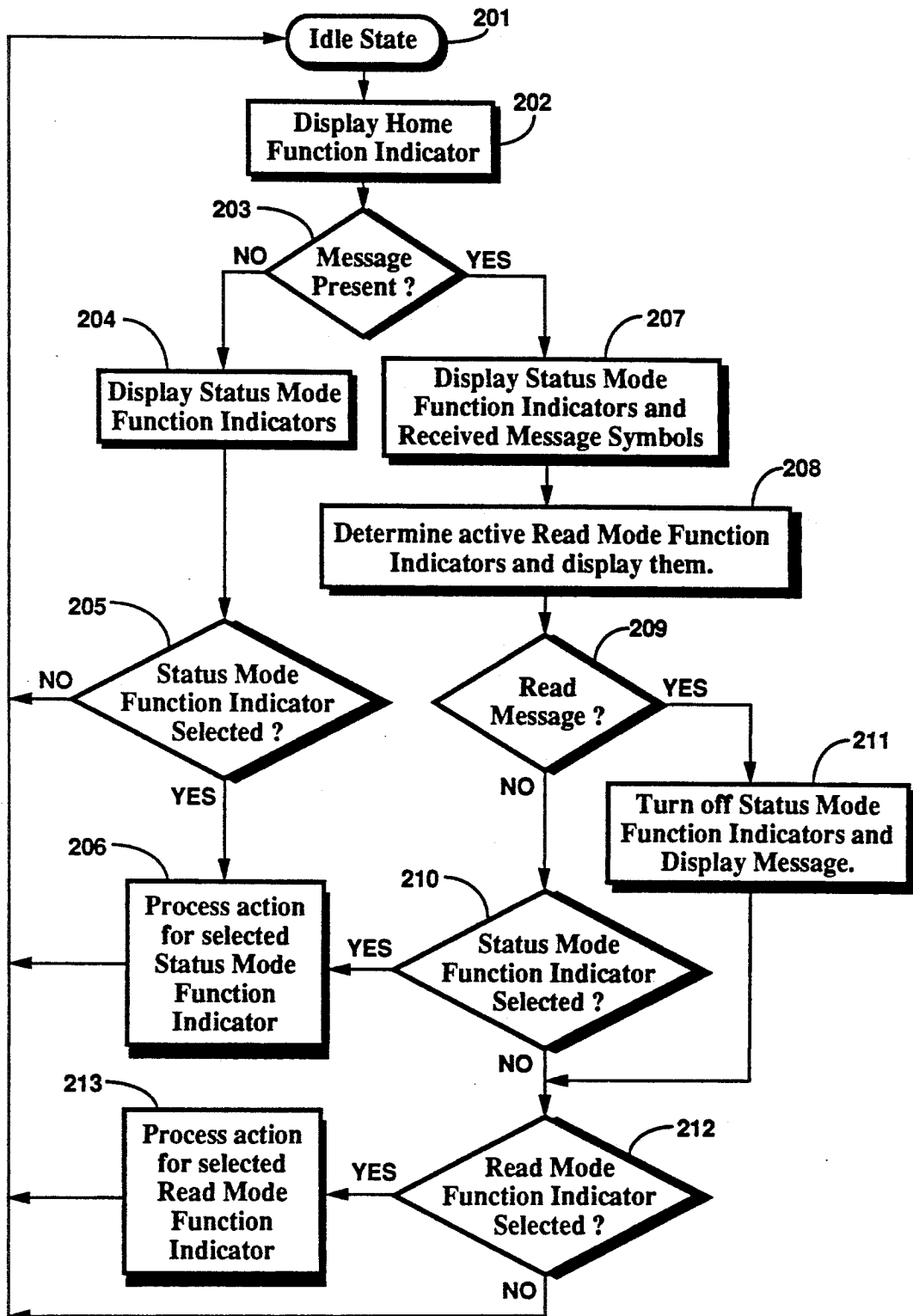
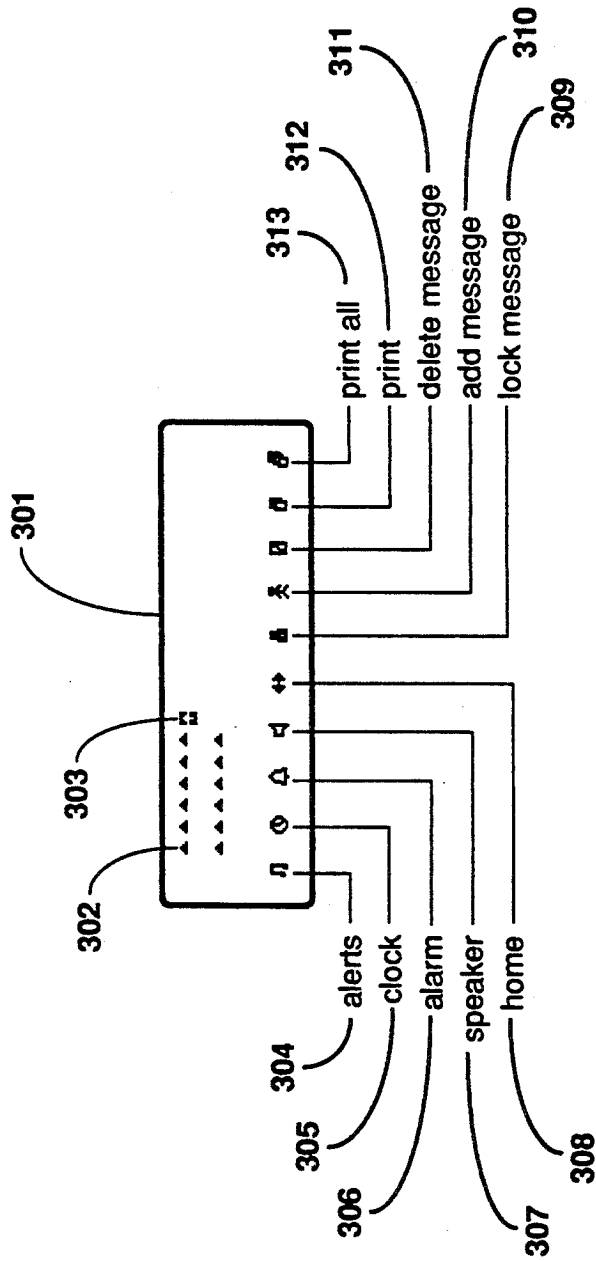


FIG. 3



# APPARATUS AND METHOD FOR DISPLAYING A PLURALITY OF FUNCTION INDICATORS IN A SELECTIVE CALL RECEIVER

## FIELD OF THE INVENTION

This invention relates in general to selective call receivers and more particularly to the menu driven alteration of configuration parameters and information stored within a selective call receiver.

## BACKGROUND OF THE INVENTION

Selective call receivers for displaying or presenting information are well known. As technology advances, the marketplace dictates that more features are to be offered on a selective call receiver. In order to access these features, manufacturers have included an array of switches used singularly or in combination to access a specific feature. To achieve user friendly operation of a selective call receiver, the keystroke operation sequence to access a feature must be kept to a minimum. Because of size constraints, the number of switches on a typical selective call receiver is limited to four. Using four switches as an example, the current technology using single keystroke commands can execute four functions directly from the front panel. If one of the switches is designated as a shift operator, the other three can be multiplexed into addressing six functions from the front panel. More functions can be multiplexed on a doubly or triply shifted level but this presents the need for the casual user who has not memorized the operating sequence to refer to an operating manual. Thus, what is needed is a method utilizing a menu driven interface which provides function access using a minimal number of keystrokes.

## SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide an improved method of accessing one or more functions using a menu driven interface to provide for the alteration of configuration parameters and information stored within a selective call receiver.

In carrying out the above and other objects of the invention in one form, there is provided a method for presenting function indicators on a selective call receiver capable of receiving a message, displaying in a first mode a first set of function indicators associated with the first mode and a message, and displaying in a second mode a second set of function indicators associated with the second mode.

## BRIEF DESCRIPTION OF THE INVENTION

FIG. 1 is a block diagram of a prior art selective call receiver system.

FIG. 2 is a flow chart of the decision tree used in accordance with a preferred embodiment.

FIG. 3 is a drawing of the display screen used in accordance with the preferred embodiment.

## DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. 1, pager circuitry 102 provides an alert 105 and a message on the display 103 in response to an RF signal received by the antenna 101. The user selects one or more functions by activating controls 104. The selective call receiver shown in FIG. 1 is well known to those skilled in the art.

Referring to FIG. 2, the flow chart shows a decision tree which controls the display of function indicators that represent specific function actions. In the standby mode, the controller waits in an idle state 201. When the user invokes the function menu, the home function indicator is displayed 202 and the controller checks for the presence of at least one message 203. If no messages are present, the selective call receiver displays status mode function indicators 204. The controller then checks for the selection of a status mode function indicator 205. When a status mode function indicator has been selected, the controller processes the action associated with the selected status mode function indicator 206. In all cases, when the selected action has been completed or the user chooses to escape from the sequence, control is returned to the idle state 201.

If the controller is in the idle state 201 and at least one message has been received by the selective call receiver, when the user invokes the function menu, the home function indicator is displayed 202 and the message present test 203 is true. The controller displays the status mode function indicators and received message symbols 207, then determines which read mode function indicators are active by examining information associated with the selected message to uniquely associate specific read mode function indicators with the selected message and display these function indicators 208. If the user chooses to read the message 209, the status mode indicators are turned off and the message is displayed 211. The user may then select an active read mode indicator 212 and process the action associated with the selected mode indicator 213. If the user does not choose to read the selected message 209, the options are to select either a status mode indicator 210 and its associated action 206 or a read mode indicator 212 and its associated action 213. In all cases, when the selected action has been completed or the user chooses to escape from the sequence, control is returned to the idle state 201.

Referring to FIG. 3, the preferred embodiment of a display screen layout 301 is shown. The filled triangles are received message symbols 302 which represent message slots (information storage "bins") that contain information received by the selective call receiver. The inverse highlighted filled triangle 303 represents the position of the active message pointer.

The function indicators 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, are arranged in a menu format below the message slot display lines. These function indicators represent actions which can be performed on information within the selective call receiver. The indicators are grouped by function into read and status modes. The read mode function indicators 308, 309, 310, 311, 312, 313 are used to control the disposition of messages received by the selective call receiver. In this embodiment, read mode function indicators include message locking 309, message addition 310, message deletion 311, print message 312, and print all messages 313. The status mode function indicators 304, 305, 306, 307, 308, are used to access and alter operational parameters associated with intrinsic functions within the selective call receiver. In this embodiment, status mode function indicators include alert selection 304, clock configuration 305, alarm configuration 306, and speaker control 307. The home function indicator 308 is shared by both the read and status modes.

I claim:

1. A method of presenting a plurality of function indicators in a selective call receiver capable of receiving a message, the method comprising the steps of:

in a message read mode:  
displaying a first set of said plurality of function indicators associated with said message read mode and said message; and

in a selective call receiver status mode:  
displaying a second set of said plurality of function indicators associated with said selective call receiver status mode.

2. A method for displaying a plurality of function indicators on a display of a selective call receiver capable of receiving and presenting a message, said method comprising the steps of:

in a message read mode:  
determining at least one active indicator from a first set of said plurality of function indicators by examining characteristics associated with said message;

displaying said at least one active indicator; and  
in selective call receiver status mode:

displaying a second set of said plurality of function indicators associated with the characteristics of said selective call receiver.

3. The method according to claim 2 wherein said determining step comprises the step of comparing information associated with each of said messages to uniquely associate specific operations and their corresponding function indicators within said first set of said plurality of function indicators with each of said messages.

4. The method according to claim 3 wherein said selective call receiver includes an information storage medium and said method executes at least one of the steps of:

reading at least one received message by presenting the received message on the display;

printing at least one received message;

deleting at least one received message from the information storage medium;

adding at least one received message to a different message slot within the information storage medium; and

locking at least one received message to prevent deletion from the information storage medium.

5. An apparatus for presenting a plurality of function indicators in a selective call receiver capable of receiving a message, comprising:

in a message read mode:  
first means for displaying a first set of said plurality of function indicators associated with said message read mode and said message; and

in a selective call receiver status mode:  
second means for displaying a second set of said plurality of function indicators associated with said selective call receiver status mode.

6. An apparatus for displaying a plurality of function indicators on a display of a selective call receiver capable of receiving and presenting a message, said apparatus comprising:

in a message read mode of operation:  
first means for determining at least one active indicator from a first set of said plurality of function indicators by examining characteristics associated with said message;

second means for displaying said at least one active indicator; and

in a selective call receiver status mode of operation:  
third means for displaying a second set of said plurality of function indicators associated with the characteristics of said selective call receiver.

7. The apparatus according to claim 6 wherein said first means comprises comparing information associated with each of said messages to uniquely associate specific operations and their corresponding function indicators within said first set of said plurality of function indicators with each of said messages.

8. An apparatus for displaying a function menu including a plurality of function indicators on a display of a selective call receiver of the type which receives messages and presents messages, said method comprising:

means for displaying only those of said function indicators which may be selected; and

means for performing an operation associated with one of said plurality of function indicators when said function indicator is selected.

9. The apparatus according to claim 8 wherein said selective call receiver includes an information storage medium and wherein said means for performing comprises means for reading, writing, deleting, and moving information within said information storage medium.

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[54] METHOD AND APPARATUS FOR SELECTIVELY STORING A PORTION OF A RECEIVED MESSAGE IN A SELECTIVE CALL RECEIVER

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Assistant Examiner—Gregg V. Miller
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[75] Inventors: Fernando A. Gomez, West Palm Beach; Mark T. Stair, Delray Beach, both of Fla.

[57] ABSTRACT

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

A method and apparatus allows a user to selectively store (604) a portion of a received message in a selective call receiver (100). The selective call receiver (100) includes first and second memory elements (118) for storing the received message and the portion thereof, respectively. The second memory element has a plurality of partitions (122, 124, 126, 128) corresponding to a plurality of file types. The user defines (FIG. 5) the portion of the received message stored in the first memory element, which portion is to be stored in the second memory element, and then selects (602) one of the plurality of partitions (122, 124, 126, 128) for storing the defined portion of the received message. The defined portion of the received message is then stored (604) in the selected one of the plurality of partitions (122, 124, 126, 128).

[21] Appl. No.: 958,847

[22] Filed: Oct. 9, 1992

[51] Int. Cl.5 ..... H04Q 7/00

[52] U.S. Cl. .... 340/825.44; 340/825.22

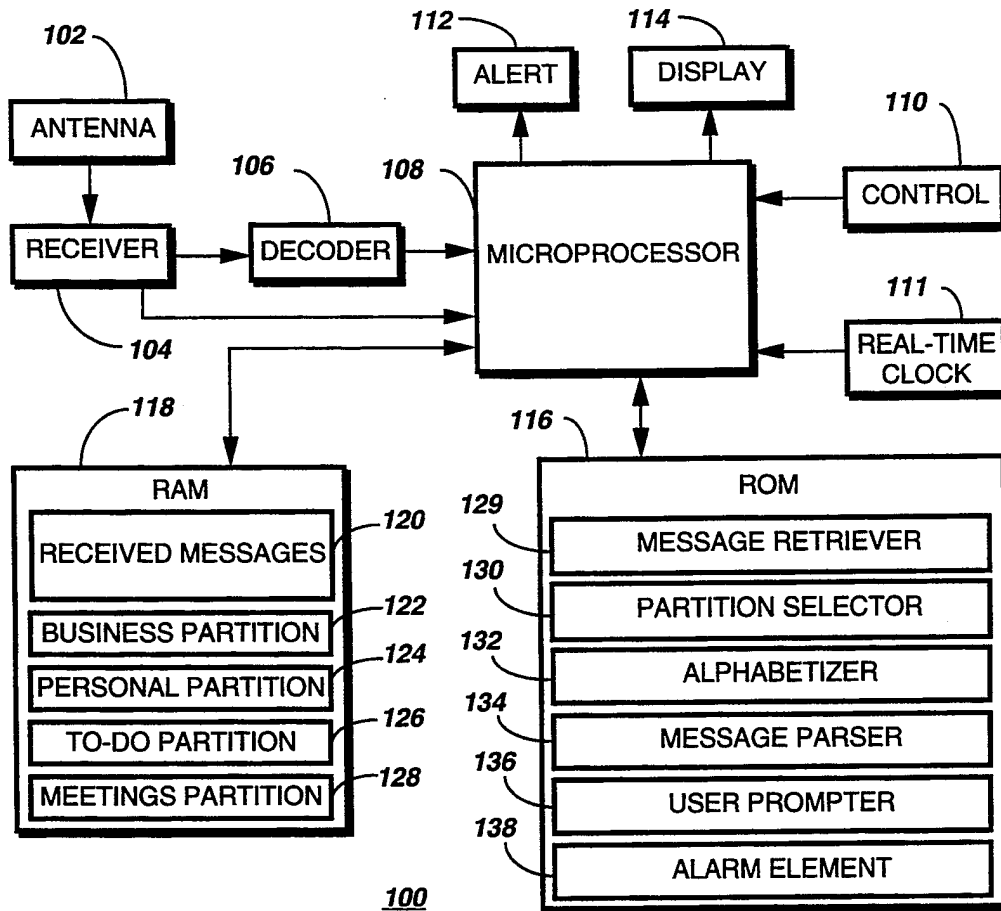
[58] Field of Search ..... 340/825.44, 825.22, 340/825.44, 825.22

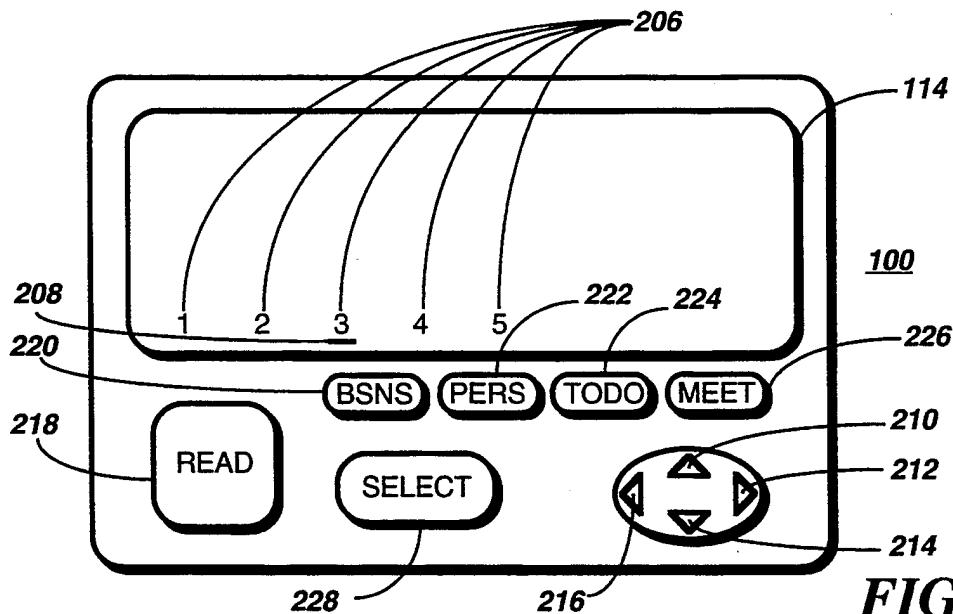
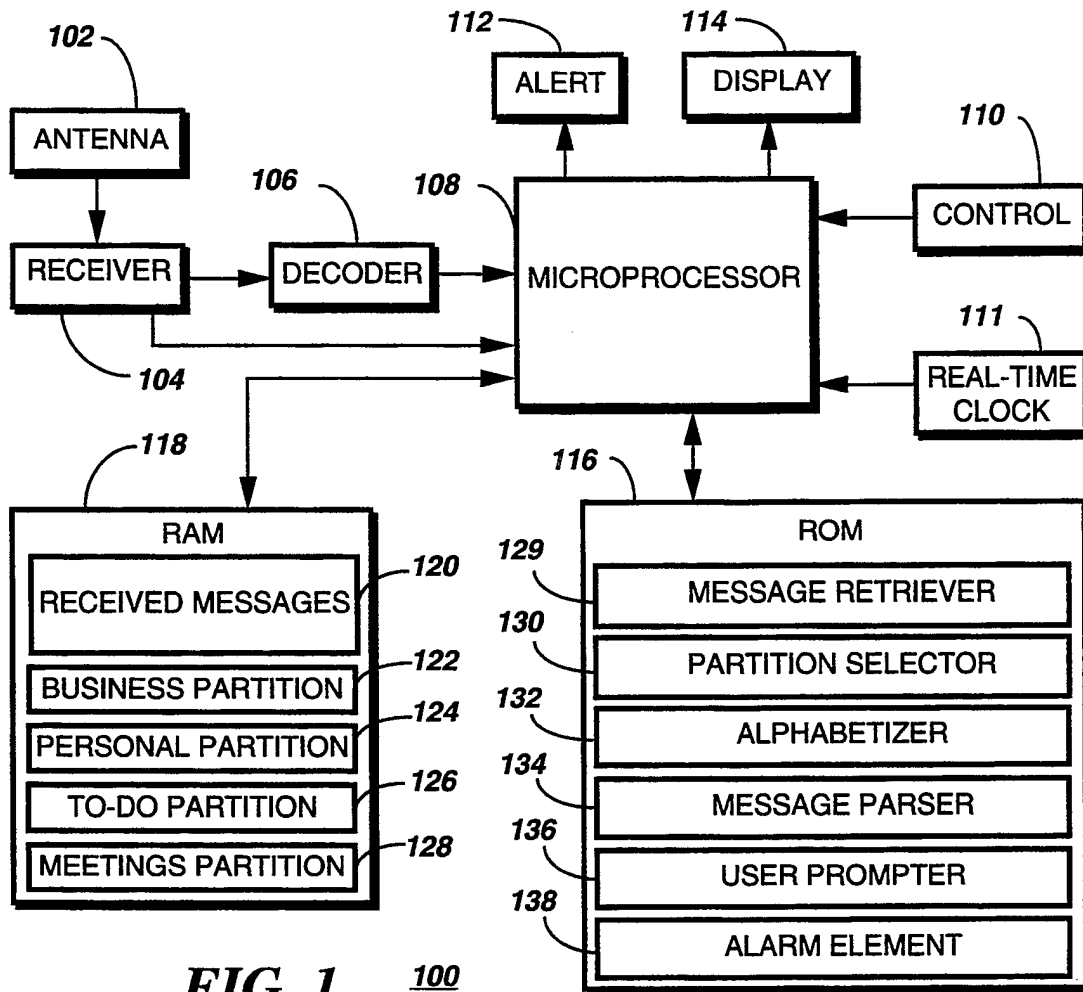
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Table with 4 columns: Patent Number, Date, Inventor, and Class Number. Includes entries for Davis et al., DeLuca et al., and Fennell et al.

