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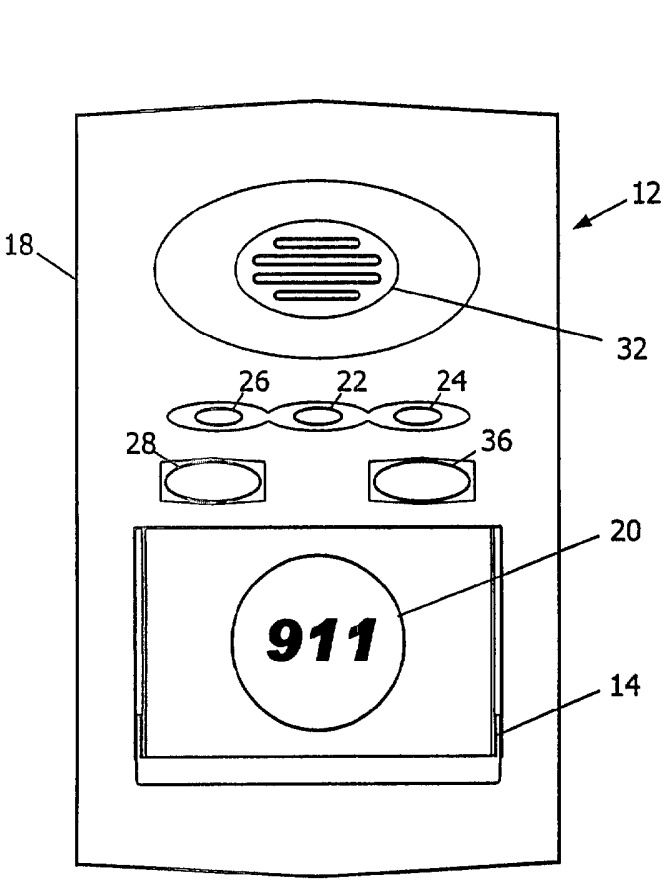
(54) Title: VEHICLE-MOUNTED WIRELESS PHONE



(57) Abstract: A vehicle-mounted wireless phone provides for establishing full duplex voice communication with a call monitoring center. The phone is designed to be flush-mounted in a dashboard or console of a motor vehicle. The phone has a single activation button which, when pressed one time, initiates the following functions: (1) electrical power is provided to a wireless transmitter and receiver, (2) the wireless receiver is activated to search for an available channel from among A or B system wireless channels, (3) a telephone number is accessed from memory, and (4) the wireless transmitter is activated to establish communication with the call monitoring center. Since all functions are initiated by pressing a single activation button, communication with the call monitoring center may be established simply and speedily, even under stressful conditions. To prevent inadvertent activation, the activation button is protected by a retractable door built into the phone housing.

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VEHICLE-MOUNTED WIRELESS PHONE

This application is a continuation-in-part of co-pending patent application Serial No. 09/538,364, filed March 29, 2000, entitled PANIC BUTTON PHONE WITH SINGLE-BUTTON ACTIVATION, which is a continuation-in-part of patent application Serial No. 09/495,080, filed January 31, 2000, entitled PANIC BUTTON PHONE, which is a continuation of patent application Serial No. 09/044,497, filed March 19, 1998, which issued as U.S. Patent No. 6,044,257, entitled PANIC BUTTON PHONE.

Field of the Invention

In general, the present invention relates to vehicle-mounted wireless telephones. In particular, the present invention relates to a vehicle-mounted wireless telephone which is activated by a single button, and which is configured to be semi-permanently mounted in a dashboard or console of an automobile.

Background of the Invention

In the past, conventional, full-service wireless telephones have been used in emergency situations to call for help from public call monitoring services by dialing 911. Generally, placing such a call with a conventional wireless telephone requires performing the following steps: (1) pressing a POWER button to power-on the phone, (2) dialing the numbers 9-1-1 on a keypad, and (3) pressing a SEND or CALL button. Although this typical procedure to place a wireless phone call appears to be straightforward, it becomes much more difficult when it must be accomplished during a stressful emergency situation, such as immediately after an automobile accident or during an assault. In such situations, summoning help should be as simple and involve as few steps as possible. Thus, in emergency situations, it is desirable that the user need not have to remember any phone numbers to dial or which of many keys to press to initiate an emergency call.

