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Baudino et al.

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(54) **METHOD FOR PUSH-TO-LISTEN REMOTE MONITORING**

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(22) Filed: **Sep. 8, 2003**

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(51) **Int. Cl.**[7] **H04M 3/00**

(52) **U.S. Cl.** **455/418**; 455/419; 455/420; 455/517; 455/518; 455/519; 370/276; 370/277; 370/328; 340/825.24; 340/825.25; 340/825.69

(58) **Field of Search** 455/418–420, 455/517–521, 9–11.1, 67.1–67.4, 67.11, 67.12; 340/825.24, 825.25, 825.69; 370/328, 276–277

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,640,147 A * 6/1997 Chek et al. 340/573.4
6,449,491 B1 * 9/2002 Dailey 455/518
6,477,150 B1 * 11/2002 Maggenti et al. 370/312
6,751,468 B1 * 6/2004 Heubel et al. 455/518
6,759,961 B2 * 7/2004 Fitzgerald et al. 340/573.1
2003/0096580 A1 5/2003 Kaplan
2003/0139175 A1 * 7/2003 Kim 455/419

* cited by examiner

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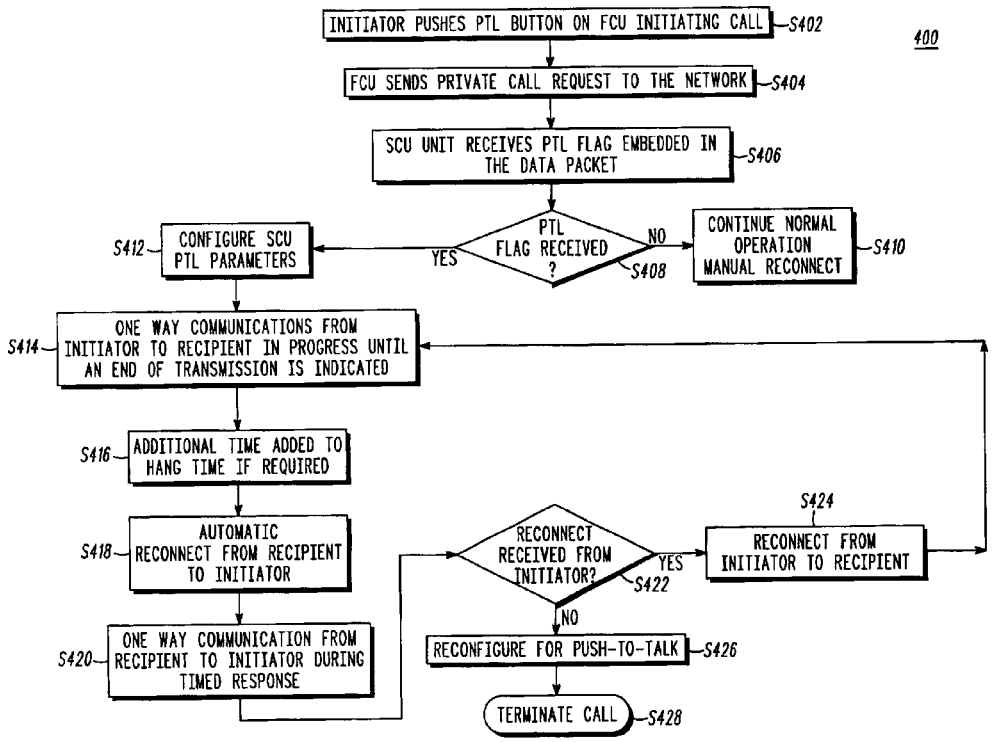
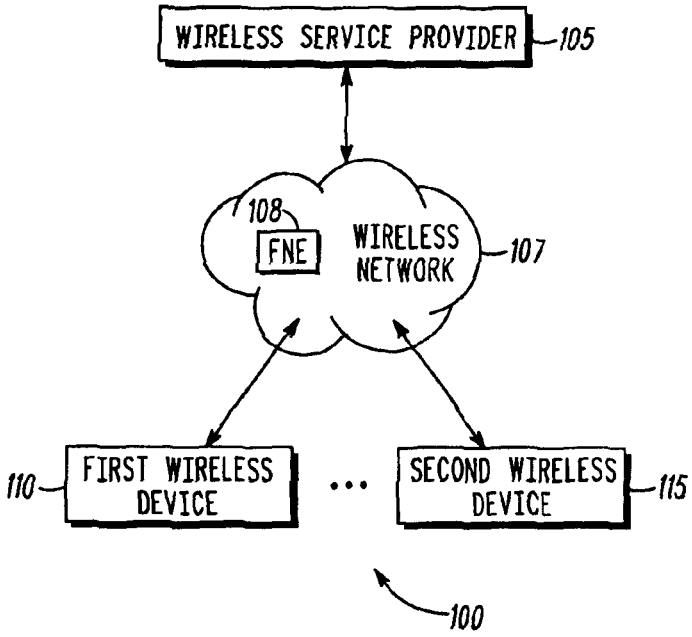
Assistant Examiner—Anthony S. Addy

(57) **ABSTRACT**

A method of operating a wireless communication system **(101)** including initiating **(S402)** a call from a first communications unit **(120)** to a second communications unit **(130)**, embedding **(S404)** a push-to-listen control protocol configuration in a data packet **(140)** responsive to the call initiation, transmitting **(S406)** the data packet **(140)** from the first communications unit **(120)** to the second communications unit **(130)**, configuring **(S412)** the second communications unit **(130)** based on the push-to-listen control protocol configuration and transmitting **(S418)** an automatic reconnect from the second communications unit **(130)** to the first communications unit **(120)** responsive to configuration of the second communications unit **(130)**.

