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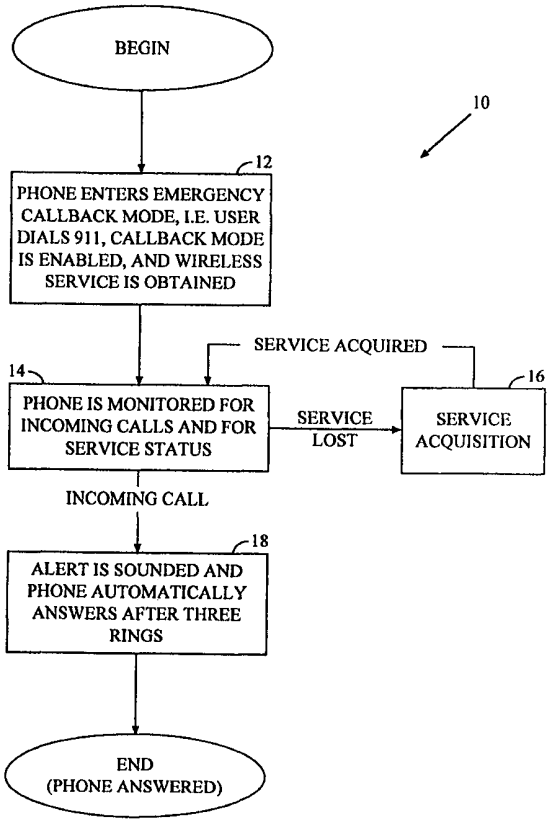
(54) Title: SYSTEM AND METHOD FOR AUTOMATICALLY ANSWERING INCOMING EMERGENCY CALLS TO A WIRELESS PHONE

(57) Abstract

A system and method (10) for enhancing the operation of a wireless phone in emergency situations. The system sets the wireless phone in an emergency callback state (12) when an emergency call is placed via the wireless phone. The system then controls the phone to automatically answer (18) an incoming call when the wireless phone is in the emergency callback state. In a specific embodiment, the emergency callback state is characterized by high wireless phone volume settings. In the callback state (12), modification of network service settings is not permitted and use of the wireless phone is limited to placing emergency calls only. The emergency callback mode may be exited by depressing the END button. The second mechanism includes software running on a computer included in the wireless phone. The software includes commands for automatically answering the wireless phone after a predetermined number of rings.



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SYSTEM AND METHOD FOR AUTOMATICALLY ANSWERING INCOMING EMERGENCY CALLS TO A WIRELESS PHONE

BACKGROUND OF THE INVENTION

I. Field of Invention:

This invention relates to wireless communications systems. Specifically, the present invention relates systems and methods for improving the operation of wireless phones in emergency situations.

II. Description of the Related Art:

As cellular telephone usage has increased, reliance upon cellular telephones to obtain emergency service has increased as well. Currently, a user of a wireless phone dials 911 to reach an emergency service. The user of the phone may become unconscious after dialing 911 and be unable to answer a return phone call from an emergency call center. Currently, the emergency call center must continue trying to complete the call until someone answers the phone. The phone may go unanswered or the phone battery may fail. As a result, the emergency call center may be unable to obtain valuable information about the scene of the emergency.

Accordingly, the Federal Communications Commission (FCC) recently implemented legislation which requires wireless service providers to implement methods to facilitate cellular telephone emergency call connections.

Hence, a need exists in the art for an improved system and method for automatically answering incoming emergency calls to a wireless phone.

SUMMARY OF THE INVENTION

The need in the art is addressed by the system for enhancing the operation of a wireless phone in emergency situations of the present invention. In the illustrative embodiment, the inventive system is adapted for use with an emergency call center and sets the wireless phone in an emergency callback state when an emergency call is placed via the wireless phone. The system then controls the phone to automatically answer an incoming call when the wireless phone is in the emergency callback state.

In a specific embodiment, the emergency callback state is characterized by high wireless phone volume settings and a short message service setting of 'on + remind'. The callback state is also characterized by locked network service settings. When the phone is in the emergency callback state the phone is limited to placing emergency calls only.

The emergency callback mode may be exited by depressing the END button. The system includes software running on a computer included in the phone. The system also includes a mechanism for automatically answering the wireless phone after a predetermined number of rings.

