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

MOTOROLA, INC.,	§	
	§	
Plaintiff,	§	Civil Action No. 2:08-cv-69(TJW)
	§	
v.	§	
	§	**JURY**
RESEARCH IN MOTION LIMITED AND RESEARCH IN MOTION CORPORATION,	§	
	§	
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 21st day of February 2008.

Dated: February 20, 2008

/s/ John M. Pickett
John M. Pickett

United States Patent [19]

DeLuca

[11] **Patent Number: 5,075,684**

[45] **Date of Patent: Dec. 24, 1991**

[54] **SELECTIVE CALL MESSAGE MANAGEMENT**

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

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

[21] Appl. No.: **418,055**

[22] Filed: **Oct. 6, 1989**

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

[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

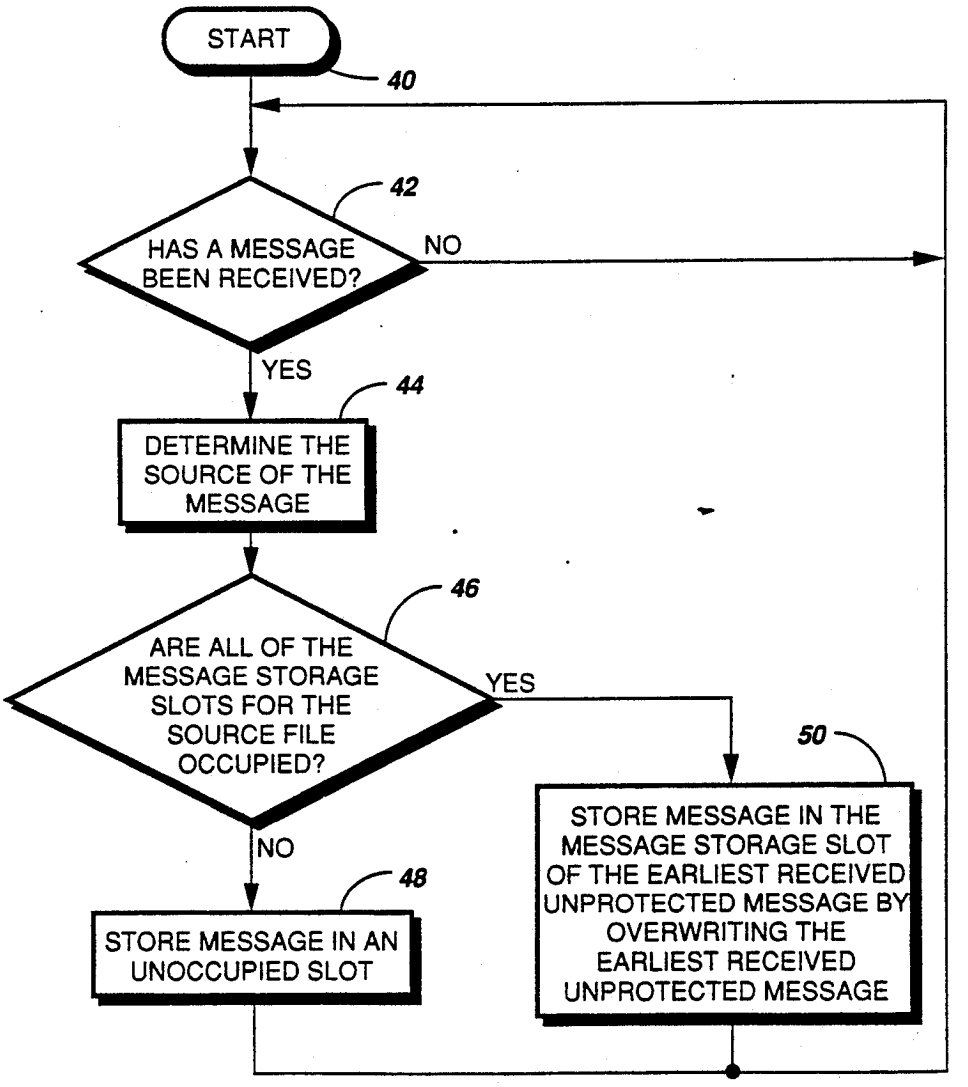
4,438,433	3/1984	Smoot et al.	340/825.44
4,518,961	5/1985	Davis et al.	179/2 EC
4,649,538	3/1987	DeLuca et al.	371/25
4,688,034	8/1987	De Graaf	340/825.27
4,755,816	7/1988	DeLuca	340/825.44
4,786,901	11/1988	Matai et al.	340/825.44
4,851,829	7/1989	DeLuca et al.	340/825.44

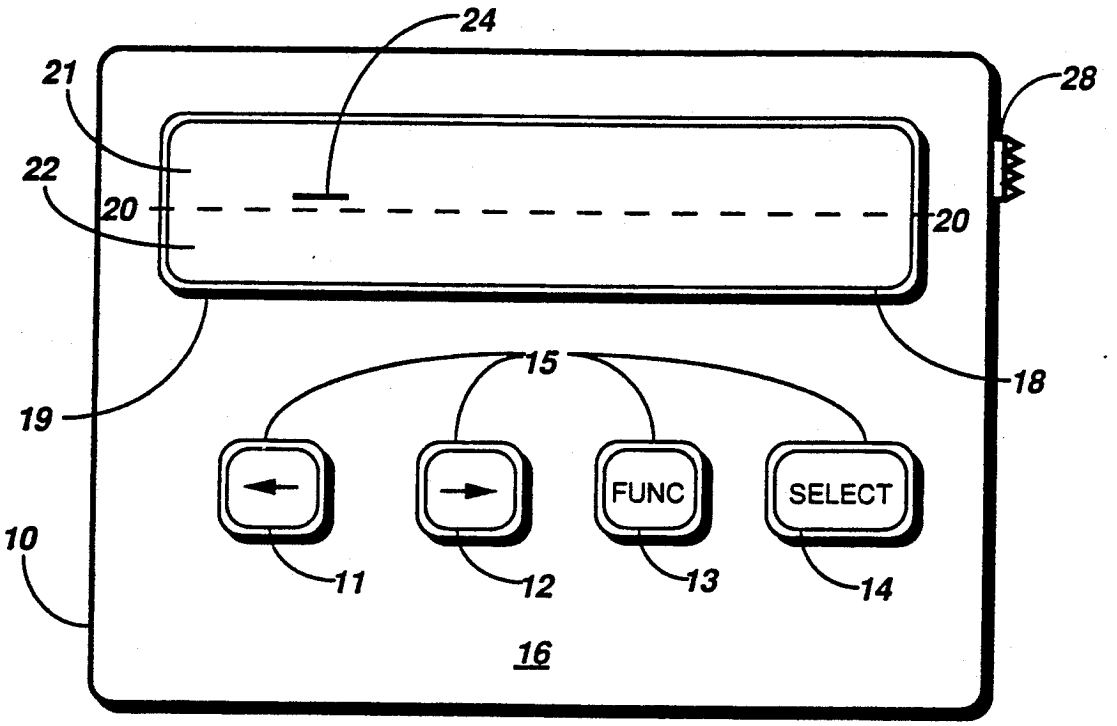
Primary Examiner—Donald J. Yusko
Assistant Examiner—Peter S. Weissman
Attorney, Agent, or Firm—Daniel R. Collopy; Vincent B. Ingrassia; William E. Koch

[57] **ABSTRACT**

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.

19 Claims, 5 Drawing Sheets




24
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FUNC
SELECT
10
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14
16

FIG. 1

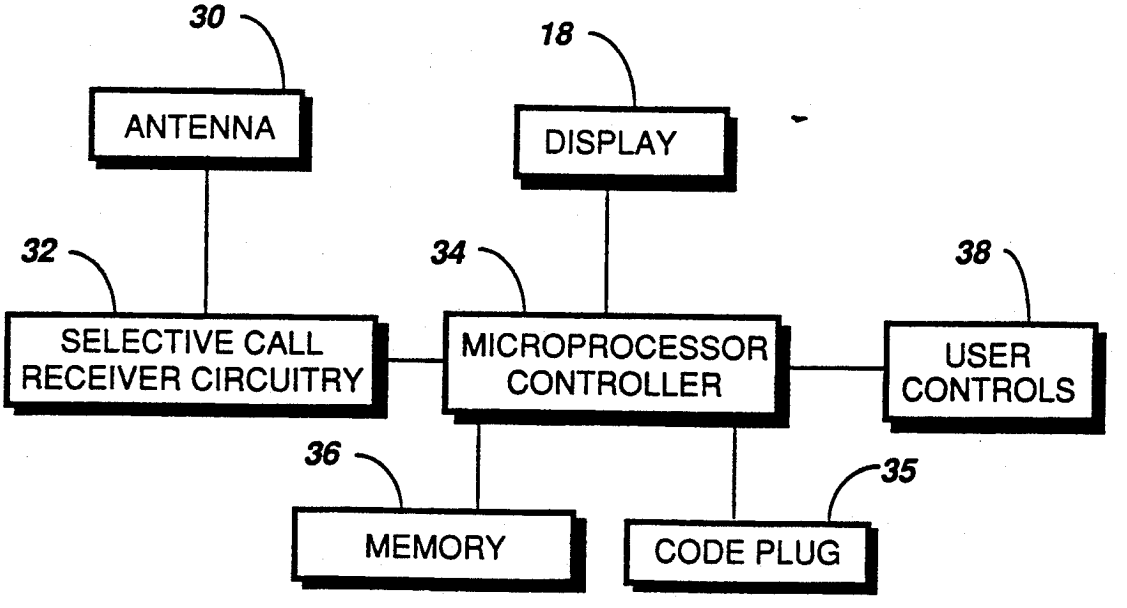
30
18
ANTENNA
DISPLAY
32
34
38
SELECTIVE CALL RECEIVER CIRCUITRY
MICROPROCESSOR CONTROLLER
USER CONTROLS
36
35
MEMORY
CODE PLUG

FIG. 2

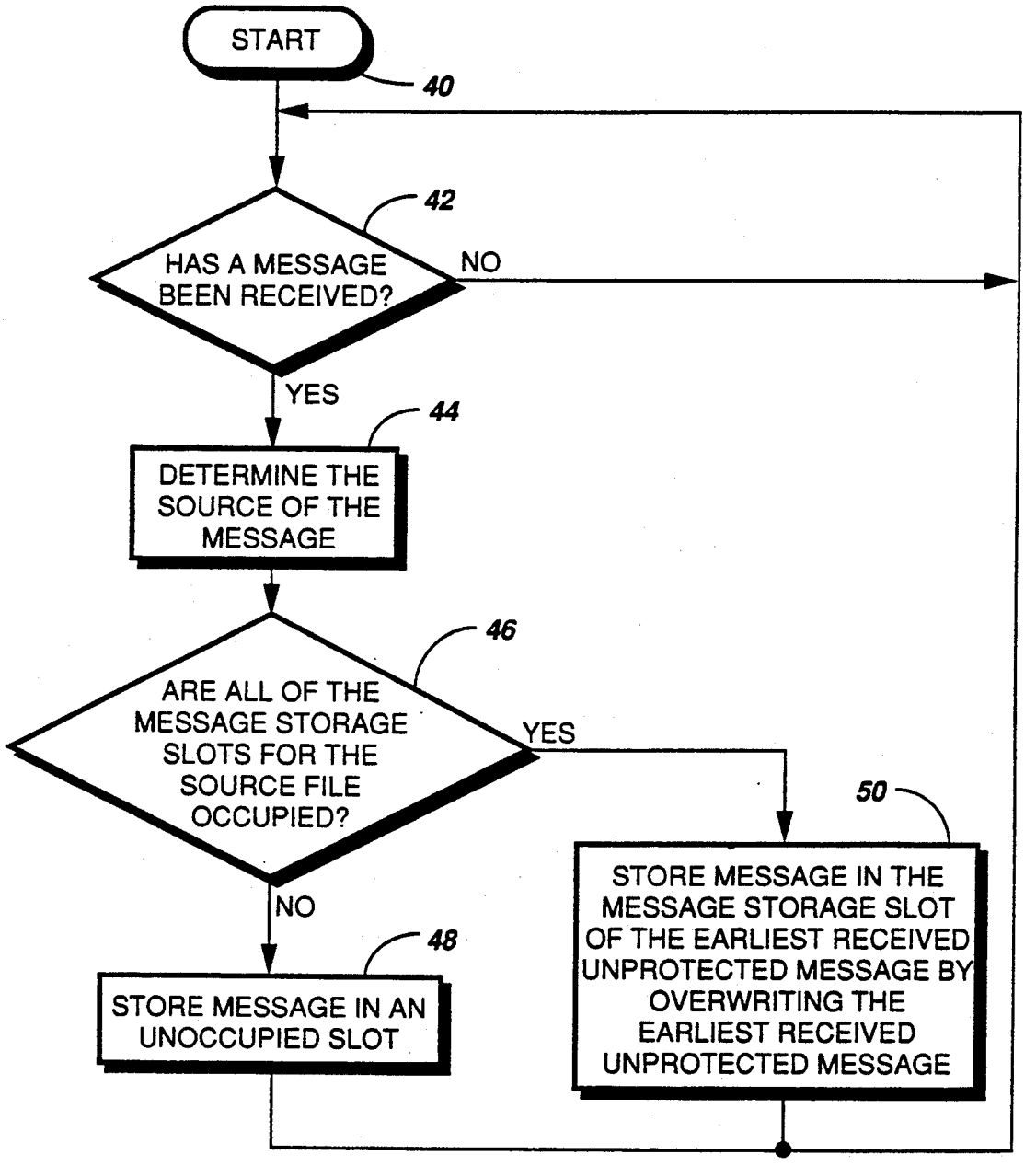
START
40
42
HAS A MESSAGE BEEN RECEIVED?
NO
YES
44
DETERMINE THE SOURCE OF THE MESSAGE
46
ARE ALL OF THE MESSAGE STORAGE SLOTS FOR THE SOURCE FILE OCCUPIED?
YES
NO
48
STORE MESSAGE IN AN UNOCCUPIED SLOT
50
STORE MESSAGE IN THE MESSAGE STORAGE SLOT OF THE EARLIEST RECEIVED UNPROTECTED MESSAGE BY OVERWRITING THE EARLIEST RECEIVED UNPROTECTED MESSAGE