It is also desirable to have a wireless telephone that is designed for limited-use, such as in emergency situations only, thereby significantly reducing the cost of wireless service.

Often, emergency situations arise during operation of a motor vehicle. In such situations, it is desirable to be able to call for help from the vehicle using a wireless phone. However, it is not desirable to have to search for a phone within the vehicle during a stressful emergency situation. For example, a conventional hand-held wireless phone being transported in an automobile may get tossed

about during a collision, and may be difficult to find after the collision. Further, a conventional wireless phone that is tossed about during a collision is likely to be damaged and unusable after the collision.

Therefore, a communication apparatus is needed that provides low-cost wireless communication with a call monitoring service, that is always easy to find within a motor vehicle, and that is easy to activate to make wireless telephone calls, such as during stressful emergency situations.

Summary of the Invention

The above and other needs are met by a communication device for mounting in a vehicle to provide full-duplex communication between an occupant of the vehicle and personnel associated with a call monitoring service. The device includes a rigid housing that is operable to be semi-permanently attached within a recess of an occupant-accessible structure of the vehicle, such as a dashboard or console. The housing includes a front panel accessible to the occupant of the vehicle when the housing is attached within the recess. Disposed within the housing is a wireless transmitter which is operable to transmit outgoing wireless signals for establishing a full-duplex communication session only with the call monitoring service. Also disposed within the housing is a wireless receiver for receiving incoming wireless signals only from the call monitoring service during the full-duplex communication session. Since the device is intended only for use in placing outgoing calls, the wireless receiver is not operable to receive an incoming wireless telephone call. Preferred embodiments of the device include a battery compartment disposed within the housing for receiving replaceable batteries for supplying electrical power to the apparatus. In the front panel of the housing is a wireless activation button which, when pressed a first time, causes electrical power to be provided to the wireless transmitter and receiver, initiates activation of the wireless receiver to search for an available wireless system channel, and initiates activation of the wireless transmitter to transmit the outgoing wireless signals to establish full-duplex wireless communication with the call monitoring service. Since all of these communication activities are initiated by a single press of the activation button, the device substantially simplifies communication with the call monitoring service in a stressful situation. Further, since the device may only be used to make outgoing calls to a call monitoring service, costs typically associated with full-service wireless phones are reduced or eliminated.

Brief Description of the Drawings

Other features and advantages of the present invention will become apparent by reference to the following detailed description when considered in conjunction with the accompanying drawings, which are not to scale, and in which like reference characters refer to like parts throughout the views, and wherein:

Fig. 1 depicts a front view of an vehicle-mounted phone with a retractable door in an open position according to a preferred embodiment of the invention;

Fig. 2 depicts a side view of the vehicle-mounted phone with the retractable door in an open position according to a preferred embodiment of the invention;

Fig. 3 depicts a front view of an vehicle-mounted phone with a retractable door in a closed position according to a preferred embodiment of the invention;

Fig. 4 depicts a side view of the vehicle-mounted phone with the retractable door in a closed position according to a preferred embodiment of the invention;

Fig. 5 depicts a rear view of the vehicle-mounted phone according to a preferred embodiment of the invention;

Fig. 6 is a functional block diagram of the vehicle-mounted phone according to a preferred embodiment of the invention;

Fig. 7 depicts a remote alarm activation unit according to a preferred embodiment of the invention;

Fig. 8 is a functional block diagram of the remote alarm activation unit according to a preferred embodiment of the invention; and

Figs. 9A and 9B depict a functional flow diagram of the operation of the vehicle-mounted phone according to a preferred embodiment of the invention.