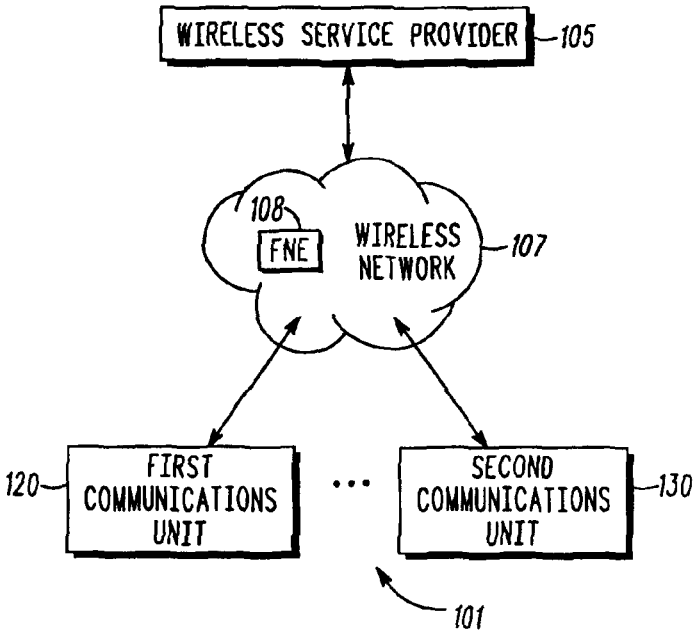
34 Claims, 7 Drawing Sheets





—PRIOR ART—

FIG. 1



—PRIOR ART—

FIG. 2

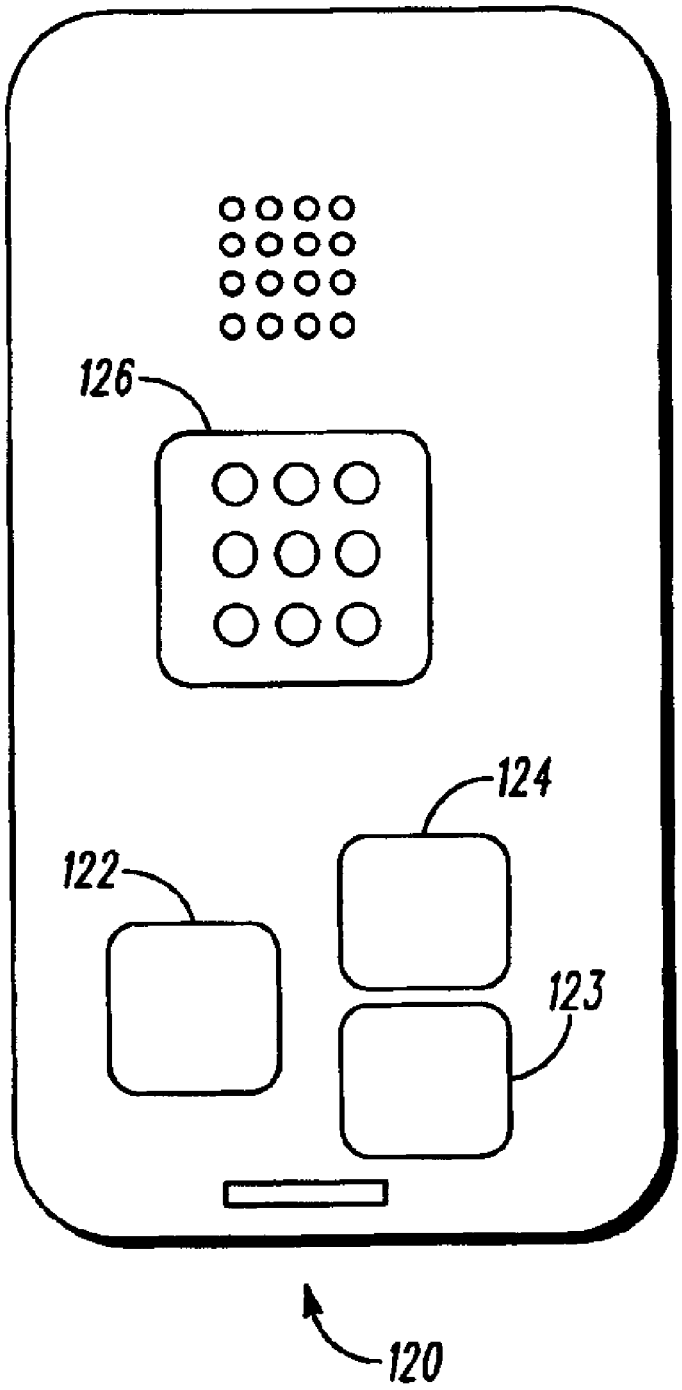


FIG. 3

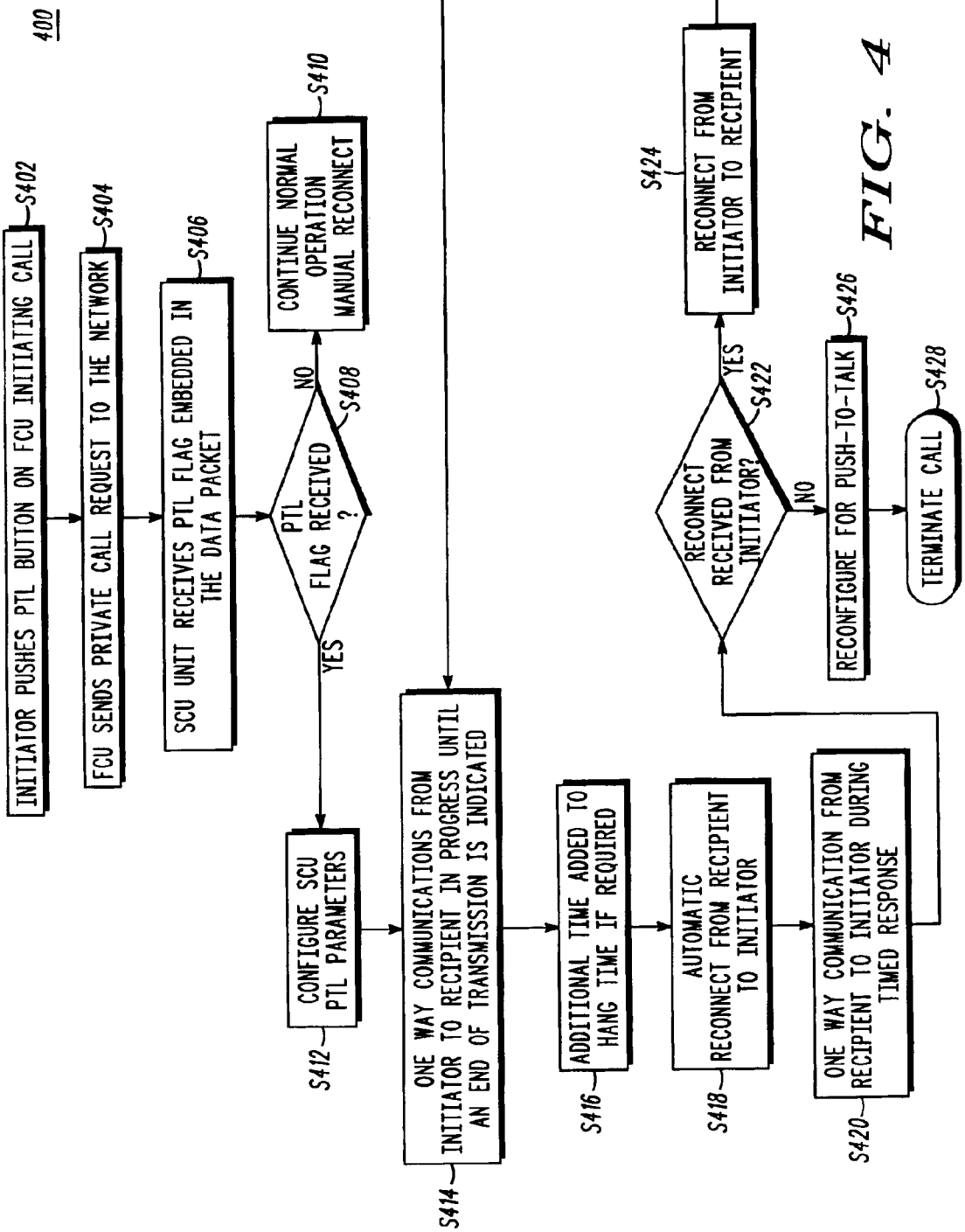

400
INITIATOR PUSHES PTL BUTTON ON FCU INITIATING CALL
S402
FCU SENDS PRIVATE CALL REQUEST TO THE NETWORK
S404
SCU UNIT RECEIVES PTL FLAG EMBEDDED IN THE DATA PACKET
S406
PTL FLAG RECEIVED ?
S408
NO
YES
CONTINUE NORMAL OPERATION MANUAL RECONNECT
S410
CONFIGURE SCU PTL PARAMETERS
S412
ONE WAY COMMUNICATIONS FROM INITIATOR TO RECIPIENT IN PROGRESS UNTIL AN END OF TRANSMISSION IS INDICATED
S414
ADDITIONAL TIME ADDED TO HANG TIME IF REQUIRED
S416
AUTOMATIC RECONNECT FROM RECIPIENT TO INITIATOR
S418
ONE WAY COMMUNICATION FROM RECIPIENT TO INITIATOR DURING TIMED RESPONSE
S420
RECONNECT RECEIVED FROM INITIATOR?
S422
YES
NO
RECONNECT FROM INITIATOR TO RECIPIENT
S424
RECONFIGURE FOR PUSH-TO-TALK
S426
TERMINATE CALL
S428