FIG. 3

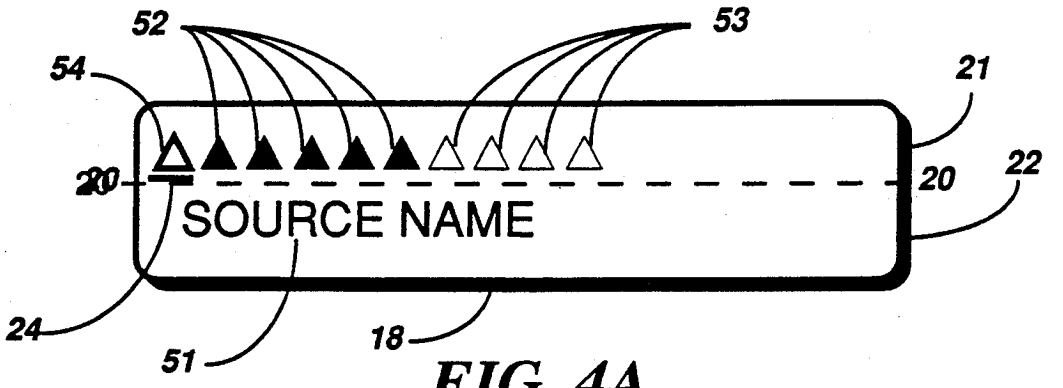

FIG. 4A

FIG. 4B

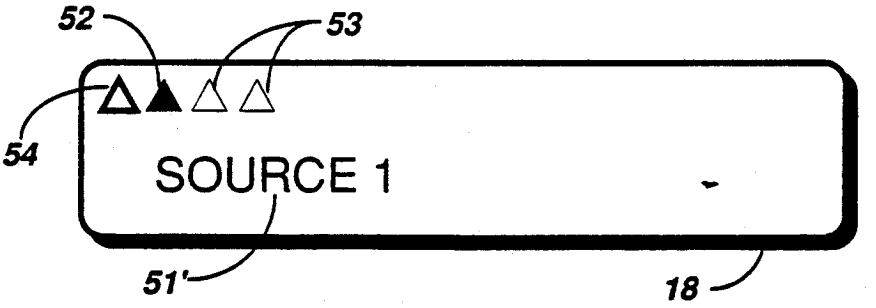

FIG. 4C

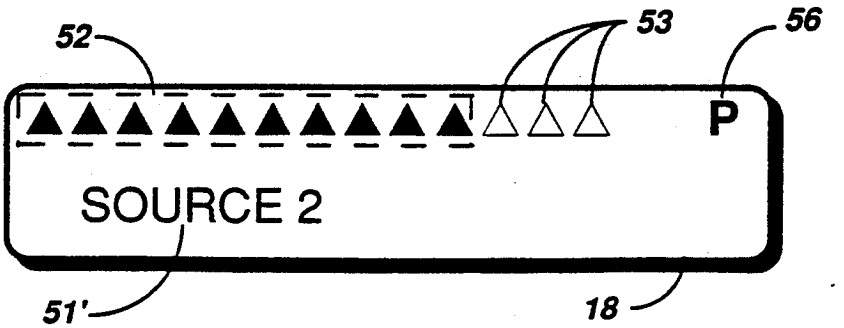

FIG. 4D

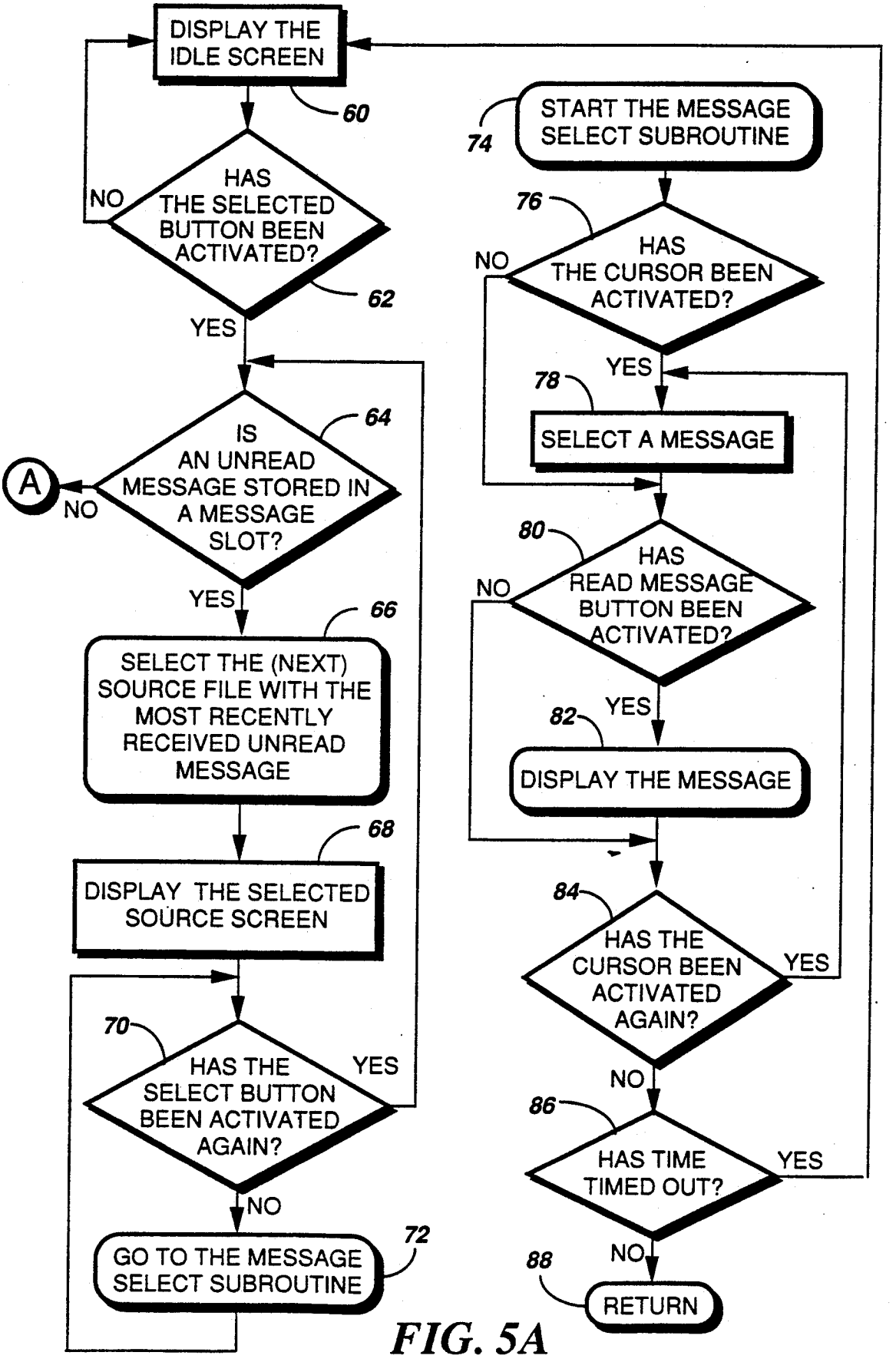
DISPLAY THE IDLE SCREEN
60
HAS THE SELECTED BUTTON BEEN ACTIVATED?
NO
62
YES
IS AN UNREAD MESSAGE STORED IN A MESSAGE SLOT?
64
A
NO
YES
SELECT THE (NEXT) SOURCE FILE WITH THE MOST RECENTLY RECEIVED UNREAD MESSAGE
66
DISPLAY THE SELECTED SOURCE SCREEN
68
HAS THE SELECT BUTTON BEEN ACTIVATED AGAIN?
70
YES
NO
GO TO THE MESSAGE SELECT SUBROUTINE
72
START THE MESSAGE SELECT SUBROUTINE
74
HAS THE CURSOR BEEN ACTIVATED?
76
NO
YES
SELECT A MESSAGE
78
HAS READ MESSAGE BUTTON BEEN ACTIVATED?
80
NO
YES
DISPLAY THE MESSAGE
82
HAS THE CURSOR BEEN ACTIVATED AGAIN?
84
YES
NO
HAS TIME TIMED OUT?
86
YES
NO
RETURN
88

FIG. 5A

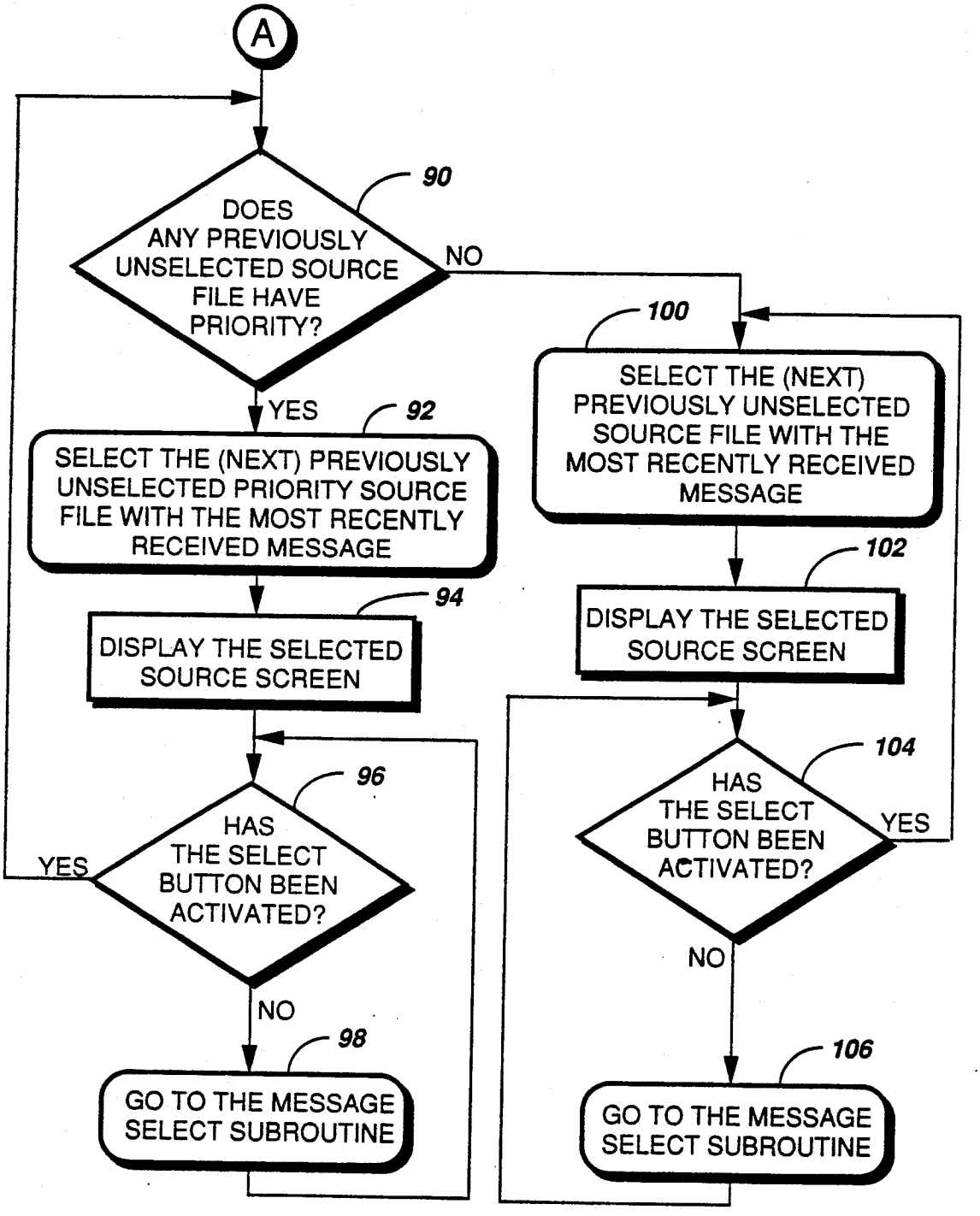
A
90
DOES ANY PREVIOUSLY UNSELECTED SOURCE FILE HAVE PRIORITY?
NO
YES
92
SELECT THE (NEXT) PREVIOUSLY UNSELECTED PRIORITY SOURCE FILE WITH THE MOST RECENTLY RECEIVED MESSAGE
94
DISPLAY THE SELECTED SOURCE SCREEN
96
HAS THE SELECT BUTTON BEEN ACTIVATED?
YES
NO
98
GO TO THE MESSAGE SELECT SUBROUTINE
100
SELECT THE (NEXT) PREVIOUSLY UNSELECTED SOURCE FILE WITH THE MOST RECENTLY RECEIVED MESSAGE
102
DISPLAY THE SELECTED SOURCE SCREEN
104
HAS THE SELECT BUTTON BEEN ACTIVATED?
YES
NO
106
GO TO THE MESSAGE SELECT SUBROUTINE

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 accomodate 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 alloted 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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United States Patent [19]

Weitzen

[11] Patent Number: 5,157,391

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

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

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

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

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

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

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

[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

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,354,260	10/1982	Planzo	364/709.15
4,419,668	6/1983	Davis et al.	340/825.44
4,549,279	10/1985	Lapeyre	364/709.15
4,713,808	12/1987	Gaskill et al.	370/93
4,766,746	8/1988	Henderson et al.	340/825.31
4,829,466	5/1989	Davis et al.	364/900
4,857,898	8/1989	Smith	341/22
4,864,592	9/1989	Lee	364/709.12

OTHER PUBLICATIONS

Motorola "PMR200", 1986, pp. 2–5 (anonymous author(s).

Primary Examiner—Donald J. Yusko
Assistant Examiner—Dervis Magistre
Attorney, Agent, or Firm—Gregg E. Rasor; Vincent B. Ingrassia; William E. Koch

[57] **ABSTRACT**

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.