22 Claims, 4 Drawing Sheets







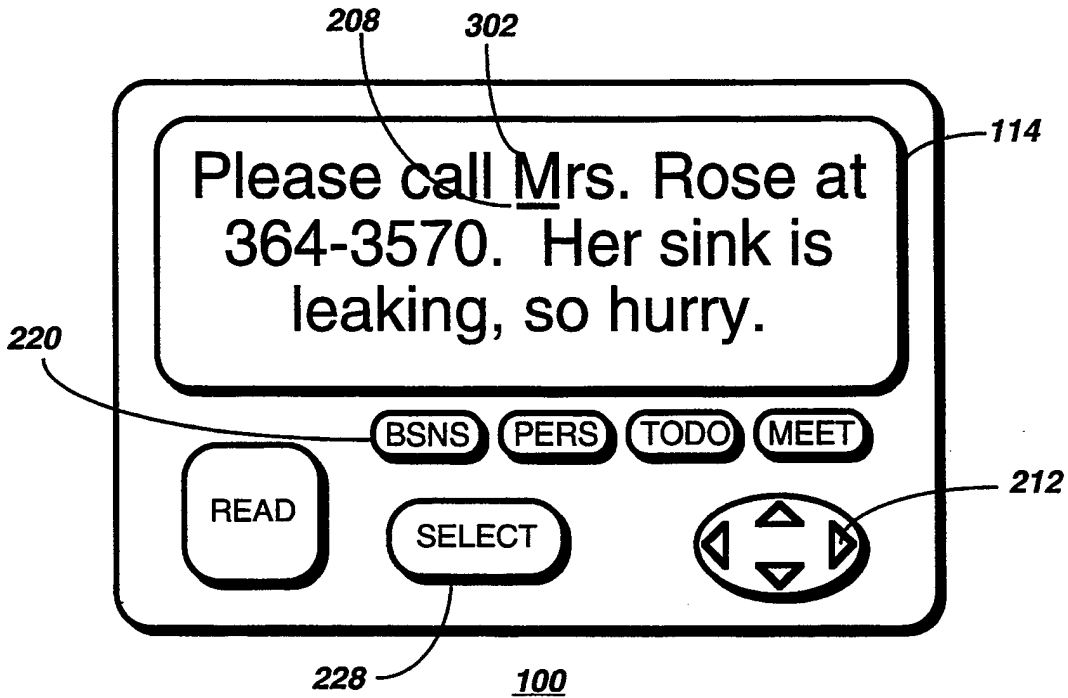


FIG. 3

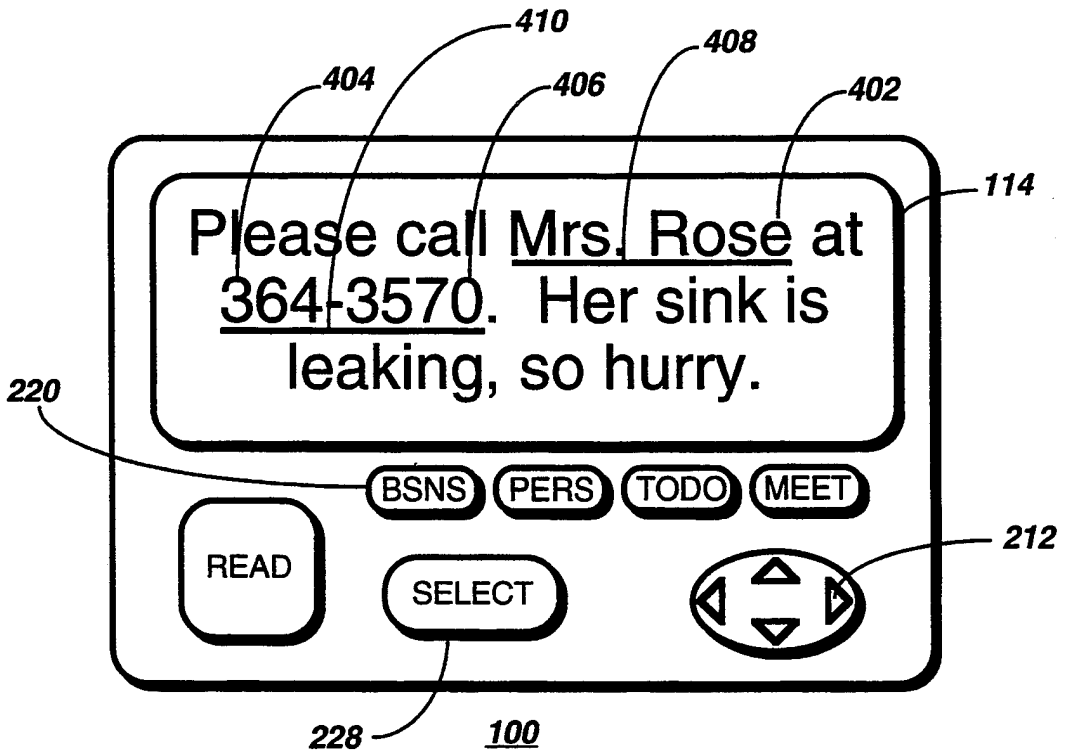


FIG. 4

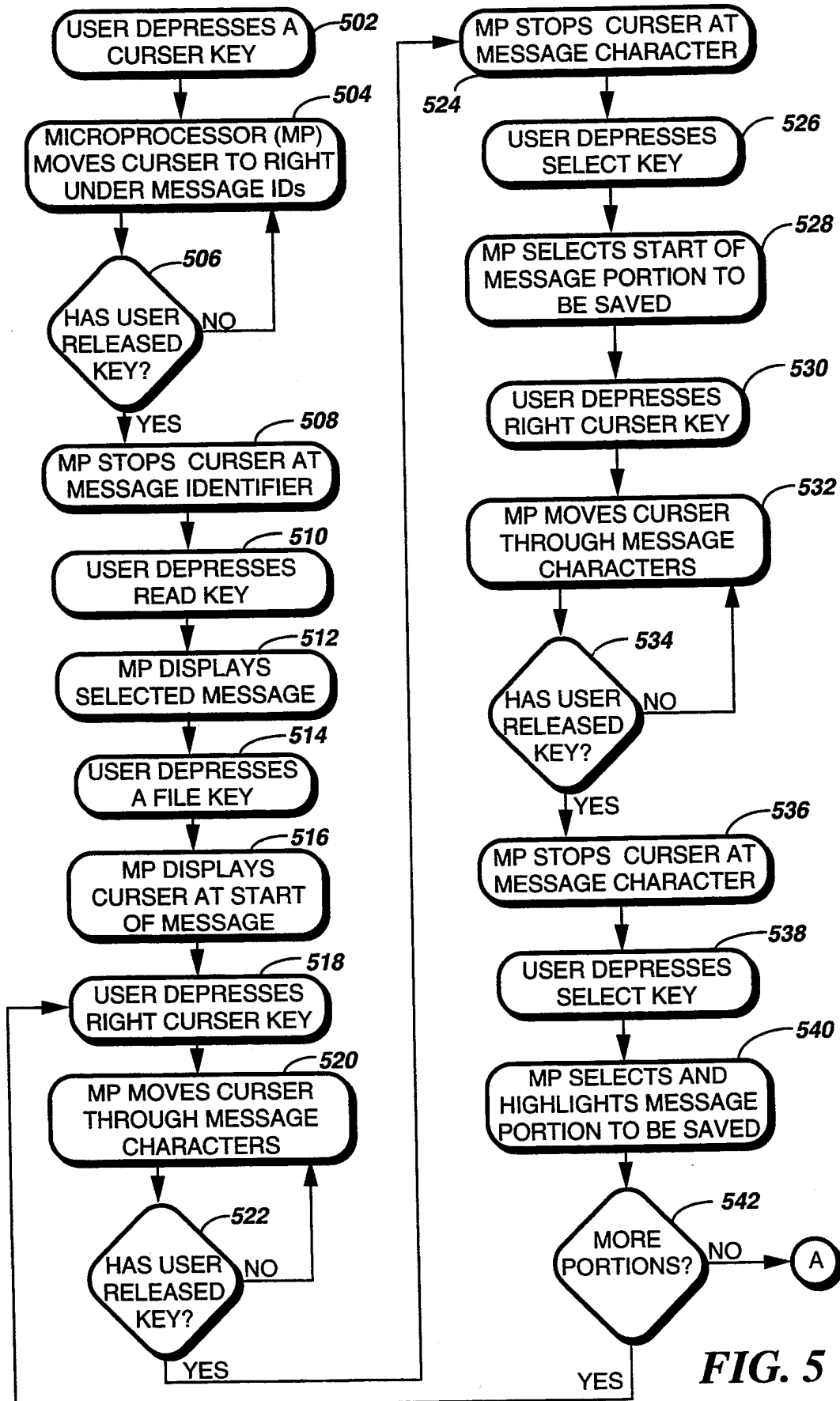


FIG. 5

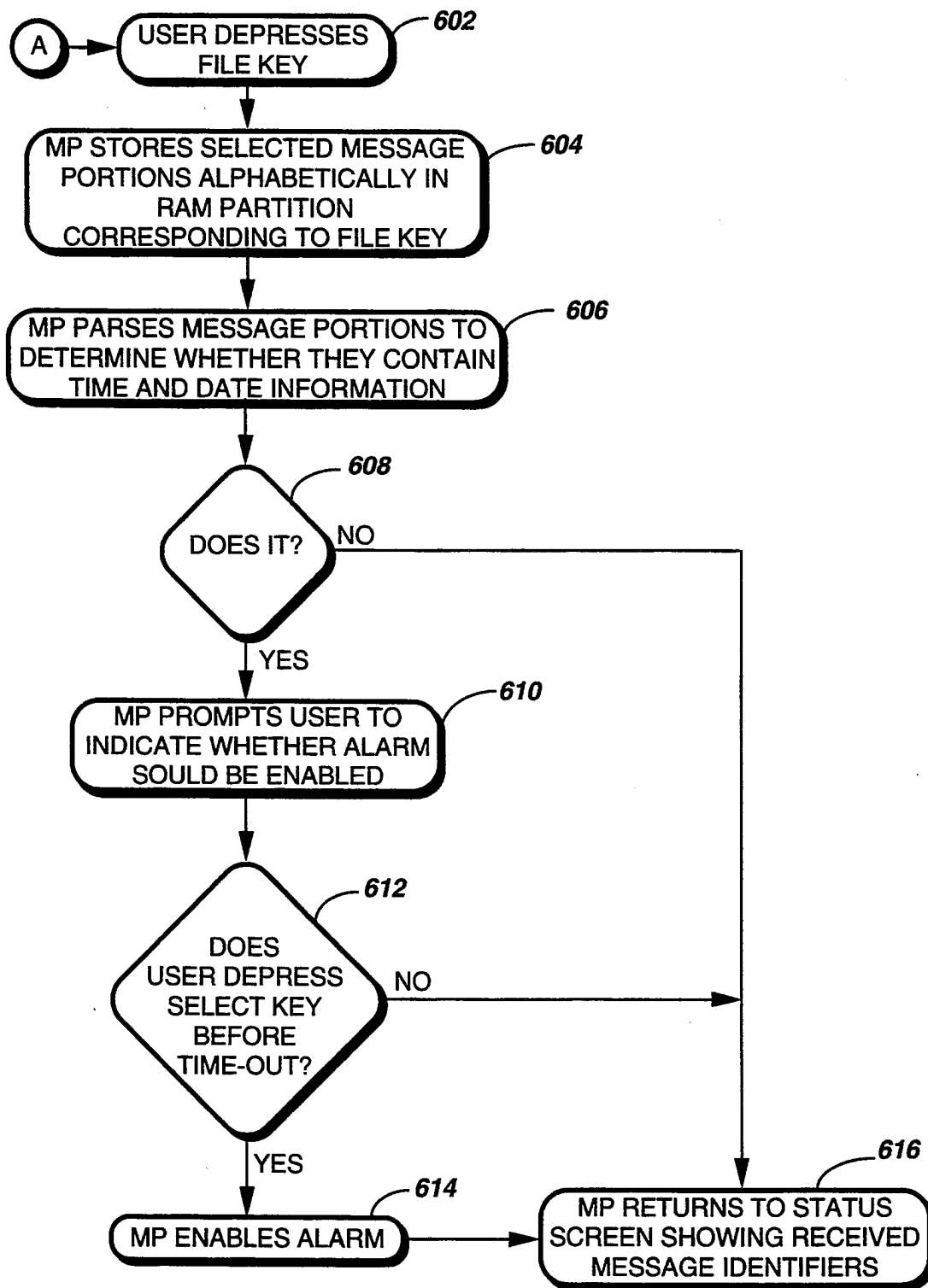


FIG. 6

## METHOD AND APPARATUS FOR SELECTIVELY STORING A PORTION OF A RECEIVED MESSAGE IN A SELECTIVE CALL RECEIVER

### FIELD OF THE INVENTION

This invention relates in general to selective call receivers, and more specifically to a method and apparatus for selectively storing a portion of a received message in a selective call receiver.

### BACKGROUND OF THE INVENTION

Selective call receivers having an alphanumeric display for displaying received messages and a memory for storing the received messages are well-known in the art. Such receivers typically have had a limited amount of memory for storing message characters, e.g., memory for 2,000 characters. Consequently, received messages could not be retained indefinitely, because the messages would accumulate over time and overflow the limited amount of memory. Even as new selective call receivers are designed and constructed with larger amounts of memory, there is still a limit to the amount of information that can be stored.

Conventional selective call receivers have offered a user a limited choice regarding the retention of received messages in memory. Typically the user has been able either to retain a received message in its entirety or to delete a received message in its entirety. Also typically, there has not been a way to organize retained messages.

Still, some portions of a received message, e.g., a sender's name and telephone number, might be far more important for the user to retain than some other parts of a received message. Currently, a user must consume memory sufficient to store a whole message, even though the user is interested in only a small part of the information contained therein. The ultimate result is memory waste.

Thus, what is needed is a way of retaining the interesting parts of a received message without having to retain the uninteresting parts. What is also needed is a way of organizing the retained message parts to facilitate recalling them at a future time.

### SUMMARY OF THE INVENTION

One aspect of the present invention is a method for selectively storing by a user a portion of a received message in a selective call receiver. The selective call receiver comprises first and second memory elements for storing the received message and the portion thereof, respectively. The second memory element has a plurality of partitions corresponding to a plurality of file types. The method comprises the steps of defining by the user the portion of the received message stored in the first memory element to be stored in the second memory element, and selecting by the user one of the plurality of partitions for storing the defined portion of the received message. The method further comprises the step of storing in the selected one of the plurality of partitions the defined portion of the received message.

Another aspect of the present invention is a selective call receiver including an apparatus for selectively storing by a user a portion of a received message in the selective call receiver. The selective call receiver comprises a receiver element for receiving a signal comprising an address and a message, and a decoder coupled to the receiver element for decoding the address defining an intended recipient of the message. The selective call

receiver further comprises a processor coupled to the receiver element for processing the received message, and a display coupled to the processor for displaying the received message. The selective call receiver also includes a first memory element coupled to the processor for storing the received message, and a second memory element coupled to the processor for storing the portion of the received message. The second memory element comprises a plurality of partitions corresponding to a plurality of file types for categorizing portions of received messages stored therein. The selective call receiver further comprises a user control coupled to the processor for accepting user commands for controlling the processing of the received message. The user control is utilized by the user to define the portion of the received message that is to be stored, and further to select one of the plurality of partitions for storing the portion of the received message.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an electrical block diagram of a selective call receiver in accordance with the preferred embodiment of the present invention.

FIG. 2 is an orthographic front view of the selective call receiver depicting a status screen having a cursor and message identifiers for five received messages in accordance with the preferred embodiment of the present invention.

FIG. 3 is an orthographic front view of a selective call receiver depicting a displayed message and the cursor for selecting a portion of the displayed message in accordance with the preferred embodiment of the present invention. FIG. 4 is an orthographic front view of a selective call receiver depicting selected portions of the displayed message in accordance with the preferred embodiment of the present invention. FIG. 5 is a flow chart of the operation of a selective call receiver in accordance with the preferred embodiment of the present invention. FIG. 6 is a continuation of the flow chart of the operation of a selective call receiver in accordance with the preferred embodiment of the present invention.

### DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference to FIG. 1, an electrical block diagram of a selective call receiver 100 in accordance with the preferred embodiment of the present invention comprises an antenna 102 for intercepting RF signals comprising information. The antenna 102 is coupled to a receiver 104 for receiving the intercepted RF signals. A decoder 106 is coupled to the receiver 104 for decoding a selective call address contained within the information received. A microprocessor 108 is coupled to the receiver 104 for processing the information received to recover messages. The microprocessor 108 is also coupled to the decoder 106 for responding to a selective call address decoded therein. An alert device 112 is coupled to the microprocessor 108 for providing an audible or tactile alert to the user when the microprocessor 108 has a message ready for presentation. A display 114 is coupled to the microprocessor 108 for displaying recovered messages. A control section 110 comprises user accessible interfaces for allowing the user to command the microprocessor 108 to perform selective call receiver operations, and includes control switches such as an on/off control button, a cursor

control key, and other control keys that are described herein below in accordance with the preferred embodiment of the present invention. A real-time clock 111 is also coupled to the microprocessor 108 for providing an alarm function.

The microprocessor 108 is coupled to and controls a random access memory (RAM) 118 supplied with battery-backed-up power to provide non-volatility of memory contents. The RAM 118 comprises a received message area 120 for storing messages as they are received. The RAM 118 further comprises a business partition 122 for storing portions of business messages, and a personal partition 124 for storing portions of personal messages. In addition, the RAM 118 comprises a to-do partition 126 for storing portions of messages requiring future action, and a meetings partition 128 for storing portions of messages related to meetings. As will be apparent to one of ordinary skill in the art, the number of the partitions 122, 124, 126, 128 may be changed to a greater or lesser number, and the partitions 122, 124, 126, 128 may be either of fixed size or dynamically controlled size, i.e., size adjusted according to data storage requirements for each file type.

The microprocessor 108 also is coupled to a read-only memory (ROM) 116 for accessing stored software algorithms for performing various tasks in accordance with the preferred embodiment of the present invention. The software algorithms include a message retriever 129 for retrieving received messages stored in the RAM 118, a partition selector 130 for selecting a partition 122, 124, 126, 128 corresponding to a selected file type, and an alphabetizer 132 for storing message portions in alphabetical order within each partition 122, 124, 126, 128. In addition, there is a message examiner 134 for examining a message portion to determine whether the message portion contains date and time information. Also included are a user prompter 136 for prompting the user to respond about setting an alarm, and an alarm element 138 for setting and generating an alarm.

With reference to FIG. 2, an orthographic front view of the selective call receiver 100 depicts a status screen having a cursor 208 and message identifiers 206 for five received messages in accordance with the preferred embodiment of the present invention. The selective call receiver 100 includes cursor control keys comprising an up key 210, a right key 212, a down key 214, and a left key 216. The cursor control keys 210, 212, 214, 216 are used to move the cursor 208 to character positions in received messages and to message identifiers 206 for use in selecting the corresponding character position or message identifier 206.

Also included are a read key 218 for displaying a received message corresponding to a selected message identifier 206, and a select key 228 for selecting portions of a displayed received message. In addition there are business, personal, to-do, and meetings file keys 220, 222, 224, 226, respectively. The business file key 220 is used for storing selected message portions in the business partition 122 of the RAM 118 (FIG. 1), and the personal file key 222 is used for storing selected message portions in the personal partition 124 (FIG. 1). Similarly, the to-do key 224 is used for storing selected message portions in the to-do partition 126 (FIG. 1), and the meetings key 226 is used for storing selected message portions in the meetings partition 128 (FIG. 1).

With reference to FIG. 3, an orthographic front view of the selective call receiver 100 depicts a displayed

message and the cursor 208 for selecting a portion of the displayed message in accordance with the preferred embodiment of the present invention. In FIG. 3 a user has depressed one of the file keys 220, 222, 224, 226 to begin a process of selecting at least one message portion for storage. Next, the user has depressed the right key 212 to move the cursor 208 under the "M" character 302. If desired, the user may now select the "M" character 302 as the starting point of message portion selection by depressing the select key 228.

With reference to FIG. 4, an orthographic front view of the selective call receiver 100 depicts selected portions of the displayed message in accordance with the preferred embodiment of the present invention. First and second message portions that have been selected are indicated by underlines 408, 410. The selection of the first message portion was accomplished by using the right key 212 to move the cursor 208 from the selected starting point at the "M" character 302 (FIG. 3) to an ending point 402, followed by depressing the select key 228. Then the right key 212 was used to move the cursor 208 to the starting point 404 of the second message portion, after which the select key 228 was again depressed. Next the right key 212 was used to move the cursor 208 to the ending point 406 of the second message portion, after which the select key 228 was again depressed to select the second message portion. At this point of operation, depressing a file key, e.g., the business file key 220, will cause the selected message portions to be stored in the business partition 122 of the RAM 118 (FIG. 1). If desired, e.g., for longer messages, it is of course possible to select more than two message portions for storage.

With reference to FIG. 5, a flow chart of the operation of the selective call receiver 100 in accordance with the preferred embodiment of the present invention begins with the display 114 of the selective call receiver 100 (FIGS. 1 and 2) showing received message status by means of the message identifiers 206, as depicted in FIG. 2. The user depresses 502 a cursor key, e.g., the right key 212 (FIG. 2), to cause the microprocessor 108 (FIG. 1) to move 504 the cursor 208 (FIG. 2) to the right under a message identifier 206. This process repeats until in step 506 the user releases the cursor key, at which time the microprocessor 108 stops 508 the cursor 208 under a message identifier 206. To display a message corresponding to the message identifier 206 above the cursor 208, the user depresses 510 the read key 218 (FIG. 2). In response, the microprocessor 108 accesses the ROM-based message retriever 129 (FIG. 1) and displays 512 the corresponding message.

To begin a process of message portion selection the user next depresses 514 a file key, e.g., the business file key 220 (FIG. 2), which causes the microprocessor 108 (FIG. 1) to display 516 the cursor 208 (FIG. 2) at the start of the message. The user then depresses 518 a cursor key, e.g., the right key 212 (FIG. 2) to cause the microprocessor 108 to move 520 the cursor through the message characters until in step 522 the user releases the cursor key, at which time the microprocessor 108 stops moving 524 the cursor 208. If the message selected in step 510 is longer than can be displayed on a single screen "page," then in moving the cursor 208 the microprocessor 108 will scroll to a new page of the message each time the cursor 208 reaches the end of a currently displayed page.

To select a beginning point for a first message portion the user depresses 526 the select key 228 (FIG. 2). This

causes the microprocessor 108 (FIG. 1) to select 528 the message character over the cursor 208 (FIG. 2) as the start of a message portion to be saved. Next, the user depresses 530 the right key 212 (FIG. 2) to cause the microprocessor 108 to move 532 the cursor 208 through message characters to the right. This process continues until in step 534 the user releases the right key 212, at which time the microprocessor 108 stops 536 moving the cursor 208. If desired, the user may also adjust the cursor position in single steps by using short depressions of the right or left keys 212, 216. The user then depresses 538 the select key 228 (FIG. 2), which causes the microprocessor 108 to select and underline 540 the message portion to be saved from the beginning point through the current cursor position. If in step 542 the user desires to select additional portions of the message, then the user depresses the right key 212, and the process repeats from step 518. If in step 542 the user does not desire to select additional message portions, then the process moves to step 602 (FIG. 6).

With reference to FIG. 6, in step 602 the user depresses a file key, e.g., the business file key 220 (FIG. 2). This causes the microprocessor 108 (FIG. 1) to access the ROM-based partition selector 130 (FIG. 1) and alphabetizer 132 (FIG. 1) to store 604 the selected message portions alphabetically in the partition in the RAM 118 (FIG. 1) corresponding to the file key, e.g., the business partition 122 (FIG. 1). Next, the microprocessor 108 accesses its message examiner 134 (FIG. 1) to examine 606 the message portions to determine whether they contain time and date information, i.e., information matching certain pre-programmed patterns, e.g., "NN/NN/NN at NN:NN PM," where N represents a numeric digit. If not, in step 608 the microprocessor 108 returns 616 the display 114 to the status screen showing the received message identifiers 206 (FIG. 2). If, on the other hand, the microprocessor 108 determines in step 608 that there is time and date information in the message portions, then the microprocessor accesses 610 its user prompter 136 to ask the user whether alarm setting is desired.

If in step 612 the user responds by depressing the select key 228 (FIG. 2) before a pre-programmed timeout, e.g., five seconds, then the microprocessor 108 (FIG. 1) accesses its alarm element 138 (FIG. 1) to enable 614 an alarm that will occur when the real-time clock 111 (FIG. 1) reaches the time and date contained in the message portions. Then the microprocessor 108 returns 616 the display 114 to the status screen showing the received message identifiers 206 (FIG. 2). If, on the other hand, the user does not respond in time in step 612, then the microprocessor 108 simply returns 616 the display 114 to the status screen showing the received message identifiers 206 (FIG. 2).

Thus, the present invention provides a way of retaining the interesting parts of a message received by a selective call receiver without having to retain the uninteresting parts. This allows a user to store portions of a message, for example, a name and telephone number, while discarding the remainder of the message to conserve memory in the selective call receiver. The present invention also provides a way of organizing the retained message parts alphabetically and by category to facilitate recalling the retained message parts at a future time. Over time, the present invention allows the user to build and access a library of useful information selected and stored by the user from messages received by the selective call receiver.

What is claimed is:

1. A method for selectively storing by a user portion of a received message in a selective call receiver comprising first and second memory means for storing the received message and the portion thereof, respectively, the second memory means having a plurality of partitions corresponding to a plurality of file types, the method comprising the steps of:

(a) defining by the user the portion of the received message stored in the first memory means to be stored in the second memory means;

(b) selecting by the user one of the plurality of partitions for storing the defined portion of the received message; and

(c) storing in the selected one of the plurality of partitions the defined portion of the received message.