FIG. 4

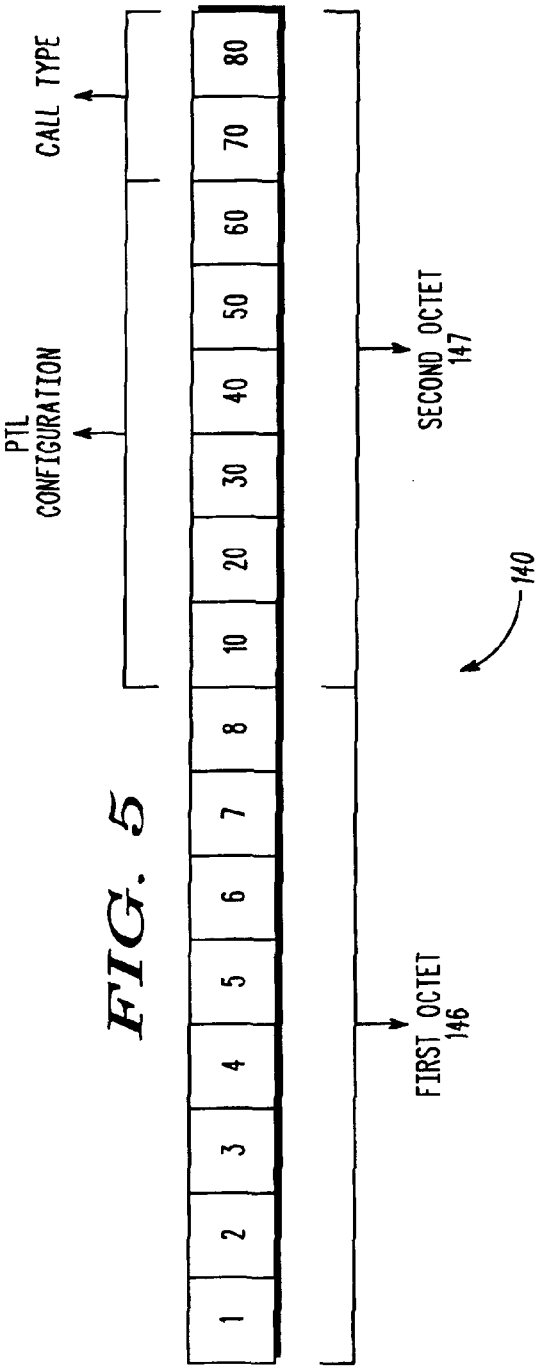

CALL TYPE
PTL CONFIGURATION
1
2
3
4
5
6
7
8
10
20
30
40
50
60
70
80
SECOND OCTET 147
FIRST OCTET 146
140

FIG. 5

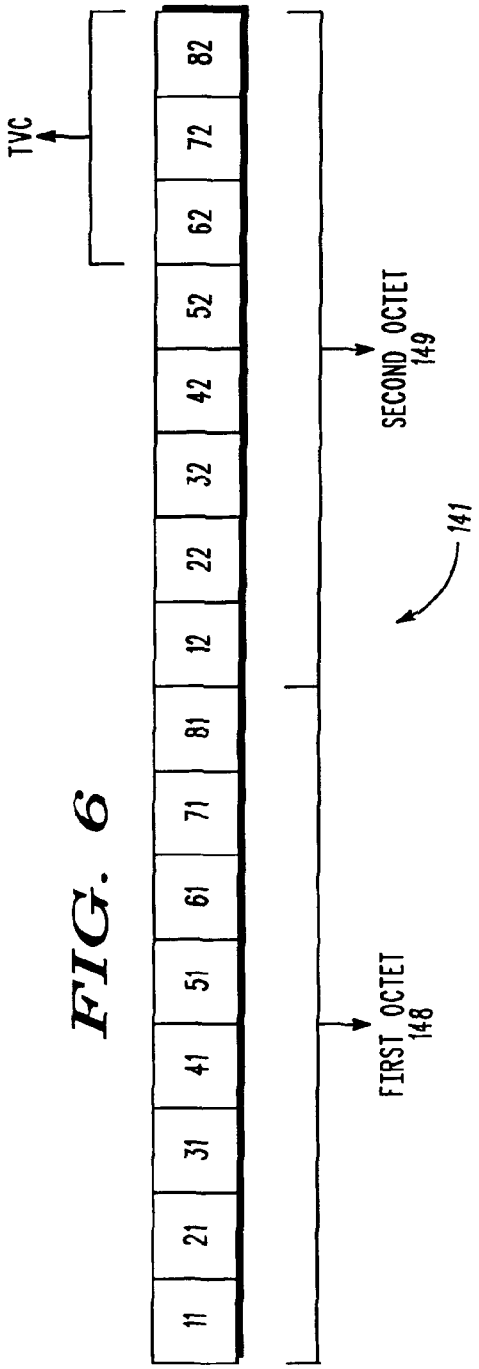

TVC
11
21
31
41
51
61
71
81
12
22
32
42
52
62
72
82
SECOND OCTET 149
FIRST OCTET 148
141

FIG. 6

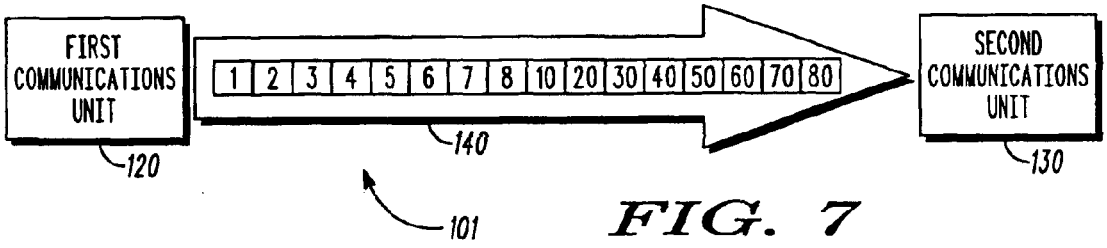


FIG. 7

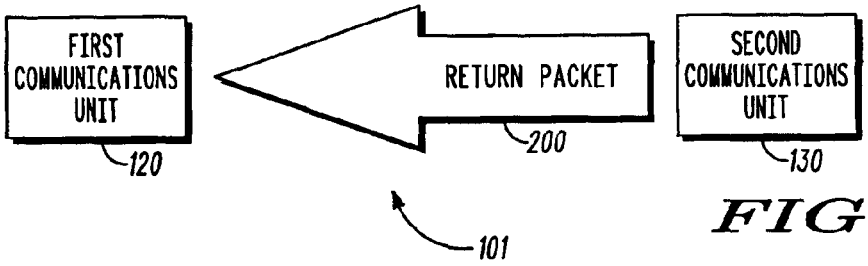


FIG. 8

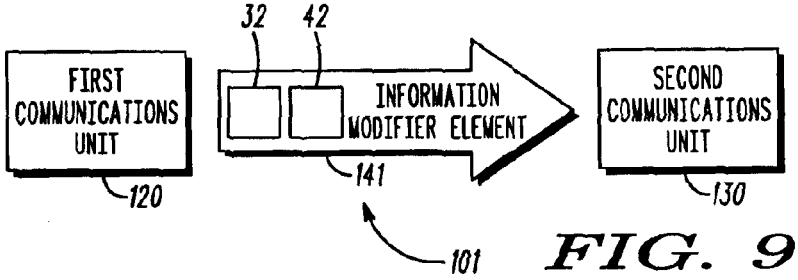


FIG. 9

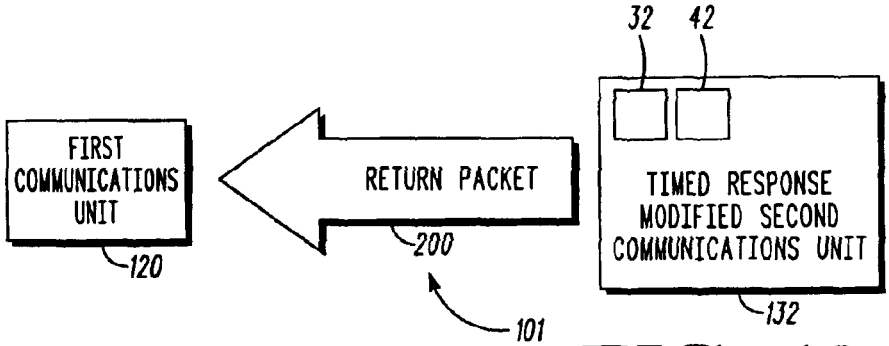


FIG. 10

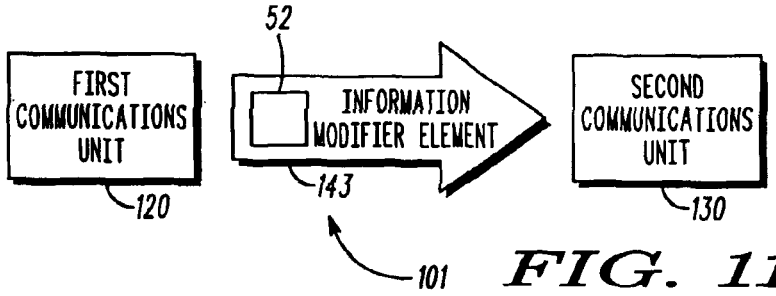


FIG. 11

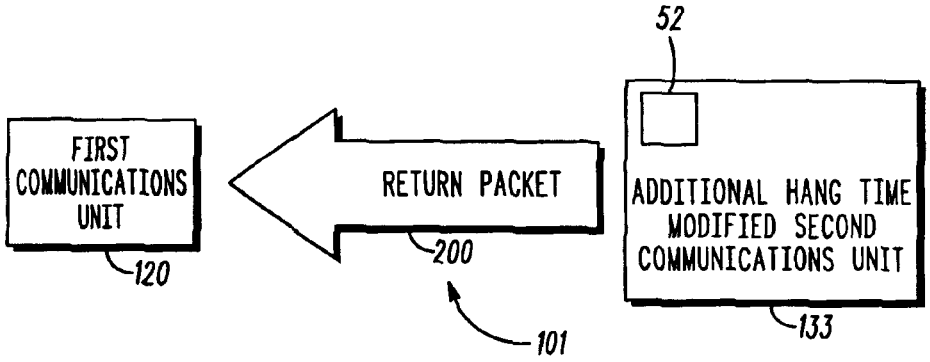


FIG. 12

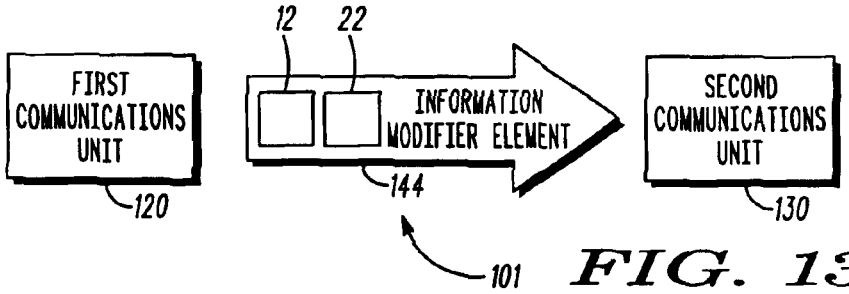


FIG. 13

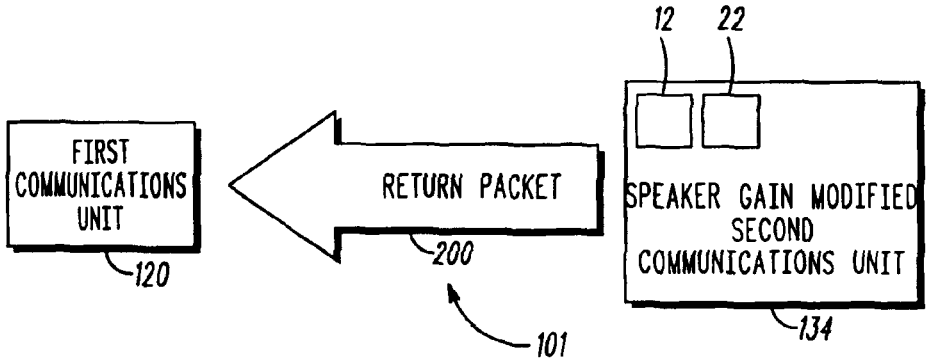


FIG. 14

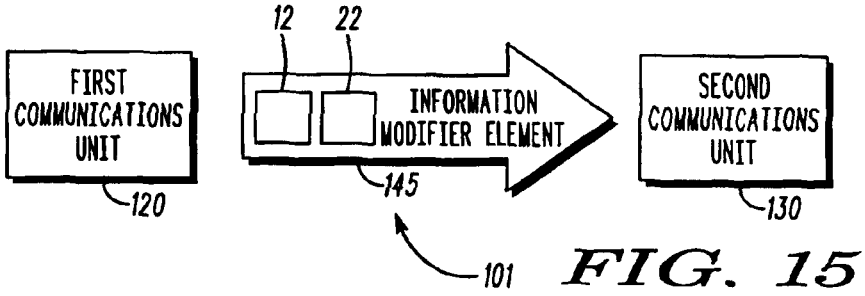


FIG. 15

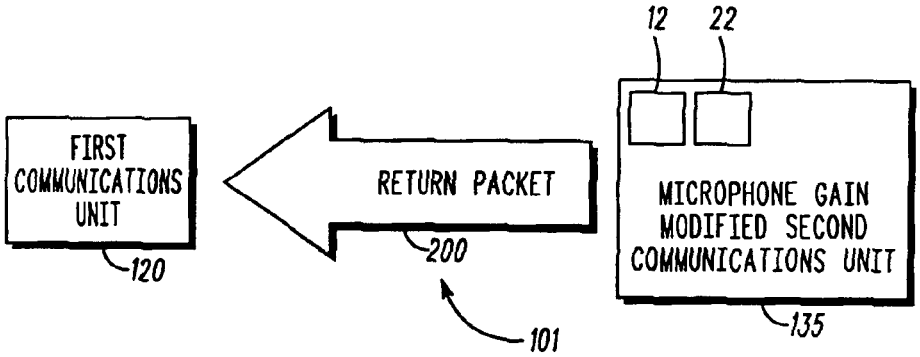
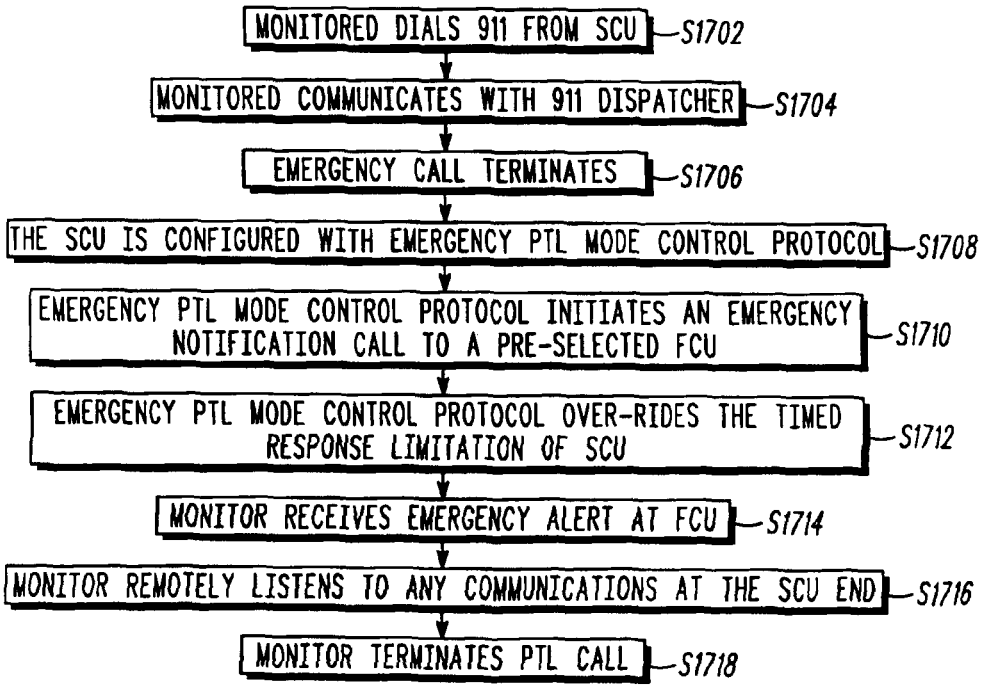


FIG. 16

1700

FIG. 17



METHOD FOR PUSH-TO-LISTEN REMOTE MONITORING

The present invention generally relates to push-to-listen monitoring via wireless communication system. More specifically the present invention relates to monitoring without a need for the monitored to push any buttons.

BACKGROUND

FIG. **1** is a block diagram illustrating a conventional wireless communication system **100**. The exemplary wireless communication system of FIG. **1** comprises a wireless service provider **105**, a wireless network **107** and wireless devices **110** through **115**. The wireless network includes a plurality of base stations and cell towers, which are shown as a fixed network element (FNE) **108**. The wireless network **107** and the FNE **108** can support both cellular telephone and dispatch service. The wireless service provider **105** is a first-generation analog mobile phone service (1G), a second-generation (2G) digital mobile phone service (including interim 2.5G and 2.75G networks) or a third-generation (3G) Internet-capable mobile phone service. The exemplary wireless network **107** is a mobile phone network, a mobile text messaging device network, a pager network, or the like. In one example, the communications standard of the wireless network **107** of FIG. **1** is Code Division Multiple Access (CDMA), Time Division Multiple Access (TDMA), Global System for Mobile Communications (GSM), General Packet Radio Service (GPRS), Frequency Division Multiple Access (FDMA) or the like. The operation and configuration of the wireless network **107** and the FNE **108** is well known, and an in-depth discussion is not warranted.

The wireless network **107** supports any number of wireless devices **110** to **115**, which are mobile phones, text messaging devices, handheld computers, pagers, beepers, or the like.

It is desirable to have a method of communicating with persons who are incapable of pushing a button, in particular for a monitoring situation where a person wants to be able to call an elderly parent or a small child. A small child does not have the skill to push the correct buttons to receive or send a phone call. An elderly person may be incapable of pushing buttons or may find it difficult or painful to push buttons on a telephone. An invalid may be incapacitated and unable to use their hands well enough to push a button.

SUMMARY OF THE INVENTION

One aspect of the present invention provides a method of operating a wireless communication system comprising initiating a call from a first communications unit to a second communications unit and embedding a push-to-listen control protocol configuration in a data packet responsive to the call initiation. The method additionally comprises transmitting the data packet from the first communications unit to the second communications unit and configuring the second communications unit based on the push-to-listen control protocol configuration.

Another aspect of the present invention provides a wireless communication system, which comprises means to initiate a call from a first communications unit to a second communications unit and means to embed a push-to-listen control protocol configuration in a data packet responsive to the call initiation. The wireless communication system also comprises means to transmit the data packet from the first communications unit to the second communications unit and means to configure the second communications unit based on the push-to-listen control protocol configuration.