9 Claims, 3 Drawing Sheets

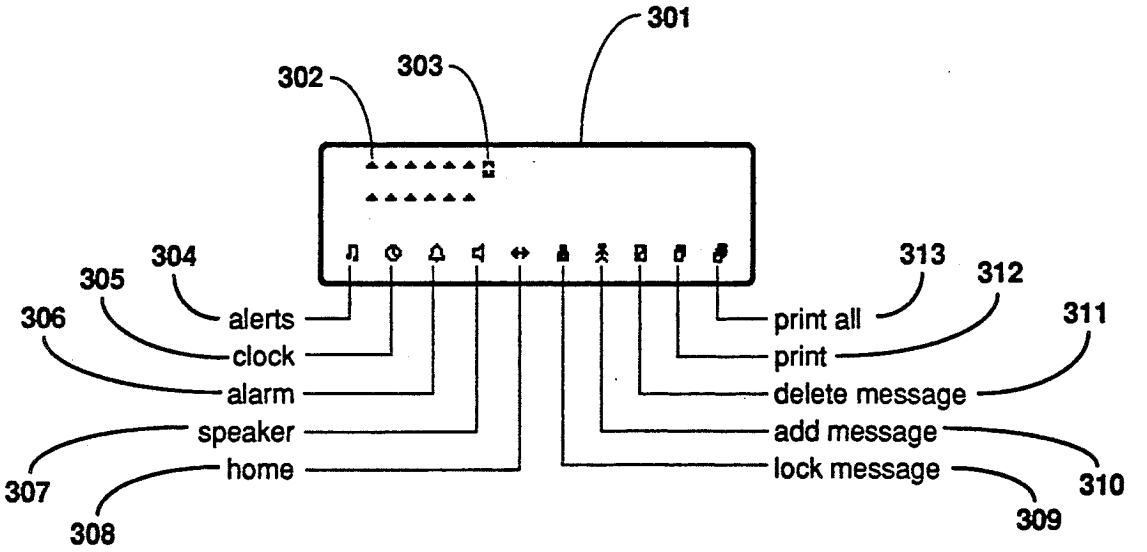


FIG. 1
Prior Art

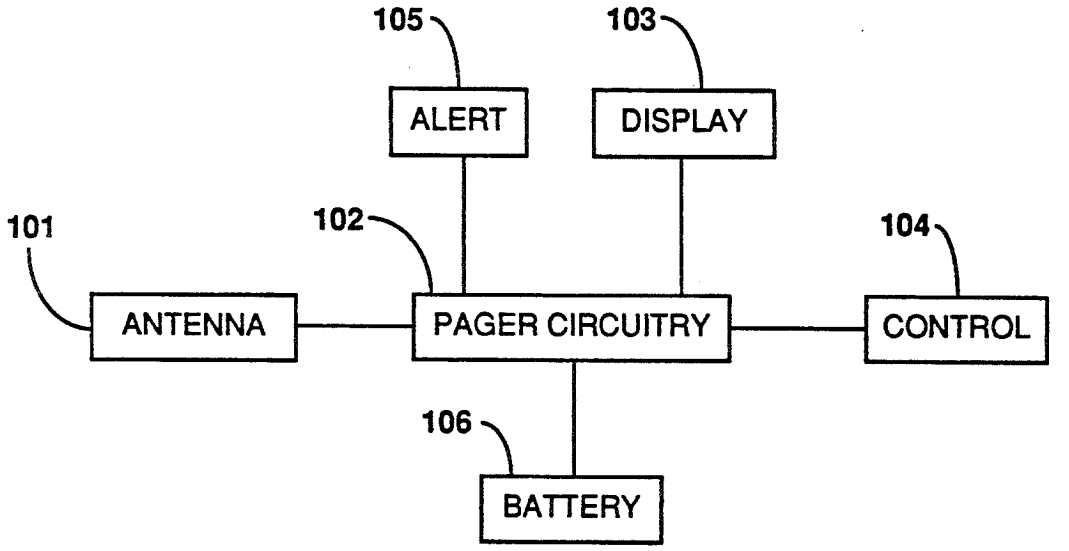


FIG. 2

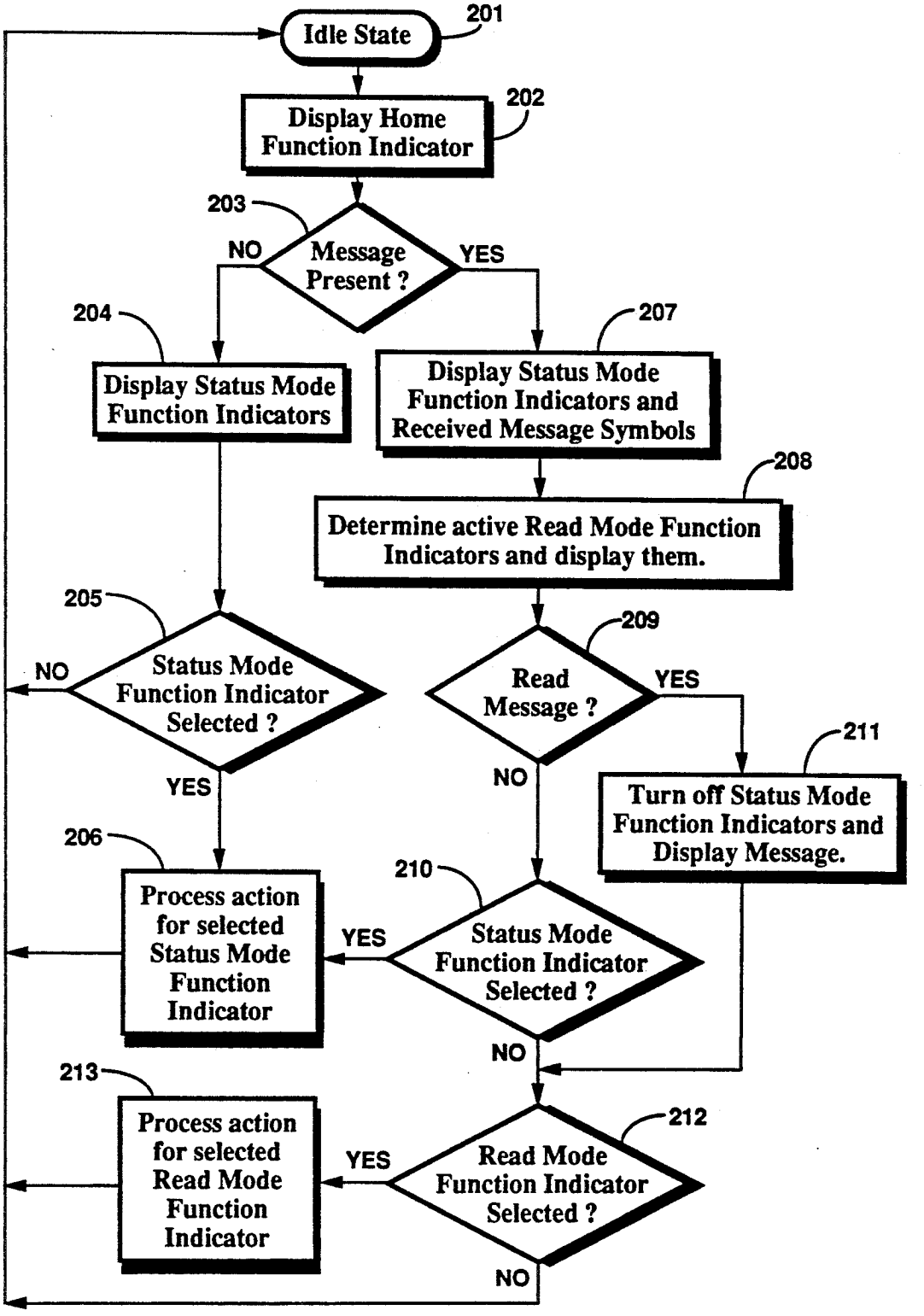
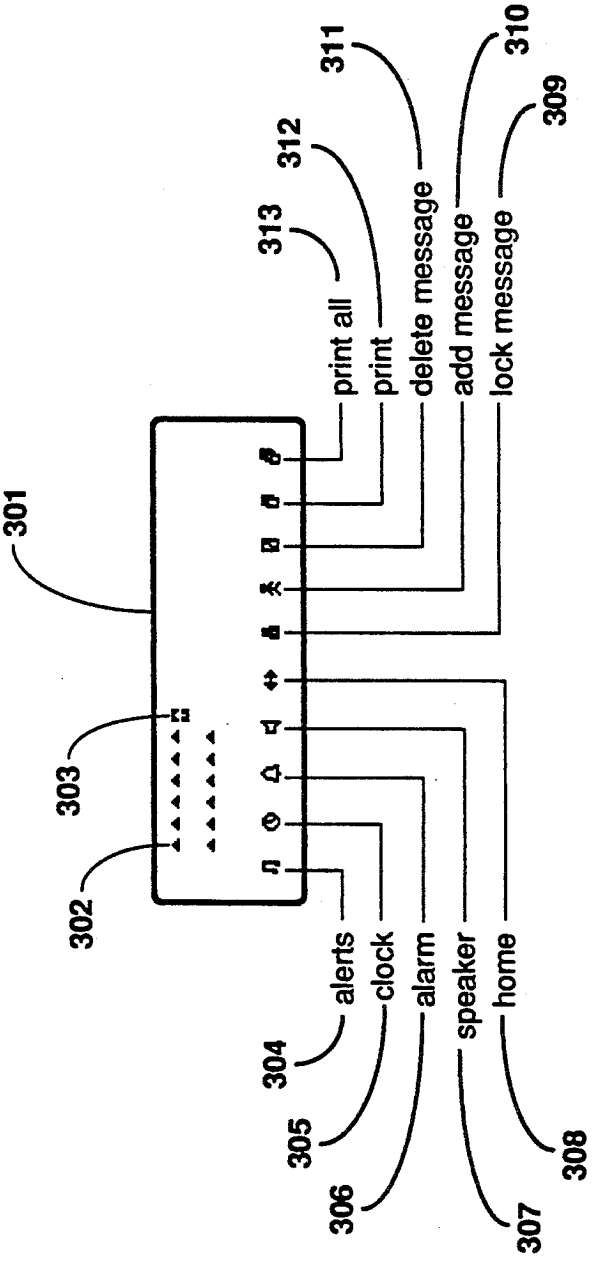

Idle State
201
Display Home Function Indicator
202
203
Message Present ?
NO
YES
204
Display Status Mode Function Indicators
207
Display Status Mode Function Indicators and Received Message Symbols
208
Determine active Read Mode Function Indicators and display them.
205
Status Mode Function Indicator Selected ?
NO
YES
209
Read Message ?
YES
NO
211
Turn off Status Mode Function Indicators and Display Message.
206
Process action for selected Status Mode Function Indicator
210
Status Mode Function Indicator Selected ?
YES
NO
213
Process action for selected Read Mode Function Indicator
212
Read Mode Function Indicator Selected ?
YES
NO

FIG. 3


301
302
303
304
305
306
307
308
309
310
311
312
313
print all
print
delete message
add message
lock message
alerts
clock
alarm
speaker
home

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 o 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 receive 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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United States Patent [19]

Gomez et al.

[11] Patent Number: 5,359,317

[45] Date of Patent: Oct. 25, 1994

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

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

[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

[56] **References Cited**

U.S. PATENT DOCUMENTS

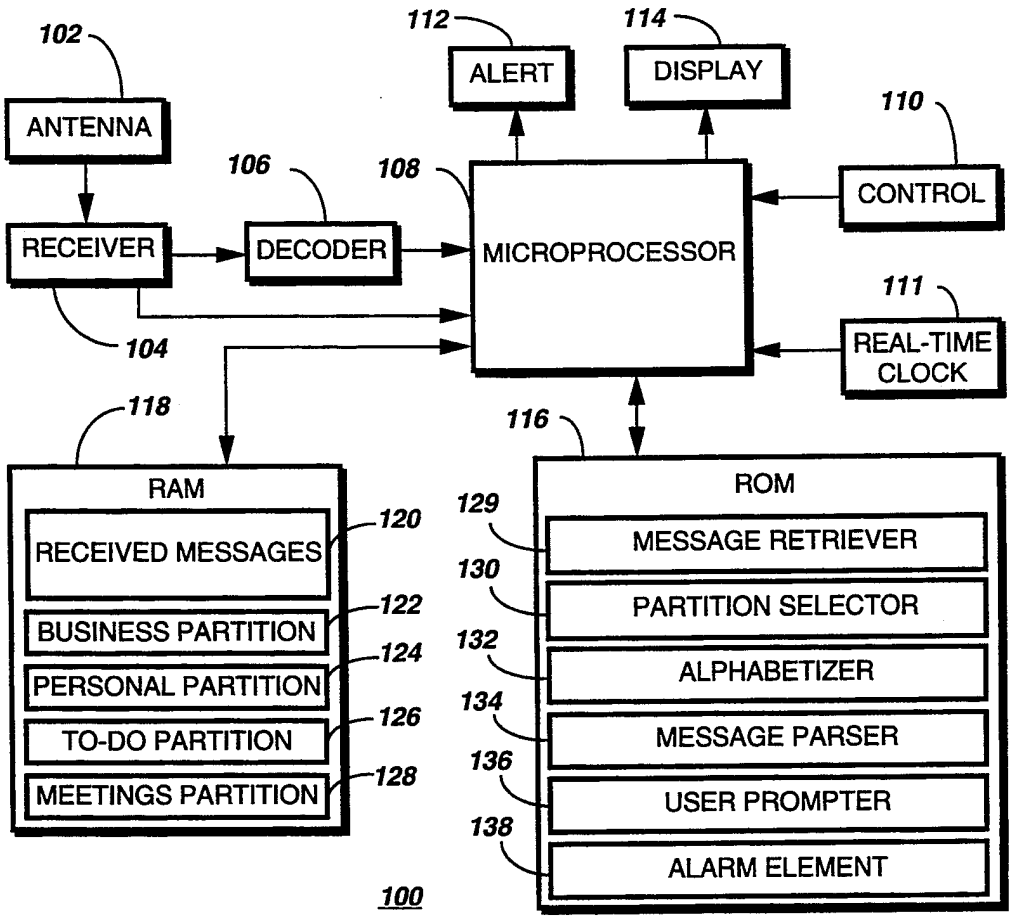
4,839,628	6/1989	Davis et al.	340/825.44
4,872,005	10/1989	DeLuca et al.	340/825.44
4,894,649	1/1990	Davis	340/825.22
5,075,684	12/1991	DeLuca	340/825.44
5,177,477	1/1993	Fennell et al.	340/825.44
5,258,739	11/1993	DeLuca et al.	340/825.44

Primary Examiner—Donald J. Yusko
Assistant Examiner—Gregg V. Miller
Attorney, Agent, or Firm—R. Louis Breeden; Thomas G. Berry

[57] **ABSTRACT**

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**).

22 Claims, 4 Drawing Sheets



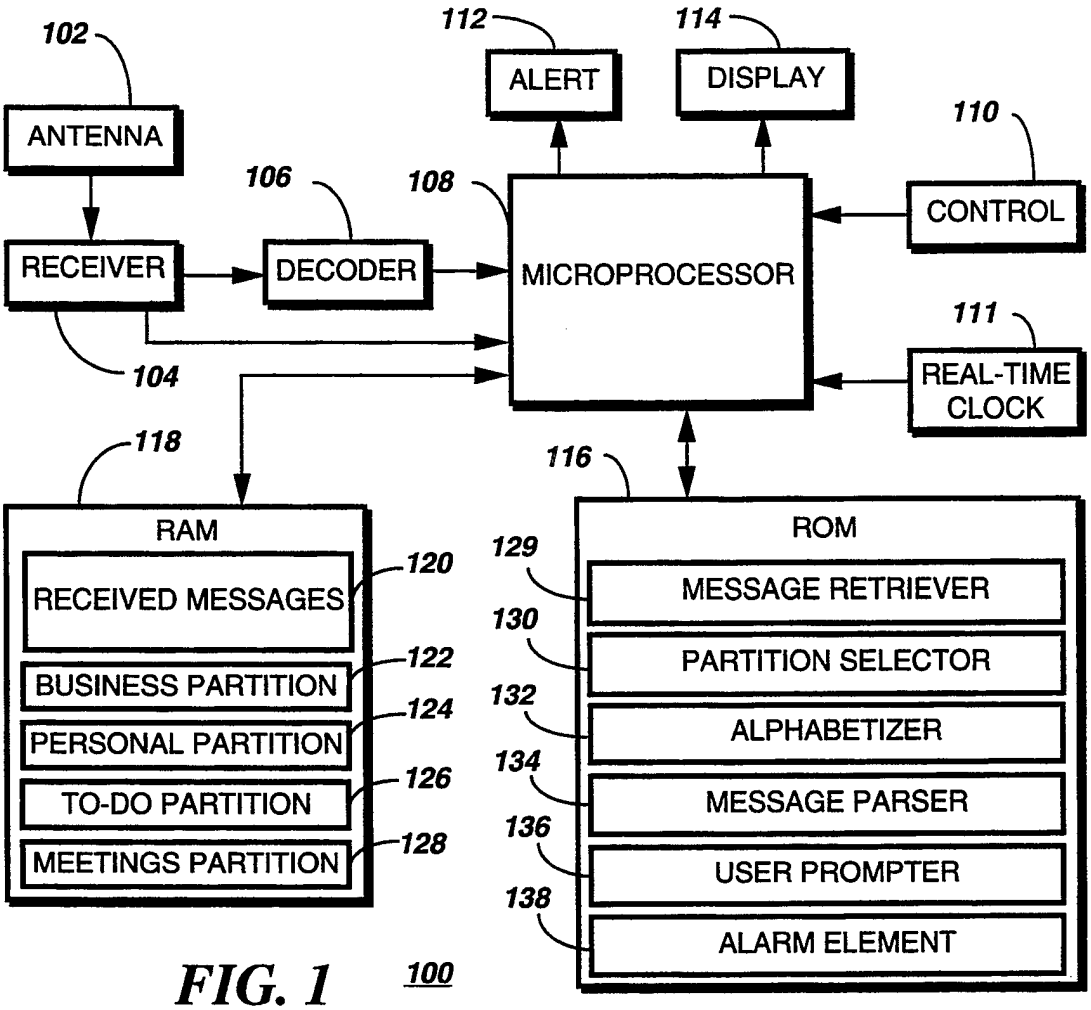

102
ANTENNA
112
ALERT
114
DISPLAY
110
CONTROL
106
DECODER
108
MICROPROCESSOR
RECEIVER
104
111
REAL-TIME CLOCK
118
RAM
116
ROM
RECEIVED MESSAGES
120
BUSINESS PARTITION
122
PERSONAL PARTITION
124
TO-DO PARTITION
126
MEETINGS PARTITION
128
129
MESSAGE RETRIEVER
130
PARTITION SELECTOR
132
ALPHABETIZER
134
MESSAGE PARSER
136
USER PROMPTER
138
ALARM ELEMENT
100

FIG. 1

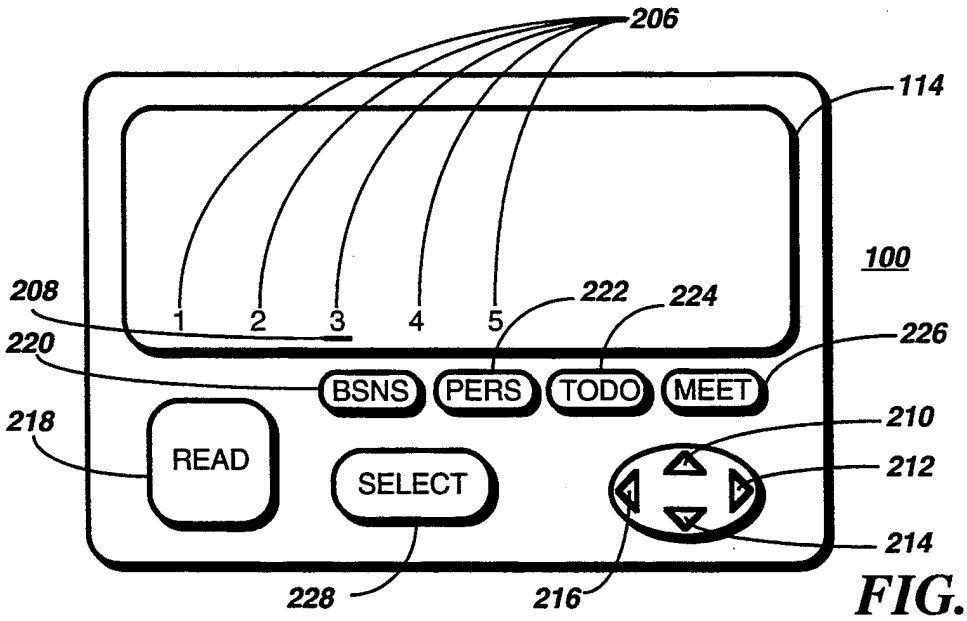

206
114
100
208
1
2
3
4
5
222
224
226
220
BSNS
PERS
TODO
MEET
218
READ
SELECT
210
212
214
228
216

FIG. 2

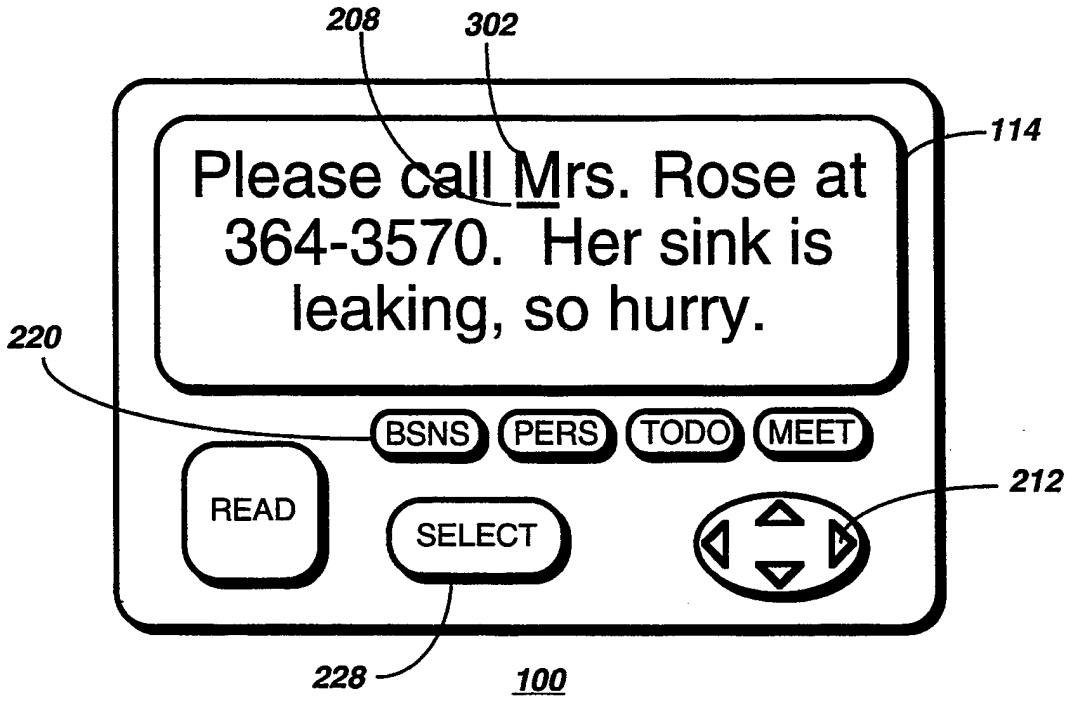

208
302
114
Please call Mrs. Rose at 364-3570. Her sink is leaking, so hurry.
220
BSNS
PERS
TODO
MEET
READ
SELECT
212
228
100