2. The method according to claim 1, wherein the selective call receiver further comprises display means for displaying the received message along with a message identifier and a movable indicator, and

wherein step (a) comprises the steps of:

(d) moving the movable indicator to a displayed starting point of the portion of the received message;

(e) selecting the displayed starting point to which the movable indicator was moved in step (d);

(f) moving the movable indicator to a displayed ending point of the portion of the received message; and

(g) selecting the displayed ending point to which the movable indicator was moved in step (f).

3. The method according to claim 1, wherein step (b) comprises the steps of:

(d) selecting one of the plurality of file types; and

(e) selecting the corresponding one of the plurality of partitions for storing the portion of the received message.

4. The method according to claim 1, wherein step (c) comprises the step of:

(d) storing the portion of the received message in alphabetical order relative to previously stored portions of received messages.

5. The method according to claim 1, wherein step (a) comprises the step of:

(d) choosing from a plurality of received messages in the first memory means a received message to store selectively.

6. The method according to claim 5, wherein the selective call receiver further comprises display means for displaying the received message along with a message identifier and a movable indicator, and

wherein step (d) comprises the steps of:

(e) moving the movable indicator to the message identifier corresponding to the received message to be selectively stored;

(f) selecting the message identifier to which the movable indicator was moved in step (e); and

(g) displaying the received message corresponding to the message identifier selected in step (f).

7. The method according to claim 1, wherein the selective call receiver further comprises control means for controlling the selection and storing of the at least one portion of the received message, and

wherein the method further comprises the steps of:

(d) examining by the control means characters of the portion of the received message defined in step (a)

to determine whether the portion of the received message contains characters matching a pre-programmed pattern corresponding to a common representation of time and date; and

(e) generating a user prompt for alarm setting in response the portion of the received message having been determined in step (d) to contain characters matching the pre-programmed pattern corresponding to the common representation of time and date.

8. The method according to claim 7, further comprising the step of:

(f) setting by the control means an alarm having an activation time and date corresponding to the characters matching the pre-programmed pattern in response to a user having responded affirmatively to the user prompt.

9. A selective call receiver including an apparatus for selectively storing by a user a portion of a received message in the selective call receiver comprises:

receiver means for receiving a signal comprising an address and a message;

decoder means coupled to the receiver means for decoding the address defining an intended recipient of the message;

processor means coupled to the receiver means for processing the received message;

display means coupled to the processor means for displaying the received message;

first memory means coupled to the processor means for storing the received message;

second memory means coupled to the processor means for storing the portion of the received message, the second memory means comprising a plurality of partitions corresponding to a plurality of file types for categorizing portions of received messages stored therein; and

user control means coupled to the processor means for accepting user commands for controlling the processing of the received message, wherein the user control means is utilized by the user to define the portion of the received message that is to be stored, and further to select one of the plurality of partitions for storing the portion of the received message.

10. The selective call receiver according to claim 9, wherein the display means comprises a movable indicator, and

wherein the user control means comprises a movable indicator control means for moving the movable indicator to a displayed starting point and to a displayed ending point of the portion of the received message, and

wherein the user control means further comprises a portion selector for selecting the portion of the received message from the displayed starting point to the displayed ending point.

11. The selective call receiver according to claim 9, wherein the processor means further comprises an alphabetizing means for storing the portion of the received message in alphabetical order relative to previously stored portions of messages.

12. The selective call receiver according to claim 9, further comprising real-time clock means, and

wherein the processor means comprises examining means for examining characters of the portion of a received message to determine whether the portion of the received message contains characters match-

ing a pre-programmed pattern corresponding to a common representation of time and date; and

wherein the processor means further comprises user prompting means for generating a user prompt for alarm setting in response to the portion of the received message having been determined to contain characters matching the pre-programmed pattern corresponding to the common representation of time and date, and

wherein the processor means further comprises alarm setting means coupled to the real-time clock means for setting an alarm having an activation time and date corresponding to the characters matching the pre-programmed pattern in response to a user having responded affirmatively to the user prompt.

13. The selective call receiver according to claim 9, wherein the user control means comprises selector means coupled to the processor means for selecting the portion of the received message to be stored in one of the plurality of partitions.

14. The selective call receiver according to claim 13, wherein the user control means further comprises a file selector for selecting a file type, and

wherein the processor means comprises a partition selector means for selecting the one of the plurality of partitions for storing the portion of the received message such that the selected one of the plurality of partitions corresponds to the file type selected.

15. The selective call receiver according to claim 9, further comprising a message identifier means, wherein the user control means further comprises a message identifier selection means for choosing from a plurality of received messages in the first memory means a received message to be stored selectively.

16. The selective call receiver according to claim 15, wherein the display means comprises a movable indicator, and

wherein the user control means comprises a movable indicator control means for moving the movable indicator to the message identifier means corresponding to the received message to be selectively stored, and

wherein the user control means further comprises an identifier selector for selecting the message identifier to which the movable indicator has been moved, and

wherein the processor means comprises message retrieval means for displaying the received message corresponding to the selected message identifier.

17. A selective call receiver including an apparatus for selectively storing by a user a portion of a received message in the selective call receiver comprises:

a receiver for receiving a signal comprising an address and a message;

a decoder coupled to the receiver for decoding the address defining an intended recipient of the message;

a processor coupled to the receiver for processing the received message;

a display coupled to the processor for displaying the received message;

a first memory element coupled to the processor for storing the received message;

a second memory element coupled to the processor for storing the portion of the received message, the second memory element comprising a plurality of partitions corresponding to a plurality of file types

for categorizing portions of received messages stored therein; and  
 a user control coupled to the processor for accepting user commands for controlling the processing of the received message, wherein the user control is utilized by the user to define the portion of the received message that is to be stored, and further to select one of the plurality of partitions for storing the portion of the received message.

18. The selective call receiver according to claim 17, wherein the display comprises a movable indicator, and wherein the user control comprises a movable indicator control for moving the movable indicator to a displayed starting point and to a displayed ending point of the portion of the received message, and wherein the user control further comprises a portion selector for selecting the portion of the received message from the displayed starting point to the displayed ending point.

19. The selective call receiver according to claim 17, further comprising a message identifier, wherein the user control comprises a message identifier selector for choosing from a plurality of received messages in the first memory a received message to be stored selectively, and wherein the display comprises a movable indicator, and wherein the user control further comprises a movable indicator control for moving the movable indicator to the message identifier corresponding to the received message to be selectively stored, and wherein the user control further comprises an identifier selector for selecting the message identifier to which the movable indicator has been moved, and

wherein the processor comprises a message retriever for displaying the received message corresponding to the selected message identifier.

20. The selective call receiver according to claim 17, further comprising a real-time clock, and wherein the processor comprises an examining element for examining characters of the portion of the received message to determine whether the portion of the received message contains characters matching a pre-programmed pattern corresponding to a common representation of time and date; and wherein the processor further comprises a prompting element for generating a user prompt for alarm setting in response to the portion of the received message having been determined to contain characters matching the pre-programmed pattern corresponding to the common representation of time and date, and wherein the processor further comprises an alarm setting element coupled to the real-time clock for setting an alarm having an activation time and date corresponding to the characters matching the pre-programmed pattern in response to a user having responded affirmatively to the user prompt.

21. The selective call receiver according to claim 17, wherein the user control comprises a selector coupled to the processor for selecting the portion of the received message to be stored in one of the plurality of partitions.

22. The selective call receiver according to claim 21, wherein the user control further comprises a file selector for selecting a file type, and wherein the processor comprises a partition selector for selecting the one of the plurality of partitions for storing the portion of the received message such that the selected one of the plurality of partitions corresponds to the file type selected.

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UNITED STATES PATENT AND TRADEMARK OFFICE  
CERTIFICATE OF CORRECTION

PATENT NO. : 5,359,317  
DATED : October 25, 1994  
INVENTOR(S) : Gomez et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 6, line 2, after the word "user" insert --a--.

Column 7, line 6, after the word "response" insert --to--.

Signed and Sealed this  
Fifteenth Day of August, 1995

Attest:



BRUCE LEHMAN

Attesting Officer

Commissioner of Patents and Trademarks



- [54] **METHOD AND APPARATUS FOR PRE-PROGRAMMED CALL-BACK-NUMBER-DETERMINED ALERT**
- [75] Inventors: **Poh-T'in Wong**, Boynton Beach; **Allen J. Weidler**, Lake Worth; **William J. Burke**, Boca Raton, all of Fla.
- [73] Assignee: **Motorola, Inc.**, Schaumburg, Ill.
- [21] Appl. No.: **980,047**
- [22] Filed: **Nov. 23, 1992**
- [51] Int. Cl.<sup>6</sup> ..... **G08B 5/22**
- [52] U.S. Cl. .... **340/825.44; 340/825.22**
- [58] Field of Search ..... **340/825.44, 825.45, 340/825.46, 825.48, 311.1, 825.22; 364/705.05, 715.11; 455/38.1, 38.2, 38.5**

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Primary Examiner—Michael Horabik  
 Attorney, Agent, or Firm—R. Louis Breeden

[57] **ABSTRACT**

A method and apparatus in a communication receiver (110) for controlling an alert in response to a received call-back number (233) include receiving (402) the call-back number (233). A processor (208) in the communication receiver (110) compares (406) the received call-back number (233) with a list of pre-programmed call-back numbers (226, 228, 230) stored in a memory (210). If the received call-back number (233) matches (408) one of the pre-programmed call-back numbers (226, 228, 230), the processor (208) selects (410) a pre-programmed alert (236, 238, 240) corresponding to the matched pre-programmed call-back number (233), and instructs (414) an alert generator (212) to generate the selected pre-programmed alert (236, 238, 240).

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20 Claims, 6 Drawing Sheets

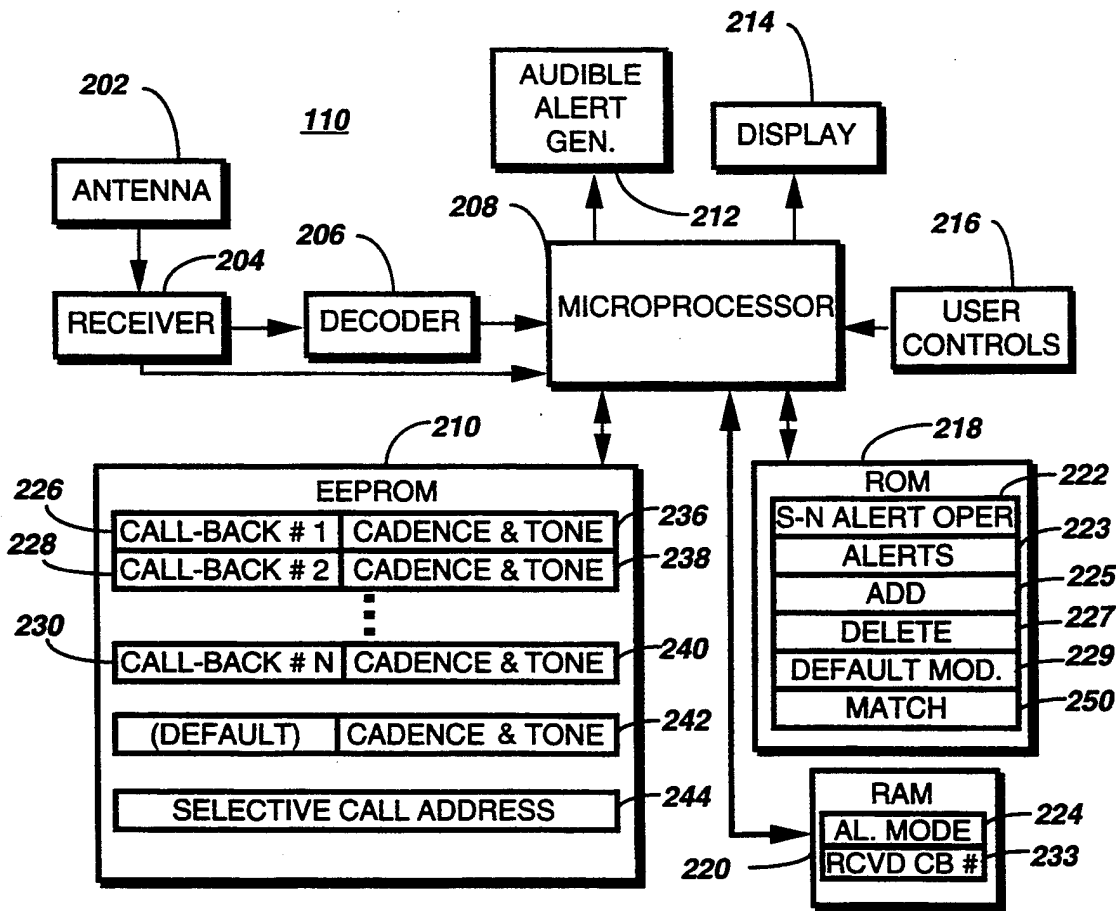


FIG. 1

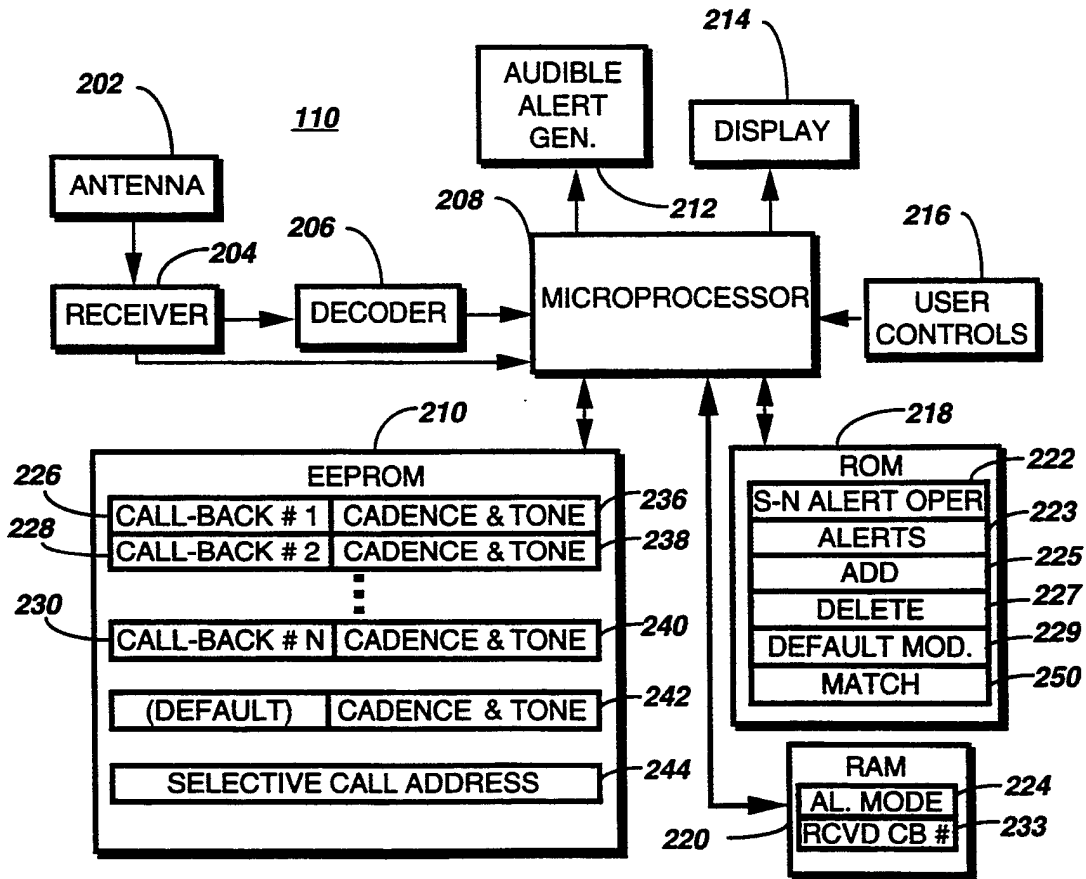
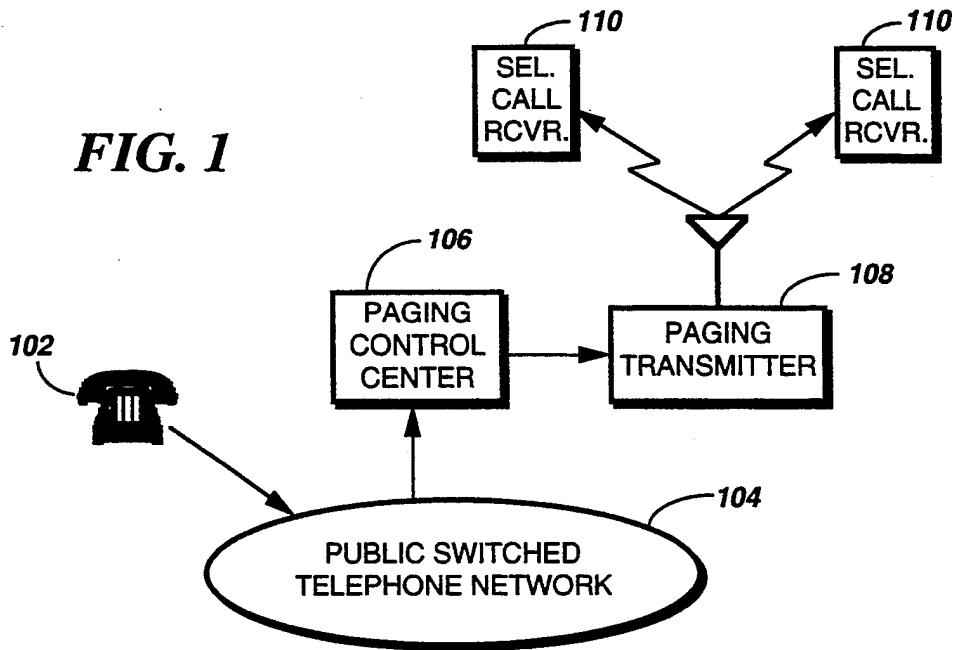