The wireless phone stays on the same communications system that the emergency call originated on. This ensures that the communications network governing the system is aware of the presence of the phone in the service area in which the call originated. This allows the emergency call center to call back the wireless phone even if the phone is not officially registered on that system.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a flow diagram of the method for automatically answering a call from an emergency call center of the present invention.

Fig. 2 is a diagram of a cellular telephone constructed in accordance with the teachings of the present invention for implementing the method of Fig. 1.

Fig. 3 is a state diagram showing a user screen of the cellular telephone of Fig. 2 as telephone circuitry cycles through various states in accordance with the method of Fig. 1.

DESCRIPTION OF THE INVENTION

While the present invention is described herein with reference to illustrative embodiments for particular applications, it should be understood that the invention is not limited thereto. Those having ordinary skill in the art and access to the teachings provided herein will recognize additional modifications, applications, and embodiments within the scope thereof and additional fields in which the present invention would be of significant utility.

Fig. 1 is a flow diagram of a method 10 for automatically answering a call via a cellular telephone (as is discussed more fully below) from an emergency call center of the present invention. Initially, in a callback step 12, the user of

the cellular telephone dials an emergency number such as 911 when a callback mode is enabled for the cellular telephone. The cellular telephone subsequently enters the emergency callback mode.

After the original emergency 911 call is ended, software (not shown) easily implemented by those having ordinary skill in the art, sets the state of the cellular telephone to a 911 mode. In 911 mode, the phone system searching and scanning algorithm and alert mode behave differently than in the normal call mode as discussed more fully below.

The wireless phone stays on the same communications system that the emergency call originated on. This ensures that the communications network governing the system is aware of the presence of the phone in the service area in which the call originated. This allows the emergency call center to call back the wireless phone even if the phone is not officially registered on that system.

In the emergency callback mode, all employed alert volumes and other capabilities of the cellular telephone are maximized. For example, ringer volume is set to high, ringer type settings are set to standard, keybeep volume settings are set to high, and a short message service (SMS) alert setting is set to 'ON + REMIND'.

Originally, the a cellular telephone SMS alert can be in one of three settings: OFF, ON, or ON + REMIND. The ON + REMIND setting causes software running on the cellular telephone to remind the user every minute after as message is received but unread that the message has not yet been read. In a poor signal environment such as a severly Raleigh faded environment, a voice call may not be able to sustain the call. When the SMS alert is set to ON + REMIND emergency call center has an option to send a short message to the cellular telephone. The ON + REMIND setting helps to ensure that the user is aware of the message and reads the message. The use of the ON + REMIND setting is easily implemented by those having ordinry skill in the art.

Any permitted emergency numbers may be entered and dialed during the emergency callback mode. Emergency phone numbers such as 911 are not universal and may vary from country to country. A wireless carrier may provide special entries in an electronic phonebook specifying other emergency numbers. When a user dials a number or code associated with an emergency number in the phone book, emergency call processing is initiated in accordance with the teachings of the present invention. See for example, co-pending U.S.

Patent Application Serial No. 09/246,395 filed on February 9, 1999, entitled SPECIAL PHONEBOOK ENTRIES, assigned to the Assignee of the present invention and incorporated herein by reference. Software for implementing the phone book may run on a computer such as that shown in Fig 2 and discussed more fully below.

When a non-emergency number is dialed or accessed during the emergency callback mode, the cellular telephone displays a message informing the user that use is restricted to emergency calls only (as is discussed more fully below).

No modification of network service settings, such as NAM (number assignment module) settings, is allowed during the emergency callback mode.

If the cellular telephone is not locked, then access to a features menu, phonebook, and calls list is permitted. The access is obtained by pressing or rotating a dial-shuttle (not shown) on the cellular telephone.

If the cellular telephone is locked, pressing the dial shuttle returns "My Number," which is the mobile identification number of the phone number of the cellular telephone. Access to the features menu, phonebook, and calls list is not permitted if the cellular telephone is locked.

When the cellular telephone acquires a system, i.e., a wireless service in the callback mode step 12, control is passed to a phone-monitoring step 14 where the cellular telephone is monitored for incoming calls and for service status. If wireless service is lost, control is passed to a service acquisition step 16 where the cellular telephone searches for available wireless service. Methods and software for performing wireless service searching functions are disclosed in U.S. Patent Application Serial No. 09/447,462 filed on November 22, 1999, entitled: METHOD AND APPARATUS FOR ACQUIRING EMERGENCY SERVICE IN A MOBIL RADIO COMMUNICATION SYSTEM, assigned to the Assignee of the present invention and incorporated herein by reference.