FIG. 3

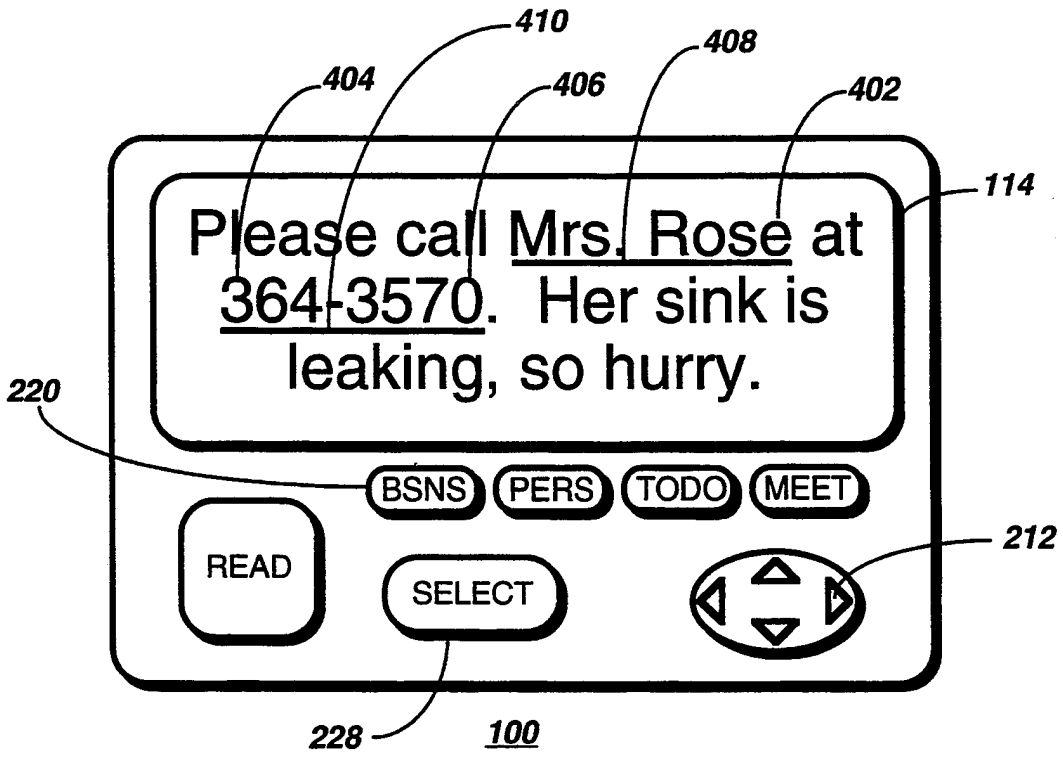

410
404
406
408
402
114
Please call Mrs. Rose at 364-3570. Her sink is leaking, so hurry.
220
BSNS
PERS
TODO
MEET
READ
SELECT
212
228
100

FIG. 4

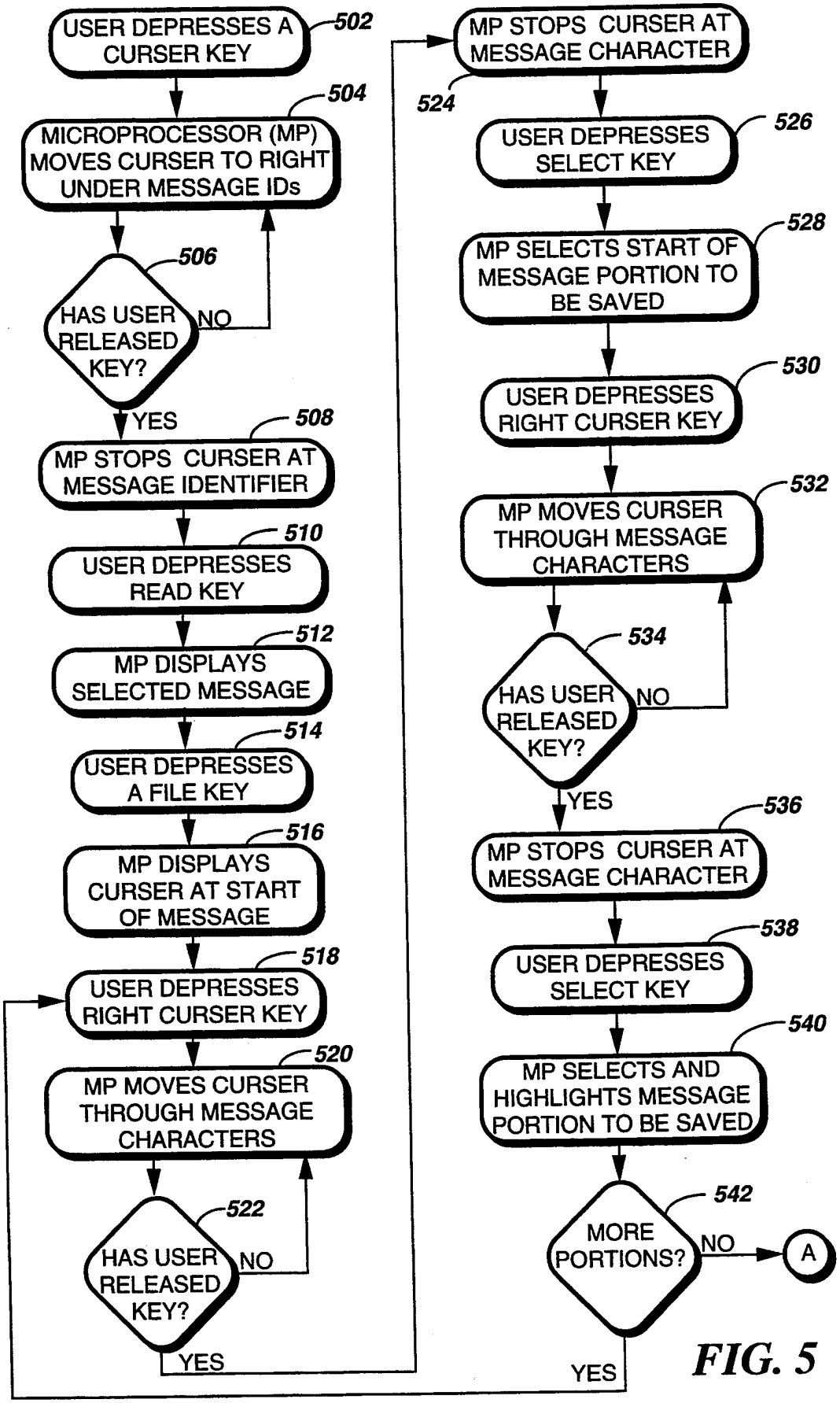

USER DEPRESSES A CURSER KEY
502
MICROPROCESSOR (MP) MOVES CURSER TO RIGHT UNDER MESSAGE IDs
504
HAS USER RELEASED KEY?
506
NO
YES
MP STOPS CURSER AT MESSAGE IDENTIFIER
508
USER DEPRESSES READ KEY
510
MP DISPLAYS SELECTED MESSAGE
512
USER DEPRESSES A FILE KEY
514
MP DISPLAYS CURSER AT START OF MESSAGE
516
USER DEPRESSES RIGHT CURSER KEY
518
MP MOVES CURSER THROUGH MESSAGE CHARACTERS
520
HAS USER RELEASED KEY?
522
NO
YES
MP STOPS CURSER AT MESSAGE CHARACTER
524
USER DEPRESSES SELECT KEY
526
MP SELECTS START OF MESSAGE PORTION TO BE SAVED
528
USER DEPRESSES RIGHT CURSER KEY
530
MP MOVES CURSER THROUGH MESSAGE CHARACTERS
532
HAS USER RELEASED KEY?
534
NO
YES
MP STOPS CURSER AT MESSAGE CHARACTER
536
USER DEPRESSES SELECT KEY
538
MP SELECTS AND HIGHLIGHTS MESSAGE PORTION TO BE SAVED
540
MORE PORTIONS?
542
NO
A
YES

FIG. 5

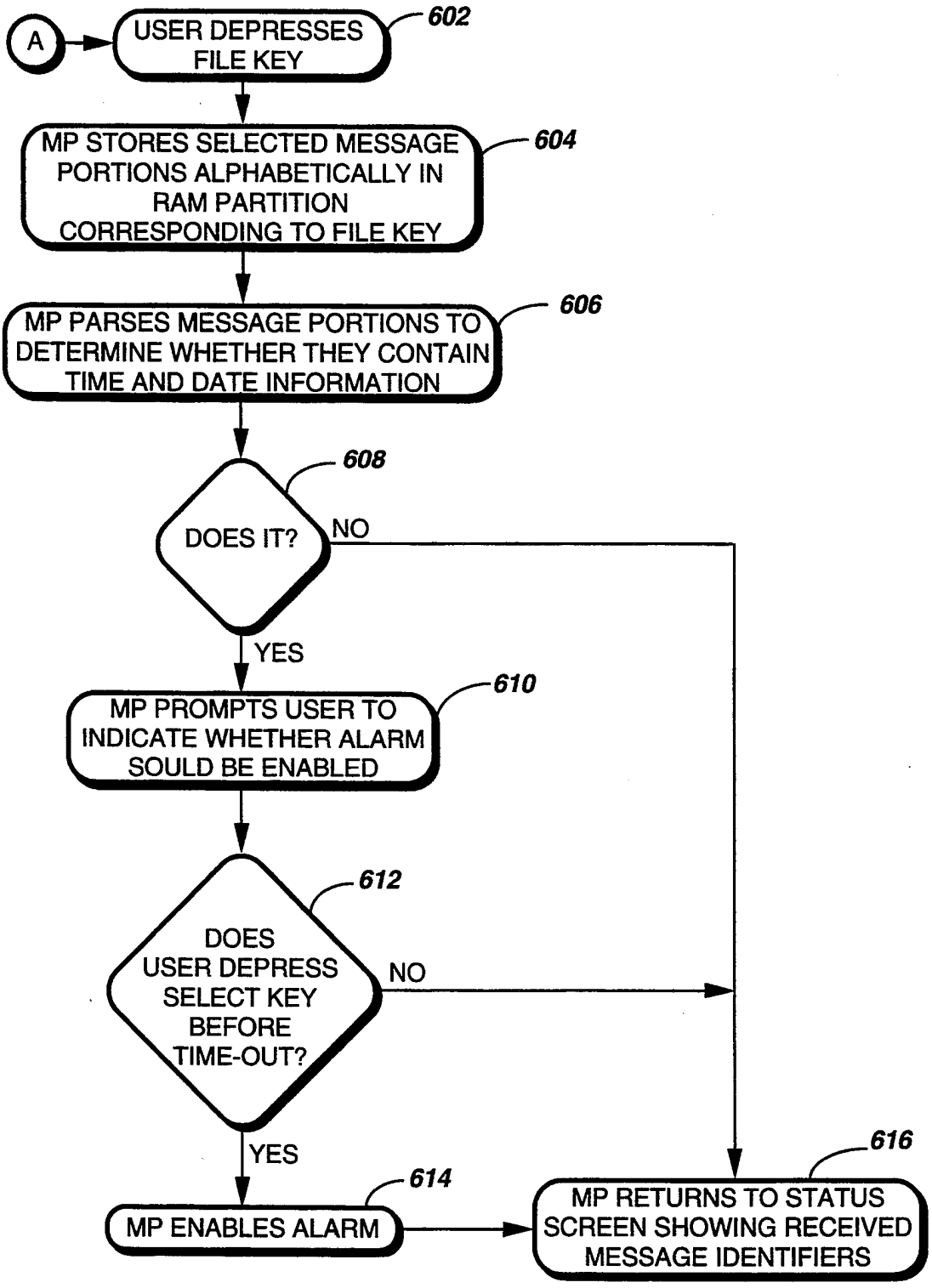

A
USER DEPRESSES FILE KEY
602
MP STORES SELECTED MESSAGE PORTIONS ALPHABETICALLY IN RAM PARTITION CORRESPONDING TO FILE KEY
604
MP PARSES MESSAGE PORTIONS TO DETERMINE WHETHER THEY CONTAIN TIME AND DATE INFORMATION
606
608
DOES IT?
NO
YES
MP PROMPTS USER TO INDICATE WHETHER ALARM SOULD BE ENABLED
610
612
DOES USER DEPRESS SELECT KEY BEFORE TIME-OUT?
NO
YES
614
MP ENABLES ALARM
616
MP RETURNS TO STATUS SCREEN SHOWING RECEIVED MESSAGE IDENTIFIERS

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 curser 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 curser control keys comprising an up key **210**, a right key **212**, a down key **214**, and a left key **216**. The curser control keys **210, 212, 214, 216** are used to move the curser **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 curser **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 curser **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 curser **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 curser **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 curser **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 curser key, e.g., the right key **212** (FIG. **2**), to cause the microprocessor **108** (FIG. **1**) to move **504** the curser **208** (FIG. **2**) to the right under a message identifier **206**. This process repeats until in step **506** the user releases the curser key, at which time the microprocessor **108** stops **508** the curser **208** under a message identifier **206**. To display a message corresponding to the message identifier **206** above the curser **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 curser **208** (FIG. **2**) at the start of the message. The user then depresses **518** a curser key, e.g., the right key **212** (FIG. **2**) to cause the microprocessor **108** to move **520** the curser through the message characters until in step **522** the user releases the curser key, at which time the microprocessor **108** stops moving **524** the curser **208**. If the message selected in step **510** is longer than can be displayed on a single screen "page," then in moving the curser **208** the microprocessor **108** will scroll to a new page of the message each time the curser **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 curser **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 curser **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 curser **208**. If desired, the user may also adjust the curser 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 curser 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 time-out, 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 matching 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.

* * * * *

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

[redacted]

US005394140A

United States Patent [19]

Wong et al.

[11] Patent Number: 5,394,140

[45] Date of Patent: Feb. 28, 1995

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

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

[21] Appl. No.: **980,047**

[22] Filed: **Nov. 23, 1992**

[51] **Int. Cl.**[6] **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

[56] **References Cited**

U.S. PATENT DOCUMENTS

H1,173	4/1993	Davis et al.	340/825.44
4,758,834	7/1988	Sato et al. .	
4,868,561	9/1989	Davis .	
4,922,221	5/1990	Sato et al. .	
4,994,797	2/1991	Breeden .	
5,043,721	8/1991	May	364/705.05
5,122,778	6/1992	Erhart et al.	364/715.11

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**).