A third aspect of this invention provides a computer usable medium storing a computer program comprising computer readable code for initiating a call from a first communications unit to a second communications unit and for embedding a push-to-listen control protocol configuration in a data packet responsive to the call initiation. The computer usable medium storing a computer program comprising computer readable code also provides computer readable code for transmitting the data packet from the first communications unit to the second communications unit and for configuring the second communications unit based on the push-to-listen control protocol configuration.

The forgoing device and other devices as well as features and advantages of the present invention will become further apparent from the following detailed description of the presently preferred embodiments, read in conjunction with the accompanying drawings. The detailed description and drawings are merely illustrative of the present invention rather than limiting, the scope of the present invention being defined by the appended claims and equivalents thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention is illustrated by way of example and not limitation in the accompanying figures, in which like references indicate similar elements, and in which:

FIG. **1** illustrates a block diagram illustrating a conventional wireless communication system;

FIG. **2** is a block diagram illustrating a push-to-listen system in accordance with one embodiment of the present invention;

FIG. **3** is a block diagram of a communications unit in accordance with one embodiment of the present invention;

FIG. **4** is a flowchart representing operation of one embodiment of the push-to-listen system in accordance with one embodiment of the present invention;

FIG. **5** is a block diagram of a private call information element to initiate a push-to-listen call in accordance with one embodiment of the present invention;

FIG. **6** is block diagram of a private call information element to modify a push-to-listen call in progress in accordance with one embodiment of the present invention;

FIG. **7** is a block diagram illustrating transmission of a packet from a monitoring device to a monitored device to initiate a push-to-listen call in accordance with one embodiment of the present invention;

FIG. **8** is a block diagram illustrating transmission of a packet to a monitoring device from a monitored device configured for a push-to-listen call in accordance with one embodiment of the present invention;

FIG. **9** is a block diagram illustrating transmission of a timed response modifying packet from a monitoring device to a monitored device in accordance with one embodiment of the present invention;

FIG. **10** is a block diagram illustrating transmission of a packet to a monitoring device from a monitored device reconfigured for a modified timed response in accordance with one embodiment of the present invention;

FIG. **11** is a block diagram illustrating transmission of an additional hang time modifying packet from a monitoring device to a monitored device in accordance with one embodiment of the present invention;

FIG. **12** is a block diagram illustrating transmission of a packet to a monitoring device from a monitored device reconfigured for a modified additional hang time in accordance with one embodiment of the present invention;

FIG. **13** is a block diagram illustrating transmission of a speaker gain modifying packet from a monitoring device to a monitored device in accordance with one embodiment of the present invention;

FIG. **14** is a block diagram illustrating transmission of a packet to a monitoring device from a monitored device reconfigured for adjusted speaker gain in accordance with one embodiment of the present invention;

FIG. **15** is a block diagram illustrating transmission of a microphone gain modifying packet from a monitoring device to a monitored device in accordance with one embodiment of the present invention;

FIG. **16** is a block diagram illustrating transmission of a packet to a monitoring device from a monitored device reconfigured for adjusted microphone gain in accordance with one embodiment of the present invention; and

FIG. **17** is a flowchart representing operation of a second embodiment of the push-to-listen system of the present invention.

DETAILED DESCRIPTION OF THE DRAWINGS

FIG. **2** is a block diagram illustrating a push-to-listen wireless communication system **101** in accordance with one embodiment of the present invention. The exemplary push-to-listen wireless communication system **101** comprises the wireless service provider **105**, the wireless network **107** and at least a wireless first communications unit **120** and wireless second communications unit **130**. The wireless network includes a plurality of base stations and cell towers, which are shown as a fixed network element (FNE) **108**. The wireless service provider **105** and the wireless network **107** provide the same functionality as described in FIG. **1**.

FIG. **3** illustrates a first communications unit **120** in accordance with one aspect of the invention. In one embodiment, the first communications unit comprises at least a push-to-listen button **122**, operable to initiate a push-to-listen call, a scroll down button **123**, an up scroll key **124** and a keypad **126** operable to control some of the functionality of the first and second communications units **120** and **130**. In another embodiment, the second communications unit **130** is identical to the first communications unit **120**. In another embodiment, the first and second communications units **120**, **130** are not identical, but both the first and second communications units **120**, **130** comprise push-to-listen capability as disclosed herein. In yet another embodiment, the second communications unit **130** may not comprise a scroll button or a push-to-listen button, and in such an embodiment, the second communications unit may solely function as a push-to-listen device. The push-to-listen button **122** on the first communications unit **120** is operable to initiate a transmission over a communications channel within the wireless network **107**. For example, when the user (not shown) of the first communications unit **120** presses the push-to-listen button **122**, a communications channel is assigned within the wireless network **107** and the first communications unit **120** can begin transmitting a communication from the user. The first communications unit **120** and the second communications unit **130** have, in one embodiment, the capability to operate as push-to-talk communications units or as push-to-listen communications units.

When the monitor releases the push-to-listen button **122**, the first communications unit **120** transmits an end-of-transmission (EOT) message over a communications channel within the wireless network **107**. At this point, the first communications unit **120** is no longer transmitting over the communications channel within the wireless network **107**.

The first communications unit **120** and the second communications unit **130** may have capability to operate as normal cell phones, as illustrated in FIG. **1**, and to operate as a push-to-listen devices, as illustrated in FIG. **2**. This combination of cell phone and push-to-talk capability hard-wired into a single wireless communication unit is known to those of ordinary skill in the art and such units are commercially available, from vendors, such as, for example, Nextel. The first communications unit **120** and the second communications unit **130** may support both cellular telephone service and push-to-listen service, although the first communications unit **120** and the second communications unit **130** are not limited in this regard. In fact, the term "communications unit" can include any telecommunications unit suitable for conducting a call, including even a fixed telecommunications device. Thus, the definition of "communications unit" comprises "land lines," push-to-talk devices, push-to-listen devices, cellular phones and any portable communications device.

The push-to-listen capability described herein functions as a monitoring and communicating system for elderly people, invalids, children, as well as others. The push-to-listen capability allows for the monitored person on the second communications unit **130** to have a conversation with the monitor on the first communications unit **120**, without the monitored pushing a button or picking up the second communications unit. The monitor on the first communications unit **120** is the only person required to push buttons or pick up a communications unit for the conversation to occur.

The phrases "the monitor" and "the initiator" are used interchangeably within this document to describe the person who initiated the call and controls various parameters with button pushes during the call. Likewise, the phrases "the monitored" and "the recipient" are used interchangeably within this document to describe the person who receives a phone call and carries on a conversation with the monitor without any button pushing required.

FIG. **4** is a flowchart **400** representative of one embodiment of the push-to-listen wireless communication system **101**. During stage **S402**, the initiator pushes the push-to-listen button (PTL) **122** on the first communications unit (FCU) **120**, as illustrated in FIG. **3**, to initiate a call. During stage **S404**, the first communications unit **120** sends a call request to the wireless network **107** with a protocol for push-to-listen embedded in the transmitted data packets in order to open a communication channel for the initiator to communicate with the recipient. The fixed network element **108** in the wireless system **107** locates the second communications unit **130** and sends the call request message to the second communications unit **130**.

During stage **S406** the second communications unit **130** receives the push-to-listen (PTL) flag embedded in the data packet from the fixed network element **108**.

During stage **S408** it is determined if a push-to-listen flag was received at the second communications unit **130**. Because the push-to-listen flag was embedded in the call request received at the second communication device **130** during stage **S406**, the flow proceeds to stage **S412**. If no push-to-listen flag had been embedded in the call request received at the recipient phone during stage **S406**, the flow proceeds to stage **S410** and the call continues with push-to-talk manual reconnect operation on the part of the person using the second communications unit **130**, as is known to those of ordinary skill in the art.

During stage **S412**, the second communications unit **130** is configured for the default push-to-listen parameters in response to the input data packet containing the push-to-listen flag.

During stage **S414**, the first communications unit **120** opens a voice channel and becomes the talker. One way communication from the initiator to the recipient is in progress as the initiator speaks to the recipient while holding down the push-to-listen button **122**. When the initiator releases the push-to-listen button **122**, a private call end of transmission is indicated.

The private call end of transmission is transmitted from the first communications unit **120** to the fixed network element **108** of the wireless system **107**. At this time, the fixed network unit **108** of the wireless system **107** provides an open channel for a reconnect to be established from the second communications unit **130** to the first communications unit **120**. Hang time is the amount of time that the temporary communication channel, which is assigned to the communication units **120** and **130** when they are not transmitting, is held open.