Generally, in the above referenced patent application, when a user makes an emergency 911 call, the cellular telephone makes an effort to quickly acquire an emergency service based on a best conjecture on current network service availability. If the cellular telephone is out of normal service when an emergency 911 call is made, the phone tries to acquire analog systems first and often, since analog network service is likely more ubiquitous that other types of service. The cellular telephone tries to acquire code division multiple access

(CDMA) systems in most recently acquired order, independent of customer preferred roaming specifications. The phone maintains CDMA channels acquired since the last power-up in random access memory (RAM). After the phone successfully delivers an emergency 911 origination to the communications network under which the phone is operating, and the emergency call is released, the phone automatically enters an emergency callback waiting mode, which facilitates the ability of emergency call centers to call back the cellular telephone. During the emergency callback waiting mode, the phone retains the service where the emergency 911 call was made so that and emergency 911 center can reach the user even if the phone does not have a normal service at the time. The user explicitly instructs the phone to exit the emergency 911 callback waiting mode.

Once the cellular telephone acquires service in the service acquisition step 16, control is passed back to the phone-monitoring step 14.

If an incoming call is received in the phone-monitoring step 14 or during the service acquisition step 16, control is passed to an auto-answering step 18. In the auto-answering step 18, an audible incoming call alert is sounded and the cellular telephone automatically answers the phone after a predetermined number of rings (e.g. 3) if the phone is not answered by the user. Software for causing the phone to automatically answer an incoming call is within the level of skill of one ordinarily skilled in the art

In the auto-answering step 18, the user is also provided with an incoming call notification message displayed on the screen, as discussed more fully below.

When the user of the cellular telephone dials 911 and connects to an emergency call center, pre-existing network caller-ID features allow the emergency call center to obtain the number of the cellular telephone that made the call. The emergency call center may then dial the number of the cellular telephone in the event that the call is inadvertently dropped.

When an incoming call is answered by the user or is automatically answered by the cellular telephone, the method 10 is complete.

Fig. 2 is a diagram of a cellular telephone 50 constructed in accordance with the teachings of the present invention to implement the method 10 of Fig. 1. The cellular telephone 50 includes an antenna 52 connected to a duplexer 54. The duplexer 54 is connected to transceiver circuitry 56 and the transceiver

circuitry 56 is connected to a computer 58. The computer 58 is connected to a data interface adapter 60, voice encoding and decoding circuitry 62, a keypad 64, and a screen 66. The voice encoding and decoding circuitry 62 is connected to a microphone 68 and a speaker 70.

In operation, the antenna 52 transmits signals input via the duplexer 54 and receives signals that are input to the duplexer 54. The duplexer 54 facilitates sharing of resources of the antenna 52 between transmit and receive functions. As is known in the art, the transceiver 56 includes circuitry for transmitting signals such as encoded voice signals or service negotiation signals via the antenna 52 and duplexer 54. The transceiver 56 also includes circuitry for receiving signals such as service negotiation messages or encoded voice signals via another phone, base station, or mobile switching center. The transceiver 56 also includes downconversion circuitry required to convert receive signals to digital baseband signals in preparation for processing via the computer 58. In addition, the transceiver 56 includes upconversion circuitry required to convert transmit signals from digital baseband signals to radio frequency signals in preparation for transmission via the antenna 52.

A user may initiate a call by dialing a number via the keypad 64. Software or hardware algorithms running on the computer 58 negotiate a service connection with an available wireless service provider via the transceiver circuitry 56, the duplexer 54, and the antenna 52. Once service is established, the user's voice is input to the microphone 68, encoded by the voice encoding and decoding circuitry 62 and transmitted via the computer 58, transceiver circuitry 56, duplexer 54, and then antenna 52. Similarly, received voice messages are decoded by the voice encoding and decoding circuitry 62 and as voice via the speaker 70.