20 Claims, 6 Drawing Sheets

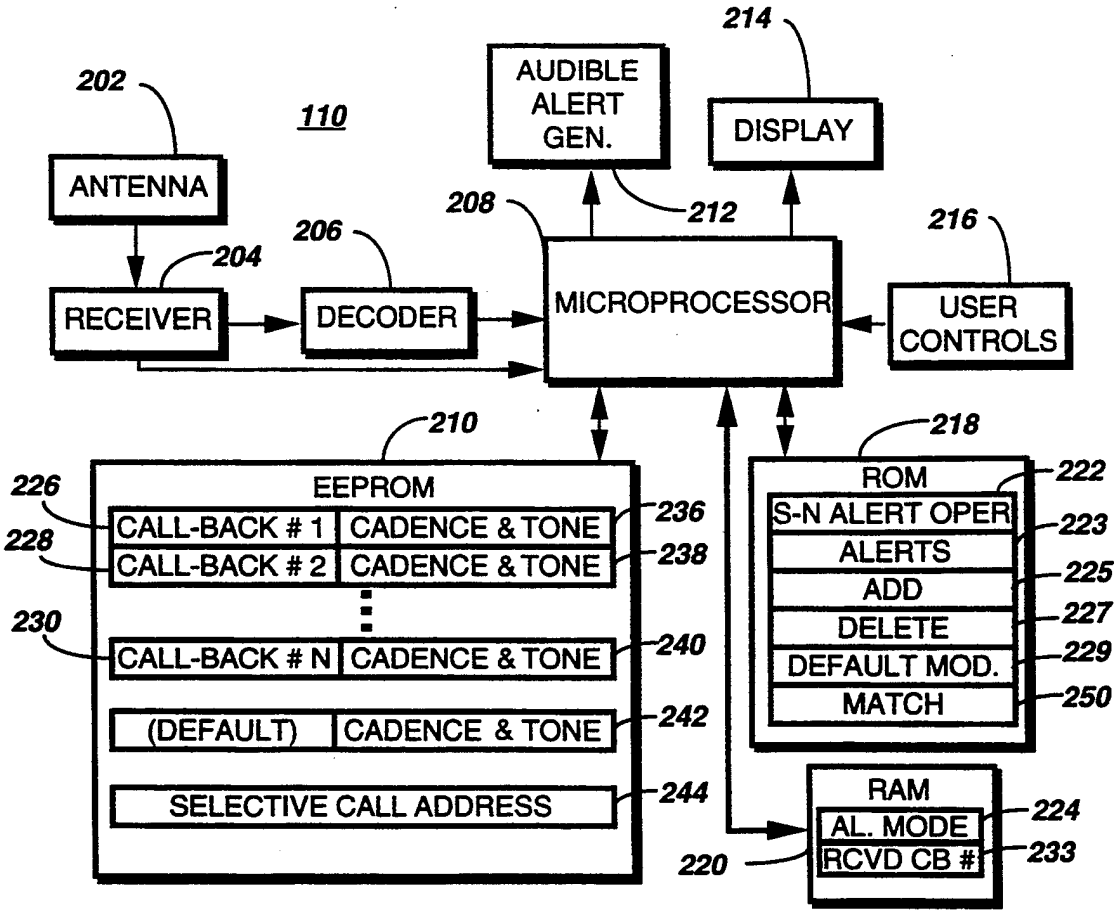
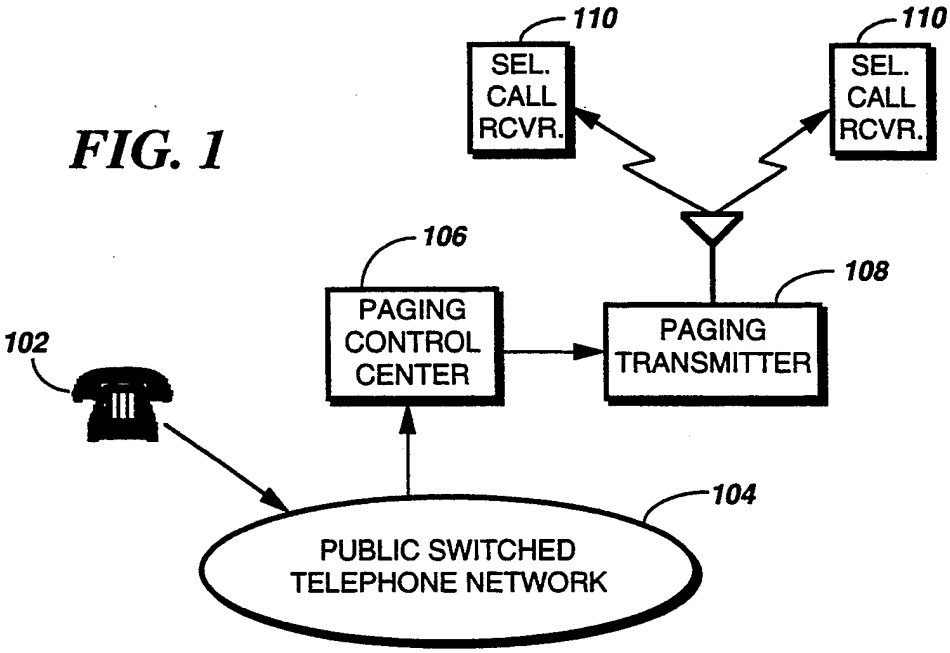


FIG. 1


110
SEL. CALL RCVR.
110
SEL. CALL RCVR.
106
PAGING CONTROL CENTER
108
PAGING TRANSMITTER
102
104
PUBLIC SWITCHED TELEPHONE NETWORK

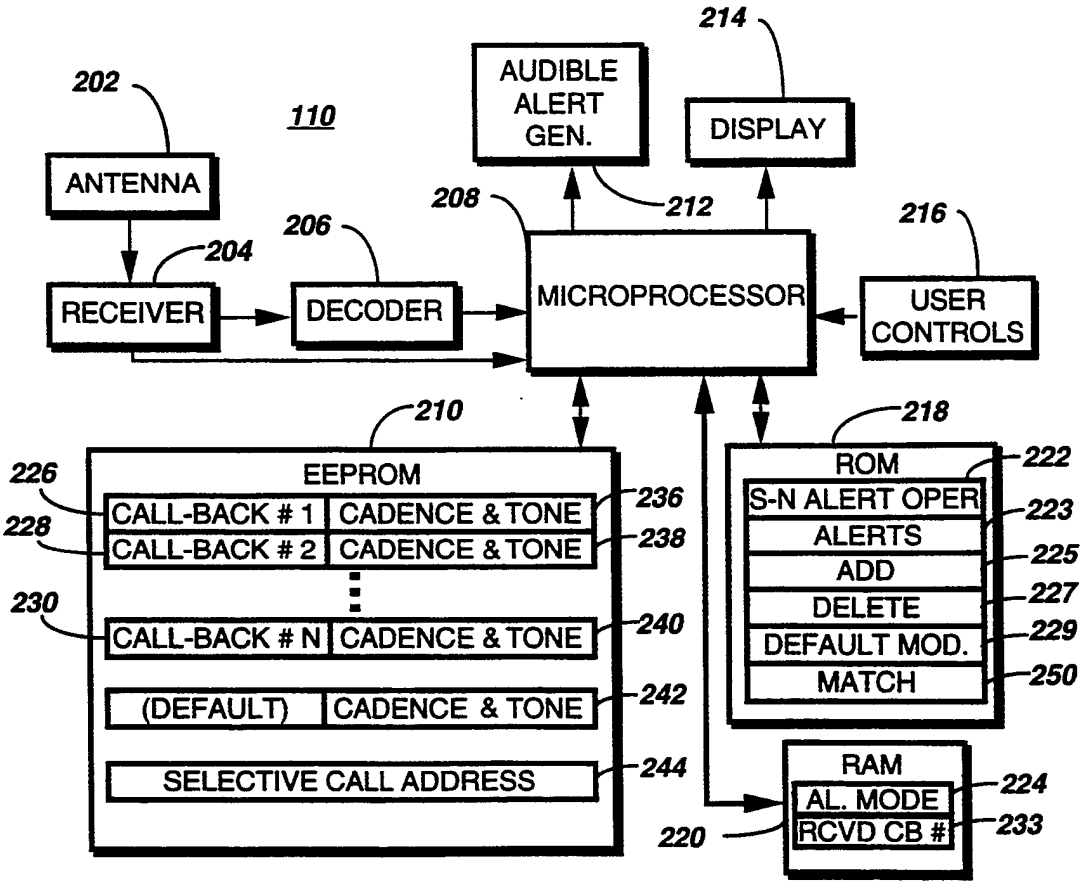

214
AUDIBLE ALERT GEN.
DISPLAY
202
110
ANTENNA
208
212
216
206
204
RECEIVER
DECODER
MICROPROCESSOR
USER CONTROLS
210
218
EEPROM
ROM
222
226
CALL-BACK # 1
CADENCE & TONE
236
S-N ALERT OPER
223
228
CALL-BACK # 2
CADENCE & TONE
238
ALERTS
225
ADD
227
230
CALL-BACK # N
CADENCE & TONE
240
DELETE
229
DEFAULT MOD.
(DEFAULT)
CADENCE & TONE
242
MATCH
250
SELECTIVE CALL ADDRESS
244
RAM
AL. MODE
224
220
RCVD CB #
233

FIG. 2

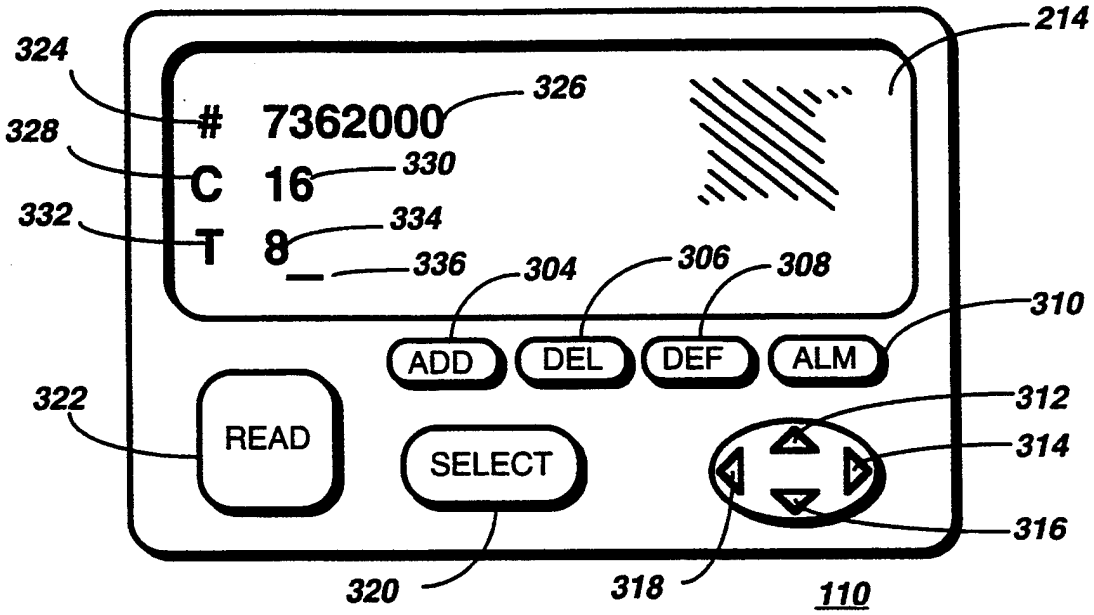

324
328
332
214
326
7362000
C 16
T 8_
330
334
336
304
306
308
310
ADD
DEL
DEF
ALM
322
READ
SELECT
312
314
316
320
318
110

FIG. 3

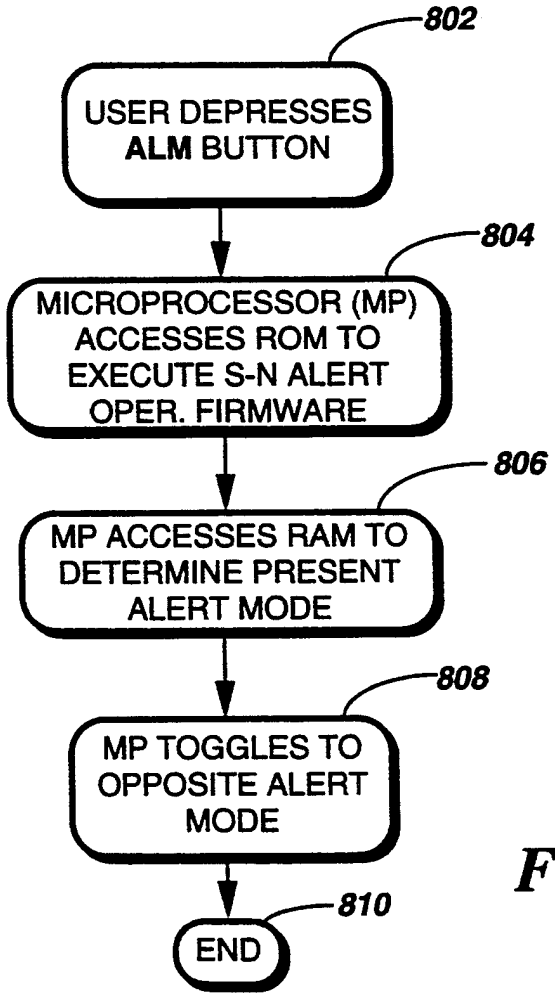

802
USER DEPRESSES ALM BUTTON
804
MICROPROCESSOR (MP) ACCESSES ROM TO EXECUTE S-N ALERT OPER. FIRMWARE
806
MP ACCESSES RAM TO DETERMINE PRESENT ALERT MODE
808
MP TOGGLES TO OPPOSITE ALERT MODE
810
END

FIG. 8

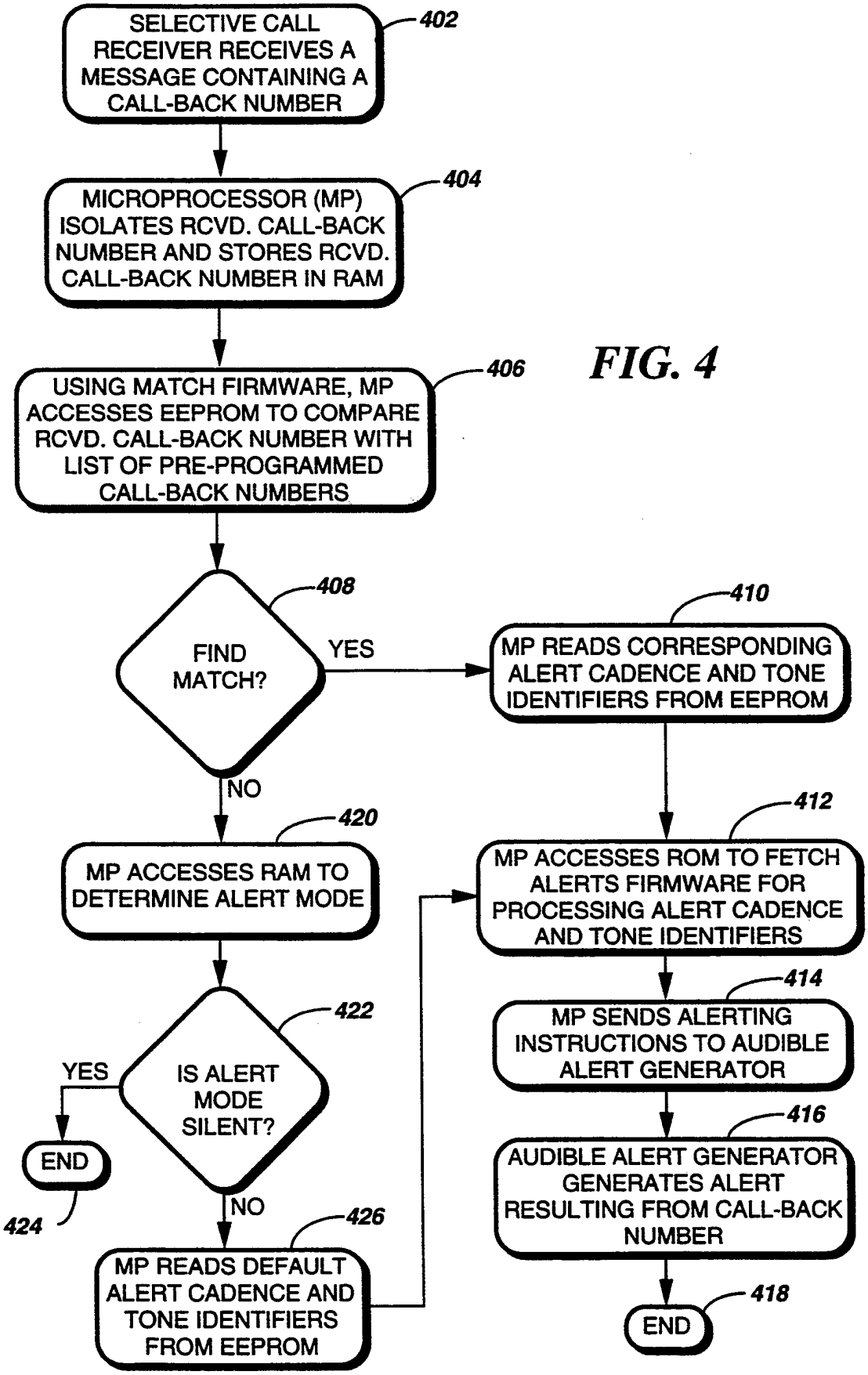

SELECTIVE CALL RECEIVER RECEIVES A MESSAGE CONTAINING A CALL-BACK NUMBER
402
MICROPROCESSOR (MP) ISOLATES RCVD. CALL-BACK NUMBER AND STORES RCVD. CALL-BACK NUMBER IN RAM
404
USING MATCH FIRMWARE, MP ACCESSES EEPROM TO COMPARE RCVD. CALL-BACK NUMBER WITH LIST OF PRE-PROGRAMMED CALL-BACK NUMBERS
406
FIND MATCH?
408
YES
NO
MP READS CORRESPONDING ALERT CADENCE AND TONE IDENTIFIERS FROM EEPROM
410
MP ACCESSES RAM TO DETERMINE ALERT MODE
420
MP ACCESSES ROM TO FETCH ALERTS FIRMWARE FOR PROCESSING ALERT CADENCE AND TONE IDENTIFIERS
412
IS ALERT MODE SILENT?
422
YES
NO
END
424
MP SENDS ALERTING INSTRUCTIONS TO AUDIBLE ALERT GENERATOR
414
AUDIBLE ALERT GENERATOR GENERATES ALERT RESULTING FROM CALL-BACK NUMBER
416
END
418
MP READS DEFAULT ALERT CADENCE AND TONE IDENTIFIERS FROM EEPROM
426