FIG. 2

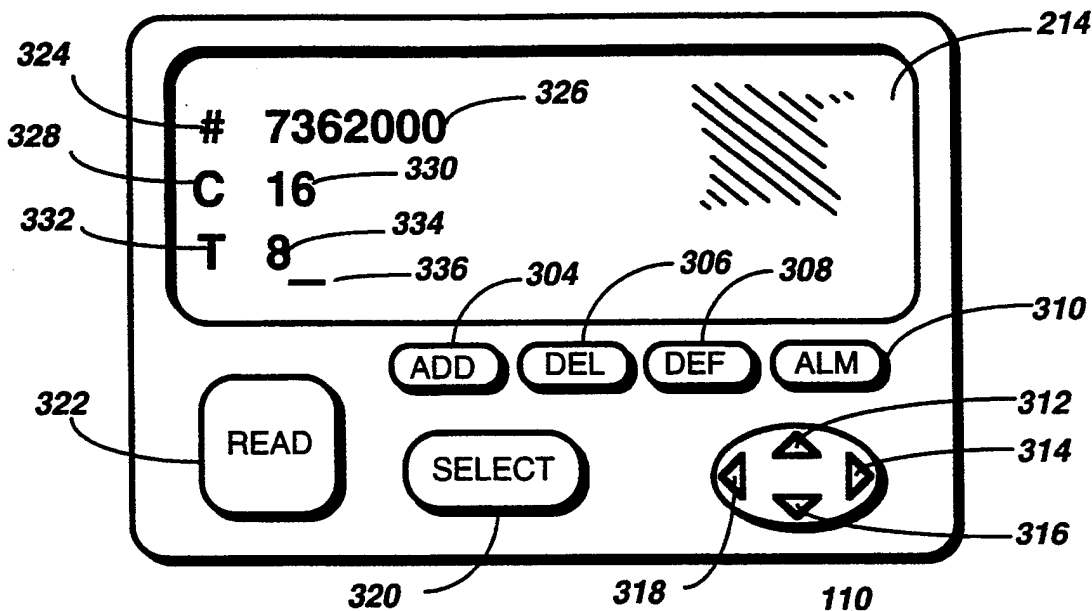


FIG. 3

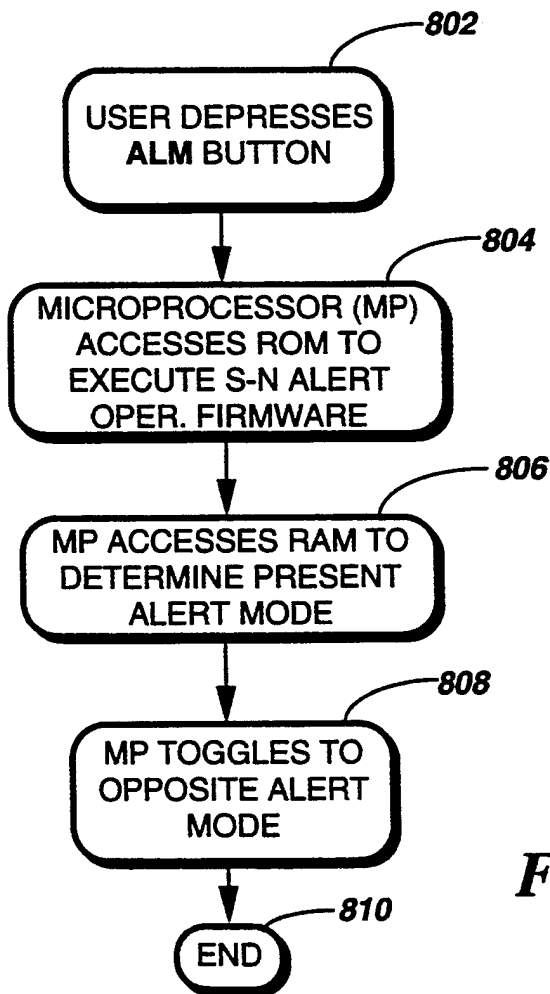


FIG. 8

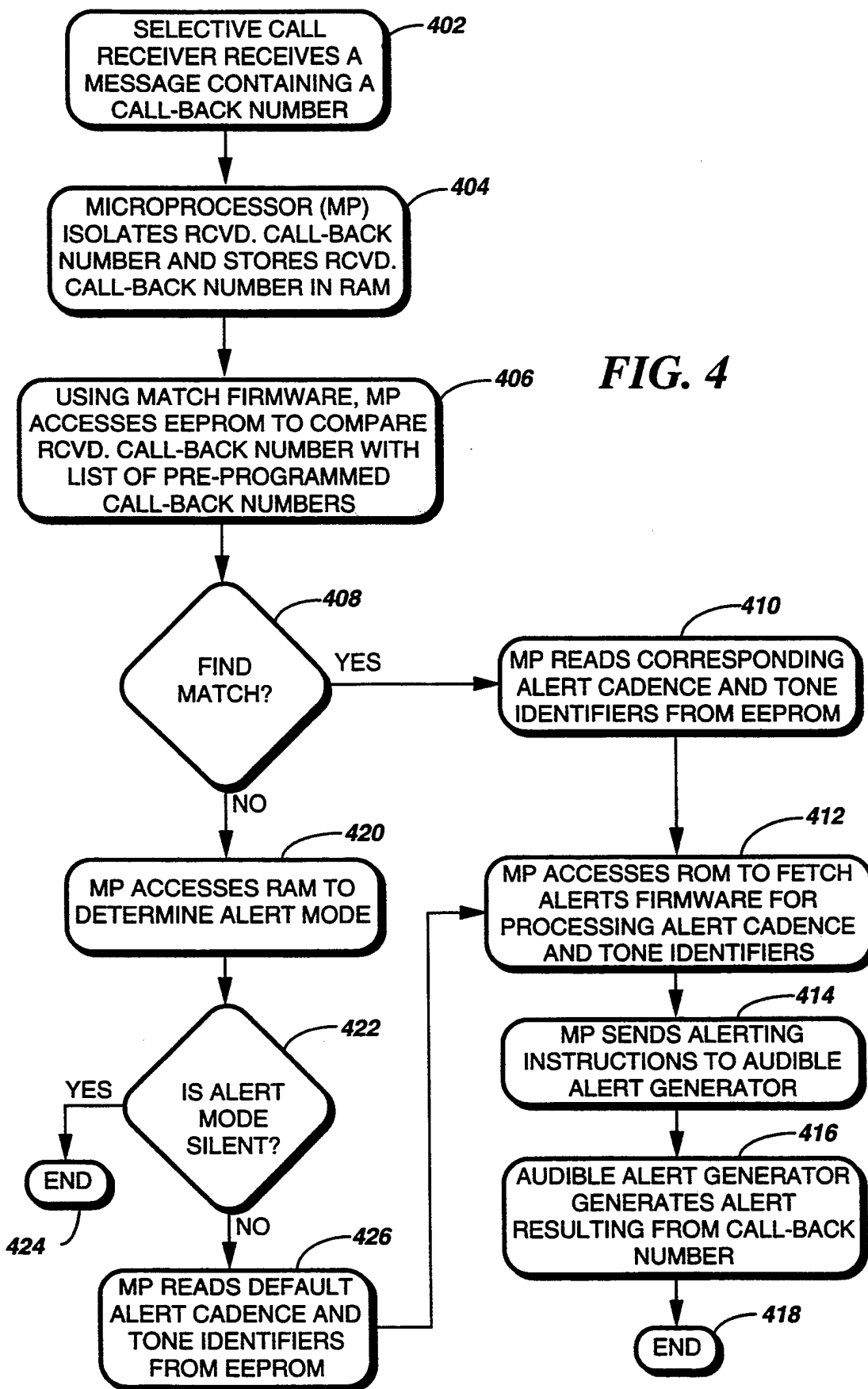


FIG. 4

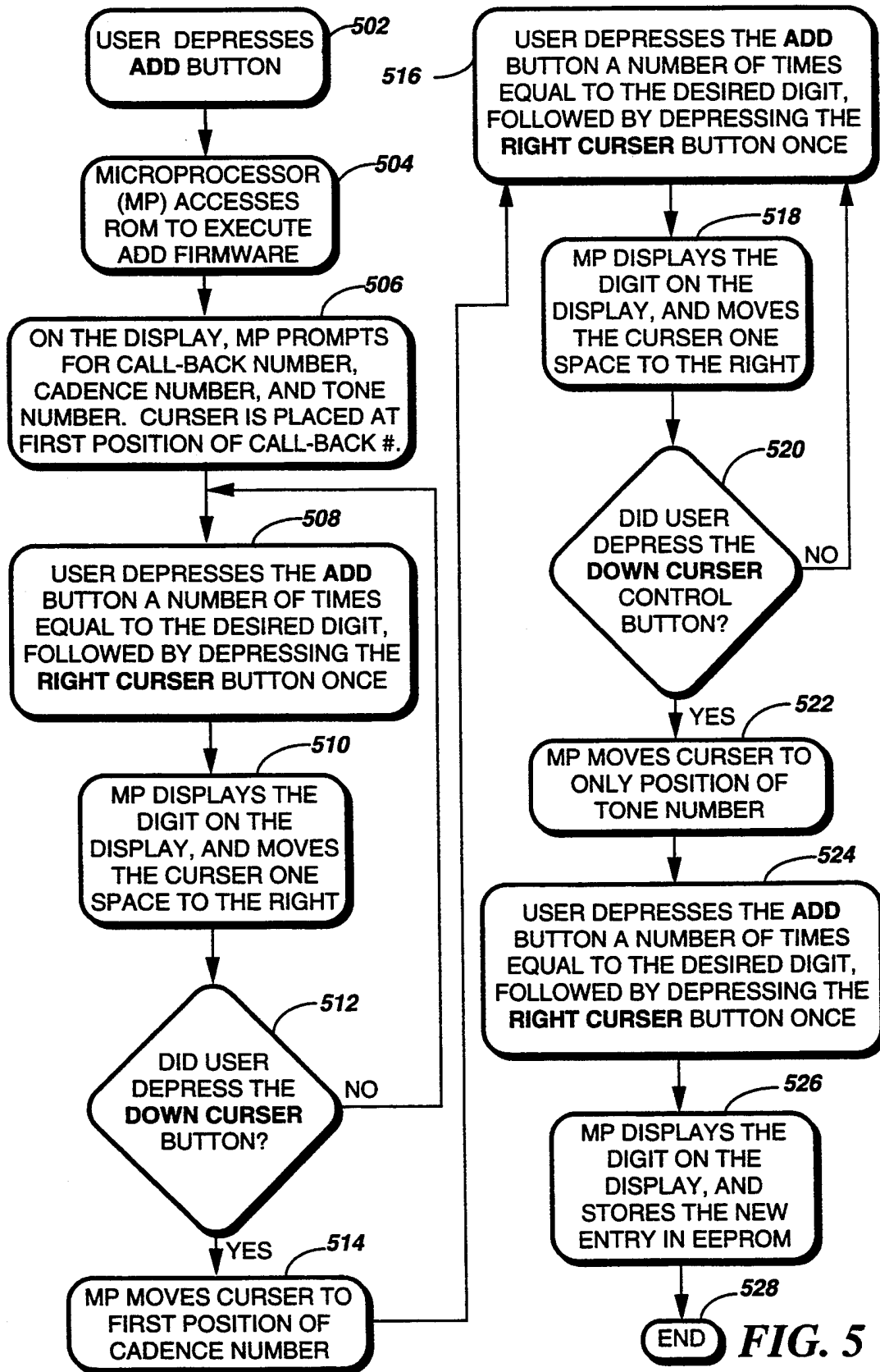


FIG. 5

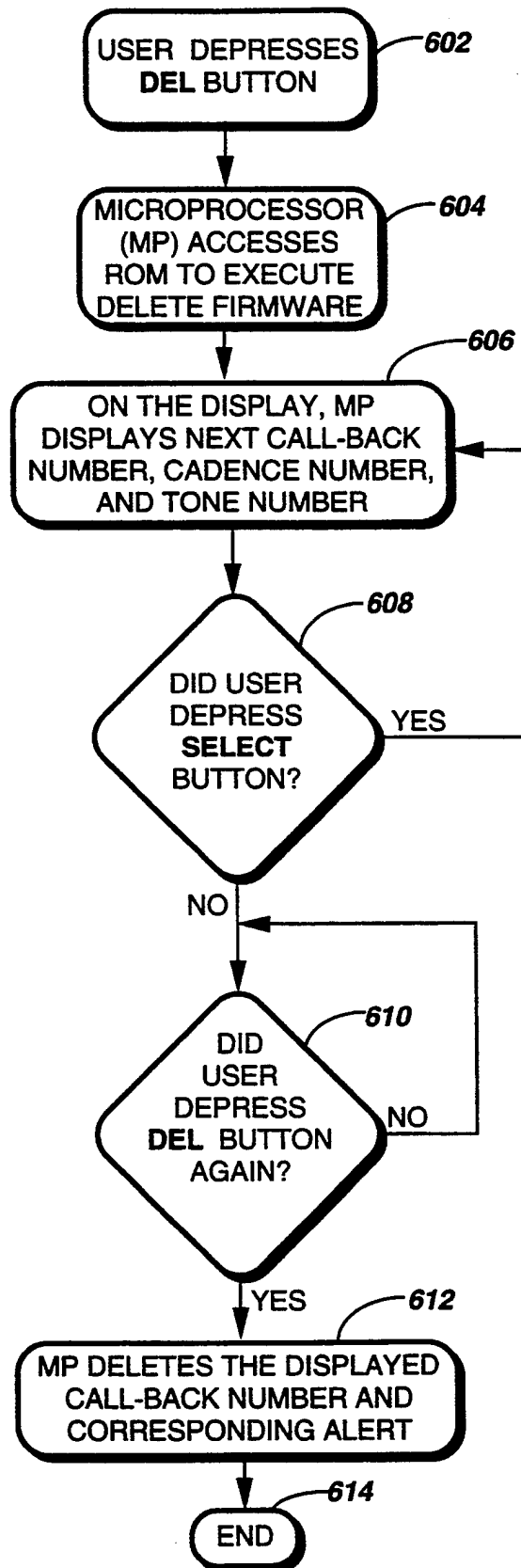


FIG. 6

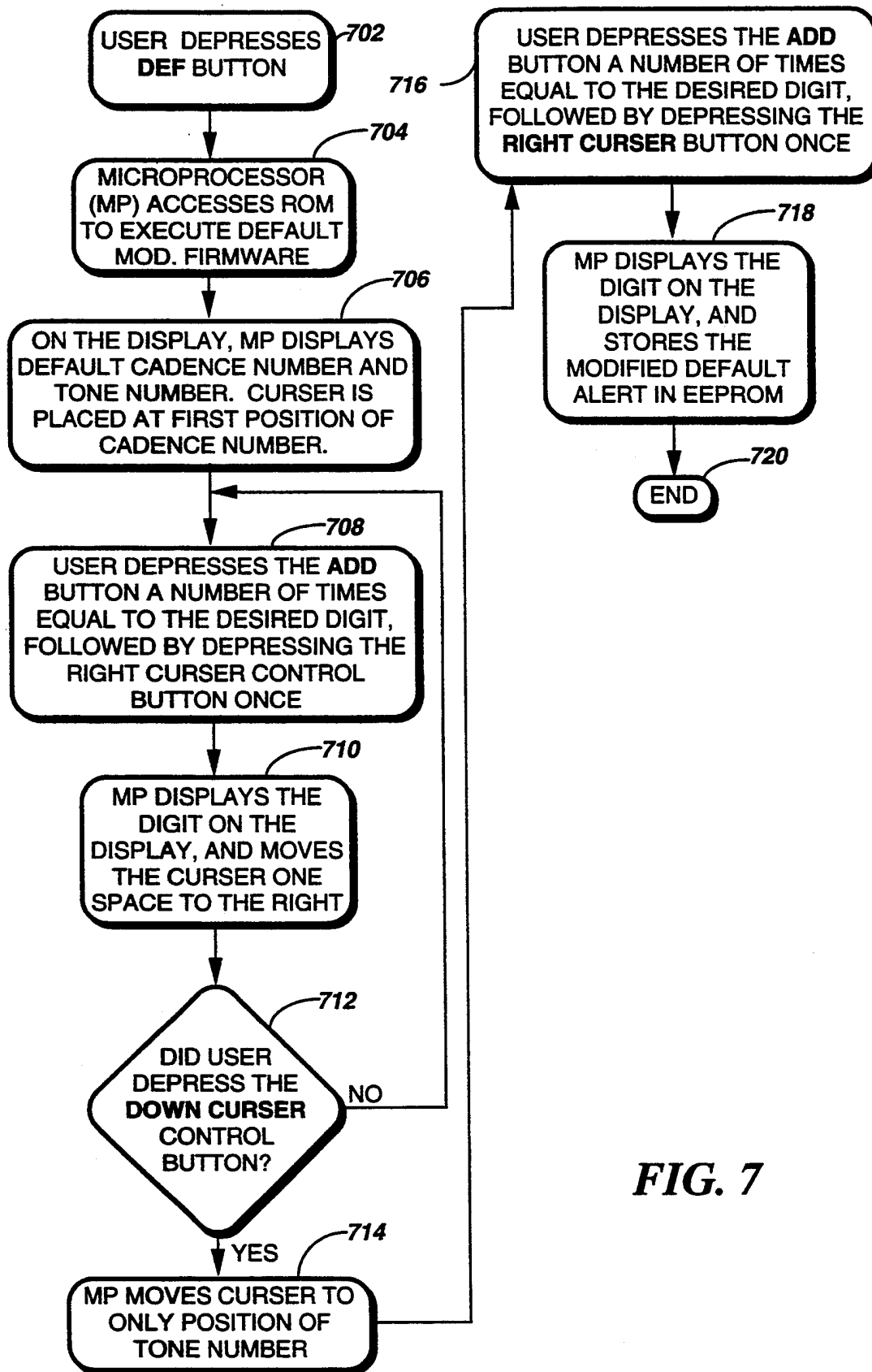


FIG. 7



**METHOD AND APPARATUS FOR  
PRE-PROGRAMMED  
CALL-BACK-NUMBER-DETERMINED ALERT**

**FIELD OF THE INVENTION**

This invention relates in general to communication receivers, and more specifically to a method and apparatus in a communication receiver for generating a pre-programmed special alert in response to receiving a call-back number that matches a pre-programmed number.

**BACKGROUND OF THE INVENTION**

Radio pagers (also known as selective call receivers) having a plurality of alerts are well known. It was common before numeric display pagers became available for a radio pager to have a plurality of predetermined selective call addresses, each associated with a telephone access number that could be dialed by callers to send pages to the associated selective call address. Typically, an indication, e.g., a unique alert tone or alert cadence, was generated in response to receiving a page directed to the selective call address. By partitioning potential callers into several different groups, each given a different telephone access number to call, a user could attain some degree of knowledge of the source of the call. For example, a user could give a first telephone access number to business associates, a second number to friends, a third number to relatives, etc. By noting the unique alert accompanying a page, a user was able to discern which telephone access number was dialed to send the page, and thus which of the groups of callers probably originated the page. A significant drawback to this approach of call source identification is that assigning multiple telephone access numbers to a pager is expensive. Another drawback resulted from the limited number of unique addresses and corresponding telephone access numbers possible for each pager.

The arrival of the numeric display pager significantly reduced the need to partition callers into separate groups dialing separate telephone access numbers. By utilizing numeric display paging, callers could dial a single telephone access number to send a call-back number (entered by the caller using, for example, a tone dialing telephone set) that the page recipient could then call to contact the caller by telephone. In many instances the page recipient could discern the identity of a familiar caller by recognizing a familiar call-back number, e.g., the number of the page recipient's home or office, or that of an important client. This ability largely eliminated the need for the expensive multiple telephone access number approach of source identification.

Still, there are situations that can impair one's ability to discern the identity of even an important caller from a displayed call-back number. For example, the call-back number might be that of a relatively new business associate and not yet committed to the page recipient's memory, or perhaps the display might be poorly lighted, making it difficult to read.

Thus, what is needed is a way to aid a user in discerning that a call is from a predetermined subset of important callers without the user's having to memorize call-back numbers or having to read a poorly lighted displayed number. A way is needed that does not require

expensive multiple telephone access numbers for a single pager.

**SUMMARY OF THE INVENTION**

5 An aspect of the present invention is a communication receiver comprising a receiver element for receiving a message comprising at least a received call-back number, and a storage element for storing at least one user-programmed call-back number along with data defining at least one corresponding user-programmed special audible alert, and further for storing data defining a user-programmed default audible alert. The communication receiver further comprises a processor coupled to the receiver element for processing the message to derive the received call-back number and coupled to the storage element for comparing the received call-back number with the at least one user-programmed call-back number. The communication receiver also includes an audible alert generation element coupled to the processor for generating, in response to the received call-back number being found equal to a call-back number included in the at least one user-programmed call-back number, the corresponding user-programmed special audible alert in accordance with the data defining said alert. The processor comprises a first processor element for controlling the audible alert generation element to generate the user-programmed default audible alert in response to the received call-back number being found not equal to any call-back number included in the at least one user-programmed call back number.

Another aspect of the present invention is a selective call receiver comprising a receiver for receiving information comprising an address and a message containing at least a received call-back number, and a decoder coupled to the receiver for decoding the received address. The selective call receiver further comprises a memory element for storing at least one user-programmed call-back number and data defining at least one corresponding user-programmed special audible alert, and further for storing data defining a user-programmed default audible alert. The selective call receiver also includes a processor responsive to the decoder and coupled to the receiver for processing the received message to derive the received call-back number, the processor also coupled to the memory element for comparing the received call-back number with the at least one user-programmed call-back number. In addition, the selective call receiver includes a display coupled to the processor for displaying the received message, and an audible alert generator coupled to the processor for generating, in response to the received call-back number being found equal to a call-back number included in the at least one user-programmed call-back number, the corresponding user-programmed special audible alert in accordance with the data defining the alert. The processor comprises a first processor element for controlling the audible alert generator to generate the user-programmed default audible alert in response to the received call-back number being found not equal to any call-back number included in the at least one user-programmed call back number.

Another aspect of the present invention is a method in a communication receiver for controlling an audible alert in response to a received call-back number, the method comprising the steps of (a) receiving a message comprising at least the received call-back number, and (b) comparing the received call-back number with at least one user-programmed call-back number. The

method further comprises the steps of (c) selecting a user-programmed special audible alert corresponding to the received call-back number in response to determining in step (b) that the received call-back number is equal to a call-back number included in the at least one user-programmed call-back number, and (d) selecting a user-programmed default audible alert in response to determining in step (b) that the received call-back number is not equal to any call-back number included in the at least one user-programmed call-back number. The method further comprises the step of (e) generating the user-programmed audible alert selected in accordance with steps (c) and (d).

#### BRIEF DESCRIPTION OF THE DRAWINGS

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

FIG. 2 is an electrical block diagram of a selective call receiver in accordance with the preferred embodiment of the present invention.

FIG. 3 is an orthographic front view of a selective call receiver in accordance with the preferred embodiment of the present invention.

FIG. 4 is a flow chart of a method in the selective call receiver for alert control responsive to a received call-back number in accordance with the preferred embodiment of the present invention.

FIG. 5 is a flow chart of a method in the selective call receiver for adding a new call-back number and corresponding special alert in accordance with the preferred embodiment of the present invention.

FIG. 6 is a flow chart of a method in the selective call receiver for deleting a call-back number and corresponding special alert in accordance with the preferred embodiment of the present invention.

FIG. 7 is a flow chart of a method in the selective call receiver for modifying a default alert in accordance with the preferred embodiment of the present invention.

FIG. 8 is a flow chart of a method in the selective call receiver for toggling an alert mode in accordance with the preferred embodiment of the present invention.

#### DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, an electrical block diagram of a communication system in accordance with the preferred embodiment of the present invention depicts a telephone 102 coupled through the Public Switched Telephone Network (PSTN) 104 to a paging control center 106. The paging control center 106 is coupled to a paging transmitter 108, which transmits selective call messages by radio signals to a selective call receiver 110 preferably having display capability for displaying a call-back number. In operation, a caller desiring to contact a user of a selective call receiver 110 uses the telephone 102 to place a call through the PSTN 104 by dialing a paging access number assigned to an address of the selective call receiver 110. Upon receiving the call, the paging control center 106 prompts the caller to enter a call-back number using tone dialing buttons of the telephone 102, after which the paging control center 106 sends the address of the called selective call receiver 110 and the call-back number to the paging transmitter 108. In response, the paging transmitter 108 transmits over the air the address along with the call-back number, preferably using a standard radio paging

protocol such as the Post Office Code Standardization Advisory Group (POCSAG) protocol, although it will be appreciated that other signaling protocols can be utilized as well.

After receiving the address and upon recognizing that the address matches an address of the selective call receiver 110, the selective call receiver 110 generates an alert, and then in response to an action by a user of the selective call receiver 110, e.g., a button push, displays the call-back number. The user then finds a telephone and places a call to the call-back number to converse with the caller. Additionally, in accordance with the preferred embodiment of the present invention, upon receipt of the call-back number the selective call receiver 110 accesses a list of pre-programmed call-back numbers 226, 228, 230 (FIG. 2) and corresponding special alerts 236, 238, 240 (FIG. 2), as is described in detail herein below. Then, if the received call-back number matches one of the pre-programmed call-back numbers 226, 228, 230, the selective call receiver 110 generates one of the corresponding special alerts 136, 238, 240.

Referring to FIG. 2, an electrical block diagram of the selective call receiver 110 in accordance with the preferred embodiment of the present invention comprises an antenna 202 for intercepting the radio signals transmitted by the paging transmitter 108 (FIG. 1). The antenna 202 is coupled to a receiver 204 for demodulating the intercepted radio signals to derive address and message information comprising at least a call-back number. The receiver 204 is coupled to a decoder 206 for decoding the address information, and to a microprocessor 208 for processing the message information. The microprocessor 208 is coupled to an audible alert generator 212 for generating an audible alert in response to instructions from the processor after receipt of a message. The microprocessor 208 is also coupled to a display 214, such as a liquid crystal display, for displaying the received message. The microprocessor 208 is also coupled to user controls 216, such as well-known buttons and switches, for allowing a user to control operation of the selective call receiver 110.

In addition, the microprocessor 208 is coupled to an electrically erasable programmable read only memory (EEPROM) 210, a read only memory (ROM) 218, and a random access memory (RAM) 220 for storing pre-programmed values, operating firmware, and temporarily needed values, respectively. The EEPROM 210 comprises values for the pre-programmed call-back numbers 226, 228, 230 and the corresponding special alerts 236, 238, 240 comprising values for both alert cadence and alert tone frequency. Also included in the EEPROM 210 are alert cadence and alert tone frequency values for a default alert 242 associated with a default call-back number, i.e., a received call-back number that does not match any of the pre-programmed call-back numbers 226, 228, 230. In addition, the EEPROM 210 stores values for at least one pre-programmed selective call address 244 to which the selective call receiver is responsive.

The ROM 218 comprises Silent and Non-silent Alert Operation firmware 222 for controlling alerting of the selective call receiver 110 according to a silent or non-silent alert mode selected by the user. Also included is Alerts firmware 223 for controlling the audible alert generator 212 in accordance with the pre-programmed special alerts 236, 238, 240 and default alert 242. In addition, Add, Delete, and Default Modify firmware 225, 227, and 229 are provided for adding a new mem-

ber of the pre-programmed call-back numbers 226, 228, 230 and corresponding special alerts 236, 238, 240, and for modifying the default alert 242. Also included is Match firmware 250 for comparing a received call-back number with the pre-programmed call-back numbers 226, 228, 230.

The RAM 220 is utilized by the microprocessor 208 for temporary storage of operational values, such as timer values, counters, received information, etc., in RAM locations in a manner well known in the art of stored program processing systems. One such location is an Alert Mode location 224 for storing the alert mode, i.e., silent or non-silent alert mode, last selected by the user. Another such location is a received call-back number location 233 for storing a received call-back number.

Referring to FIG. 3, an orthographic front view of the selective call receiver 110 in accordance with the preferred embodiment of the present invention depicts the display 214 as it would appear during a procedure for adding a new member to the pre-programmed call-back numbers 226, 228, 230 and corresponding special alerts 236, 238, 240 (FIG. 2). Also depicted are members of the user controls 216 (FIG. 2) comprising an ADD button 304 for adding a new member to the pre-programmed call-back numbers 226, 228, 230 and corresponding special alerts 236, 238, 240, and a DEL button 306 for deleting one of the pre-programmed call-back numbers 226, 228, 230 and corresponding special alerts 236, 238, 240. A DEF button 308 is for modifying the default alert 242 (FIG. 2), while an ALM button 310 is provided for toggling between silent and non-silent alert modes. Movement of a cursor 336 on the display 214 is controlled by an UP CURSOR button 312, a RIGHT CURSOR button 314, a DOWN CURSOR button 316, and a LEFT CURSOR button 318. In addition, there is a SELECT button 320 for selecting a displayed item, as described herein below, and a READ button 322 for reading a selected received message. Operation of the user controls 214 in accordance with the preferred embodiment of the present invention is more fully described herein below in the detailed description of FIGS. 5, 6, 7, and 8.

On the display 214 are a call-back number prompt 324 and an entered call-back number 326 entered by the user. A cadence prompt 328 is also on the display, followed by a cadence identifier 330 selected by the user. In addition, the display shows a tone frequency prompt 332 and a tone frequency identifier 334 selected by the user.

Referring to FIG. 4, a flow chart of a method in the selective call receiver 110 (FIG. 2) for alert control responsive to a received call-back number in accordance with the preferred embodiment of the present invention begins with the selective call receiver 110 receiving 402 a message containing a call-back number. The microprocessor 208 (FIG. 2) of the selective call receiver 110 isolates 404 the received call-back number and stores it temporarily in the received call-back number location 233 in the RAM 220 (FIG. 2). Next, using the Match firmware 250 (FIG. 2), the microprocessor 208 accesses 406 the EEPROM 210 (FIG. 2) to compare the received call-back number with the pre-programmed call-back numbers 226, 228, 230 to see if any of the pre-programmed call-back numbers 226, 228, 230 match the received call-back number. If in step 408 a match is found, then the microprocessor 208 reads 410 from the EEPROM 210 the corresponding one of the

special alerts 236, 238, 240 (FIG. 2) comprising alert cadence and tone frequency identifiers. Using the Alerts firmware 223 (FIG. 2), the microprocessor 208 processes 412 the alert cadence and tone frequency identifiers to determine alerting instructions. Next, the microprocessor 208 sends 414 the alerting instructions to the audible alert generator 212 (FIG. 2). In response, the audible alert generator 212 generates 416 an alert corresponding to the one of the special alert 236, 238, 240 pre-programmed for the matched received call-back number, and the process ends 418. Programmable audible alert generators, such as the audible alert generator 212, are well known in the art. U.S. Pat. No. 4,868,561 issued Sep. 19, 1989 to Davis, which describes a programmable audible alert generator, is hereby incorporated by reference herein.