The user of the cellular telephone 50 may dial an emergency service such as 911 via the keypad 64. Software designed in accordance with the present teachings and running on the computer 58 determines that the call is an emergency call and begins the method illustrated in Fig. 1. Those ordinarily skilled in the art can easily develop software to run on the computer 58 to implement the method of Fig. 1. The computer employs the screen 66 to selectively display messages such as "Searching for emergency service...." in accordance with the method of Fig. 1.

The data interface connection 60 allows software running on the computer 58 to be upgraded and/or changed. In the present specific embodiment, the computer 58 includes a 186 processor.

Emergency call attempts are permitted at any time including when a cellular telephone 50 is locked or when no service is available. If an emergency call attempt is made when no service is available then the cellular telephone 50 will continue to scan for service until either the search is cancelled (by pressing END), the call is originated, the telephone 50 battery expires (if external power is not present), or when the cellular telephone 50 is turned off.

Only certain numbers that are designated as true emergency numbers force the cellular telephone 50 into an emergency call mode in where the method of Fig. 1 is activated. The certain numbers are edited through the PST (phone support tool) or through software hard-coding to selectively change parameters within a cellular telephone.

For clarity, additional circuitry such as clocking circuitry and power supplies are not shown in the cellular telephone 50, but those ordinarily skilled in the art will know where and how to include the requisite additional circuitry.

Fig. 3 is a state diagram showing a user screen of the cellular telephone of Fig. 2 as telephone circuitry cycles through various states 80 in accordance with the method of Fig. 1. The cellular telephone 50 of Fig. 2 enters emergency callback mode or when the phone 50 is automatically set to emergency callback mode in response to the user dialing 911. The callback mode is entered only after an emergency call is originated.

With reference to Figs. 1, 2 and 3, if the cellular telephone 50 is in emergency callback mode and is in use, such as when the phone 50 is performing a silent redial or when the phone 50 is searching for wireless service, and an incoming call arrives, an alert sounds or is displayed, and control is passed to the auto-answering step 18 of Fig. 1. Silent redial is discussed more fully in co-pending U.S. Patent Application serial no. 09/246,396, filed on February 9, 1999, entitled SYSTEM AND METHOD FOR FACILITATING WIRELESS CALL CONNECTIONS IN EMERGENCY SITUATIONS, assigned to the assignee of the present invention and herein incorporated by reference herein.

With reference to Figs. 2 and 3, the emergency callback mode is exited by pressing an END button on a keypad 64 of the cellular telephone 50 (as is

discussed more fully below) when the display 66 of the cellular telephone 50 is an emergency callback standby state 82 and when a call is not active (as is discussed more fully below). If END is pressed during an emergency call, then the emergency callback mode standby display 82 is displayed. If END is pressed when the display 66 is in any other display state (such as a features menu display) and when a call is not active, then the display 66 enters an emergency callback mode standby state. An auto-answer capability is provided for calls received when the cellular telephone 50 is in the emergency callback mode.

After a user dials an emergency number such as 911, the display screen 66 enters the emergency callback mode standby display state 82 and displays the following message: "Emergency calls only. END to exit." When the display screen 66 enters the standby display state 82, the cellular telephone 50 enters the emergency call mode that is exited by pressing END. If available, the current time and date is displayed on line 4 of the cellular telephone display screen 66 when in the standby display state 82.

If during the emergency callback mode standby display state 82 wireless service is lost, the display screen 66 enters a service-lost state 84 and displays the following message "Emergency service lost. Looking... END to exit." If during the service lost state 84 wireless service is regained, the display screen 66 re-enters the standby display state 82.

If during the emergency callback mode standby display 82a number is entered via the keypad 64 and SEND (SND) is pressed, the display screen 66 enters a restricted-use state 86 and displays the following message "Use is restricted. Emergency calls only."

If during the emergency callback mode standby display 82 an incoming call is received, the display screen 66 enters an incoming-call state 88 and displays the following message "Incoming call."

If during the emergency callback mode standby display 82 SEND is pressed, the display screen 66 enters a redialing state 90 and displays the following message "Redialing 911."

Thus, the present invention has been described herein with reference to a particular embodiment for a particular application. Those having ordinary skill in the art and access to the present teachings will recognize additional modifications, applications and embodiments within the scope thereof.

It is therefore intended by the appended claims to cover any and all such applications, modifications and embodiments within the scope of the present invention.