FIG. 4

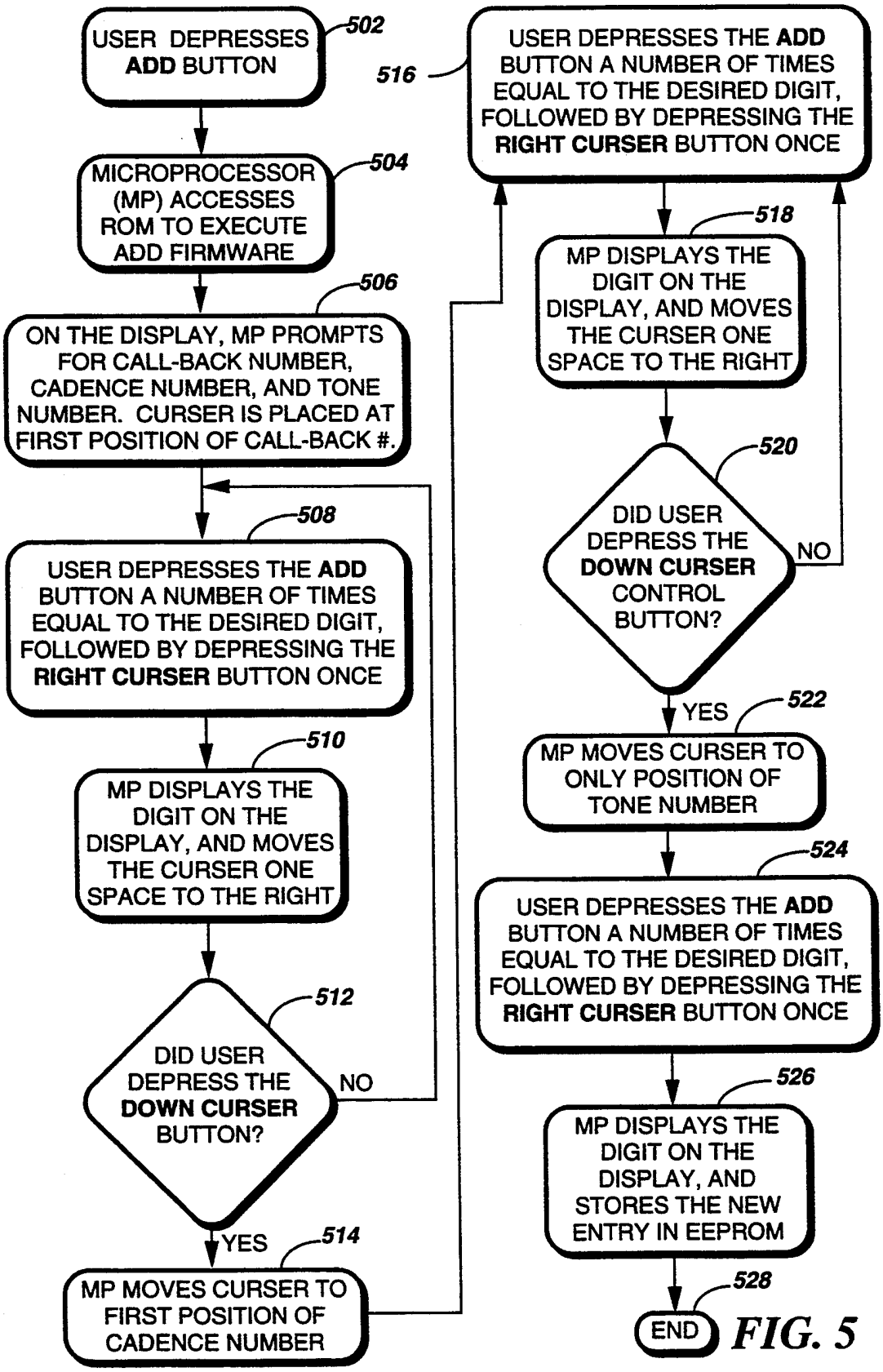

USER DEPRESSES ADD BUTTON
502
MICROPROCESSOR (MP) ACCESSES ROM TO EXECUTE ADD FIRMWARE
504
ON THE DISPLAY, MP PROMPTS FOR CALL-BACK NUMBER, CADENCE NUMBER, AND TONE NUMBER. CURSER IS PLACED AT FIRST POSITION OF CALL-BACK #.
506
USER DEPRESSES THE ADD BUTTON A NUMBER OF TIMES EQUAL TO THE DESIRED DIGIT, FOLLOWED BY DEPRESSING THE RIGHT CURSER BUTTON ONCE
508
MP DISPLAYS THE DIGIT ON THE DISPLAY, AND MOVES THE CURSER ONE SPACE TO THE RIGHT
510
DID USER DEPRESS THE DOWN CURSER BUTTON?
512
NO
YES
MP MOVES CURSER TO FIRST POSITION OF CADENCE NUMBER
514
USER DEPRESSES THE ADD BUTTON A NUMBER OF TIMES EQUAL TO THE DESIRED DIGIT, FOLLOWED BY DEPRESSING THE RIGHT CURSER BUTTON ONCE
516
MP DISPLAYS THE DIGIT ON THE DISPLAY, AND MOVES THE CURSER ONE SPACE TO THE RIGHT
518
DID USER DEPRESS THE DOWN CURSER CONTROL BUTTON?
520
NO
YES
MP MOVES CURSER TO ONLY POSITION OF TONE NUMBER
522
USER DEPRESSES THE ADD BUTTON A NUMBER OF TIMES EQUAL TO THE DESIRED DIGIT, FOLLOWED BY DEPRESSING THE RIGHT CURSER BUTTON ONCE
524
MP DISPLAYS THE DIGIT ON THE DISPLAY, AND STORES THE NEW ENTRY IN EEPROM
526
END
528

FIG. 5

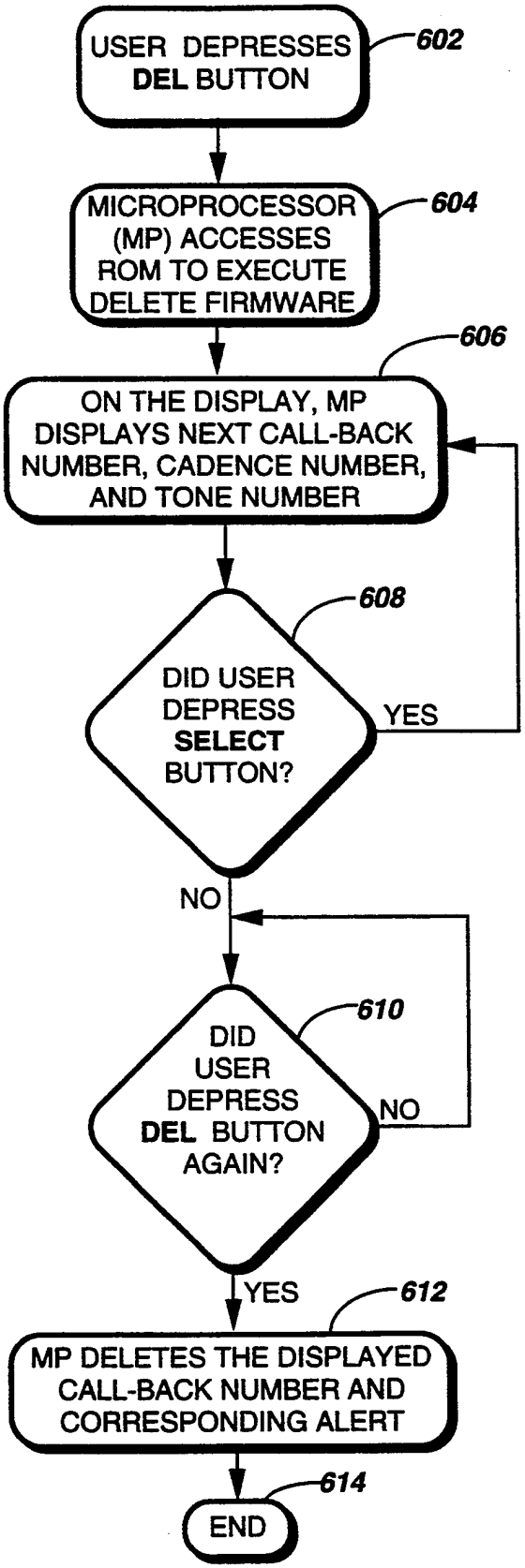

USER DEPRESSES DEL BUTTON
602
MICROPROCESSOR (MP) ACCESSES ROM TO EXECUTE DELETE FIRMWARE
604
ON THE DISPLAY, MP DISPLAYS NEXT CALL-BACK NUMBER, CADENCE NUMBER, AND TONE NUMBER
606
DID USER DEPRESS SELECT BUTTON?
608
YES
NO
DID USER DEPRESS DEL BUTTON AGAIN?
610
NO
YES
MP DELETES THE DISPLAYED CALL-BACK NUMBER AND CORRESPONDING ALERT
612
END
614

FIG. 6

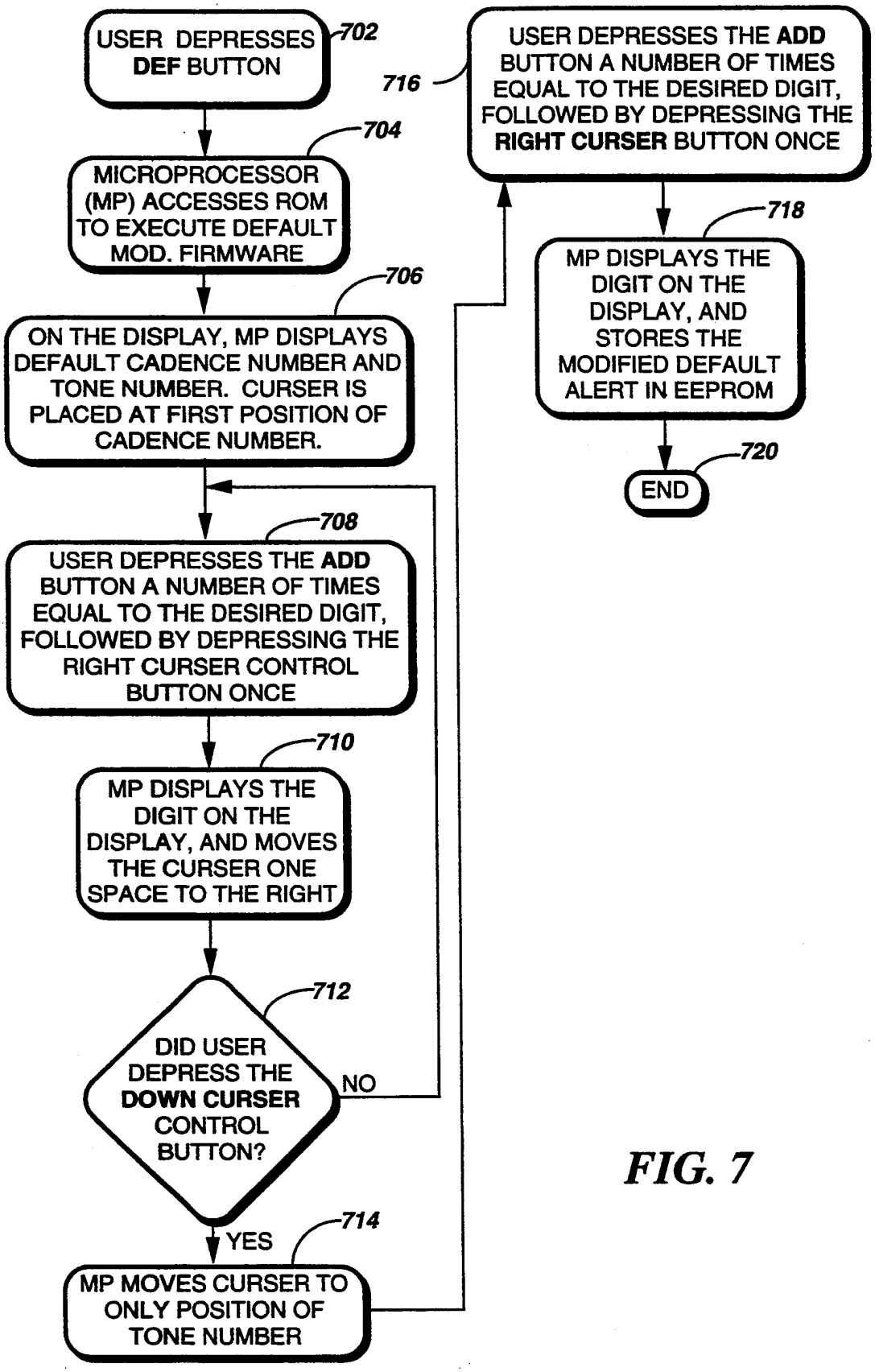

USER DEPRESSES DEF BUTTON
702
MICROPROCESSOR (MP) ACCESSES ROM TO EXECUTE DEFAULT MOD. FIRMWARE
704
ON THE DISPLAY, MP DISPLAYS DEFAULT CADENCE NUMBER AND TONE NUMBER. CURSER IS PLACED AT FIRST POSITION OF CADENCE NUMBER.
706
USER DEPRESSES THE ADD BUTTON A NUMBER OF TIMES EQUAL TO THE DESIRED DIGIT, FOLLOWED BY DEPRESSING THE RIGHT CURSER CONTROL BUTTON ONCE
708
MP DISPLAYS THE DIGIT ON THE DISPLAY, AND MOVES THE CURSER ONE SPACE TO THE RIGHT
710
DID USER DEPRESS THE DOWN CURSER CONTROL BUTTON?
712
NO
YES
MP MOVES CURSER TO ONLY POSITION OF TONE NUMBER
714
USER DEPRESSES THE ADD BUTTON A NUMBER OF TIMES EQUAL TO THE DESIRED DIGIT, FOLLOWED BY DEPRESSING THE RIGHT CURSER BUTTON ONCE
716
MP DISPLAYS THE DIGIT ON THE DISPLAY, AND STORES THE MODIFIED DEFAULT ALERT IN EEPROM
718
END
720

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

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 **522** 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.

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 received 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.

* * * * *

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-indentified 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

US005612682A

United States Patent [19]

DeLuca et al.