If, on the other hand, in step 408 the microprocessor 208 (FIG. 2) does not find a match to the received call-back number, then the microprocessor 208 accesses 420 the Alert Mode location 224 in the RAM 220 to determine the alert mode. If in step 422 the microprocessor 208 finds that the alert mode is silent, then the process ends 424. If in step 422 the microprocessor 208 finds that the alert mode is non-silent, then the microprocessor 208 reads 426 the default alert 242 (FIG. 2) from the EEPROM 210 and sends the cadence and tone frequency identifiers to step 412 as before, ultimately resulting in generation of an alert corresponding to the default alert 242.

Referring to FIG. 5, a flow chart of a method in the selective call receiver 110 (FIG. 2) for adding a new call-back number and corresponding special alert in accordance with the preferred embodiment of the present invention begins with a user depressing 502 the ADD button 304 (FIG. 3). In response, the microprocessor 208 (FIG. 2) accesses 504 the ROM 218 to execute the Add firmware 225 (FIG. 2). Next, the microprocessor 208 instructs 506 the display 214 (FIG. 3) to generate the call-back number prompt 324, the cadence prompt 328, and the tone frequency prompt 332 (FIG. 3), while placing the cursor 336 at a first position for entry of the new call-back number. To enter the first digit of the new call-back number, the user depresses 508 the ADD button 304 a number of times equal to the desired digit, e.g., no times for the digit zero or six times for the digit six, followed by depressing the RIGHT CURSOR button 314 (FIG. 3) once to move to the next digit. While not shown in the flow chart of FIG. 5, the user also may depress the DEL button 306 (FIG. 3) to reduce the value of a digit at the position of the cursor 336 by a count of one, e.g., to correct an overcount. Concurrent with the depression of the ADD (or DEL) button 304, 306 the microprocessor 208 displays 510 the resultant digit on the display 214, and after the depression of the RIGHT CURSOR button 314, moves the cursor 336 one position to the right. If in step 512 the user has not additionally depressed the DOWN CURSOR button 316 (FIG. 3), then flow returns to step 508 for entry of the next digit of the new call-back number.

If, on the other hand, in step 512 the user has depressed the DOWN CURSOR button 316 (FIG. 3), then the microprocessor 208 (FIG. 2) moves 514 the cursor 336 (FIG. 3) to a first position for entry of a cadence identifier number. As before, the user depresses 516 the ADD (or DEL) button 304, 306 (FIG. 3) a number of times to reach the desired digit, followed by depressing the RIGHT CURSOR button 314 (FIG. 3) to move to the next digit position. Also as before, con-

current with the depression of the ADD (or DEL) button 304, 306 the microprocessor 208 displays 518 the resultant digit on the display 214 (FIG. 3), and after the depression of the RIGHT CURSOR button 314, moves the cursor 336 one position to the right. If in step 520 the user has not additionally depressed the DOWN CURSOR button 316, then flow returns to step 516 for entry of the next digit of the cadence identifier number.

If, on the other hand, in step 520 the user has depressed the DOWN CURSOR button 316 (FIG. 3), then the microprocessor 208 (FIG. 2) moves the cursor 336 (FIG. 3) to the single position for entry of a tone frequency identifier number. Next, the user depresses 524 the ADD (or DEL) button 304, 306 (FIG. 3) a number of times to reach the desired digit, followed by depressing the RIGHT CURSOR button 314 (FIG. 3) once. In response, the microprocessor 208 displays 526 the digit on the display 214 (FIG. 3) and stores the new call-back number and corresponding special alert along with the other pre-programmed call-back numbers 226, 228, 230 and corresponding special alerts 236, 238, 240 in the EEPROM 210 (FIG. 2). At step 528, the process ends.

Referring to FIG. 6, a flow chart of a method in the selective call receiver 110 (FIG. 2) for deleting one of the call-back numbers 226, 228, 230 (FIG. 2) and corresponding special alerts 236, 238, 240 (FIG. 2) in accordance with the preferred embodiment of the present invention begins with the user depressing the DEL button 306 (FIG. 3). In response, the microprocessor 208 (FIG. 2) accesses 604 the ROE 218 to execute the Delete firmware 227. On the display 214 (FIG. 3) the microprocessor 208 displays 606 the first one of the pre-programmed call-back numbers 226, 228, 230, along with an alert descriptor of the corresponding one of the special alerts 236, 238, 240, the alert descriptor comprising a cadence identifier number and a tone frequency identifier number. If in step 608 the user depresses the SELECT button 320 (FIG. 3), then the flow returns to step 606 to display the next one of the pre-programmed call-back numbers 226, 228, 230 and corresponding alert descriptor, and so on, until the user finds one of the call-back numbers 226, 228, 230 that the user desires to delete. When in step 608 the user has not depressed the SELECT button 320, but instead has again pressed the DEL button 306, then from step 610 flow advances to step 612, where the microprocessor 208 deletes the currently displayed one of the call-back numbers 226, 228, 230 and corresponding one of the special alerts 236, 238, 240, after which the process ends 614.

Referring to FIG. 7, a flow chart of a method in the selective call receiver 110 (FIG. 2) for modifying the default alert 242 (FIG. 2) in accordance with the preferred embodiment of the present invention begins with the user depressing 702 the DEF button 308 (FIG. 3). In response, the microprocessor 208 (FIG. 2) accesses 704 the ROM 218 (FIG. 2) to execute the Default Modify firmware 229 (FIG. 2). On the display 214 (FIG. 3) the microprocessor 208 displays 706 the currently programmed default cadence identifier number and default tone frequency identifier number. The cursor 336 (FIG. 3) is placed at the first position for entry of the cadence identifier number. As before, the user depresses 708 the ADD (or DEL) button 304, 306 (FIG. 3) a number of times to reach the desired digit, followed by depressing the RIGHT CURSOR button 314 (FIG. 3) to move to the next digit position. If the user does not wish to change a displayed digit at the cursor position, the user

may depress the RIGHT CURSOR button 314 without depressing the ADD (or DEL) button 304, 306. Also as before, concurrent with the depression of the ADD (or DEL) button 304, 306 (FIG. 3) the microprocessor 208 displays 710 the resultant digit on the display 214 (FIG. 3), and after the depression of the RIGHT CURSOR button 314, moves the cursor 336 one position to the right. If in step 712 the user has not additionally depressed the DOWN CURSOR button 316 (FIG. 3), then flow returns to step 708 for entry of the next digit of the cadence identifier number.

If, on the other hand, in step 712 the user has depressed the DOWN CURSOR button 316 (FIG. 3), then the microprocessor 208 (FIG. 2) moves 714 the cursor 336 (FIG. 3) to the single position for entry of a tone frequency identifier number. Next, the user depresses 716 the ADD (or DEL) button 304, 306 (FIG. 3) a number of times to reach the desired digit, followed by depressing the RIGHT CURSOR button 314 (FIG. 3) once. If the user does not wish to change the displayed digit at the cursor position, the user may depress the RIGHT CURSOR button 314 without depressing the ADD (or DEL) button 304, 306. In response, the microprocessor 208 displays 718 the digit on the display 214 (FIG. 3) and writes the newly entered values into the location in the EEPROM 210 (FIG. 2) for the modified default alert 242 (FIG. 2), after which the process ends 720.

Referring to FIG. 8, a flow chart of a method in the selective call receiver 110 (FIG. 2) for toggling the alert mode 224 (FIG. 2) in accordance with the preferred embodiment of the present invention begins with the user depressing 802 the ALM button 310 (FIG. 3). In response, the microprocessor 208 (FIG. 2) accesses the ROM 218 (FIG. 2) to execute the Silent and Non-silent Alert Operation firmware 222 (FIG. 2). Next, the microprocessor 208 accesses 806 the Alert Mode location 224 in the RAM 220 (FIG. 2) to determine the current alert mode, and then toggles 808 the alert mode to the mode opposite the current mode, e.g., to the silent alert mode if the current alert mode is non-silent, and vice versa, after which the process ends 810.

It will be appreciated that different user controls and different user control operation may be substituted for the user controls and user control operation described herein above for the preferred embodiment without departing from the intent of the present invention. For example, a displayed menu and a cursor could be used instead of direct buttons to access functions such as Add, Delete, etc., in a manner well known in the art. For another example, a full numeric keypad could be used to enter information such as call-back number, cadence number, etc., instead of multiple depressions of a single button to count up or down to a digit value.

Thus, the present invention provides a way of helping a user discern that a call is from a predetermined important caller or group of important callers without the user's having to memorize call-back numbers or having to read a poorly lighted displayed number. The present invention advantageously enables the user to pre-program a selective call receiver such that the selective call receiver generates a recognizable, unique, audible alert in response to receiving a call-back number that the user considers important. The present invention advantageously eliminates the need to use expensive multiple telephone access numbers for a single pager in order to provide audibly distinct alerts.

We claim:

1. A communication receiver comprising:  
 receiver means for receiving a message comprising at least a received call-back number;  
 storage means for storing at least one user-programmed call-back number along with data defining at least one corresponding user-programmed special audible alert, and further for storing data defining a user-programmed default audible alert;  
 processor means coupled to the receiver means for processing the message to derive the received call-back number and coupled to the storage means for comparing the received call-back number with the at least one user-programmed call-back number; and  
 audible alert generation means coupled to the processor means for generating, in response to the received call-back number being found equal to a call-back number included in the at least one user-programmed call-back number, the corresponding user-programmed special audible alert in accordance with the data defining said alert,  
 wherein the processor means comprises a first processor element for controlling the audible alert generation means to generate the user-programmed default audible alert in response to the received call-back number being found not equal to any call-back number included in the at least one user-programmed call back number.
2. The communication receiver in accordance with claim 1, further comprising user control means coupled to the processor means and to the storage means for allowing a user to add or delete a user-programmed call-back number and a corresponding user-programmed special audible alert.
3. The communication receiver in accordance with claim 1, wherein the storage means comprises a non-volatile memory.
4. The communication receiver in accordance with claim 1, further comprising user control means coupled to the processor means for allowing a user to modify the user-programmed default audible alert.
5. The communication receiver in accordance with claim 4, further comprising a second processor element coupled to the processor means and responsive to the user control means for controlling the generation of the user-programmed default audible alert,  
 wherein the second processor element disallows generation of the user-programmed default audible alert but allows generation of the user-programmed special audible alert in response to user selection of a first alert mode, and  
 wherein the second processor element allows generation of both the user-programmed default audible alert and the user-programmed special audible alert in response to user selection of a second alert mode.
6. The communication receiver in accordance with claim 2, wherein the user control means comprises:  
 means for a user to select a cadence for a new user-programmed special audible alert; and  
 means for a user to select a tone frequency for the new user-programmed special audible alert, and  
 wherein the audible alert generation means generates the new user-programmed special audible alert in accordance with the selected cadence and tone frequency.
7. The communication receiver in accordance with claim 4, wherein the user control means comprises:

- means for a user to select a cadence for the user-programmed default audible alert; and  
 means for a user to select a tone frequency for the user-programmed default audible alert, and  
 wherein the audible alert generation means generates the user-programmed default audible alert in accordance with the selected cadence and tone frequency.
8. (Amended) A selective call receiver comprising:  
 a receiver for receiving information comprising an address and a message containing at least a received call-back number;  
 a decoder coupled to the receiver for decoding the received address;  
 a memory element for storing at least one user-programmed call-back number and data defining at least one corresponding user-programmed special audible alert, and further for storing data defining a user-programmed default audible alert;  
 a processor responsive to the decoder and coupled to the receiver for processing the received message to derive the received call-back number, the processor also coupled to the memory element for comparing the received call-back number with the at least one user-programmed call-back number;  
 a display coupled to the processor for displaying the received message; and  
 an audible alert generator coupled to the processor for generating, in response to the received call-back number being found equal to a call-back number included in the at least one user-programmed call-back number, the corresponding user-programmed special audible alert in accordance with the data defining said alert,  
 wherein the processor comprises a first processor element for controlling the audible alert generator to generate the user-programmed default audible alert in response to the received call-back number being found not equal to any call-back number included in the at least one user-programmed call back number.
  9. The selective call receiver in accordance with claim 8, further comprising user controls coupled to the processor and to the memory element for allowing a user to add or delete a user-programmed call-back number and a corresponding user-programmed special audible alert.
  10. The selective call receiver in accordance with claim 8, wherein the memory element comprises a non-volatile memory.
  11. The selective call receiver in accordance with claim 8, further comprising user controls coupled to the processor for allowing a user to modify the user-programmed default audible alert.
  12. The selective call receiver in accordance with claim 11, further comprising a second processor element coupled to the processor and responsive to the user controls for controlling the generation of the user-programmed default audible alert,  
 wherein the second processor element disallows generation of the user-programmed default audible alert but allows generation of the user-programmed special audible alert in response to user selection of a first alert mode, and  
 wherein the second processor element allows generation of both the user-programmed default audible alert and the user-programmed special audible alert in response to user selection of a second alert mode.

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13. The selective call receiver in accordance with claim 9, wherein the user controls comprise: first elements that allow a user to select a cadence for a new user-programmed special audible alert; and second elements that allow a user to select a tone frequency for the new user-programmed special audible alert, and wherein the audible alert generator generates the new user-programmed special audible alert in accordance with the selected cadence and tone frequency.

14. The selective call receiver in accordance with claim 11, wherein the user controls comprise: first elements that allow a user to select a cadence for the user-programmed default audible alert; and second elements that allow a user to select a tone frequency for the user-programmed default audible alert, and wherein the audible alert generator generates the user-programmed default audible alert in accordance with the selected cadence and tone frequency.

15. A method in a communication receiver for controlling an audible alert in response to a received call-back number, the method comprising the steps of:

- (a) receiving a message comprising at least the received call-back number;
- (b) comparing the received call-back number with at least one user-programmed call-back number;
- (c) selecting a user-programmed special audible alert corresponding to the received call-back number in response to determining in step (b) that the received call-back number is equal to a call-back number included in the at least one user-programmed call-back number;
- (d) selecting a user-programmed default audible alert in response to determining in step (b) that the re-

ceived call-back number is not equal to any call-back number included in the at least one user-programmed call-back number; and

(e) generating the user-programmed audible alert selected in accordance with steps (c) and (d).

16. The method in accordance with claim 15, further comprising the step of adding a new user-programmed call-back number and a corresponding new user-programmed special audible alert in response to a user control sequence.

17. The method in accordance with claim 15, further comprising the step of deleting an existing user-programmed call-back number and a corresponding user-programmed special audible alert in response to a user control sequence.

18. The method in accordance with claim 15, further comprising the step of modifying the user-programmed default audible alert in response to a user control sequence.

19. The method in accordance with claim 15, wherein step (d) further comprises the step of de-selecting the user-programmed default audible alert to prevent the generation thereof, a user of the communication receiver having selected a silent alert mode.

20. The method in accordance with claim 16, wherein the step of adding the new user-programmed call-back number and the corresponding new user-programmed special audible alert comprises the steps of:

- selecting a user-programmable cadence for the new user-programmed special audible alert; and
- selecting a user-programmable tone frequency for the new user-programmed special audible alert, and wherein the new user-programmed special audible alert is generated in accordance with the selected cadence and tone frequency.

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UNITED STATES PATENT AND TRADEMARK OFFICE  
**CERTIFICATE OF CORRECTION**

PATENT NO. : 5,394,140  
DATED : February 28, 1995  
INVENTOR(S) : Wong et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 10, line 9, please delete "(Amended)".

Signed and Sealed this  
Twelfth Day of September, 1995

*Attest:*



BRUCE LEHMAN

*Attesting Officer*

*Commissioner of Patents and Trademarks*

- [54] **METHOD AND APPARATUS FOR CONTROLLING UTILIZATION OF A PROCESS ADDED TO A PORTABLE COMMUNICATION DEVICE**
- [75] Inventors: **Michael J. DeLuca**, Boca Raton;  
**George W. Smoot**, Lake Worth;  
**Douglas R. Kraul**, Parkland, all of Fla.
- [73] Assignee: **Motorola, Inc.**, Schaumburg, Ill.
- [21] Appl. No.: **452,785**
- [22] Filed: **May 30, 1995**
- [51] Int. Cl.<sup>6</sup> ..... **G07D 7/00; G08B 5/22**
- [52] U.S. Cl. .... **340/825.34; 340/825.44; 340/825.33; 379/57**
- [58] **Field of Search** ..... **340/825.34, 825.44, 340/825.33, 825.35, 825.22; 379/57; 395/200.01, 200.05**

5,335,278 8/1994 Matchett et al. .... 340/825.34  
5,371,493 12/1994 Sharpe et al. .... 340/825.33

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*Assistant Examiner*—Edward Merz  
*Attorney, Agent, or Firm*—John H. Moore

[57] **ABSTRACT**

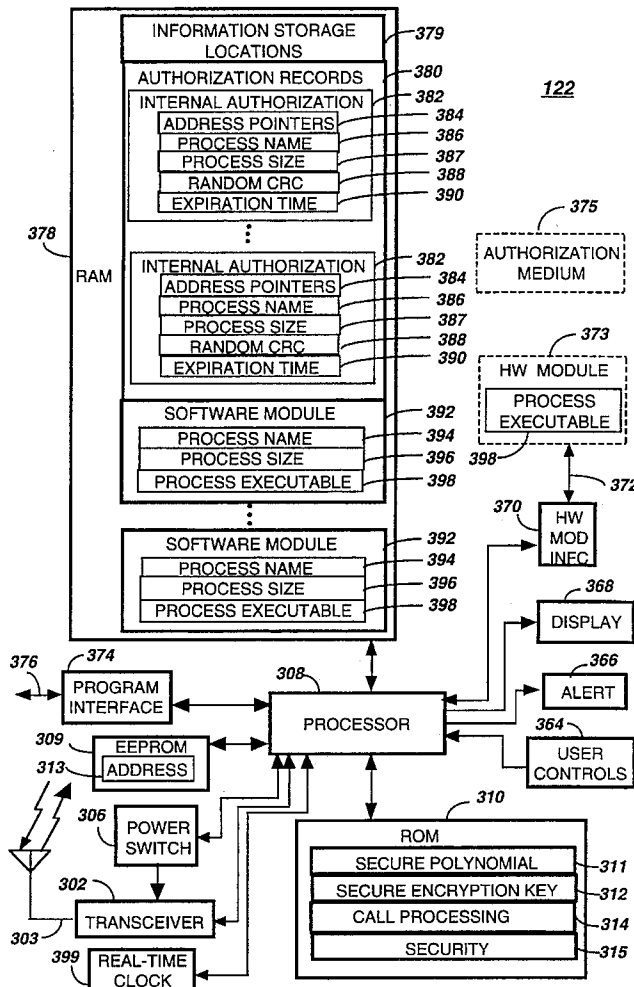
A method and apparatus in a communication system operated by a service provider controls utilization of a module (602, 606) added to a portable communication device (122) including a transceiver (302) which communicates with a fixed portion (102) of the communication system. The portable communication device (122) receives (604) a request for utilization of the module. In response, the portable communication device (122) acts (612) to obtain a usage authorization for utilizing the module. The portable communication device (122) disallows (640) the utilization of the module, in response to the usage authorization being unobtainable.

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,875,038 10/1989 Siwiak et al. .... 340/825.44