WHAT IS CLAIMED IS:

CLAIMS

1. A system for enhancing the operation of a wireless phone in emergency situations comprising:

first means for entering said wireless phone into an emergency callback state when an emergency call is attempted or placed via said wireless phone and

second means for controlling said phone to automatically answer an incoming call when said wireless phone is in said emergency callback state.

2. The system of Claim 1 wherein said emergency callback state is characterized by high wireless phone volume settings.

3. The system of Claim 2 wherein said emergency callback state is characterized by an short message service setting of on + remind and a keybeep volume setting of high.

4. The system of Claim 1 wherein said emergency callback state is characterized by locked network service settings and use of the wireless phone is limited to placing emergency calls only.

5. The system of Claim 1 wherein said wireless phone includes an end button for exiting said emergency callback mode.

6. The system of Claim 1 wherein said second means for controlling includes software running on a computer included in said wireless phone.

7. The system of Claim 6 wherein said second means includes means for automatically answering said wireless phone after a predetermined number of rings.

8. A system for enhancing the operation of a wireless phone in emergency situations comprising:

first means for completing a call to an emergency call center via said wireless phone and a wireless service provider;

second means for automatically providing a phone number of said wireless phone to said wireless service provider upon said call completion; and

third means for enabling said wireless service provider to re-establish said call via said provided phone number without user assistance.

9. The system of Claim 8 wherein said first means includes a cellular telephone having a computer.

10. The system of Claim 9 wherein said computer includes a 186 processor.

11. The system of Claim 9 wherein said third means includes software running on said computer for implementing said third means.

12. The system of Claim 11 wherein said software includes instructions for controlling said phone, said instructions including commands for automatically answering said phone in response to the receipt of a call from said emergency call center to re-establish said call.

13. The system of Claim 11 wherein said software includes means for placing said phone in an emergency callback mode or state after said dropping of said call.

14. The system of Claim 13 wherein said software includes means for causing said phone to automatically answer incoming calls when said phone is in said emergency callback mode or state.

15. A method for enhancing the operation of a wireless phone in emergency situations comprising the step of:

entering said wireless phone into an emergency callback state when an emergency call is placed via said wireless phone and

controlling said phone to automatically answer an incoming call when said wireless phone is in said emergency callback state.