[11] Patent Number: 5,612,682

[45] Date of Patent: Mar. 18, 1997

[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.**[6] **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

[56] **References Cited**

U.S. PATENT DOCUMENTS

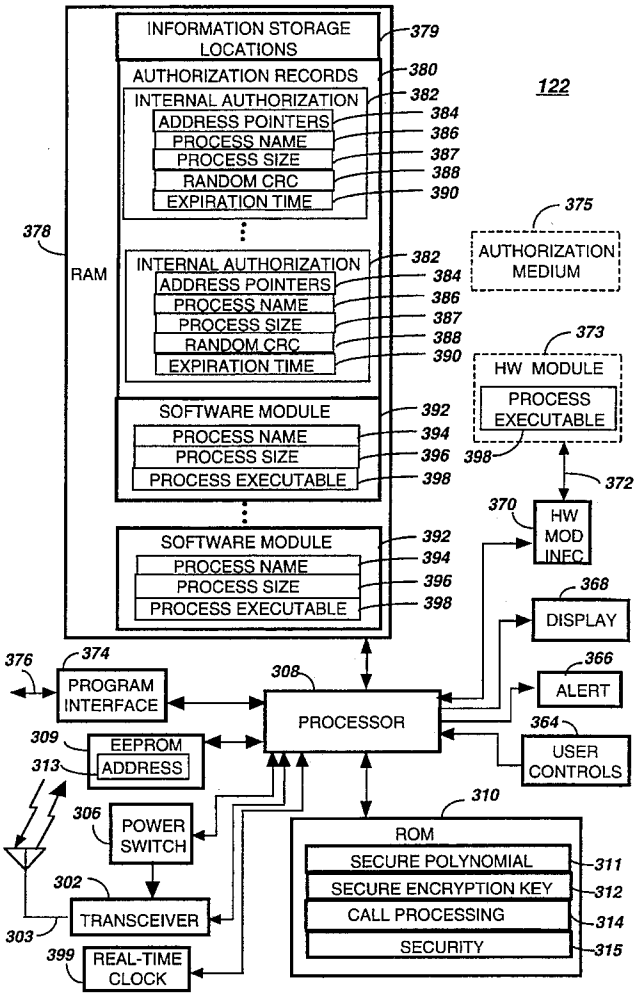
4,875,038	10/1989	Siwiak et al.	340/825.44
5,335,278	8/1994	Matchett et al.	340/825.34
5,371,493	12/1994	Sharpe et al.	340/825.33

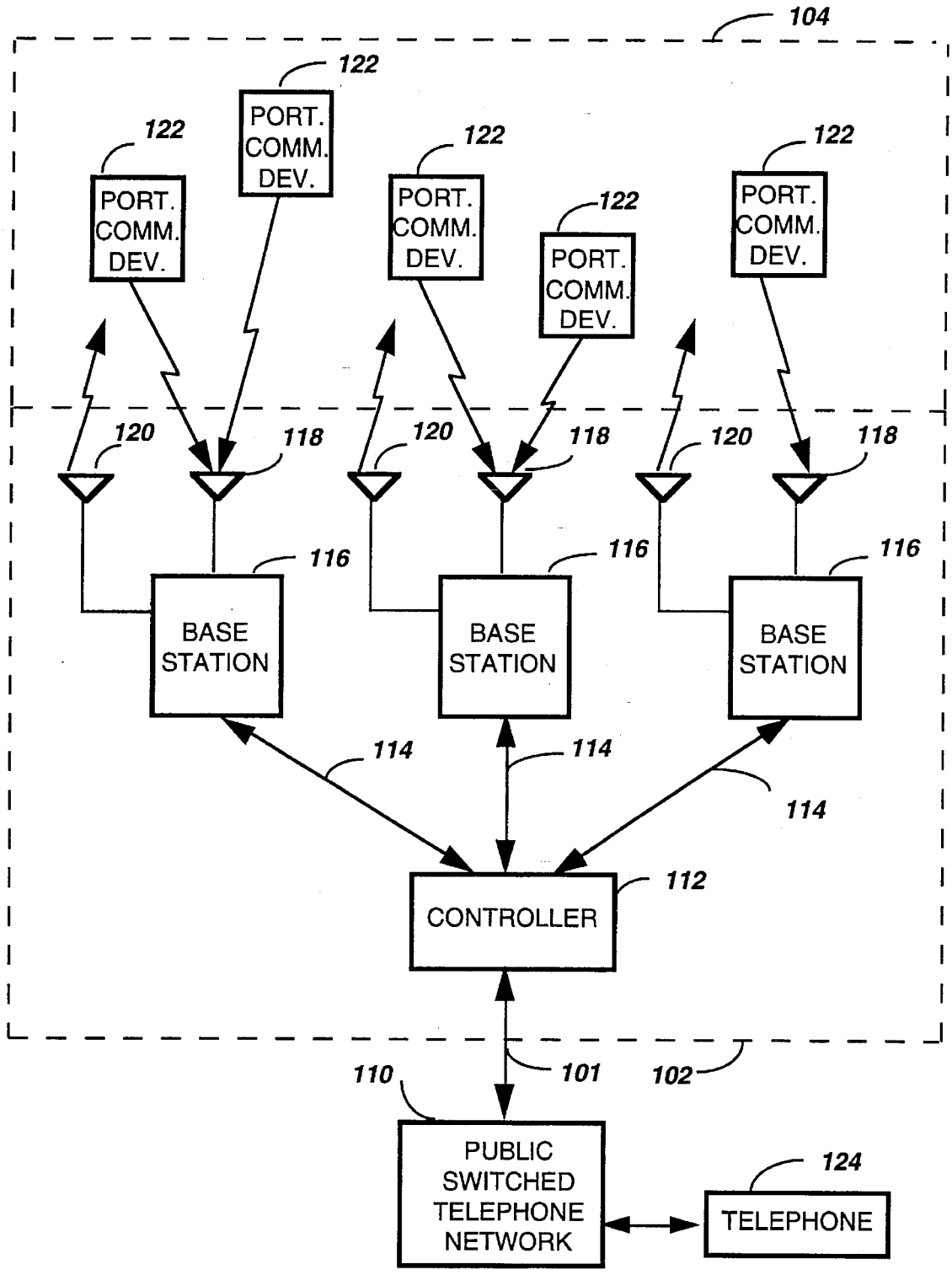
Primary Examiner—Michael Horabik
Assistant Examiner—Edward Merz
Attorney, Agent, or Firm—John H. Moore

[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.

24 Claims, 7 Drawing Sheets

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122
PORT. COMM. DEV.
120
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CONTROLLER
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110
PUBLIC SWITCHED TELEPHONE NETWORK
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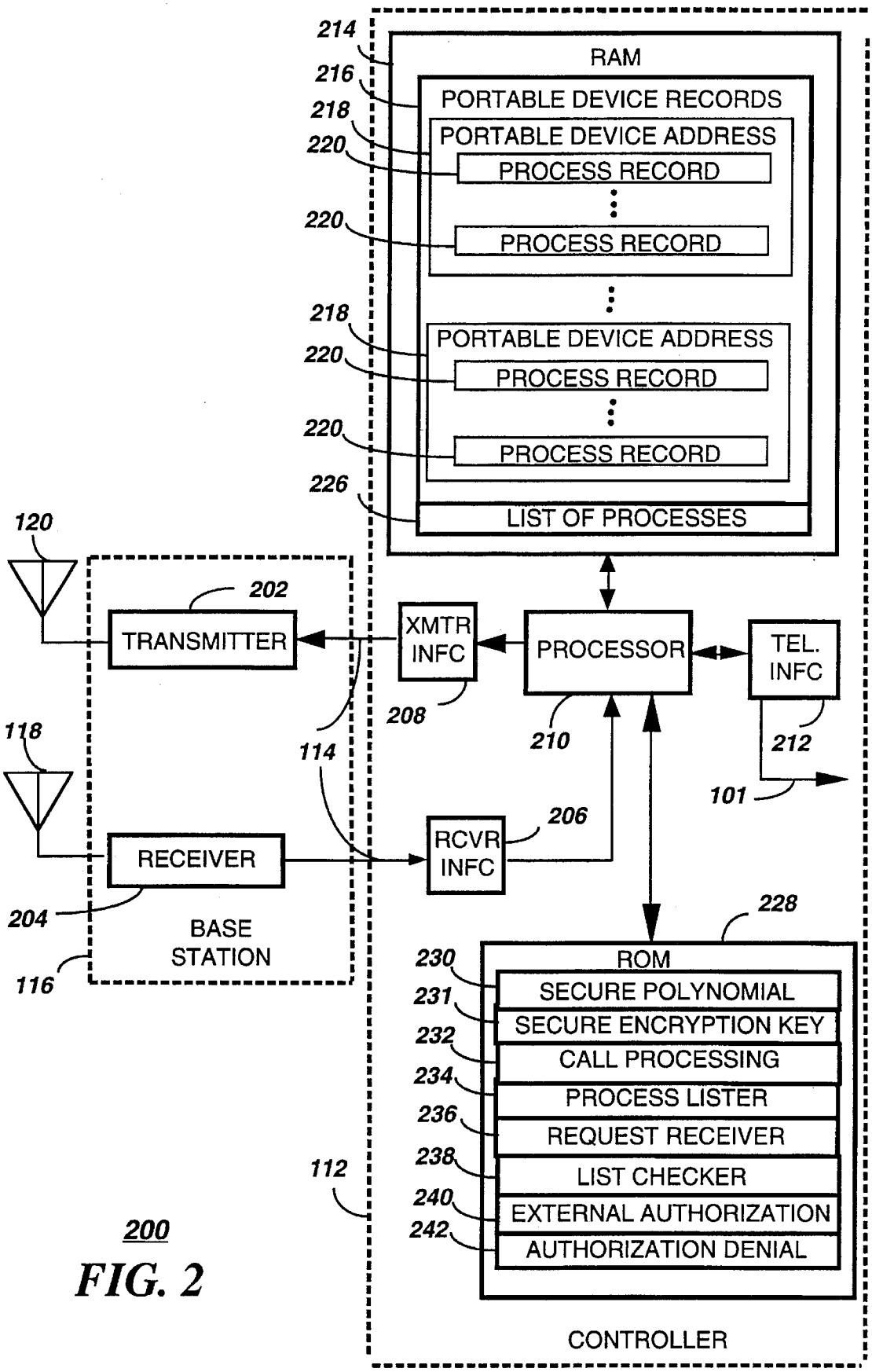
TELEPHONE

FIG. 1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RAM
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218
PORTABLE DEVICE ADDRESS
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PROCESS RECORD
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PROCESS RECORD
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PORTABLE DEVICE ADDRESS
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PROCESS RECORD
220
PROCESS RECORD
226
LIST OF PROCESSES
120
202
TRANSMITTER
XMTR INFC
PROCESSOR
TEL. INFC
208
210
212
118
114
101
206
RECEIVER
RCVR INFC
204
BASE STATION
116
228
230
ROM
SECURE POLYNOMIAL
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SECURE ENCRYPTION KEY
232
CALL PROCESSING
234
PROCESS LISTER
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REQUEST RECEIVER
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LIST CHECKER
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EXTERNAL AUTHORIZATION
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AUTHORIZATION DENIAL
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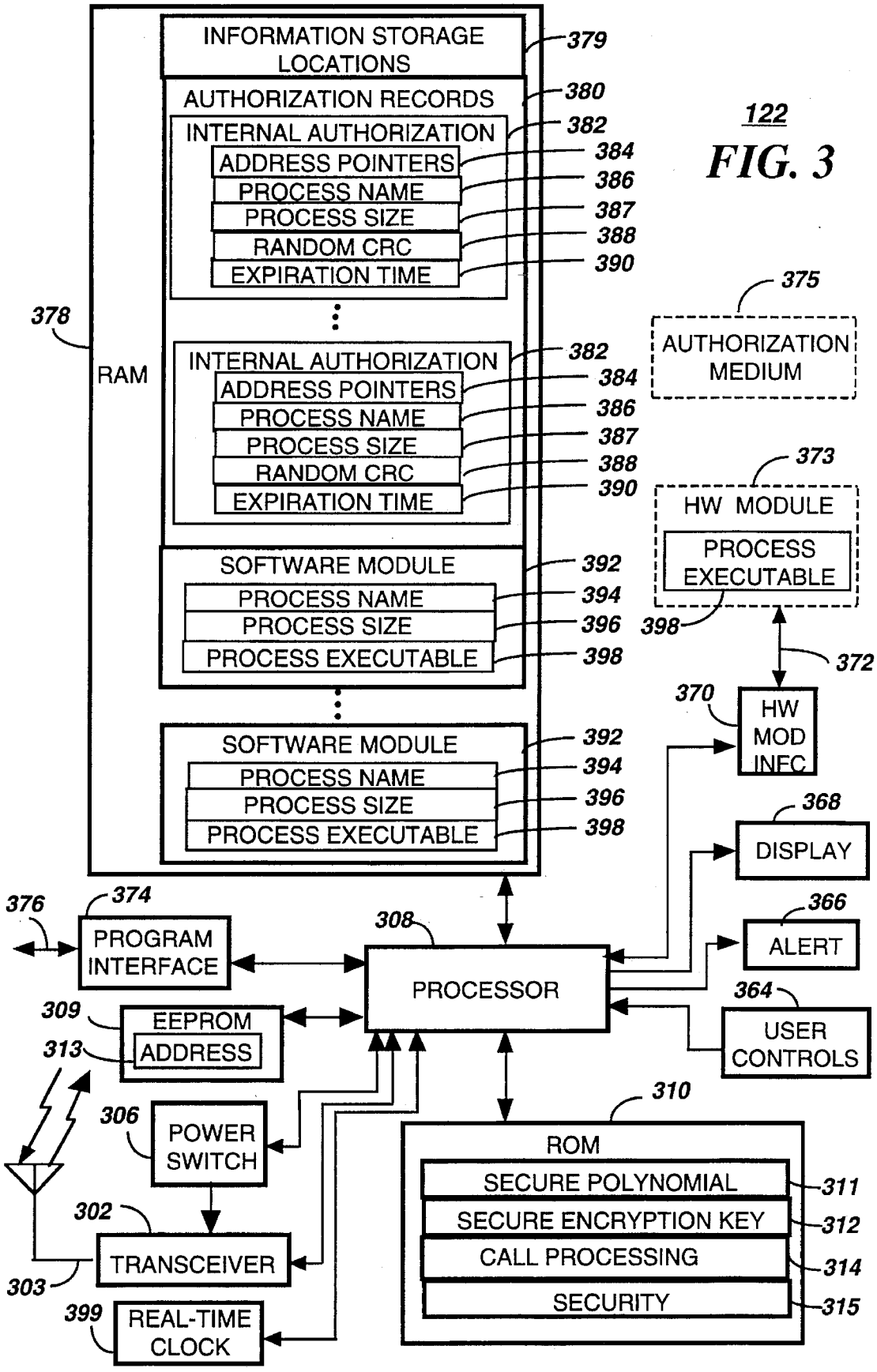
CONTROLLER