Detailed Description

Referring generally to Figs. 1-5, a preferred embodiment of an in-dash wireless telephone 10 for summoning help from a call monitoring center is shown. The internal components of the phone 10 are contained within a rigid housing 12, which is preferably constructed of a durable material, such as polycarbonate. As shown in Figs. 1-4, the housing preferably includes a retractable door 14 which is pivotally attached to the rigid housing 12 by a pair of hinges 16. Figs. 1 and 2 depict the door 14 in an open position, and Figs. 3 and 4 depict the door 14 in a closed position. In the preferred embodiment, the door 14 is constructed of clear polycarbonate.

When the door 14 is opened, as depicted in Figs. 1 and 2, a large activation switch or button 20 becomes accessible. The activation button 20 is used to activate the phone 10 to establish wireless communication with a call monitoring service, such as a publicly-funded 911 call center or a privately-operated call monitoring service. To summon assistance, a user simply opens the door 14 and presses the button 20. As described in more detail below, when the button 20 is pressed, the phone 10 powers up and begins to establish wireless communication with the call monitoring service.

The activation button 20 is preferably the only control button disposed beneath the door 14. Thus, when closed, the door 14 prevents accidental pressing of the activation button 20 which could inadvertently place a call to the call monitoring service. Preferably, other functions provided by the phone 10, as described hereinafter, may be activated when the door 14 is closed.

As shown in Figs. 1 and 2, the preferred embodiment of the phone 10 includes three indicator lights 22, 24, and 26. The centermost of the three lights is a low signal indicator light 22, which is preferably a red light emitting diode (LED). On the right is a high signal indicator light 24, which is preferably a green LED, and on the left is an in-use indicator light 26, which is preferably a yellow LED. The particular circumstances in which each of these lights is illuminated is described in more detail hereinafter.

As shown in Figs. 1 and 3, a speaker port 32 is also provided in the housing 12.

In order to minimize the cost of the wireless service needed to support it, the phone 10 is strictly limited to making out-going calls only. Further, since governmental regulations currently prohibit wireless service providers from refusing calls to 911 emergency response centers, even if the caller does not subscribe to a wireless service, the user may place 911 emergency calls using the phone 10 without having previously contracted for wireless service. As discussed in more detail below, the cost of wireless service for placing calls only to a single telephone number of a private assistance service, such as AAA, may be purchased at a rate far less than is typically paid for conventional wireless service. Further, this cost may be included in a membership fee that the user pays to the private organization that provides the roadside assistance, such as AAA.

Another one of the primary benefits of limiting use of the phone 10 to contacting only a call monitoring service using a single activation button 20 is the resulting simplicity of operation. As shown in Fig. 1, the activation button 20 is preferably relatively large in relation to the size of the housing 12. Thus, the button 20 is easy to locate during a stressful emergency situation. Since only one button 20 need be pressed to initiate a call, even very young children or persons with an aversion to most electronic devices can be taught how to use the phone 10 to easily summon help in an

emergency. Further, the time required to summon assistance from the call monitoring service is held to an absolute minimum. Almost as soon as the activation button 20 is pressed, the user has a verbal communications link to the public or private assistance service. Furthermore, as discussed in more detail below, the phone 10 may include a locator function which uses the global positioning satellite system (GPS) or other wireless location systems to provide the location of the phone 10 to the call monitoring service.

As depicted in Figs. 1 and 3, the preferred embodiment of the phone 10 includes a volume control 28 on the front panel 18. As described in more detail below, the volume control 28 is used to adjust the volume of audio signals provided via the speaker 64.

The phone 10 preferably also includes a signal check button 36 disposed in the front panel 18. As described below, an operator may press the signal check button 36 to get an indication of whether a communication channel is available.

While the user inputs 20, 28, and 36 are shown and discussed as push-buttons, it is understood that the inputs 20, 28, and 36 may operate switches, touch sensors, or other similar devices.