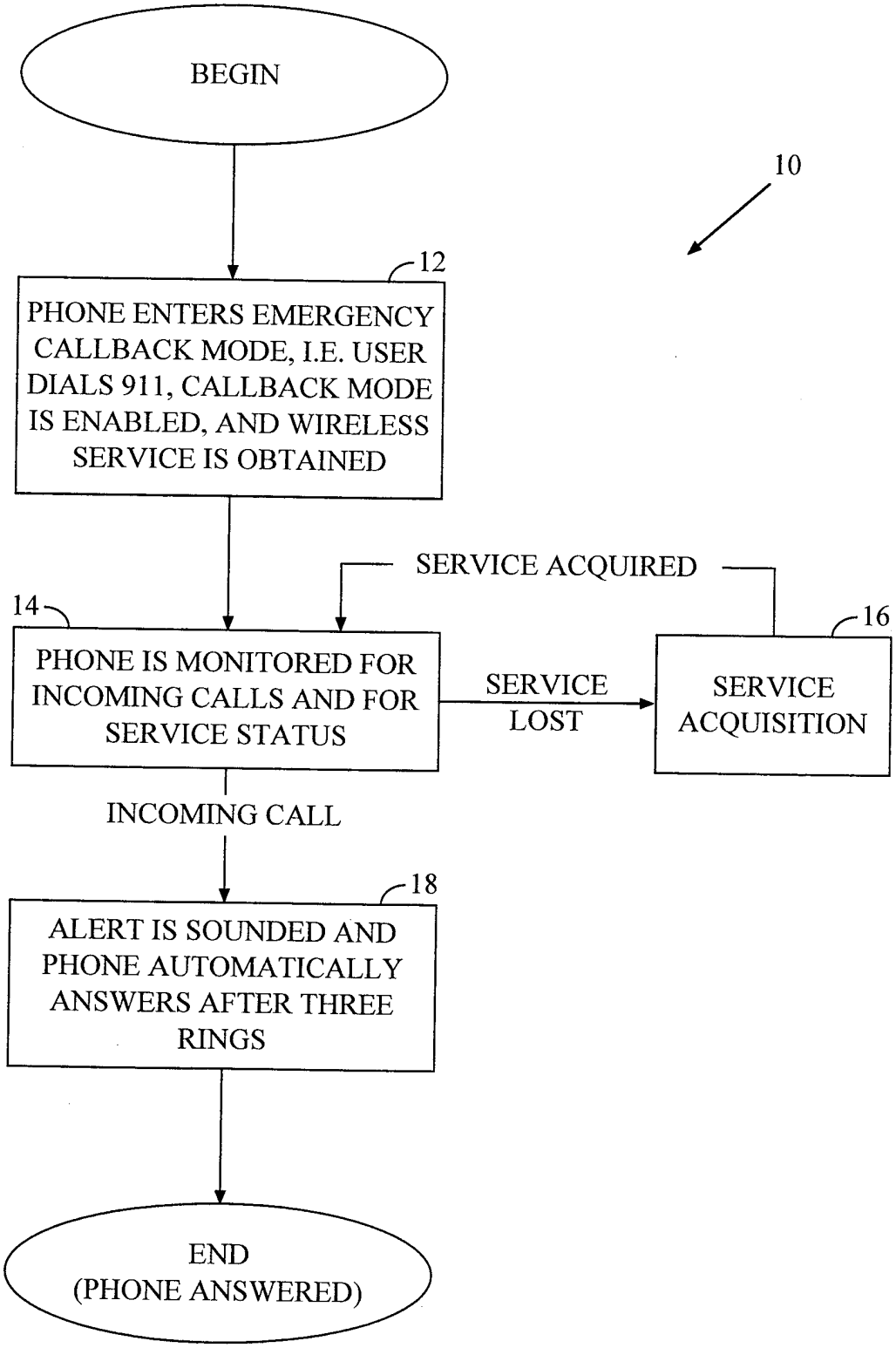