200

FIG. 2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AUTHORIZATION RECORDS
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EXPIRATION TIME
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INTERNAL AUTHORIZATION
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EXPIRATION TIME
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PROCESS NAME
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PROCESS SIZE
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PROCESS EXECUTABLE
398
SOFTWARE MODULE
392
PROCESS NAME
394
PROCESS SIZE
396
PROCESS EXECUTABLE
398
RAM
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122
FIG. 3
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AUTHORIZATION MEDIUM
373
HW MODULE
PROCESS EXECUTABLE
398
372
370
HW MOD INFC
368
DISPLAY
366
ALERT
364
USER CONTROLS
376
374
PROGRAM INTERFACE
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PROCESSOR
309
EEPROM
313
ADDRESS
306
POWER SWITCH
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TRANSCEIVER
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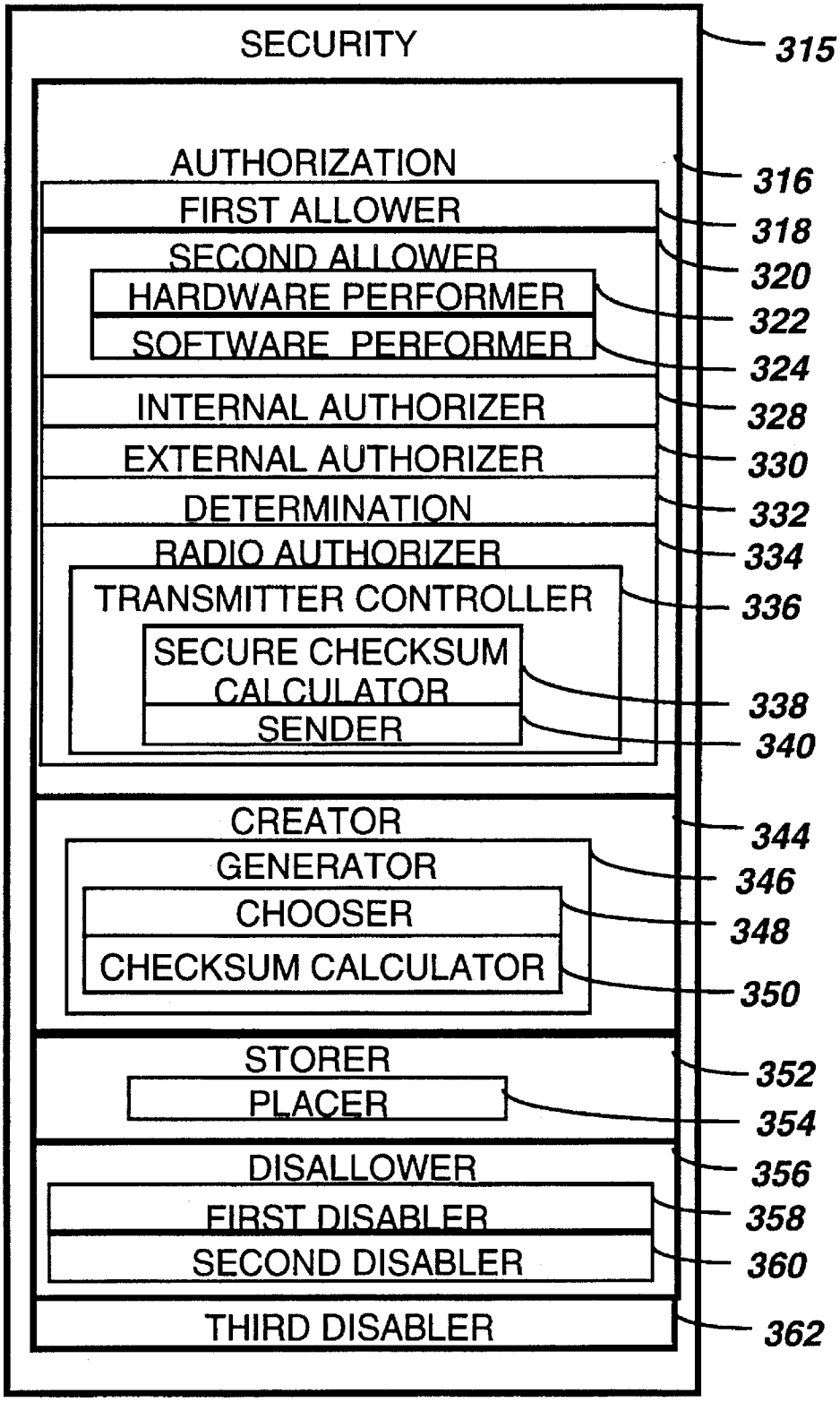
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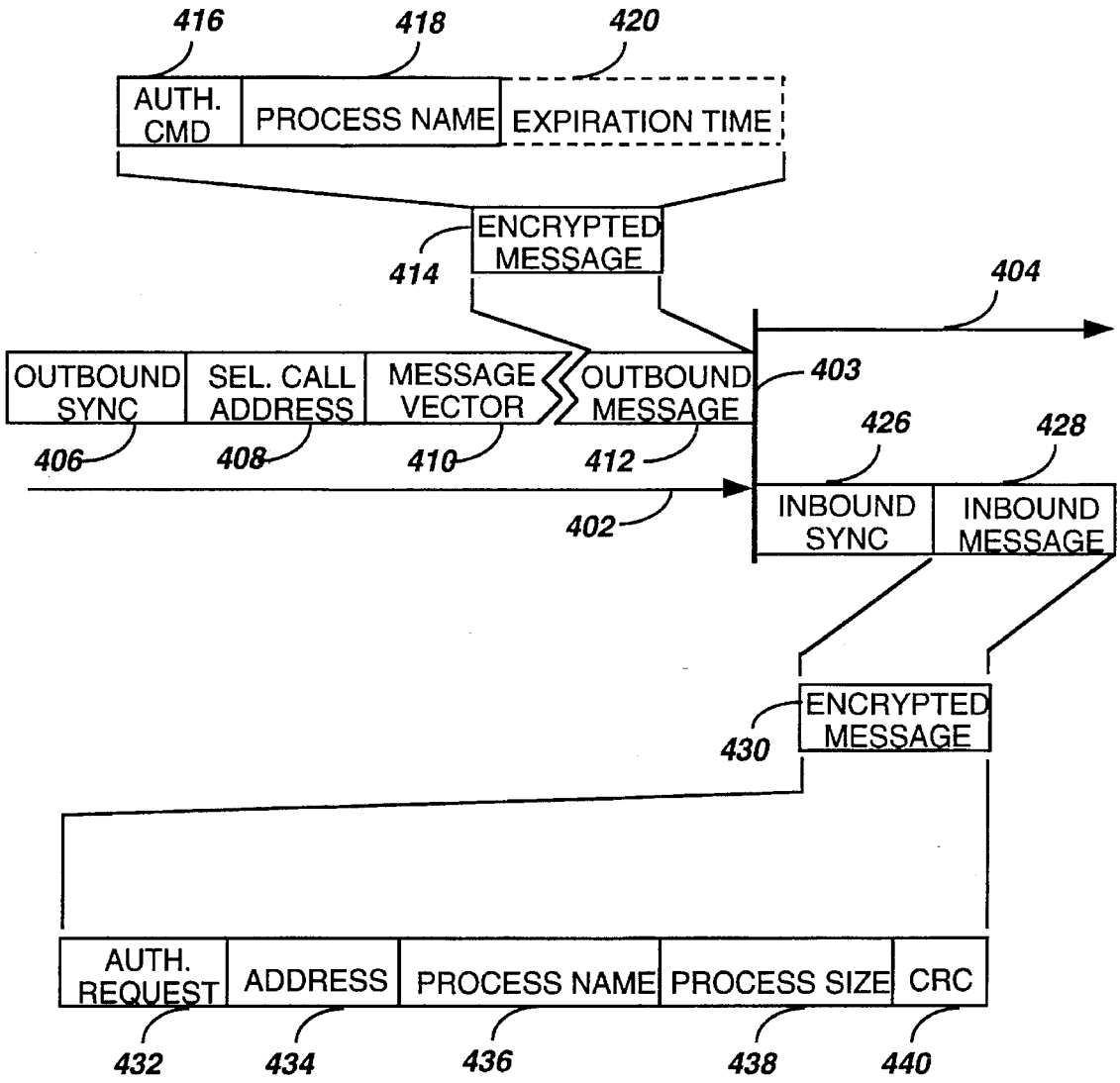
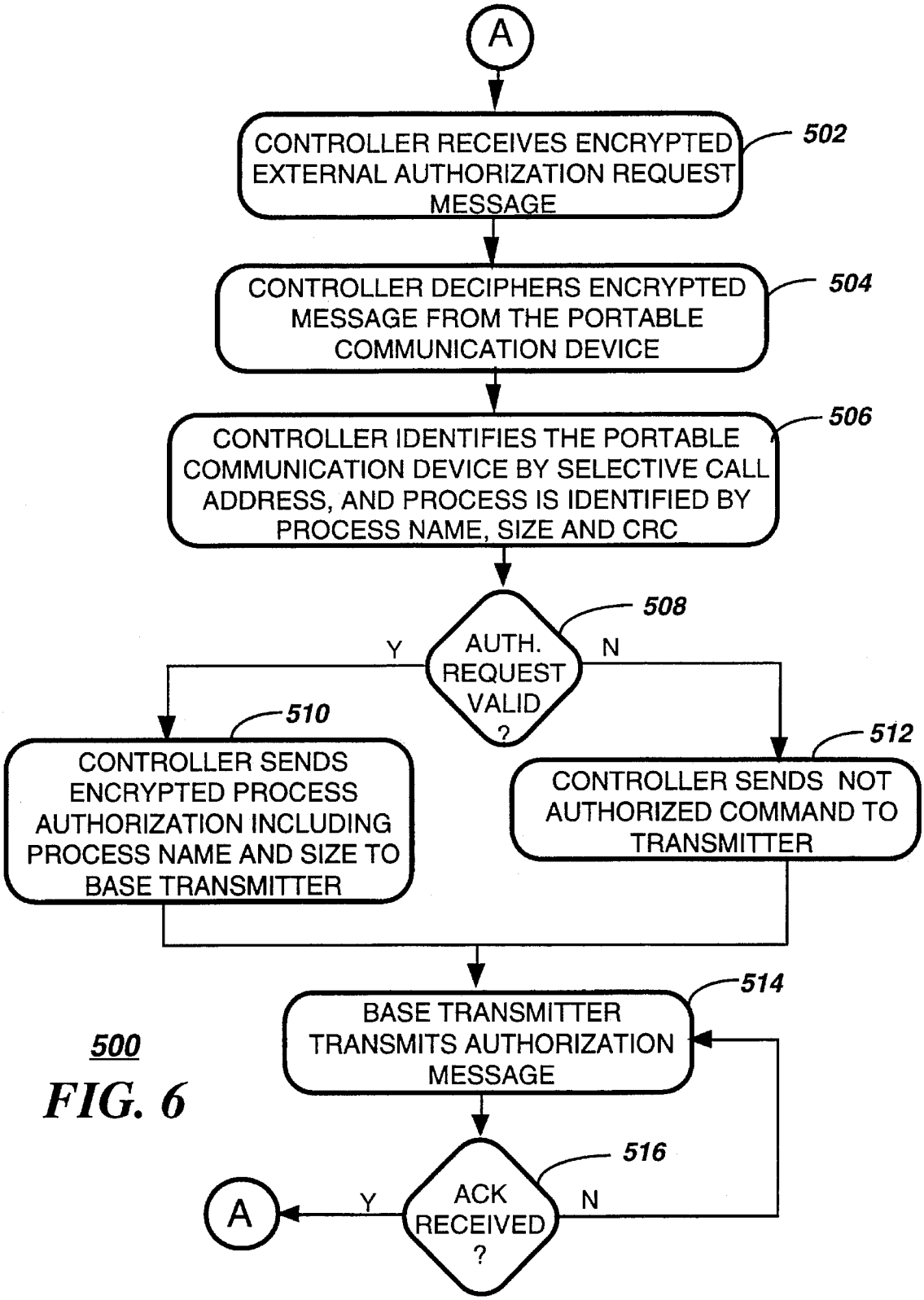
EXTERNAL AUTHORIZER
330
DETERMINATION
332
RADIO AUTHORIZER
334
TRANSMITTER CONTROLLER
336
SECURE CHECKSUM CALCULATOR
338
SENDER
340
CREATOR
344
GENERATOR
346
CHOOSER
348
CHECKSUM CALCULATOR
350
STORER
352
PLACER
354
DISALLOWER
356
FIRST DISABLER
358
SECOND DISABLER
360
THIRD DISABLER
362

FIG. 4


416
418
420
AUTH. CMD
PROCESS NAME
EXPIRATION TIME
ENCRYPTED MESSAGE
414
404
OUTBOUND SYNC
SEL. CALL ADDRESS
MESSAGE VECTOR
OUTBOUND MESSAGE
403
406
408
410
412
426
428
INBOUND SYNC
INBOUND MESSAGE
402
ENCRYPTED MESSAGE
430
AUTH. REQUEST
ADDRESS
PROCESS NAME
PROCESS SIZE
CRC
432
434
436
438
440

400

FIG. 5


A
CONTROLLER RECEIVES ENCRYPTED EXTERNAL AUTHORIZATION REQUEST MESSAGE
502
CONTROLLER DECIPHERS ENCRYPTED MESSAGE FROM THE PORTABLE COMMUNICATION DEVICE
504
CONTROLLER IDENTIFIES THE PORTABLE COMMUNICATION DEVICE BY SELECTIVE CALL ADDRESS, AND PROCESS IS IDENTIFIED BY PROCESS NAME, SIZE AND CRC
506
AUTH. REQUEST VALID ?
508
Y
N
CONTROLLER SENDS ENCRYPTED PROCESS AUTHORIZATION INCLUDING PROCESS NAME AND SIZE TO BASE TRANSMITTER
510
CONTROLLER SENDS NOT AUTHORIZED COMMAND TO TRANSMITTER
512
BASE TRANSMITTER TRANSMITS AUTHORIZATION MESSAGE
514
ACK RECEIVED ?
516
Y
N
A

500

FIG. 6

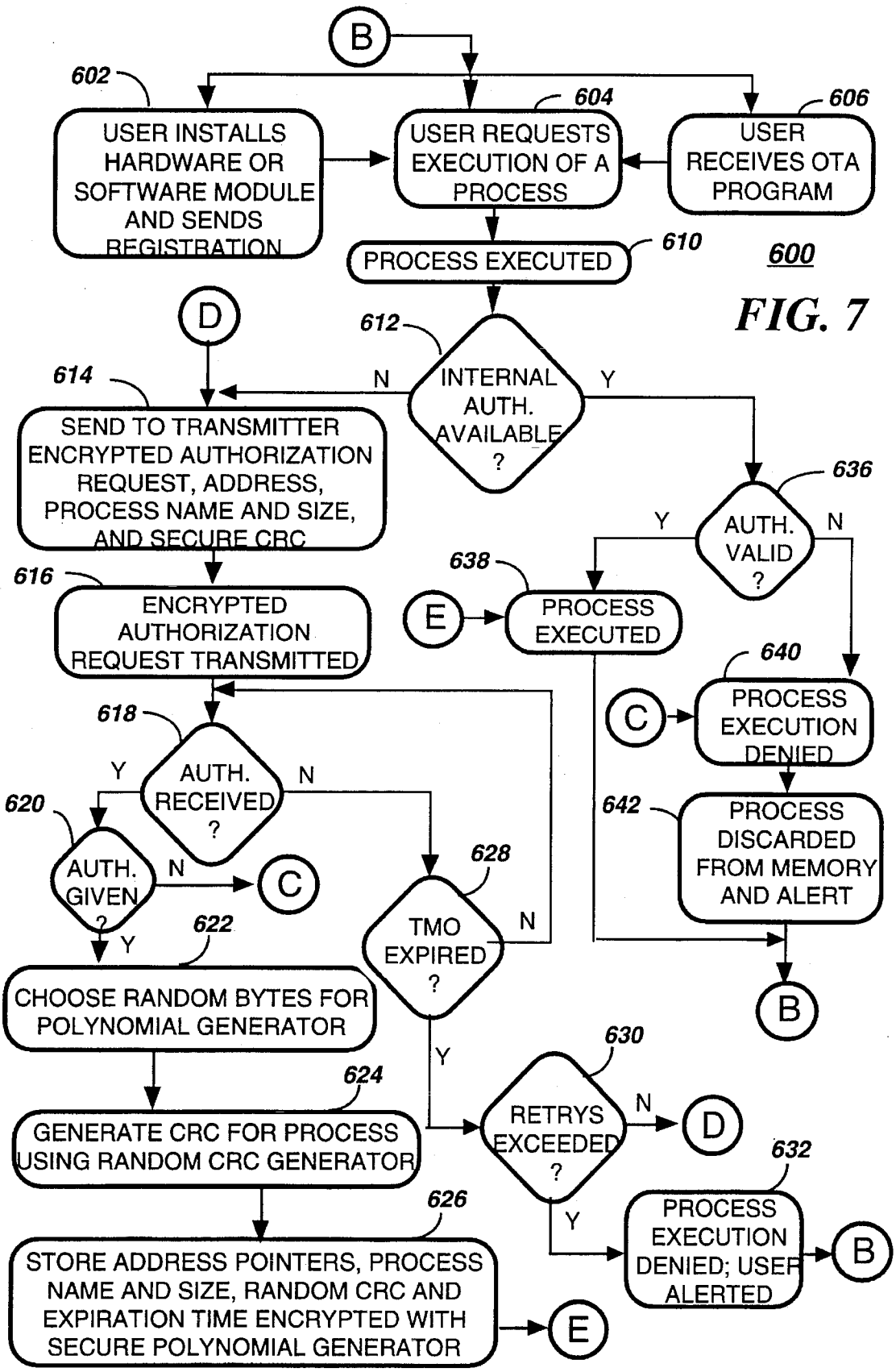

B
602
USER INSTALLS HARDWARE OR SOFTWARE MODULE AND SENDS REGISTRATION
604
USER REQUESTS EXECUTION OF A PROCESS
606
USER RECEIVES OTA PROGRAM
PROCESS EXECUTED
610
600
D
612
INTERNAL AUTH. AVAILABLE ?
N
Y
614
SEND TO TRANSMITTER ENCRYPTED AUTHORIZATION REQUEST, ADDRESS, PROCESS NAME AND SIZE, AND SECURE CRC
636
AUTH. VALID ?
Y
N
638
E
PROCESS EXECUTED
616
ENCRYPTED AUTHORIZATION REQUEST TRANSMITTED
640
C
PROCESS EXECUTION DENIED
618
AUTH. RECEIVED ?
Y
N
620
AUTH. GIVEN ?
N
C
642
PROCESS DISCARDED FROM MEMORY AND ALERT
628
TMO EXPIRED ?
N
Y
622
CHOOSE RANDOM BYTES FOR POLYNOMIAL GENERATOR
B
630
RETRYS EXCEEDED ?
N
D
Y
624
GENERATE CRC FOR PROCESS USING RANDOM CRC GENERATOR
632
PROCESS EXECUTION DENIED; USER ALERTED
B
626
STORE ADDRESS POINTERS, PROCESS NAME AND SIZE, RANDOM CRC AND EXPIRATION TIME ENCRYPTED WITH SECURE POLYNOMIAL GENERATOR
E

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 (WMG™) Administrator! paging terminal and the RF-Conductor!™ 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!™ 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™ 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 processses **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 DSP**56100** 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 allower 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 allower element **318** which, optionally, allows immediate utilization of the process requested. Whether or not the first allower 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 allower 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 allower 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 allower 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 allower 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 allower 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 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:

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.

2. The method of claim **1**,

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

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:

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:

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:

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:

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 module 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,

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.

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

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

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;

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 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

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;

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

a disallower 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

wherein the second allower 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.

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

wherein the second allower element comprises a software performer element coupled to the processor for performing 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

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

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.

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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-indentified 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:

Attesting Officer

BRUCE LEHMAN

Commissioner of Patents and Trademarks