24 Claims, 7 Drawing Sheets





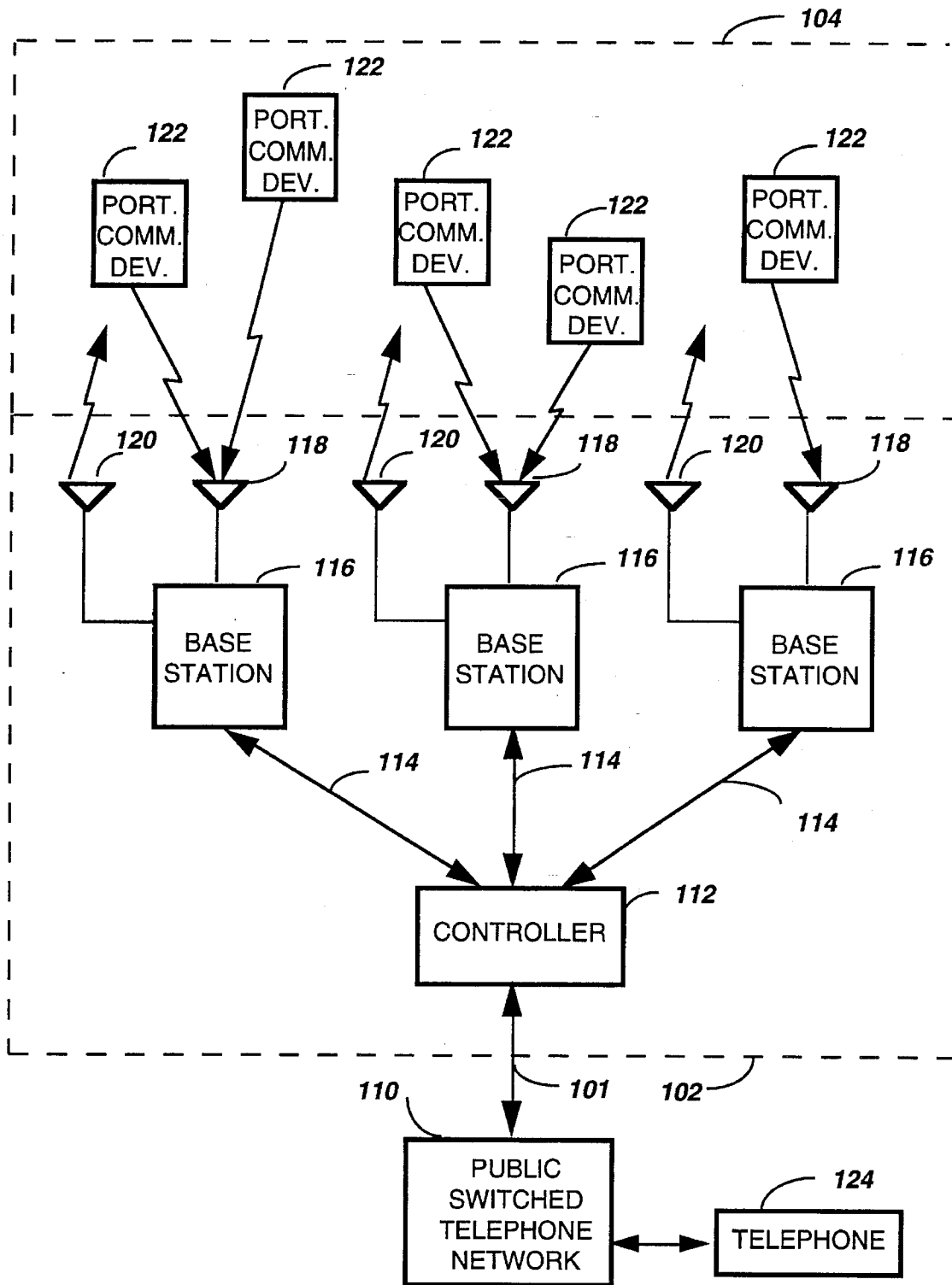
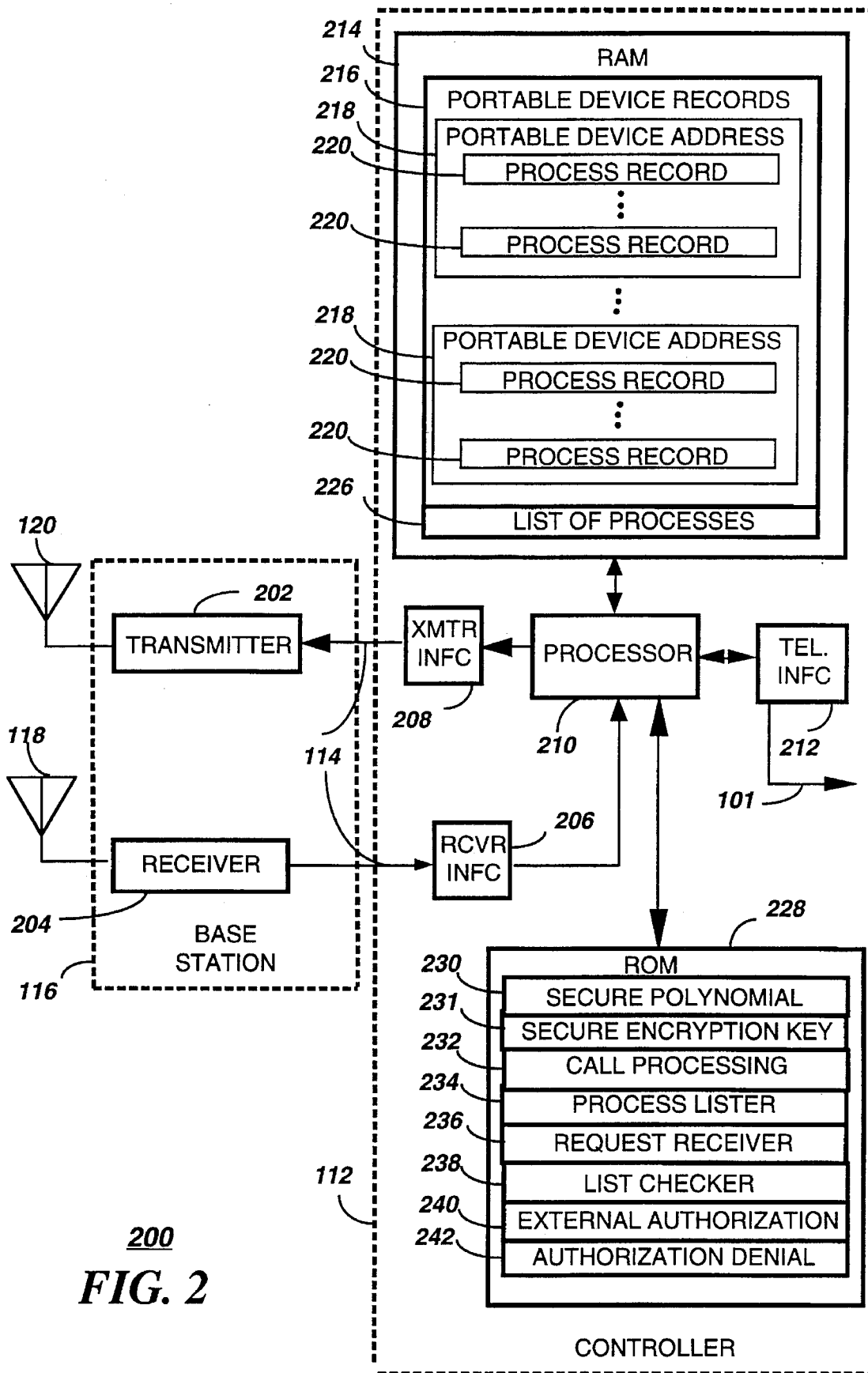
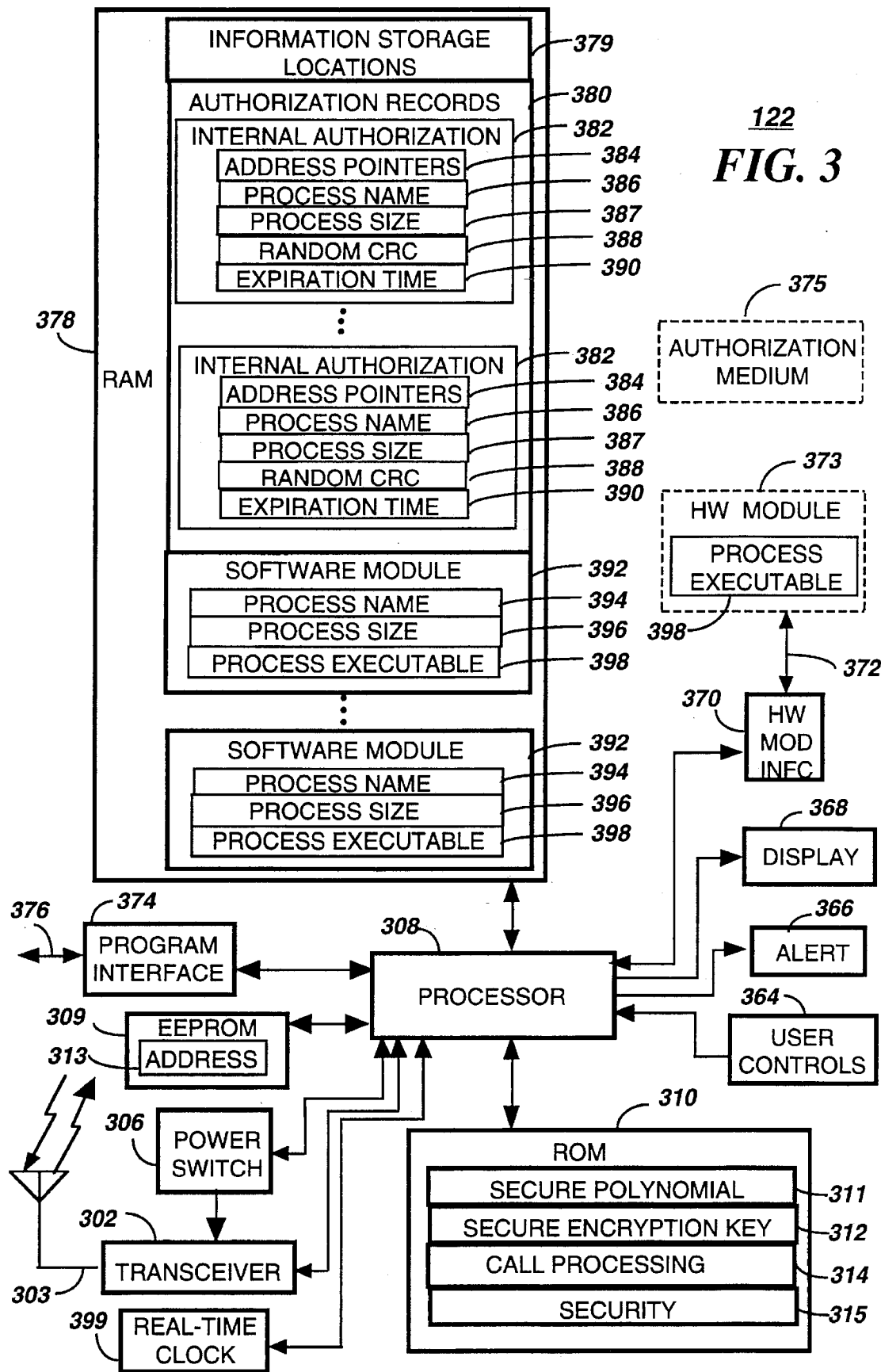
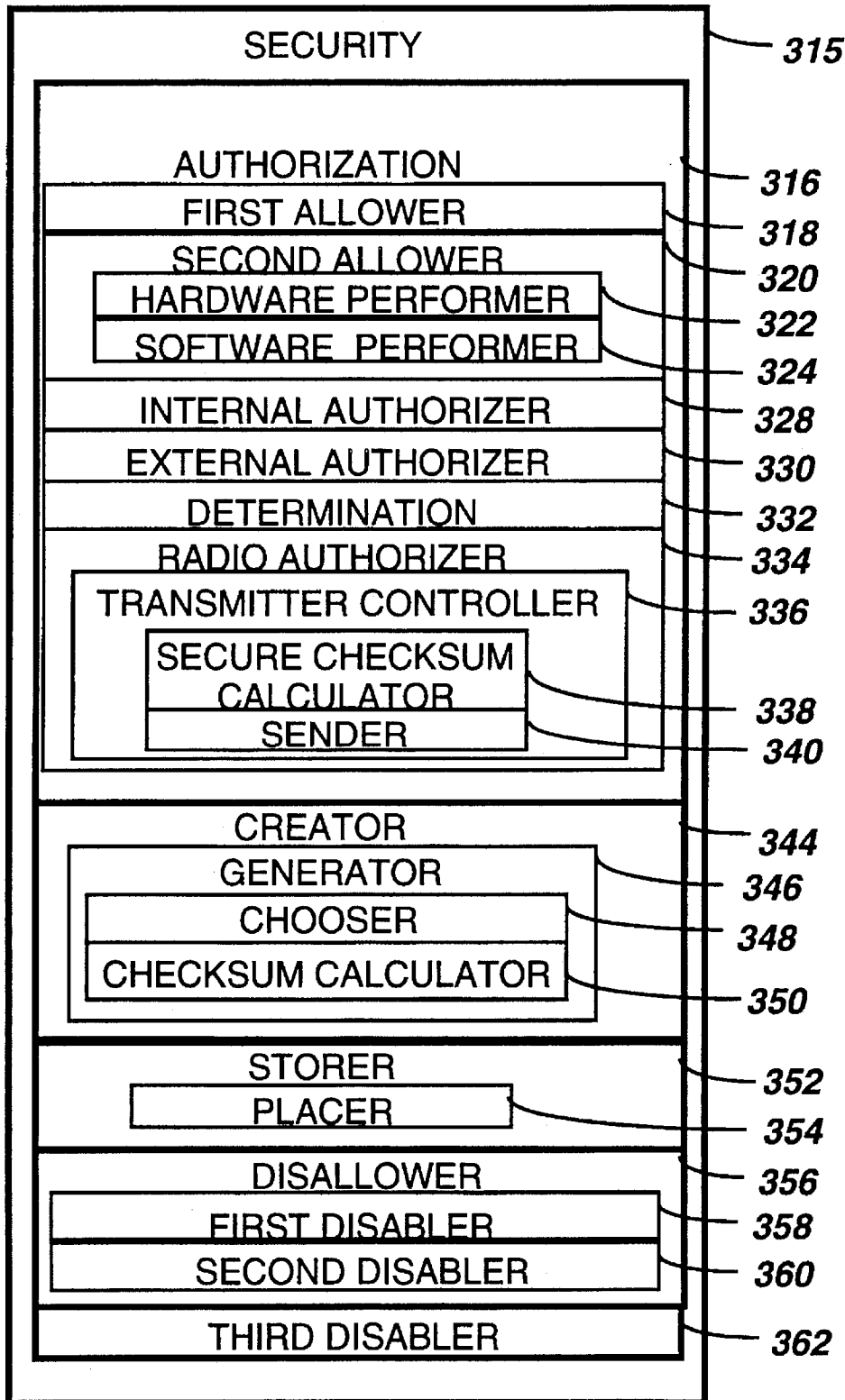


FIG. 1

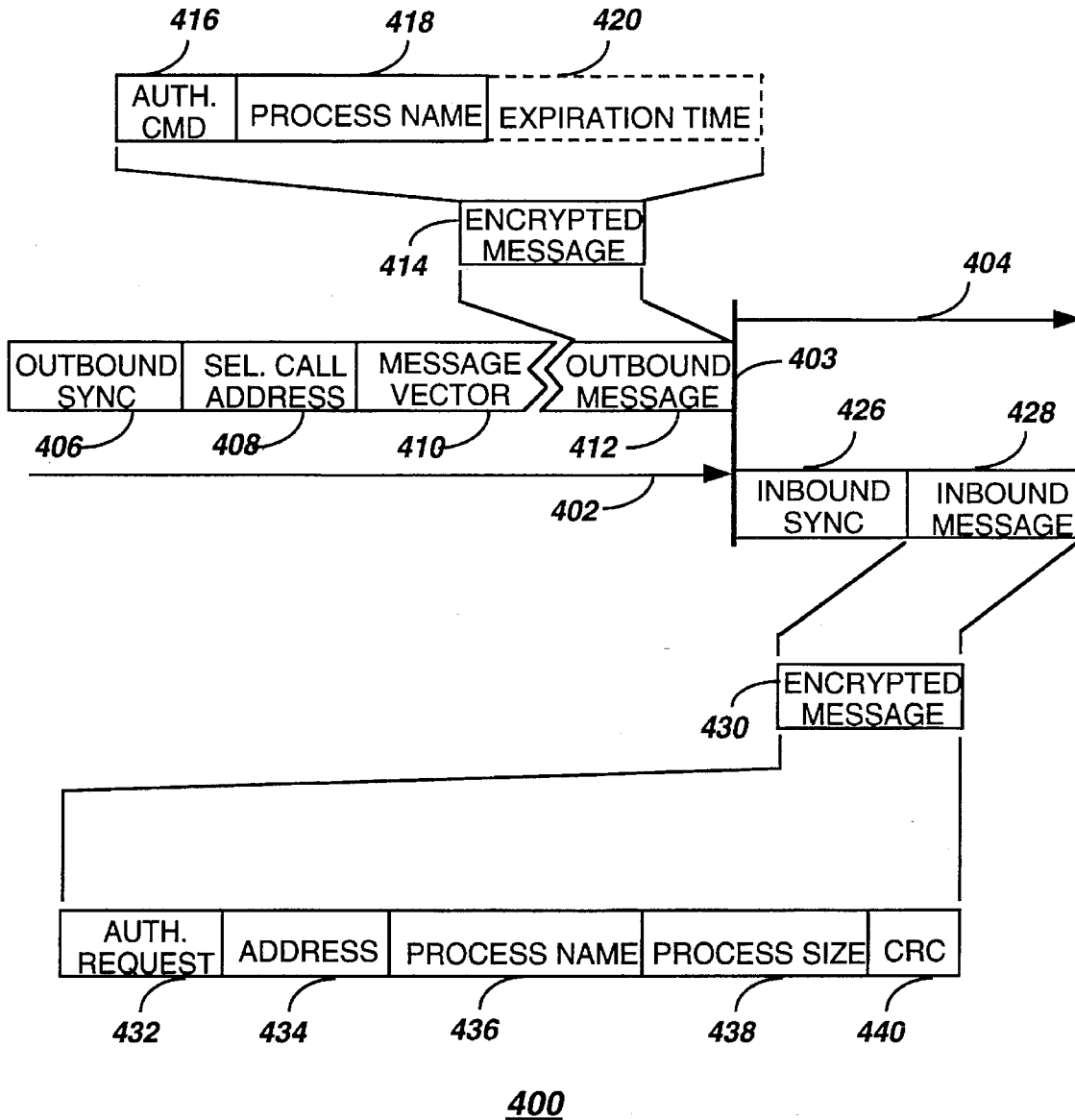


200  
FIG. 2

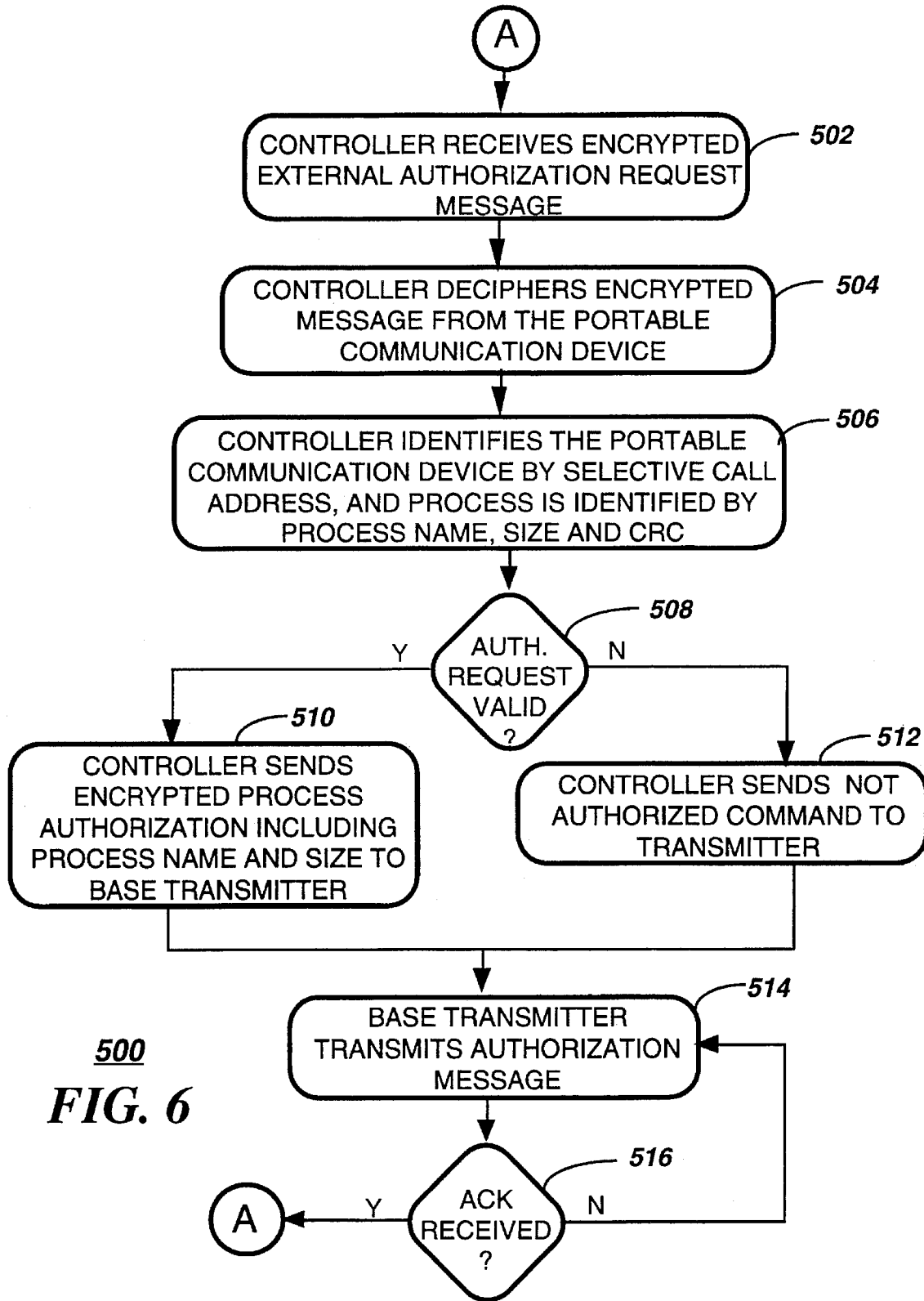




**FIG. 4**



400  
**FIG. 5**



500  
FIG. 6

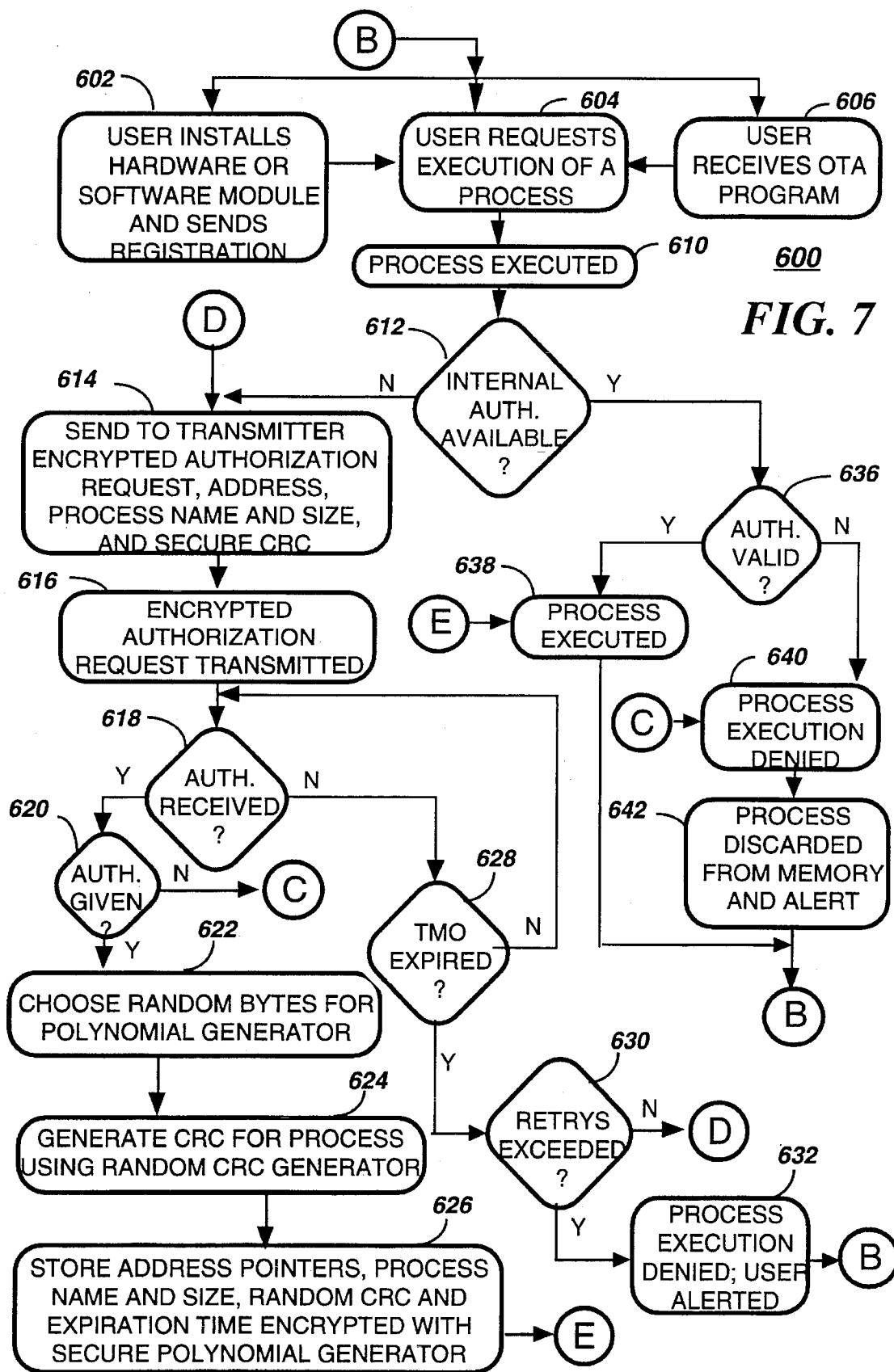


FIG. 7

**METHOD AND APPARATUS FOR  
CONTROLLING UTILIZATION OF A  
PROCESS ADDED TO A PORTABLE  
COMMUNICATION DEVICE**

**FIELD OF THE INVENTION**

This invention relates in general to communication systems, and more specifically to a method and apparatus for controlling utilization of a process added to a portable communication device.

**BACKGROUND OF THE INVENTION**

In the past, paging devices were limited to alpha-numeric and voice paging. With technology improvements in circuit integration and more efficient communication protocols which provide two-way communication, paging devices have grown in sophistication and services provided. With today's technology improvements paging devices are expected to acquire more sophisticated functions such as electronic mailing services, spread sheet applications, investment finance services such as stock market charts, quotation requests, purchase and sale transactions, etc. These services require sophisticated software applications and/or hardware modules to be operated in the paging device. Paging devices using sophisticated services such as these will require a means for registration and licensing to prevent unauthorized use of processes, including software applications and hardware modules. In prior art devices registration has been accomplished by mailing a signed certificate with a purchase receipt of a software application or hardware module. This form of registration, however, does not prevent an unscrupulous user from using pirated software applications and/or unauthorized hardware modules.

Thus, what is needed is a method and apparatus for controlling utilization of a process added to a portable communication device. Preferably, the method and apparatus serves as a mechanism to prevent unauthorized use of software applications and hardware modules.

**SUMMARY OF THE INVENTION**

One aspect of the present invention is a method in a communication system operated by a service provider, the method for controlling utilization of a module added to a portable communication device comprising a transceiver which communicates with a fixed portion of the communication system. The method comprises in the portable communication device the Steps of receiving a request for utilization of the module, and, in response, acting to obtain a usage authorization for utilizing the module. The method further comprises the step of disallowing the utilization of the module, in response to the usage authorization being unobtainable.

Another aspect of the present invention is a portable communication device in a communication system operated by a service provider, the portable communication device for controlling utilization of a module added thereto. The portable communication device comprises a transceiver for communicating with a fixed portion of the communication system, and a processor coupled to the transceiver for controlling the portable communication device. The portable communication device further comprises a memory coupled to the processor for storing information used by the portable communication device, and user controls coupled to the processor for receiving a request for utilization of the

module. The portable communication device also includes an authorization element coupled to the processor for acting to obtain a usage authorization for utilizing the module, and a disallower element coupled to the processor for disallowing the utilization of the module, in response to the usage authorization being unobtainable.

Another aspect of the present invention is a controller for use in a fixed portion of a communication system. The controller comprises a processor for controlling operation of the controller, and a memory coupled to the processor for storing information used by the controller. The controller further comprises a transmitter interface coupled to the processor for transmitting a message to a portable communication device, and a receiver interface coupled to the processor for receiving a communication from the portable communication device. The controller also includes apparatus for authorizing utilization of a process added to the portable communication device. The apparatus comprises a process lister element coupled to the processor maintaining in the memory a list of authorized processes corresponding to the portable communication device, and a request receiver element coupled to the processor for receiving a request for an external authorization from the portable communication device. The request comprises at least a process name and a process size corresponding to a process, along with a secure checksum and an address identifying the portable communication device. The apparatus further comprises a list checker element coupled to the processor for checking the list of authorized processes corresponding to the portable communication device identified by the address, to determine whether the process corresponding to the process name is authorized. The apparatus also includes an external authorization element coupled to the processor for transmitting the external authorization to the portable communication device in response to the module being authorized for the portable communication device, and an authorization denial element coupled to the processor for transmitting a "not authorized" signal to the portable communication device in response to the process not being authorized for the portable communication device.