During stage **S416**, additional time is added to the conventional hang time, if the push-to-listen embedded protocol indicated an additional hang time as a default parameter. Additional delay time may be desired if the monitor operating the first communications unit **120** anticipates that the monitored may be delayed in getting to a position to verbally respond to a push-to-listen call from the monitor. This provides additional time for the recipient to respond. Additional hang time is a preset time, which is reconfigurable during a push-to-listen call, as will be described in FIGS. **11** and **12**. Once the monitored is in a position to talk with the monitor, the monitor may desire to remove or decrease the additional hang time during the call. The additional hang time is also configurable before or after the call is made.

The push to listen protocol provides an automatic reconnect from the second communications unit **130** to the first communications unit **120**. During stage **S418**, the automatic reconnect from recipient to initiator is established. The second communications unit **130** sends a reconnect request to the wireless network **107** in order to re-open the communication channel for the initiator to communicate with the recipient. The fixed network element **108** re-opens the communication channel, and the monitored can speak to the monitor.

During stage **S420**, one-way communication from the recipient to the initiator is established for a set timed response. The push-to-listen protocol has embedded a preset timed response time for the one-way communication of stage **S420** to take place. During this time, the recipient speaks to the call initiator without having to hold or push down the push-to-listen button **122**. This preset timed response time is configurable during the call, as will be described in FIGS. **9** and **10**. The timed response time is also configurable before or after the call is made. The timed response may be any time such as, for example, 15 seconds, 40 seconds or 60 seconds. The amount of timed response is established by the monitor from the first communications unit **120**.

It is also during stage **S420** that an initiator may terminate the call, when the conversation between the initiator and the recipient is concluded. After the automatic reconnect of stage **S418** the initiator can abort the call by pressing a termination button (not shown) on the first communications unit **120**. In one embodiment of the invention, the termination button is the push-to-listen button **122**. In another embodiment of the invention, a button separate from the push-to-listen button **122** is provided as a dedicated termination button.

Once the timed response time has elapsed, the fixed network element **108** of the wireless system **107** provides an open channel for a reconnect to be established from the first communications unit **120** to the second communications unit **130**. Stage **S422** occurs during this second hang time. During stage **S422**, the wireless system **107** determines if a reconnect is sent from the initiator. It is unnecessary to modify the second hang time with the push-to-listen protocol.

The initiator can also terminate the conversation during stage **S422** by not sending a reconnect signal; that is, the initiator can terminate the conversation by not pushing the push-to-listen button **122**.

If a reconnect is received during stage **S422**, such as if the initiator has pushed the push-to-listen button **122** again, the flow proceeds to stage **S424**. During stage **S424**, the initiator is reconnected to the recipient, without the recipient ever having pushed any buttons on the second communications unit **130**. The flow then proceeds to stage **S414**, and the initiator can speak to the recipient as previously described.

The flow from **S408** through **S422** to **S424** will continue in this manner until there is no reconnect received during stage **S422** and then the flow proceeds to stage **S426**. During stage **S426**, the second communications unit **130** is reconfigured for push-to-talk operation. The call is terminated during **S428**. If the call follows the flow through stage **S422** to stage **S428**, the initiator has chosen to end the call. In this case, the call is terminated when the initiator does not press the push-to-listen button **122** on the first communications unit **120** during stage **S422** after the timed response of stage **S420** expires or after the initiator presses the termination button.

The parameters of the configuration of the second communications unit **130** may be modified at any point during the communication flow as will be described in detail in FIGS. **9–14**. For example, the speaker gain of the second communications unit **130** may be modified at any step in the method outlined above. Other parameters may be similarly modified at any step in the method.

Although the operation of the wireless communication system **101** is described in FIG. **4** as half-duplex, this invention is not limited to half-duplex but can be practiced in systems, such as, for example, full duplex or half duplex that do not rely upon the wireless network **107** communication system.

FIG. **5** is a block diagram illustrating a private call information element **140**, which is part of the packet transmitted to initiate a push-to-listen call according to one embodiment of the present invention. It should be noted that for clarity and brevity purposes, this specification describes a 16-bit information packet. However, the invention is in no way limited to 16-bit information packets and the invention may be practiced with an information packet with more or less bits. The size of the information packet is a matter of design choice, and the invention is in no way limited by the number of bits within the information packet. When the first communications unit **120** transmits a call request to the wireless network **107**, the information element **140** is embedded within the request. The information element **140** consists of 16 bits. The first octet **146** comprises the first 8 bits of the information element **140** (**1**, **2**, **3**, **4**, **5**, **6**, **7**, **8**), which contain the elements required to set up the connection through the wireless network **107**. The second octet **147** of the information element **140** comprises the second 8 bits (**10**, **20**, **30**, **40**, **50**, **60**, **70**, **80**). The bits in the second octet are set to configure a second communications unit **130** for the push-to-listen capability. Bits **70** and **80** comprise a call type indicator, which describes the type of the call that is being

requested in the private call. These bits will provide information about the type of call that is being requested in the private call sent by the initiator. Bit **60** indicates if the call is a push-to-talk or a push-to-listen call. When bit **60** is set to one, the push-to-listen flag will be received at the second communications unit **130**, as described during stage S**406** in FIG. **4**. The conversation between the initiator and the recipient will take place with no button pushing required of the recipient as described in FIG. **4**. If bit **60** is set to zero, no push-to-listen flag is received and the recipient will need to push buttons on the second communications unit **130** to open a communication channel to talk to the initiator listening on the first communications unit **120**.

Bit **50** indicates if an additional hang time is to be added to the conventional hang time at the end of transmission from the initiator (stage S**416**, FIG. **4**) and before the automatic reconnect from the recipient (Stage S**418**, FIG. **4**). If bit **50** is set to one, an additional hang time, which is preprogrammed into the second communications unit **130**, will follow the end of transmission from the initiator during stage S**146** in FIG. **4**. If bit **50** is set to zero, no additional hang time will follow the end of transmission from the initiator before a reconnect request is sent from the second communications unit **130**.

Bits **30** and **40** set the push-to-listen timed response, which is the time allotted for the monitored to speak to the monitor. The monitored does not need to push the push-to-listen button **122** to open the communication channel to speak to the monitor.

Bits **10** and **20** set the gain for the microphone on the second communications unit **130** and the gain on the speaker of the second communications unit **130**.

FIG. **6** is a block diagram illustrating a private call information modifier element **141**, which is embedded in the packet transmitted during a push-to-listen call according to one embodiment of the present invention. Information modifier element **141** is used to modify the second communications unit **130** while a call is in progress, while information element **140** is used to establish an open communication channel in the wireless network **107**.

The information modifier element **141** consists of 16 bits. The first octet **148** comprises the first 8 bits of the information modifier element **141** (**11**, **21**, **31**, **41**, **51**, **61**, **71**, **81**). The second octet **149** of the information element **141** comprises the second 8 bits (**12**, **22**, **32**, **42**, **52**, **62**, **72**, **82**). The bits in the second octet **149** contain the elements required to modify some or all of the push-to-listen configuration parameters at the second communications unit **130**.

Bits **62**, **72** and **82** of the second octet **149** of the information element **141** comprise, in one example, a standard twelve-to-one version (TVC) compression ratio. Other embodiments of the invention comprise other compression ratios, as are known and understood by those of ordinary skill in the art.

Bit **52** in the information modifier element **141** is used to modify the additional hang time value in the push-to-listen communication system **101** by changing the amount of delay between receiving the end of transmission sent from the initiator and the automatic reconnect from the second communications unit **130**. A table is preprogrammed in the second communications unit **130** to reconfigure the second communications unit **130** based on receiving a one or a zero in bit **52** in the information modifier element **141**. The additional hang time value may be modified when the push-to-listen call is in progress or it may be modified by first communications unit **120** before or after the call is made.

Bits **32** and **42** in the information modifier element **141** are used to alter the push-to-listen timed response, which is the time allotted during which words spoken by the monitored will be heard by the monitor. A table is preprogrammed in the second communications unit **130** to reconfigure the second communications unit **130** based on receiving a one or zero in bits **32** and **42** in the information modifier element **141**. The push-to-listen timed response may be modified when the push-to-listen call is in progress or it may be modified by first communications unit **120** before or after the call is made.