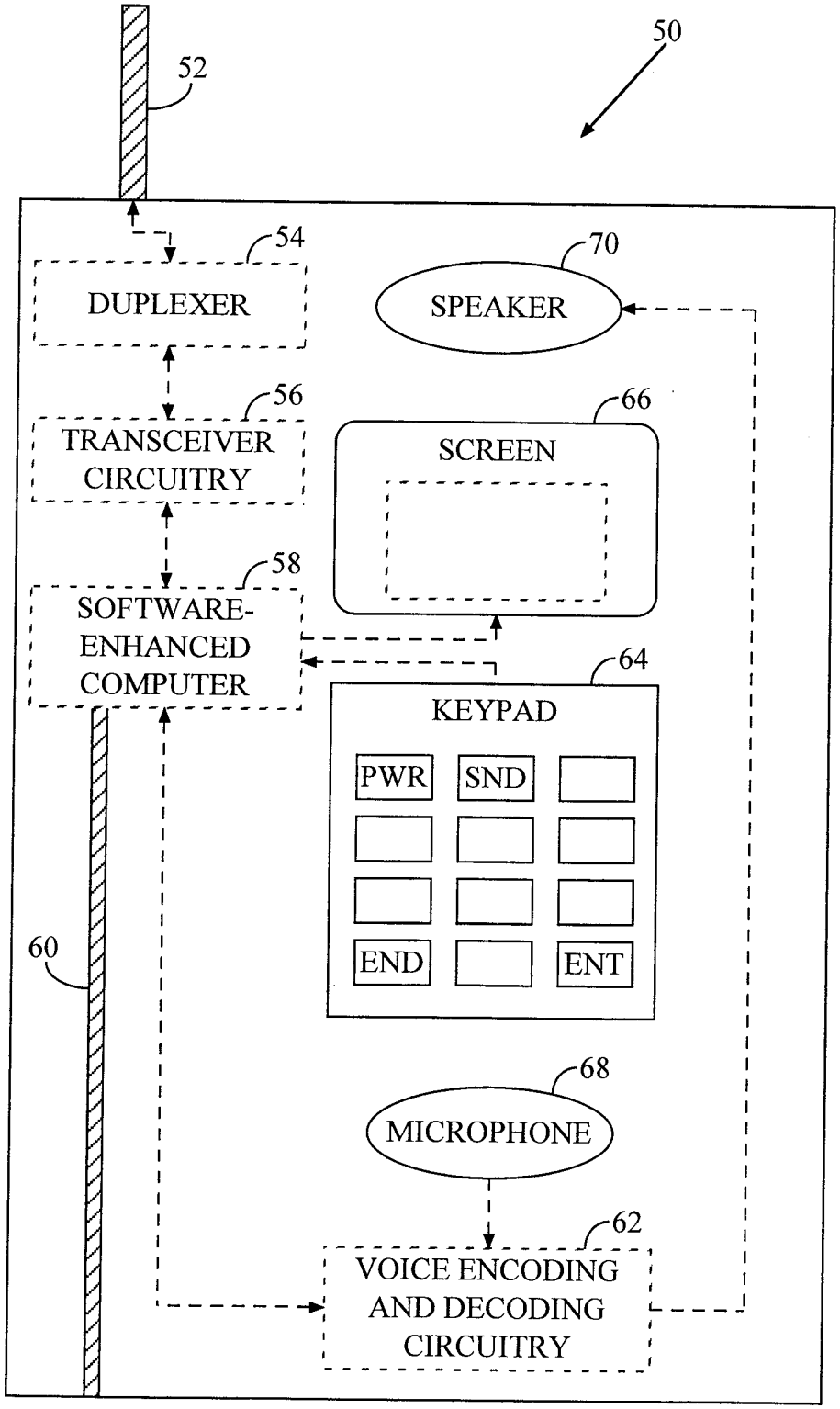