As depicted in Figs. 2 and 4, the preferred embodiment of the invention includes a microphone 66 which may be located remotely from the housing 12. Preferably, the microphone 66 is connected to the electronics within the housing 12 via a cable 67 and a connector 65 which connects at the rear of the housing 12. Alternatively, the connector 65 may make connection on the front panel 18 of the housing 12. In yet another embodiment, the microphone 66 may be located within the housing 12, with aural access to the microphone 66 through a port in the front panel 18. Thus, it should be appreciated that the invention is not limited to any particular location or configuration of the microphone 66.

Fig. 5 depicts a preferred embodiment of the phone 10 as viewed from the rear. As shown in Fig. 5, the phone 10 includes an interface port 38 which is accessible from outside the housing 12. As described in more detail below, the interface port 38 provides a programming and data transfer interface to allow modifications to the programming of the phone 10. Fig. 5 also depicts the preferred placement of the microphone connector 65 and an external power connector 42.

As mentioned above, a preferred embodiment of the invention includes a locator function. The locator function provides the call monitoring service the location of the phone 10 at the time it was activated. The locator function is implemented in a variety of manners in different embodiments of the present invention. One embodiment involves the use of a GPS receiver. A GPS receiver

utilizes signals from satellites orbiting the earth to determine the position of the receiver. Preferably, when the activation button 20 is pressed, the GPS receiver is activated to determine the location of the phone 10. The phone 10 then automatically transmits this positional information to the call monitoring service, preferably using computer-generated voice signals to simulate a voice. Another embodiment of the present invention uses a wireless location system to determine the position of the phone 10, such as by triangulation. This wireless location system uses the strength and/or the relative phase of a signal from the phone 10 received at different wireless stations to determine the location of the phone 10. Positional information is extremely beneficial in an emergency situation because it allows the call monitoring service to determine the location of the caller without requiring any input from the caller.

Referring now to Fig. 6, a block diagram of the electrical components of a preferred embodiment of the phone 10 is shown. Power for the electrical components of the phone 10 is supplied by a power supply 44. In the preferred embodiment, the power supply 44 is a DC power supply consisting of four replaceable AAA alkaline batteries. Alkaline batteries are preferred because they will allow a minimum continuous talk time of at least 30 minutes, are relatively inexpensive, are easily replaceable, and have a relatively long shelf-life between uses. Although lithium and nickel-cadmium batteries are typically the batteries of choice for conventional wireless phones, such batteries require constant recharging to maintain a useable voltage level. Such batteries are not preferred for use as the power supply 44 for the phone 10 because they cannot maintain a charge during long periods of nonuse. Since long periods of time may elapse between uses the phone 10, long-life alkaline batteries are used in the preferred embodiment of the invention.

In an alternative embodiment of the invention, the power supply 44 of the phone 10 comprises the battery of the vehicle in which the phone 10 is mounted. In this embodiment, the external power connector 42 is provided on the rear side of the housing 12 (see Fig. 5) for receiving a supply voltage, such as 12 volts from a vehicle power harness.

In one embodiment, when the activation button 20 is pressed, the microprocessor 46 activates an automatic dialer 58, and the automatic dialer 58 dials the telephone number of the call monitoring service. The telephone number may be stored in the automatic dialer 58 itself. In an alternate embodiment, the memory 60 is provided for storing the telephone number.

A wireless receiver 62 receives an incoming wireless signal from the call monitoring service and conditions the incoming signal to produce an incoming voice signal. The wireless receiver 62

may provide the voice signal to a speaker 64 directly or through the microprocessor 46 and the audio driver circuit 50, as shown in Fig. 6.

The operator of the phone 10 can respond to the incoming signal from the call monitoring service by speaking into the microphone 66. The microphone 66 converts the operator's speech into an outgoing voice signal that is conditioned by the audio driver circuit 50 and received by the microprocessor 46. The microprocessor 46 then sends the outgoing voice signal to a wireless transmitter 68, which generates an outgoing wireless signal based thereon. In an alternate embodiment, the outgoing voice signal is sent directly from the microphone 66 to the wireless transmitter 68.