Bits **12** and **22** set the gain for the microphone on the second communications unit **130** and the gain on the speaker of the second communications unit **130**. A table is preprogrammed in the second communications unit **130** to reconfigure the second communications unit **130** based on receiving ones or zeros in bits **12** and **22** in the information modifier element **141**. The gain for the microphone on the second communications unit **130** and/or the gain on the speaker of the second communications unit **130** may be modified when the call is in progress. Alternately, the gain for the microphone on the second communications unit **130** and/or the gain on the speaker of the second communications unit **130** may be modified by first communications unit **120** before or after the call is made. An increase in the speaker gain is used by the monitor when, for example, the monitored does not respond to the initial call from the monitor. For example, if the monitored is asleep and the monitor wishes to arouse the monitored, a speaker gain increase is used. In another example, if the monitored is speaking too softly or is too far away from the microphone for the monitor to hear, the monitor increases the microphone gain to be able to hear the monitored.

Lookup tables are embedded in the communications units to establish the parameters, either as default parameters or as the modified parameters. Modifications to the parameters are achieved with a series of keystrokes on buttons **122**, **123** and **124** and/or the keypad **126** on the first communications unit **120** on the first communications unit **120** by the initiator.

FIG. **7** illustrates a block diagram of wireless communication system **101** during transmission of an information element **140** from a first communications unit **120** to a second communications unit **130** configured with bits **1–8** and **10–80** to establish a push-to-listen call. For purposes of clarity the wireless network **107** interaction with the first and second communications units **120** and **130** to open and maintain the communication channel between the first communications unit **120** and the second communications unit **130** is not included in the discussion of FIGS. **7–16**, since that interaction has previously been described in FIG. **4**.

FIG. **8** is a block diagram of wireless communication system **101** illustrating transmission of a return packet **200** from a second communications unit **130**, which has been configured for a push-to-listen phone call, to a first communications unit **120** during stage S**420** of FIG. **4** when the recipient speaks to the monitor. The return packet **200** is sent with no buttons pushed by the monitored on the second communications unit **130**.

FIG. **9** illustrates a block diagram of wireless communication system **101** during transmission of an information modifier element **141** from a first communications unit **120** to a second communications unit **130**. The information modifier element **141** is configured with bits **32** and **42** set to modify the push-to-listen timed response in the second communications unit **130**.

FIG. **10** is a block diagram of wireless communication system **101** illustrating transmission of a return packet **200**

from a modified second communications unit **132** to the first communications unit **120** during stage **S420** of FIG. **4** when the recipient speaks to the initiator. Upon receipt of the information modifier element **141** in FIG. **9**, the second communications unit **130** is reconfigured in response to the embedded bits **32** and **42**, forming a timed response modified second communications unit **132** with a new modified push-to-listen timed response.

FIG. **11** illustrates a block diagram of wireless communication system **101** during transmission of an information modifier element **143** from a first communications unit **120** to a second communications unit **130**. The information modifier element **143** is configured with bit **52** set to modify the current hang time in the second communications unit **130**. This hang time is the time lapse between the received end of transmission from the first communications unit **120** and the automatic reconnect by the second communications unit **130**.

FIG. **12** is a block diagram of wireless communication system **101** illustrating transmission of a return packet **200** from a modified second communications unit **133** to the first communications unit **120** during stage **S420** of FIG. **4** when the recipient speaks to the initiator. Upon receipt of the information modifier element **143** in FIG. **11**, the second communications unit **130** is reconfigured in response to the embedded bit **52** forming a second communications unit **130** with a modified hang time. The modification can increase the hang time from the conventional hang time to a time above the conventional hang time. Alternately, the modification can decrease the hang time from a time above the conventional hang time to the conventional hang time. In an embodiment that does not utilize hang time, the modification of hang time may reduce the hang time to substantially zero, rendering the reconnect substantially simultaneous.

FIG. **13** illustrates a block diagram of wireless communication system **101** during transmission of an information modifier element **144** from a first communications unit **120** to a second communications unit **130**. The information modifier element **144** is configured with bits **12** and **22** set to modify the speaker gain in the second communications unit **130**. The modification can be either to increase or decrease the gain of the speaker.

FIG. **14** is a block diagram of wireless communication system **101** illustrating transmission of a return packet **200** from the speaker gain modified second communications unit **134** to the first communications unit **120**, during stage **S420** of FIG. **4** when the recipient speaks to the initiator. Upon receipt of the information modifier element **144** in FIG. **13**, the second communications unit **130** is reconfigured in response to the embedded bits **12** and **22** forming a modified second communications unit **134** with a new speaker gain. By pushing the up scroll key **124** or the down scroll key **123** on the first communications unit **120**, the monitored increases or decreases the gain on the speaker of the second communications unit **130**.

FIG. **15** illustrates a block diagram of wireless communication system **101** during transmission of an information modifier element **145** from a first communications unit **120** to a second communications unit **130**. The information modifier element **145** is configured with bits **12** and **22** set to modify the microphone gain in the second communications unit **130**. The modification can be either to increase or decrease the gain of the microphone. By pushing the push-to-listen button **122** and the up scroll key **124** or the down scroll key **123**, on the first communications unit **120**, the monitored increases or decreases the gain on the microphone of the second communications unit **130**.

FIG. **16** is a block diagram of wireless communication system **101** illustrating transmission of a return packet **200** from the microphone gain modified second communications unit **135** to the first communications unit **120** during stage **S420** of FIG. **4** when the recipient speaks to the initiator. Upon receipt of the information modifier element **145** in FIG. **15**, the second communications unit **130** is reconfigured in response to the embedded bits **12** and **22** forming a modified second communications unit **134** with a new mircrophone gain.

All the modifications described in FIGS. **9–16** are initiated by at least one key stroke upon at least one button on the first communications unit **120**. All the push-to-listen modifications to the second communications unit **130** may be reset upon termination of the phone call to the default positions or at any other suitable time. The push-to-listen wireless communication system **101** described herein is capable of operation with a security authentication. A mode selection is available for a private monitoring/monitored phone book for push-to-listen or a private phone book for push-to-talk.

FIG. **17** illustrates how a monitored has the capability, in an emergency situation to of open a modified push-to-listen call with the monitor by dialing an emergency number. FIG. **17** illustrates flowchart **1700**.

During stage **S1702** the monitored dials **911**, or another emergency number, from the second communications unit (SCU) **130**. In one embodiment, the emergency number to bring emergency assistance to the monitored can be a number other than 911. In any case, the emergency number can be recognized by the emergency push-to-listen mode control protocol. During stage **S1704**, the monitor communicates with the dispatcher at 911. During stage **S1706**, the monitored or the emergency dispatcher terminates the emergency call.

During stage **S1708**, the second communications unit **130** is configured with an emergency push-to-listen (PTL) mode control protocol. The configuration of second communications unit **130** with an emergency push-to-listen mode control protocol is triggered by the termination of the emergency 911 during stage **S1706**.

During stage **S1710**, initiation of the emergency push-to-listen (PTL) mode control protocol triggers a push-to-listen call to a pre-programmed emergency contact at a first communications device (FCU) **120** from the second communications unit **130**. This call is initiated without the monitored needing to push the push-to-listen button **122** on the second communications unit **120**. The fixed network element **108** allocates a communication channel for the call.

During stage **S1712**, the emergency push-to-listen (PTL) mode control protocol overrides the timed response limitation of the second communications unit (SCU) **120**. The timed response limitation is used during stage **S420** in FIG. **4** during non-emergency situations. This override feature of the emergency push-to-listen mode control protocol maintains the one-way channel until the user of the first communications unit **120** terminates the call by pushing an abort button.

During stage **S1714** the monitor receives an alert at the first communications unit (FCU) **120** that the monitored has dialed 911 and that a communication channel is open within the wireless system **107**. In one embodiment, the alert is a distinctive emergency tone emitted by the first communications unit **120**. During stage **S1716**, the monitor listens over the allocated channel to one way communication from the second communications device **130** to the first communica-

tions device **120**. During stage S**1718**, the monitor terminates the push-to-listen (PTL) call by pushing an abort button. In one embodiment the abort button is the push-to-listen button **122**. The monitor may terminate the call after the emergency personnel arrive and take the monitored to a medical care facility.

In another embodiment, a remote push to view capability may be added according to the teachings of U.S. patent application Ser. No. 10/427,069 filed on Apr. 30, 2003 and assigned to the assignee of this application. For monitoring, the first communications unit **120** will request a push-to-view and the second communications unit **130** will obtain an image and transmit it to the first communications unit **120**. This is useful when the monitored does not respond to a push-to-listen call and a monitor desires to look at the monitored, or the area surrounding the second communications unit **130**.