**BRIEF DESCRIPTION OF THE DRAWINGS**

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

FIG. 2 is an electrical block diagram of elements of a fixed portion of the communication system in accordance with the preferred embodiment of the present invention.

FIGS. 3 and 4 are elements of an electrical block diagram of a portable communication device in accordance with the preferred embodiment of the present invention.

FIG. 5 is a timing diagram of elements of an outbound protocol and an inbound protocol of the fixed and portable portions of the communication system in accordance with the preferred embodiment of the present invention.

FIG. 6 is a flow chart depicting operation of the fixed portion of the communication system in accordance with the preferred embodiment of the present invention.

FIG. 7 is a flow chart depicting operation of the portable communication device in accordance with the preferred embodiment of the present invention.

**DESCRIPTION OF THE PREFERRED  
EMBODIMENT**

Referring to FIG. 1, an electrical block diagram of a communication system in accordance with the preferred



embodiment of the present invention comprises a fixed portion **102** and a portable portion **104**. The fixed portion **102** includes a plurality of base stations **116**, for communicating with the portable portion **104**, utilizing conventional techniques well known in the art, and coupled by communication links **114** to a controller **112** which controls the base stations **116**. The hardware of the controller **112** is preferably a combination of the Wireless Messaging Gateway (WMC<sup>TM</sup>) Administrator! paging terminal and the RF-Conductor!<sup>TM</sup> message distributor manufactured by Motorola, Inc. The hardware of the base stations **116** is preferably a combination of the Nucleus® Orchestra! transmitter and RF-Audience!<sup>TM</sup> receivers manufactured by Motorola, Inc. It will be appreciated that other similar hardware can be utilized as well for the controller **112** and base stations **116**.

Each of the base stations **116** transmits radio signals to the portable portion **104** comprising a plurality of portable communication devices **122** via a transmitting antenna **120**. The base stations **116** each receive radio signals from the plurality of portable communication devices **122** via a receiving antenna **118**. The radio signals comprise selective call addresses and messages transmitted to the portable communication devices **122** and acknowledgments received from the portable communication devices **122**. It will be appreciated that the portable communication devices **122** can also originate messages other than acknowledgments, as will be described below. The controller **112** preferably is coupled by telephone links **101** to a public switched telephone network (PSTN) **110** for receiving selective call originations therefrom. Selective call originations comprising voice and data messages from the PSTN **110** can be generated, for example, from a conventional telephone **124** coupled to the PSTN **110** in a manner that is well known in the art.

Data and control transmissions between the base stations **116** and the portable communication devices **122** preferably utilize a protocol similar to Motorola's well-known FLEX<sup>TM</sup> digital selective call signaling protocol. This protocol utilizes well-known error detection and error correction techniques and is therefore tolerant to bit errors occurring during transmission, provided that the bit errors are not too numerous in any one code word.

Outbound channel transmissions comprising data and control signals from the base stations **116** preferably utilize two and four-level frequency shift keyed (FSK) modulation, operating at sixteen-hundred or thirty-two-hundred symbols-per-second (sps), depending on traffic requirements and system transmission gain. Inbound channel transmissions from the portable communication devices **122** to the base stations **116** preferably utilize four-level FSK modulation at a rate of ninety-six-hundred bits per second (bps). Inbound channel transmissions preferably occur during predetermined data packet time slots synchronized with the outbound channel transmissions. It will be appreciated that, alternatively, other signaling protocols, modulation schemes, and transmission rates can be utilized as well for either or both transmission directions. The outbound and inbound channels preferably operate on a single carrier frequency utilizing well-known time division duplex (TDD) techniques for sharing the frequency. It will be further appreciated that, alternatively, the outbound and inbound channels can operate on two different carrier frequencies using frequency division multiplexing (FDM) without requiring the use of TDD techniques.

U.S. Pat. No. 4,875,038 to Siwiak et al., which describes a prior art acknowledge-back radio communication system, is hereby incorporated herein by reference. For further

information on the operation and structure of an acknowledge-back radio communication system, please refer to the Siwiak et al. patent.

Referring to FIG. 2, an electrical block diagram of elements **200** of the fixed portion **102** in accordance with the preferred embodiment of the present invention comprises portions of the controller **112** and the base stations **116**. The controller **112** comprises a processor **210** for directing operation of the controller **112**. The processor **210** preferably is coupled through a transmitter interface **208** to a transmitter **202** via the communication links **114**. The communication links **114** use conventional means well known in the art, such as a direct wire line (telephone) link, a data communication link, or any number of radio frequency links, such as a radio frequency (RF) transceiver link, a microwave transceiver link, or a satellite link, just to mention a few. The transmitter **202** transmits two and four-level FSK data messages to the portable communication devices **122**. The processor **210** is also coupled to at least one receiver **204** through a receiver interface **206** via the communication links **114**. The receiver **204** demodulates four level FSK and can be collocated with the base stations **116**, as implied in FIG. 2, but preferably is positioned remote from the base stations **116** to avoid interference from the transmitter **202**. The receiver **204** is for receiving one or more acknowledgments and/or messages from the portable communication devices **122**.

The processor **210** is coupled to a telephone interface **212** for communicating with the PSTN **110** through the telephone links **101** for receiving selective call originations. The processor **210** is also coupled to a random access memory (RAM) **214** comprising a database of portable device records **216** and a database of processes **226**. The database of portable device records **216** contains, as a minimum, a list of process records **220** for each portable communication device **122**. To access the list of process records **220** of a portable communication device **122**, a portable device address **218** corresponding to the address of a portable communication device **122** is used to search the database of portable device records **216**. The list of process records **220** specifies the software and hardware processes which are authorized for use by a portable communication device **122** having the portable device address **218**. Each process record **220** contains a list of process verification elements used for process authorization of external authorization requests transmitted by the portable communication devices **122**, as will be described below. The verification elements contained in the process record **220** for both hardware and software processes include a process name, a process size and a secure cyclic redundancy check (CRC).

The database of processes **226** preferably comprises binary executables (machine code) of many of the authorized software processes available for use by the portable communication devices **122**. The software processes stored in the RAM **214** of the controller preferably can be delivered to portable communication devices **122** by way of over-the-air (OTA) programming utilizing techniques well known in the art.

The processor **210** also is coupled to a read-only memory (ROM) **228**. It will be appreciated that other types of memory, e.g., electrically erasable programmable ROM (EEPROM) or magnetic disk memory, can be utilized for the ROM **228**, as well as the RAM **214**. It will be further appreciated that the RAM **214** and the ROM **228**, singly or in combination, can be integrated as a contiguous portion of the processor **210**. Preferably, the processor **210** is similar to the DSP56100 digital signal processor (DSP) manufactured

by Motorola, Inc. It will be appreciated that other similar processors can be utilized for the processor 210, and that additional processors of the same or alternate type can be added as required to handle the processing requirements of the controller 112.

The first two elements in the ROM 228 include a secure polynomial 230 and a secure encryption key 231. The secure polynomial 230 is used as a secure polynomial generator for CRC verification of process executables requested by external authorization request messages transmitted by portable communication devices 122. The portable communication devices 122 use the same secure polynomial generator for CRC generation. Using the same secure polynomial generator for both the fixed portion 102 and portable portion 104 of the communication system provides a means for verifying authenticity of software and hardware processes requested by the portable communication devices 122. The secure encryption key 231 is used for encryption and decryption of authorization messages transmitted between the portable communication devices 122 and the base stations 116. Similarly, the portable communication devices 122 use the same secure encryption key for external authorization message transactions. Using secure encryption between the fixed portion 102 and the portable portion 104 of the communication system provides a method for transmitting secure two-way messages which are unlikely to be breached. The encryption process converts an unscrambled sequence to a pseudo-random sequence coded by a scrambler and decoded by a descrambler. The scrambler and descrambler use preferably polynomial generators with feedback paths which use modulo 2 (Exclusive Or) addition on the feedback taps. The descrambler uses the same architecture as the scrambler for descrambling the message. Using a nonlinear feedback shift register (NFSR) architecture provides a secure approach for message encryption which makes it difficult, if not computationally intractable for a person to decipher the encryption key. The present invention preferably uses a conventional self-synchronizing stream encryption system which utilizes a NFSR architecture, as is well known by one of ordinary skill in the art. It will be appreciated that, alternatively, other methods which provide suitably secure encryption may be used. It will be further appreciated that, alternatively, message transactions between the base stations 116 and the portable communication devices 122 can be non-encrypted.

To protect against unauthorized access, the secure polynomial 230 and the secure encryption key 231 preferably are stored in a secure portion of the ROM 228 which can only be accessed by the processor 210. Preferably, this portion of the ROM 228 is integrated with the processor 210 as a protected mask read only memory (MROM), and is programmed during the manufacturing process of the processor 210. As is well known by one of ordinary skill in the art, once a protected MROM has been programmed the protected portion of the MROM is only accessible by the processor 210 and cannot be accessed by external hardware coupled to the processor 210. Alternatively, the secure polynomial 230 and the secure encryption key 231 may be included in a re-programmable non-volatile memory such as a FLASH memory, an EEPROM memory or magnetic disk memory, but accessibility of the secure polynomial 230 and secure encryption key 231 are preferably restricted by the service provider to authorized personnel only. Using re-programmable non-volatile memories provides flexibility of adding more polynomial elements and encryption keys for system and subscriber unit expansion.

The ROM 228 of the processor 210 also includes firmware elements for use by the processor 210. The firmware

elements include a call processing element 232, a process lister element 234, a request receiver element 236, a list checker element 238, an external authorization element 240 and an authorization denial element 242. The call processing element 232 handles the processing of an incoming call for a called party and for controlling the transmitter 202 to send a selective call message to the portable communication device 122 corresponding to the called party, utilizing techniques well known in the art. The process lister element 234 manages the database of portable device records 216 stored in the RAM 214 for each portable communication device 122 utilizing database management techniques well known in the art. The request receiver element 236 processes encrypted external authorization request messages received by the receiver 204 of the base station 116 and originating from the portable communication devices 122. The encrypted external authorization request message is decrypted with the secure encryption key 231 described above. The external authorization request for hardware and software processes comprises at least a process name and a process size corresponding to the process, along with a secure checksum and an address identifying the portable communication device 122. Optionally, an authorization request command can accompany the external authorization request message. Preferably, the authorization request command is included in the address portion of the portable communication device 122 address. Alternatively, the authorization request command can be in a separate element in the external authorization request message. The secure checksum is preferably a secure CRC of the software process for which the portable communication device 122 is requesting authorization. The CRC is generated by the portable communication device 122 by using a polynomial generator stored in its memory, which is the same as the secure polynomial 230 used by the controller 112, as described above. The secure checksum provides a means for verifying that the process being used by the portable communication device 122 is an authorized version. The list checker element 238 uses the address, corresponding to the portable communication device 122, received in the external authorization request message as a portable device address 218. The processor 210, as described above, searches through the database of portable device records 216 to find the list of process records 220 corresponding to the portable device address 218 matching the address of the portable communication device 122. The list checker element 238 then checks each process record 220 for a match to the process name, process size and secure CRC received in the external authorization request message. If a match is found, then authorization is given to the portable communication device 122 for using the requested software or hardware process. If a match is not found, then authorization is denied. When the list checker element 238 authorizes a process requested by the portable communication device 122, the processor 210 calls on the external authorization element 240 to process the external authorization response message to be transmitted to the portable communication device 122. The external authorization response message preferably comprises an authorization command, the process name of the authorized process and an expiration time for the process. It will be appreciated that, alternatively, the external authorization response message can include a plurality of process names and expiration times authorizing a plurality of processes requested by the portable communication device 122. Before the external authorization element 240 sends the external authorization response message to the transmitter 202 of the base station 116, the external authorization

response message is encrypted, using the method described above, to secure the RF transmission of the message. When the list checker element 238 denies authorization of a process to a portable communication device 122, the processor 210 calls on the authorization denial element 242 to process the external authorization denial response message to be transmitted to the portable communication device 122. The external authorization denial response message comprises an authorization command which includes a "not authorized" signal denying authorization, and a process name of the process being denied. It will be appreciated that the external authorization denial response message may include a plurality of process names denying authorization to a plurality of processes requested by the portable communication device 122. As is done with the external authorization response message, the external authorization denial response message is encrypted before it is transmitted to the portable communication device 122 by the base stations 116.

Referring to FIG. 3, an electrical block diagram of the portable communication device 122 in accordance with the preferred embodiment of the present invention comprises a transceiver antenna 303 for transmitting radio signals to the base stations 116 and for intercepting radio signals from the base stations 116. The transceiver antenna 303 is coupled to a transceiver 302 utilizing conventional techniques well known in the art. The radio signals received from the base stations 116 use conventional two and four-level FSK. The radio signals transmitted by the portable communication device 122 to the base stations 116 use four-level FSK.

Radio signals received by the transceiver 302 produce demodulated information at the output. The demodulated information is coupled to the input of a processor 308, which processes the information in a manner well known in the art. Similarly, inbound response messages are processed by the processor 308 and delivered to the transceiver 302 which is coupled to the processor 308. The response messages transmitted by the transceiver 302 are preferably modulated using four-level FSK.

A conventional power switch 306, coupled to the processor 308, is used to control the supply of power to the transceiver 302, thereby providing a battery saving function. The processor 308 is coupled to a random access memory (RAM) 378 for storing messages in information storage locations 379. The RAM 378 further comprises authorization records 380 and software modules 392. The authorization records 380 include internal authorization records 382 of processes, either software or hardware, which have been authorized for use by the portable communication device 122. The software modules 392 include a process name 394, a process size 396 and a process executable 398. The internal authorization record 382 is encrypted using a secure encryption key 312 stored in a read only memory (ROM) 310 of the portable communication device 122. The encryption key used is the same as that used by the controller 112 described above. The internal authorization record 382 for hardware and software processes comprises address pointers 384, a process name 386, a process size 387, a random CRC 388 of the authorized hardware or software process executable 398 and an expiration time 390. The address pointers 384 preferably include two address pointers which point to two byte locations within the process executable 398 of the authorized hardware or software process. The two bytes are chosen by a random process which preferably uses a real-time clock 399 for generating random address pointers. The real-time clock 399 determines time (in hours, minutes and seconds) and calendar date, which is also used for determining the expiration time of a process, as will be described

below. To determine the two random address pointers the real-time clock 399 is used in conjunction with the random event of the user requesting use of a process through the user controls 364. When the user depresses a button on the user controls 364 requesting execution of a process, the processor 308 reads the time specified by the real-time clock 399. The real-time clock 399 reading is in binary format and is sufficiently long to cover a wide address spectrum. Depending on the number of bytes contained in the process executable 398 the user is requesting, a limited number of bits are chosen in the real-time clock reading to cover the size of the process executable 398. The limited real-time clock reading is then used as an address pointer to a first random byte in the requested process executable 398. The second random address pointer points to a second random byte location. The two bytes together represent a 16 bit polynomial generator seed for generating the random CRC 388 of the hardware or software process executable 398. As is well known by one of ordinary skill in the art, a polynomial generator must follow certain guidelines such as, for example, the polynomial generator must not contain all zeros or all ones. When the two bytes chosen violate any polynomial generator rules, the address pointers are moved to a next higher location in the process executable 398. If the end of the process executable 398 is reached then the random address pointers wrap around to the beginning of the process executable 398. This process continues until a valid set of bytes are chosen which meet the polynomial generator rules. It will be appreciated that, alternatively, more than two bytes may be used for the random polynomial generator. The expiration time 390 includes a date, and optionally a time when the authorization of the hardware or software process expires. Whenever a process execution is requested by the user, the expiration time 390 is compared to the real-time clock 399 to determine if authorization of the hardware or software process has expired. It will be appreciated that reprogrammable non-volatile memory devices, such as, for example, EEPROM or FLASH memories, may be used to prevent loss of the authorization records 380 stored in the RAM 378 during a power outage.

The processor 308 is also coupled to a programming interface 374 and a hardware module interface 370. The programming interface 374 allows for external software module download into the RAM 378. The programming interface 374 preferably uses a serial communication interface 376 for communication with the processor 308. The serial interface preferably uses a conventional universal asynchronous receiver transmitter (UART) well known in the art. The physical means for the interface preferably uses metal contacts. It will be appreciated that, alternatively, other physical means may be used, such as infrared, inductive coupling, etc. The hardware module interface 370 allows for attachments of hardware modules to the portable communication device 122. The hardware module interface 370 preferably uses a hardware interface 372, well known in the art, such as the Personal Computer Memory Card International Association (PCMCIA) interface. With this interface any type of hardware module 373 conforming to the PCMCIA standard may be attached to the portable communication device 122. The function of the hardware module 373 can include any number of functions such as a software module hardware accelerator, video graphics card, expanded memory card, etc. It will be appreciated that the programming interface 374 and the hardware module interface 370 may use any other interfaces for software download and hardware attachments, well known in the art.

The ROM 310 coupled to the processor 308 comprises a secure polynomial 311, a secure encryption key 312 and

firmware elements for use by the processor **308**. It will be appreciated that other types of memory, e.g., EEPROM, can be utilized as well for the ROM **310**. The secure polynomial **311** includes a secure polynomial generator for CRC generation of hardware and software process executables **398**. The secure polynomial **311** used by the portable communication device **122** matches the secure polynomial **230** used by the controller **112** described above. The secure encryption key **312** is used for scrambling and descrambling external authorization messages transmitted between the portable communication device **122** and the base stations **116**. The secure encryption key **312** used by the portable communication device **122** matches the secure encryption key **231** used by the controller **112**. The secure polynomial **311** and secure encryption key **312** are stored in a protected portion of the ROM **310** utilizing the techniques described for the controller **112**.

The firmware elements comprise a call processing element **314** which handles incoming messages on the outbound channel using techniques well known in the art. When an address is received by the processor **308**, the call processing element **314** compares one or more addresses **313** stored in an EEPROM **309**, and when a match is detected, a call alerting signal is generated to alert a user that a message has been received. The call alerting signal is directed to a conventional audible or tactile alerting device **366** for generating an audible or tactile call alerting signal. In addition, the call processing element **314** processes the message which is received in a digitized conventional manner and then stores the message in one of the information storage locations **379** in the RAM **378**. The message can be accessed by the user through user controls **364**, which provide functions such as lock, unlock, delete, read, etc. More specifically, by the use of appropriate functions provided by the user controls **364**, the message is recovered from the RAM **378**, and then displayed on a display **368**, e.g., a conventional liquid crystal display (LCD).

The firmware elements further comprise a security element **315** for processing authorization of software modules **392** and hardware modules **373**. The elements contained in the security element **315** are shown in FIG. 4. The security element **315** includes an authorization element **316**, a second allow element **320**, a creator element **344**, a storer element **352**, a disallowed element **356** and a third disabler element **362**. When a user requests utilization of a hardware or software process by the use of appropriate functions provided by the user controls **364**, the processor **308** calls on the authorization element **316** to process the request. The processor **308** begins the authorization process by invoking a first allow element **318** which, optionally, allows immediate utilization of the process requested. Whether or not the first allow element **318** allows immediate utilization of a process is determined by programming of the portable communication device **122** performed by the system provider. The processor **308** follows by invoking a determination element **332** which is used for making a determination of whether an internal authorization record **382** exists for utilizing the hardware or software process. The determination of a valid internal authorization record **382** is made by searching through the authorization records **380** for a process name **386** which matches the module name of the hardware or software process requested by the user. If a match is determined, then an internal authorizer element **328** is called on by the processor **308** to read the address pointers **384** to determine the random polynomial generator to be used for random CRC generation over the process executable **398** of the hardware or software module. The internal

authorizer element **328** uses the process size **387** corresponding to the module size of the hardware or software process executable **398** to calculate a random CRC over the process executable **398** of the hardware or software process. If the CRC generated matches the random CRC **388** stored in the internal authorization record **382**, then the processor **308** invokes the second allow element **320** to check the expiration time **390** against the real-time clock **399**. If the expiration time has not expired, then the processor **308** allows the utilization of the process, in response to the usage authorization being obtained. However, if the expiration time has expired then the processor **308** calls on the third disabler element **362** for disabling further utilization of the process in response to an expiration of the usage authorization.

If the determination element **332** does not find an internal authorization record **382** for the hardware or software process requested by the user, then a radio authorizer element **334** is called on for communicating with the fixed portion **102** by sending a signal indicative of the hardware or software module to obtain the usage authorization as an external authorization, in response to the internal authorization being absent from the authorization records **380**. The radio authorizer element **334** acts to obtain the usage authorization through a first radio channel (the inbound channel) of the communication system. If the external authorization request is denied, then the processor **308** calls on a first disabler element **358** to disable further utilization of the process, in response to receiving a "not authorized" signal through a second radio channel (the outbound channel) of the communication system. If the external authorization request is not received within a predetermined time interval, then the processor **308** invokes a second disabler element **360** to disable utilization of the process requested by the user. To create the external authorization request message, the radio authorizer element **334** invokes a transmitter controller element **336**. The transmitter controller element **336** calls on a secure checksum calculator element **338** which uses the secure polynomial **311** stored in the ROM **310** to calculate a secure CRC over the process executable **398** of the hardware or software process requested by the user. Once the secure CRC is determined, the processor **308** prepares an external authorization request message comprising an authorization request command, the address of the portable communication device **122**, the process name, the size of the hardware or software process executable **398**, and the secure CRC calculated by the secure checksum calculator element **338**. Once the external authorization request message has been determined the transmitter controller element **336** encrypts the message with the secure encryption key **312**. The processor **308** then invokes a sender element **340** and sends the message to the transceiver **302**, which thereafter transmits the encrypted external authorization request message to the base stations **116**. If an encrypted external authorization response message is received from the base stations **116** indicating the hardware or software process is authorized, then the processor **308** accesses a second allow element **320** to process the message. If the external authorization response message was for a hardware module **373** authorizing utilization of the process, then the second allow element **320** invokes a hardware performer element **322** for performing the process in accordance with circuits of the hardware module **373**. If the external authorization response message was for a software module **392** authorizing utilization of the process, then the second allow element **320** invokes a software performer element **324** for performing the process in accordance with instructions of the software module **392**.

For software modules **392** or hardware modules **373** which are user-installed, an authorization medium **375** (preferably a registration form with proof of purchase) is physically sent to the service provider to obtain authorization. When the user requests execution of the installed process, the process is optionally executed and the processor **308** invokes the external authorizer element **330** to request an external authorization from the controller **112**. The external authorizer element **330** obtains usage authorization by receiving an external authorization from the service provider through a radio channel (the outbound channel) of the communication system. The external authorization request message sent to the base stations **116**, as described above, comprises an authorization request command, the portable communication device **122** address, the process name and size, and a secure CRC of the hardware or software process executable **398**. When the controller **112** sends an authorization message granting authorization of the hardware or software process, the second allow element **320** allows the utilization of the process, in response to the usage authorization being obtained. In response to obtaining an external authorization allowing utilization of a process, the processor **308** accesses the creator element **344** to create an internal authorization record **382**. To create the internal authorization record the processor **308** invokes a generator element **346** which first calls on a chooser element **348** to select preferably two random bytes of the hardware or software process executable **398**. The random bytes are preferably chosen using the real-time clock **399** and user invocation of the user controls **364** as described above. Once the random bytes have been determined, and satisfy the polynomial generator rules, a checksum calculator element **350** is invoked to perform a CRC generation on the process executable **398** of the hardware or software module. Once the random CRC **388** has been calculated, the storer element **352** collects the verification elements used for the internal authorization record **382**. The verification elements comprise the address pointers **384** for the random polynomial generator, the process name **386**, the random CRC **388** calculated by the checksum calculator element **350** and the expiration time **390** received in the external authorization message from the controller **112**. The processor **308** then calls on a placer element **354** which uses the secure encryption key **312** to encrypt the verification elements and then stores the result in the authorization records **380** in the RAM **378**.