BEGIN
10
12
PHONE ENTERS EMERGENCY CALLBACK MODE, I.E. USER DIALS 911, CALLBACK MODE IS ENABLED, AND WIRELESS SERVICE IS OBTAINED
SERVICE ACQUIRED
14
PHONE IS MONITORED FOR INCOMING CALLS AND FOR SERVICE STATUS
SERVICE LOST
16
SERVICE ACQUISITION
INCOMING CALL
18
ALERT IS SOUNDED AND PHONE AUTOMATICALLY ANSWERS AFTER THREE RINGS
END
(PHONE ANSWERED)

FIG. 1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SPEAKER
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TRANSCEIVER CIRCUITRY
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SCREEN
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SOFTWARE-ENHANCED COMPUTER
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KEYPAD
PWR
SND
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ENT
60
68
MICROPHONE
62
VOICE ENCODING AND DECODING CIRCUITRY

FIG. 2

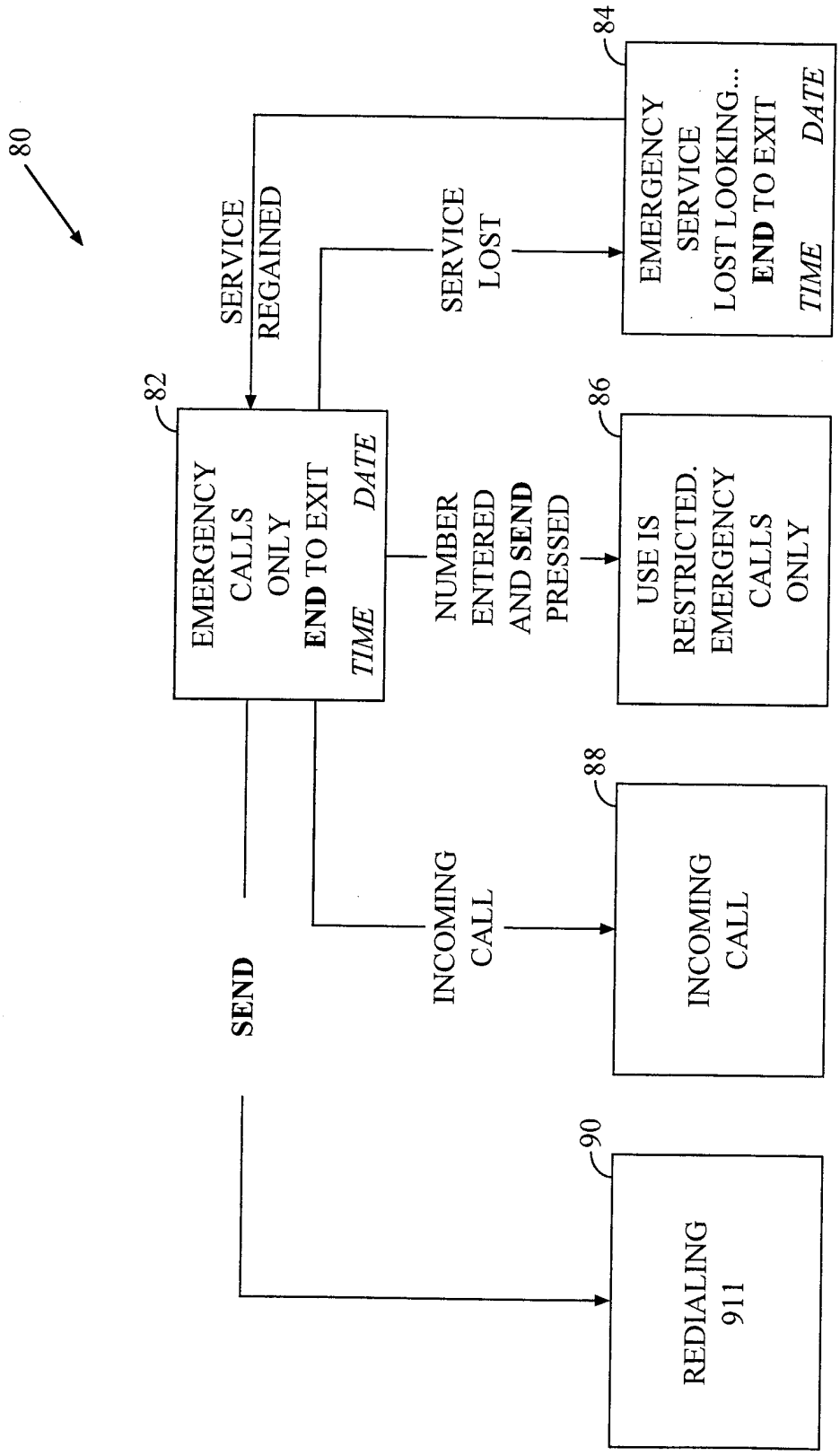
80
82
EMERGENCY CALLS ONLY
END TO EXIT
TIME DATE
SERVICE REGAINED
SERVICE LOST
84
EMERGENCY SERVICE
LOST LOOKING...
END TO EXIT
TIME DATE
NUMBER ENTERED AND SEND PRESSED
86
USE IS RESTRICTED. EMERGENCY CALLS ONLY
SEND
INCOMING CALL
88
INCOMING CALL
90
REDIALING 911

FIG. 3

INTERNATIONAL SEARCH REPORT

Inter onal Application No
PCT/US 00/03302

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04Q7/38

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04Q H04M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 563 931 A (DRUCKER ELLIOTT H ET AL) 8 October 1996 (1996-10-08) column 1, line 7 - line 13 column 6, line 15 - line 67 column 7, line 35 - line 47 column 8, line 15 - line 19 column 11, line 44 - line 53 column 13, line 22 -column 14, line 4 column 15, line 46 -column 16, line 6 column 16, line 28 - line 44 column 17, line 11 - line 39 figures 7,10	1,4-9, 11,12, 14,15

A	US 5 712 900 A (ALPEROVICH VLADIMIR ET AL) 27 January 1998 (1998-01-27)	

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
18 July 2000	28/07/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Kampouris, A

2

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INTERNATIONAL SEARCH REPORT

Inter onal Application No
PCT/US 00/03302

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	PATENT ABSTRACTS OF JAPAN vol. 016, no. 280 (E-1221), 23 June 1992 (1992-06-23) & JP 04 068948 A (MITSUBISHI ELECTRIC CORP), 4 March 1992 (1992-03-04)	
A	WO 97 23104 A (ERICSSON GE MOBILE INC) 26 June 1997 (1997-06-26)	

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INTERNATIONAL SEARCH REPORT

Information on patent family members

Inter ›nal Application No
PCT/US 00/03302

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5563931 A	08-10-1996	NONE	
US 5712900 A	27-01-1998	AU 3221397 A	09-12-1997
		EP 0900494 A	10-03-1999
		WO 9744945 A	27-11-1997
JP 04068948 A	04-03-1992	NONE	
WO 9723104 A	26-06-1997	AU 1341397 A	14-07-1997
		US 6078804 A	20-06-2000