To ensure privacy, the present invention provides, in one embodiment, an option (entry field) on the phone book to select a push-to-listen/push-to-talk type call. The monitor stores a private identification number of other communication units in the phone book of the first communications unit **120**. The private identification numbers are listed as push-to-talk, push-to-listen or both. When the initiator wants to generate a push-to-listen call, the push-to-listen field is selected at the first communications unit **120**.

Once the fixed network element **108** allocates a communication channel for the call, the wireless system **107** begins the security authentication protocol. The security authentication protocol will only transmit push-to-listen calls for numbers in the push-to-listen phone book of the first communications unit **120**. To be able to accept a push-to-listen call, the second communications unit **130** must have the private identification number of the first communications unit **120** on the phone book as push-to-listen. The security authentication is established when the wireless system **107** recognizes that the private identification number of first communications unit **120** is in the push-to-listen entry field of the phone book of the second communications unit **130**. This security authentication protocol ensures that an unauthorized person cannot call a recipient and listen to the area surrounding the second communications unit **130**. The call will be accepted only after both communication units **120** and **130** are authenticated.

The illustrated embodiment of the wireless communication system **101** is meant to illustrate method, means and computer readable code to provide a remote monitoring system in which a monitor and monitored can talk without the monitored pushing any buttons, and is not intended to be exhaustive of all possibilities or to limit what can be fabricated for the aforementioned purpose. There is therefore a multiplicity of other possible combinations and embodiments. By using what is shown and described herein, a method of communication is available to those who are incapable of pushing a button on a telephone. Those having ordinary skill in the art will therefore appreciate the benefit of employing an embodiment of wireless communication system **101** in numerous and various systems.

In the foregoing specification, the invention has been described with reference to specific embodiments. However, one of ordinary skill in the art appreciates that various modifications and changes can be made without departing from the scope of the present invention as set forth in the claims below. Accordingly, the specification and figures are to be regarded in an illustrative rather than a restrictive sense, and all such modifications are intended to be included within the scope of present invention.

We claim:

1. A method of operating a wireless communication system, the method comprising:

initiating a call from a first communications unit to a second communications unit;

embedding a push-to-listen control protocol configuration in a data packet responsive to the call initiation;

transmitting the data packet from the first communications unit to the second communications unit; and

configuring the second communications unit based on the push-to-listen control protocol configuration.

2. The method of claim **1**, further comprising:

transmitting an automatic reconnect from the second communications unit to the first communications unit responsive to said configuring step.

3. The method of claim **1** further comprising:

performing a security authorization.

4. The method of claim **3** wherein the step of performing a security authorization

further comprises:

comparing an incoming push-to-listen call with a list of authorized push-to-listen calls;

initiating the call if the caller is on the list.

5. The method of claim **1**, further comprising:

embedding a timed response control protocol configuration in the data packet; and

configuring the second communications unit based on the timed response control protocol configuration.

6. The method of claim **5** further comprising:

adjusting the timed response control protocol configuration in at least one subsequent data packet during the call; and

reconfiguring the second communications unit based on the timed response control protocol configuration.

7. The method of claim **1**, further comprising:

embedding an additional hang time control protocol configuration in the data packet; and

configuring the second communications unit based on the additional hang time control protocol configuration.

8. The method of claim **7**, further comprising:

adjusting the additional hang time control protocol configuration in at least one subsequent data packet during the call; and

reconfiguring the second communications unit based on the additional hang time control protocol configuration.

9. The method of claim **1**, further comprising:

embedding a gain control protocol configuration in the data packet; and

configuring the second communications unit based on the gain control protocol configuration.

10. The method of claim **9**, wherein the gain control protocol controls the gain of the microphone of the second communications unit.

11. The method of claim **9**, wherein the gain control protocol controls the gain of the speaker of the second communications unit.

12. The method of claim **9**, further comprising:

adjusting the gain control protocol configuration in at least one subsequent data packet during the call; and

reconfiguring the second communications unit based on the gain control protocol configuration.

13. The method of claim **12**, wherein adjusting the gain control protocol configuration adjusts the gain of the microphone of the second communications unit.

14. The method of claim 12, wherein adjusting the gain control protocol configuration adjusts the gain of the speaker of the second communications unit.

15. A wireless communication system comprising:

means to initiate a call from a first communications unit to a second communications unit;

means to embed a push-to-listen mode control protocol configuration in a data packet responsive to the call initiation;

means to transmit the data packet from the first communications unit to the second communications unit; and

means to configure the second communications unit based on the push-to-listen mode control protocol configuration.

16. The system of claim 15, further comprising:

means to transmit an automatic reconnect from the second communications unit to the first communications unit responsive to said configuring step.

17. The wireless communication system of claim 15, further comprising:

means to embed an additional hang time control protocol configuration in the data packet; and

means to configure the second communications unit based on the additional hang time control protocol configuration.

18. The wireless communication system of claim 16 further comprising:

means to adjust the additional hang time control protocol configuration in at least one subsequent data packet during the call; and

means to reconfigure the second communications unit based on the additional hang time control protocol configuration.

19. The wireless communication system of claim 15, further comprising:

means to embed a timed response control protocol configuration in the data packet; and

means to configure the second communications unit based on the timed response control protocol configuration.

20. The wireless communication system of claim 18 further comprising:

means to adjust the timed response control protocol configuration in at least one subsequent data packet during the call; and

means to reconfigure the second communications unit based on the timed response control protocol configuration.

21. The wireless communication system of claim 15 further comprising:

means to embed a gain control protocol configuration in the data packet; and

means to configure the second communications unit based on the gain control protocol configuration.

22. The wireless communication system of claim 20 further comprising:

means to adjust the gain control protocol configuration in at least one subsequent data packet during the call; and

means to reconfigure the second communications unit based on the gain control protocol configuration to increase the gain on the microphone of the second communications unit.

23. The wireless communication system of claim 20 further comprising:

means to adjust the gain control protocol configuration in at least one subsequent data packet during the call; and

means to reconfigure the second communications unit based on the gain control protocol configuration to increase the gain on the speaker of the second communications unit.

24. A computer usable medium storing a computer program comprising

computer readable code for initiating a call from a first communications unit to a second communications unit;

computer readable code for embedding a push-to-listen mode control protocol configuration in a data packet responsive to the call initiation;

computer readable code for transmitting the data packet from the first communications unit to the second communications unit; and

computer readable code for configuring the second communications unit based on the push-to-listen mode control protocol configuration.

25. The computer usable medium storing a computer program of claim 24, further comprising:

computer readable code for transmitting an automatic reconnect from the second communications unit to the first communications unit responsive to the configuration of the second communications unit based on the push-to-listen mode control protocol configuration.

26. The computer usable medium storing a computer program of claim 24, further comprising:

computer readable code for performing a security authorization.

27. The computer usable medium storing a computer program of claim 24, further comprising:

computer readable code for embedding an additional hang time control protocol configuration in the data packet; and

computer readable code for configuring the second communications unit based on the additional hang time control protocol configuration.

28. The computer usable medium storing a computer program of claim 27, further comprising:

computer readable code for adjusting the additional hang time control protocol configuration in at least one subsequent data packet during the call; and

computer readable code for reconfiguring the second communications unit based on the additional hang time control protocol configuration.

29. The computer usable medium storing a computer program of claim 24, further comprising:

computer readable code for embedding a timed response control protocol configuration in the data packet; and

computer readable code for configuring the second communications unit based on the timed response control protocol configuration.

30. The computer usable medium storing a computer program of claim 29, further comprising:

computer readable code for adjusting the timed response control protocol configuration in at least one subsequent data packet during the call; and

computer readable code for reconfiguring the second communications unit based on the timed response control protocol configuration.

31. The computer usable medium storing a computer program of claim 24, further comprising:

computer readable code for embedding a gain control protocol configuration in the data packet; and

computer readable code for configuring the second communications unit based on the gain control protocol configuration.

32. The computer usable medium storing a computer program of claim **31**, further comprising:

computer readable code for adjusting the gain control protocol configuration in at least one subsequent data packet during the call; and

computer readable code for reconfiguring the second communications unit based on the gain control protocol configuration to increase the gain on the speaker of the second communications unit.

33. The computer usable medium storing a computer program of claim **31**, further comprising:

computer readable code for adjusting the gain control protocol configuration in at least one subsequent data packet during the call; and

computer readable code for reconfiguring the second communications unit based on the gain control protocol configuration to increase the gain on the microphone of the second communications unit.

34. A method of operating a wireless communication system, the method comprising:

initiating an emergency call from a second communications unit to an emergency number;

terminating the emergency call;

configuring the second communications unit with an emergency push-to-listen mode control protocol; and

initiating a call to a first communications unit responsive to the configuring the second communications unit with an emergency push-to-listen mode control protocol.

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