Referring to FIG. 5, a timing diagram **400** depicts elements of an outbound protocol and an inbound protocol of the fixed portion **102** and portable portion **104** of the communication system in accordance with the preferred embodiment of the present invention. The signaling format on the outbound and inbound channels preferably operates on a single carrier frequency utilizing well-known time division duplex (TDD) techniques for sharing the frequency. It will be appreciated that the outbound and inbound channels may use separate frequency channels utilizing frequency division multiplexing (FDM) techniques well known in the art. Using TDD transmission the outbound RF channel transmission is depicted during an outbound transmission time interval **402**, while the inbound RF channel transmission is depicted during an inbound transmission time interval **404**. The outbound transmission time interval **402** and the inbound transmission time interval **404** are subdivided by a time boundary **403**. The time boundary **403** depicts a point in time when the outbound transmissions cease and the inbound transmissions commence.

The elements of the outbound protocol comprise an outbound sync **406**, a selective call address **408**, a message

vector **410** and an outbound message **412**, while the inbound protocol comprises an inbound sync **426** and an inbound message **428**. The outbound sync **406** provides the portable communication device **122** a means for synchronization utilizing techniques well known in the art. The selective call address **408** identifies the portable communication device **122** for which the outbound message **412** is intended. The message vector **410** points in time within the TDD signal format to the position of the outbound message **412** to be received by the portable communication device **122**. The outbound message **412** can be either a well known selective call message, or an external authorization response message in accordance with the present invention. When the outbound message **412** is an external authorization response message, the message received by the portable communication device **122** is an encrypted message **414**. The encrypted message **414** comprises an authorization command **416**, a process name **418** and, optionally, an expiration time **420**. When the authorization command **416** is an authorization command denying authorization for utilization of a requested process, then the expiration time **420** is not included in the encrypted external authorization response message. It will be appreciated that the outbound external authorization response message may be extended to include multiple authorizations and/or denials by sending a plurality of authorization commands **416**, associated process names **418** and, optionally, expiration times **420**.

Similarly, the inbound sync **426** provides the base stations **116** a means for synchronization utilizing techniques well known in the art. The inbound message **428** can be either a well known acknowledge-back response message, or an external authorization request message in accordance with the present invention. When the inbound message **428** is an external authorization request message, the message transmitted by the portable communication device **122** is an encrypted message **430**. The encrypted message **430** comprises an authorization request command **432**, an address **434** corresponding to the portable communication device **122**, a process name **436**, a process size **438** and a secure CRC **440**. The secure CRC is determined, as described above, using the secure polynomial **311** over the hardware or software module's process executable **398**. It will be appreciated that the authorization request command **432** may be included as part of the field of the address **434**. It will also be appreciated that multiple authorization requests may be included within the same inbound message by sending a plurality of process names **436** and process sizes **438** with their associated secure CRCs **440**.

During selective call messaging between the base stations **116** and the portable communication devices **122**, the communication system protocol described above begins with an outbound message which delivers a message to a portable communication device **122**. The portable communication device **122** can, optionally, acknowledge reception of the message on the inbound channel. Acknowledgment messages from the portable communication device **122** are transmitted on the inbound channel during a scheduled period which is referenced to the time boundary **403** described above. Scheduled inbound messages are preferably reserved for acknowledgment messaging from the portable communication devices **122**. However, when a user invokes a process which requires transmitting an external authorization request message to the base stations **116**, the portable communication device **122** uses an unscheduled time period (slot) referenced to the time boundary **403** for unscheduled messaging to the base stations **116**. Note during inbound messaging a time period referenced to the time

boundary **403** is reserved for both scheduled and unscheduled inbound messages. Therefore, there is no contention between scheduled and unscheduled inbound messages. Since the number of unscheduled time slots is limited, it is possible for contention to exist among a plurality of portable communication devices **122** transmitting unscheduled inbound messages. To resolve contention with unscheduled inbound messages, the present invention preferably utilizes ALOHA protocol as is well known by one of ordinary skill in the art. Since the present invention concentrates primarily on acquiring authorization of hardware and software modules remotely using the communication system just described, it will be appreciated that message transactions originate first from the portable communication device **122** as unscheduled inbound messages. Subsequent responses from the fixed portion **102** of the communication system are received on the outbound channel. It will be further appreciated that, alternatively, other communication protocols which support two-way communication may be used.

Referring to FIG. 6, a flow chart **500** summarizing the operation of the fixed portion **102** of the communication system in accordance with the preferred embodiment of the present invention begins with step **502** where the controller **112** receives an encrypted external authorization request message. In step **504** the controller **112** deciphers the encrypted message using the secure encryption key **231** stored in the ROM **228**. In step **506** the controller **112** identifies the portable communication device **122** requesting the authorization by the address **434** received. Additionally, the controller **112** reads the process verification elements included in the external authorization request message. In step **508** the controller **112** checks for a match between the process verification elements received and the list of process records **220** corresponding to the portable communication device **122**. If a match is found, then in step **510** an external authorization response message is constructed authorizing utilization of the process. The external authorization response message comprising the authorization command **416** allowing utilization of the process, the process name **418** of the process authorized and an expiration time **420** for the process. Before sending the message to the base stations **116** for transmission, the external authorization response message is encrypted using the secure encryption key **231** as described above. When a match is not found, then in step **512** an external authorization response message with an "authorization denied" command is constructed. The external authorization response message then comprises the authorization command **416** for denying authorization to the requested process, and the associated process name **418**. The denial message, as described above, is encrypted by the controller **112** using the secure encryption key **231**. Once either type of the external authorization response message is constructed, then in step **514** the message is sent to the transmitter **202** of the base station **116** where it is transmitted to the portable communication device **122**. In step **516** the controller **112** checks for a message acknowledgment response from the portable communication device **122** acknowledging reception of the external authorization response message. If no acknowledgment is received, then the controller **112** resends the message in step **514**. The controller **112**, preferably, has an option to limit the number of re-transmissions by using, for example, a maximum resend count programmed by the system provider. Once an acknowledgment is received, the controller **112** returns to step **502** where it processes subsequent external authorization request messages from the portable communication devices **122**.

Referring to FIG. 7, a flow chart **600** summarizing the operation of the portable communication device **122** in accordance with the preferred embodiment of the present invention begins with any one of steps **602**, **604** and **606**. In step **602** the user installs a hardware or software module and registers the hardware or software module by sending preferably an authorization medium **375** comprising a registration form and proof of purchase receipt. In step **606** the user may receive over-the-air (OTA) programming of a software process. The request for an OTA software download may be performed by the user by way of a conventional telephone **124** call to the system provider. It will be appreciated that other ways may be used for requesting OTA programming of a software process, such as by the use of appropriate functions provided by the user controls **364**, in the portable communication device **122** for requesting software processes. Once a software or hardware module has been added to the portable communication device **122** by way of OTA programming or user-installation, the user may request execution of the process in step **604**. In step **610** the process is immediately executed without initial authorization. It will be appreciated that the portable communication device **122**, optionally, may be programmed by the system provider to skip step **610**. In step **612** the processor **308** of the portable communication device **122** checks for the presence of an internal authorization record **382** in the authorization records **380** stored in the RAM **378**. Each internal authorization record **382** is decrypted using the secure encryption key **312** stored in the ROM **310**. A match is checked between the process name **386** of the internal authorization record **382** and the process name of the requested process. If a match is not found, the processor **308** proceeds to step **614** where an encrypted external authorization request message is constructed comprising the authorization request command **432**, the address **434** of the portable communication device **122**, the process name **436**, the process size **438**, and the secure CRC **440** of the process executable **398** requested. In step **616** the encrypted external authorization request is transmitted to the base stations **116**. In step **618** the processor **308** waits for an external authorization response message from the base stations **116**. If no external authorization response message has been received, then in step **628** a time-out (TMO) indicator is checked. If the TMO indicator has expired, then in step **630** a resend counter is checked for re-transmission requests. If re-transmission requests of the encrypted external authorization request message have been exceeded, then in step **632** the process execution is denied and the user is alerted by the alerting device **366** and display **368** of the portable communication device **122**. If the resend counter has not been exceeded, then the processor **308** resends the encrypted external authorization message in step **614**. If in step **628** the TMO indicator has not expired, then the processor **308** continues to wait for an external authorization response message from the base stations **116**. If an external authorization response message is received, then step **620** checks if the requested process has been authorized for execution. If the requested process has been denied authorization, then step **640** is invoked, where the process is denied execution, and subsequently discarded in step **642** alerting the user to authorization denial. If the requested process has been authorized for execution, then in step **622** preferably two bytes are chosen from within the process executable **398** of the hardware or software module to create a 16 bit random polynomial generator. The random bytes are chosen using the real-time clock **399** and user controls **364** as described above. In step **624**, the processor **308** generates a random CRC over the process executable **398** of the



authorized hardware or software module. In step 626, an internal authorization record 382 is created comprising the random address pointers 384, the process name 386, the process size 387, the random CRC 388, and the expiration time 390 of the authorized process. The internal authorization record 382 is encrypted with the secure encryption key 312 stored in the ROM 310. Once the internal authorization record 382 has been created, the processor 308 continues to step 638 where process execution is invoked if it has not already been invoked by step 610.

In the case where in step 612 an internal authorization record 382 is found, the processor 308 continues to step 636 where the process verification elements are decrypted and then checked against the requested process executable 398. If the process verification elements are determined to be valid, then in step 638 process execution is invoked if it has not already been invoked by step 610. Validation of the process verification elements consists of matching the random CRC generated over the process executable 398 of the requested hardware or software module with the random CRC found in the internal authorization record. If the process verification elements are determined to be invalid, then in step 640 process execution is denied, and in step 642 the process is discarded from memory (for a software module) and an alert signal is created. The alert signal is preferably an audible and visual alert signal using the alerting device 366 and display 368 of the portable communication device 122. Optionally, an alert signal may be sent to the controller 112 alerting the communication system that an attempt to use an invalid hardware or software module has been detected.

Thus, it should be apparent by now that the present invention provides a method and apparatus for controlling utilization of a hardware or software process added to a portable communication device 122. In particular, the present invention provides a novel method and apparatus for remotely authorizing software and hardware modules added to a portable communication device 122. With the present invention, the authenticity of process executables 398 used by software and hardware modules can advantageously be validated by the fixed portion 102 of the communication system. In addition, the fixed portion 102 of the communication system can alternatively keep track of unauthorized installations and can optionally act upon unauthorized additions of software and hardware modules to the portable communication devices 122 by disabling operation of a portable communication device 122 using OTA techniques well known in the art. Another advantage of the present invention is the option for the system provider to program the portable communication device 122 to execute a hardware or software process without receiving immediate authorization. This option provides a user immediate access to a hardware or software process without burdening the user with the delay of receiving authorization for the process. The present invention also provides an authorization method which is secure for both inbound and outbound messaging by using a message encryption technique described above. Additionally, the authorization method used by the communication system, in accordance with the preferred embodiment of the present invention, advantageously requires only a single message transaction between the fixed portion 102 and the portable portion 104 of the communication system, thus providing efficient use of the communication system bandwidth.

What is claimed is:

1. A method in a communication system operated by a service provider, the method for controlling utilization of a

module added to a portable communication device comprising a transceiver which communicates with a fixed portion of the communication system, the method comprising in the portable communication device the steps of:

5 receiving a request for utilization of the module;  
in response, acting to obtain a usage authorization for utilizing the module; and

disallowing the utilization of the module, in response to the usage authorization being unobtainable.

10 2. The method of claim 1,

wherein the step of acting to obtain the usage authorization comprises the steps of:

15 allowing the utilization of the module; and  
thereafter acting to obtain the usage authorization through a first radio channel of the communication system, and

wherein the disallowing step comprises the step of:  
20 disabling further utilization of the module, in response to receiving a "not authorized" signal through a second radio channel of the communication system.

3. The method of claim 1,

wherein the step of acting to obtain the usage authorization comprises the steps of:

25 making a determination of whether an internal authorization exists for utilizing the module, the determination made from an authorization record stored in the portable communication device; and

obtaining the usage authorization from the internal authorization, in response to the internal authorization being present in the authorization record, and

wherein the method further comprises the step of:

allowing the utilization of the module, in response to the usage authorization being obtained.

4. The method of claim 1,

wherein the module is user-installed, and

wherein the step of acting to obtain the usage authorization comprises the steps of:

40 physically sending an authorization medium to the service provider, and

in response, obtaining the usage authorization by receiving an external authorization from the service provider through a radio channel of the communication system, and

wherein the method further comprises the step of:

allowing the utilization of the module, in response to the usage authorization being obtained.

5. The method of claim 1,

wherein the usage authorization comprises information indicative of a time at which the usage authorization will expire, and

wherein the method comprises the steps of:

55 allowing the utilization of the module in response to obtaining the usage authorization, and

disabling further utilization of the module in response to an expiration of the usage authorization.

6. A portable communication device in a communication system operated by a service provider, the portable communication device for controlling utilization of a module added thereto, the portable communication device comprising:

a transceiver for communicating with a fixed portion of the communication system;

a processor coupled to the transceiver for controlling the portable communication device;

a memory coupled to the processor for storing information used by the portable communication device;

user controls coupled to the processor for receiving a request for utilization of the module;

an authorization element coupled to the processor for acting to obtain a usage authorization for utilizing the module; and

a disallower element coupled to the processor for disallowing the utilization of the module, in response to the usage authorization being unobtainable.

7. The portable communication device of claim 6, wherein the authorization element comprises:

- a first allower element for allowing the utilization of the module; and
- a radio authorizer element coupled to the first allower element for acting to obtain the usage authorization through a first radio channel of the communication system, and

wherein the disallower element comprises:

- a first disabler element coupled to the radio authorizer element for disabling further utilization of the module, in response to receiving a "not authorized" signal through a second radio channel of the communication system.

8. The portable communication device of claim 6, wherein the authorization element comprises:

- a determination element for making a determination of whether an internal authorization exists for utilizing the module, the determination made from an authorization record stored in the portable communication device; and
- an internal authorizer element coupled to the determination element for obtaining the usage authorization from the internal authorization, in response to the internal authorization being present in the authorization record, and

wherein the portable communication device further comprises:

- a second allower element coupled to the internal authorizer element for allowing the utilization of the module, in response to the usage authorization being obtained.

9. The portable communication device of claim 6, wherein the module is user-installed, and wherein an authorization medium is physically sent to the service provider to obtain authorization, and wherein the authorization element comprises:

- an external authorizer element for obtaining the usage authorization by receiving an external authorization from the service provider through a radio channel of the communication system, and

wherein the portable communication device further comprises:

- a second allower element coupled to the external authorizer element for allowing the utilization of the module, in response to the usage authorization being obtained.

10. The portable communication device of claim 6, wherein the usage authorization comprises information indicative of a time at which the usage authorization will expire, and

wherein the portable communication device comprises:

- a second allower element coupled to the authorization element for allowing the utilization of the module in response to obtaining the usage authorization, and
- a third disabler element coupled to the second allower element for disabling further utilization of the mod-

ule in response to an expiration of the usage authorization.

11. A controller for use in a fixed portion of a communication system, the controller comprising:

- a processor for controlling operation of the controller;
- a memory coupled to the processor for storing information used by the controller;
- a transmitter interface coupled to the processor for transmitting a message to a portable communication device;
- a receiver interface coupled to the processor for receiving a communication from the portable communication device;
- apparatus, for authorizing utilization: of a process added to the portable communication device, the apparatus comprising:
  - a process lister element coupled to the processor maintaining in the memory a list of authorized processes corresponding to the portable communication device;
  - a request receiver element coupled to the processor for receiving a request for an external authorization from the portable communication device, the request comprising at least a process name and a process size corresponding to a process, along with a secure checksum and an address identifying the portable communication device;
  - a list checker element coupled to the processor for checking the list of authorized processes corresponding to the portable communication device identified by the address, to determine whether the module corresponding to the module name is authorized;
  - an external authorization element coupled to the processor for transmitting the external authorization to the portable communication device in response to the module being authorized for the portable communication device; and
  - an authorization denial element coupled to the processor for transmitting a "not authorized" signal to the portable communication device in response to the process not being authorized for the portable communication device.

12. A method in a communication system operated by a service provider, the method for controlling utilization of a process added to a portable communication device comprising a transceiver which communicates with a fixed portion of the communication system, the method comprising in the portable communication device the steps of:

- receiving a request for utilization of the process;
- in response, acting to obtain a usage authorization for utilizing the process by
  - making a determination of whether an internal authorization exists for utilizing the process, the determination made from an authorization record stored in the portable communication device, and
  - communicating with the fixed portion to obtain the usage authorization as an external authorization, in response to the internal authorization being absent from the authorization record;
- allowing the utilization of the process, in response to the usage authorization being obtained; and
- disallowing the utilization of the process, in response to the usage authorization being unobtainable.

13. The method of claim 12, wherein the process comprises a hardware module, wherein the step of allowing the utilization of the process comprises the step of performing the process in accordance with circuits of the hardware module, and



wherein the communicating step comprises the step of transmitting to the fixed portion a signal indicative of the hardware module.

**14.** The method of claim **12**,

wherein the process comprises a software module, 5  
 wherein the step of allowing the utilization of the process comprises the step of performing the process in accordance with instructions of the software module, and  
 wherein the communicating step comprises the step of transmitting to the fixed portion a signal indicative of the software module. 10

**15.** The method of claim **14**, wherein the transmitting step comprises the steps of:

performing an algorithm on at least a portion of bytes of the software module to calculate a secure checksum value therefor; and 15

sending at least a module name and a module size corresponding to the software module, along with the secure checksum value. 20

**16.** A portable communication device in a communication system operated by a service provider, the portable communication device for controlling utilization of a process added thereto, the portable communication device comprising:

a transceiver for communicating with a fixed portion of the communication system; 25

a processor coupled to the transceiver for controlling the portable communication device;

a memory coupled to the processor for storing information used by the portable communication device; 30

user controls coupled to the processor for receiving a request for utilization of the process;

an authorization element coupled to the processor for acting to obtain a usage authorization for utilizing the process, the authorization element comprising: 35

a determination element for making a determination of whether an internal authorization exists for utilizing the process, the determination made from an authorization record stored in the portable communication device, and 40

a radio authorizer element coupled to the determination element for communicating with the fixed portion to obtain the usage authorization as an external authorization, in response to the internal authorization being absent from the authorization record; 45

a second allow element coupled to the radio authorizer element for allowing the utilization of the process, in response to the usage authorization being obtained; and 50

a disallow element coupled to the processor for disallowing the utilization of the process, in response to the usage authorization being unobtainable.

**17.** The portable communication device of claim **16**, wherein the process comprises a hardware module, and 55

wherein the second allow element comprises a hardware performer element coupled to the processor for performing the process in accordance with circuits of the hardware module, and

wherein the radio authorizer element comprises a transmitter controller element coupled to a secure checksum calculator element for transmitting to the fixed portion a signal indicative of the hardware module. 60

**18.** The portable communication device of claim **16**, wherein the process comprises a software module, and 65

wherein the second allow element comprises a software performer element coupled to the processor for per-

forming the process in accordance with instructions of the software module, and

wherein the radio authorizer element comprises a transmitter controller element coupled to a secure checksum calculator element for transmitting to the fixed portion a signal indicative of the software module.

**19.** The portable communication device of claim **18**, wherein the transmitter controller element comprises:

a secure checksum calculator element coupled to the software module for performing an algorithm on at least a portion of bytes of the software module to calculate a secure checksum value therefor; and

a sender element coupled to the processor for sending at least a module name and a module size corresponding to the software module, along with the secure checksum value.

**20.** A method in a communication system operated by a service provider, the method for controlling utilization of a process added to a portable communication device comprising a transceiver which communicates with a fixed portion of the communication system, the method comprising in the portable communication device the steps of:

receiving a request for utilization of the process;

allowing the utilization of the process;

thereafter acting to obtain a usage authorization through a first radio channel of the communication system; and

disabling further utilization of the process, in response to receiving no external authorization reply through a second radio channel of the communication system within a predetermined time interval after the step of acting to obtain the usage authorization through the first radio channel is executed.

**21.** A method in a communication system operated by a service provider, the method for controlling utilization of a process added to a portable communication device comprising a transceiver which communicates with a fixed portion of the communication system, the method comprising in the portable communication device the steps of:

receiving a request for utilization of the process;

in response, acting to obtain a usage authorization from the fixed portion of the communication system for utilizing the process;

in the fixed portion of the communication system comprising the steps of:

maintaining a list of authorized processes corresponding to the portable communication device,

receiving a request for an external authorization from the portable communication device, the request comprising at least a process name and a process size corresponding to the process, along with a secure checksum and an address identifying the portable communication device,

checking the list of authorized processes corresponding to the portable communication device identified by the address, to determine whether the process corresponding to the process name is authorized,

transmitting the external authorization to the portable communication device in response to the process being authorized for the portable communication device,

transmitting a "not authorized" signal to the portable communication device in response to the process not being authorized for the portable communication device;

allowing the utilization of the process, in response to the usage authorization being obtained; and

21

disallowing the utilization of the process, in response to the usage authorization being unobtainable.

22. A method in a communication system operated by a service provider, the method for controlling utilization of a process added to a portable communication device comprising a transceiver which communicates with a fixed portion of the communication system, the method comprising in the portable communication device the steps of:

receiving a request for utilization of the process, wherein the process comprises a software module;

in response, acting to obtain a usage authorization for utilizing the process;

creating an internal authorization in response to obtaining an external authorization, comprising the step of generating a process verification from selected bytes of the software module, wherein the generating step comprises the steps of:

choosing the selected bytes of the software module by an address pointer defined by a random process, thereafter performing on the software module an algorithm responsive to the selected bytes to calculate a checksum value, wherein the checksum value and the address pointer become a portion of the process verification, and

thereafter storing the internal authorization in an authorization record, comprising the step of placing the process verification into the authorization record as a portion of the internal authorization; and

allowing the utilization of the process, in response to the usage authorization being obtained.

23. A portable communication device in a communication system operated by a service provider, the portable communication device for controlling utilization of a process added thereto, the portable communication device comprising:

a transceiver for communicating with a fixed portion of the communication system;

a processor coupled to the transceiver for controlling the portable communication device;

a memory coupled to the processor for storing information used by the portable communication device;

user controls coupled to the processor for receiving a request for utilization of the process;

an authorization element coupled to the processor for acting to obtain a usage authorization for utilizing the process, the authorization element comprising:

a first allower element for allowing the utilization of the process, and

a radio authorizer element coupled to the first allower element for acting to obtain the usage authorization through a first radio channel of the communication system; and

22

a disallower element coupled to the processor for disallowing the utilization of the process, in response to the usage authorization being unobtainable, the disallower element comprising a second disabler element coupled to the radio authorizer element for disabling further utilization of the process, in response to receiving no external authorization reply through a second radio channel of the communication system within a predetermined time interval after the radio authorizer element acts to obtain the usage authorization through the first radio channel.

24. A portable communication device in a communication system operated by a service provider, the portable communication device for controlling utilization of a process added thereto, the portable communication device comprising:

a transceiver for communicating with a fixed portion of the communication system;

a processor coupled to the transceiver for controlling the portable communication device;

a memory coupled to the processor for storing information used by the portable communication device;

user controls coupled to the processor for receiving a request for utilization of the process;

an authorization element coupled to the processor for acting to obtain a usage authorization for utilizing the process, wherein the process comprises a software module;

a creator element for creating an internal authorization in response to obtaining an external authorization, comprising a generator element for generating a process verification from selected bytes of the software module, wherein the generator element comprises:

a chooser element for choosing the selected bytes of the software module by an address pointer defined by a random process; and

a checksum calculator element coupled to the chooser element for performing on the software module an algorithm responsive to the selected bytes to calculate a checksum value, wherein the checksum value and the address pointer become a portion of the process verification, and

a storer element coupled to the creator element for storing the internal authorization in an authorization record in the memory, the storer element comprising a placer element for placing the process verification into the authorization record as a portion of the internal authorization; and

a disallower element coupled to the processor for disallowing the utilization of the process, in response to the usage authorization being unobtainable.

\* \* \* \* \*

UNITED STATES PATENT AND TRADEMARK OFFICE  
**CERTIFICATE OF CORRECTION**

PATENT NO. : 5,612,682  
DATED : March 18, 1997  
INVENTOR(S) : DeLuca et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 18, line 29, delete "module" and insert --process--.  
Column 18, line 30, delete "module" and insert --process--.  
Column 18, line 33, delete "module" and insert --process--.

Signed and Sealed this  
Ninth Day of September, 1997

Attest:



BRUCE LEHMAN

Attesting Officer

Commissioner of Patents and Trademarks