The phone 10 is designed to use the wireless communications technology that provides the most comprehensive coverage possible. Using the wireless technology that provides the largest possible coverage area is desirable because it minimizes the likelihood that the operator of the phone 10 will be out of wireless communications range when a situations arises in which the caller needs assistance. While the coverage range of digital wireless service providers is constantly increasing, the largest amount of wireless coverage is still provided by service providers using analog modulation technology. Thus, in the preferred embodiment, the wireless receiver 62 and wireless transmitter 68 use analog modulation technology. Furthermore, because the amount of time actually spent communicating with the phone 10 will likely be very low, the wireless receiver 62 and transmitter 68 components are designed for maximum range and minimal talk times.

In another alternative embodiment, the phone 10 is designed to scan for a digital wireless provider. If a digital wireless service provider is located, the phone 10 will establish digital communications with the digital service provider. If no digital service provider is located, the phone 10 then attempts to establish analog wireless communications with an analog service provider.

In the embodiment of Fig. 6, when the activation button 20 is pressed, the microprocessor 46 prompts a GPS receiver 70 coupled to a GPS antenna 71 to determine the location of the phone 10. Once the GPS receiver 70 has determined the coordinates of the phone 10, the GPS receiver 70 provides the coordinates to the microprocessor 46. The microprocessor 46 then generates the simulated voice signals containing the coordinates, and sends the simulated voice signals to the wireless transmitter 68. The wireless transmitter 68 sends the simulated voice signals to the call monitoring service by way of a wireless telephone network. The location coordinates provided by the simulated voice signals allow the call monitoring service to dispatch personnel to the location from which the call was placed without even questioning the caller.

The microprocessor 46 is also coupled to the light driver circuit 52 for controlling activation of the low signal indicator light 22, the high signal indicator light 24, and the in-use indicator light 26. The particular circumstances in which the microprocessor 46 causes activation of each of these lights is described in more detail hereinafter.

Figs. 9A and 9B depict a flow diagram of a sequence of events that are set in motion when the activation button 20 is pressed to place a wireless call. First, to gain access to the activation button 20, the user opens the protective door 14 (step 200). With the door 14 in the open position (as shown in Figs. 1 and 2), the user presses the activation button 20 to place a call to the call monitoring service. When pressing the button 20, the user maintains pressure on the button 20 for at least a minimum period of time, such as one second (step 202). The user may then close the door 14 (step 204) to prevent accidentally terminating the call, which could occur if the button 20 is inadvertently pressed again. Of course, the phone 10 is also operable to complete the call if the door 14 remains in the open position.

It is assumed for purposes of this description that the phone 10 is in a power-down mode prior to step 202. In other words, the wireless transmitter 68, the wireless receiver 62, and the microprocessor 46 are preferably drawing no power from the power supply 44. When the button 20 is pressed a first time and held for at least the minimum period of time, the phone 10 is powered up (step 206). Preferably, the microprocessor 46 powers-up and begins executing preprogrammed instructions before power is provided to the receiver 62 and transmitter 68. Alternatively, the microprocessor 46, the receiver 62, and the transmitter 68 receive power simultaneously when the button 20 is pressed and held. In either case, when the microprocessor 46 is powered on, it proceeds to retrieve system operating parameters from the memory device 60 (step 208). These operating parameters preferably include an A/B preference parameter that indicates which wireless system, A or B, is preferred.

As one skilled in the art will appreciate, the A and B wireless systems each include twenty-one wireless channels, with the A system channels occupying one frequency range and the B system channels occupying another frequency range. As required by FCC rules, both of these systems are typically available in large metropolitan areas to provide competition between wireless service providers. In some geographical areas, only one of the systems may be available. If a conventional wireless phone is receiving wireless service from a service provider operating on the A system, that phone will prefer the A system over the B system, and will scan first for an available A system channel. If an A system channel is not available, the conventional phone will then scan for a B

system channel. If a B system channel is available, the conventional phone will use the available B system channel in what is typically referred to as a "roaming" mode. When roaming, the A system-preferred user typically pays a higher cost per call to use a B system channel.

Since use of the phone 10 to make a 911 call does not require a wireless service agreement with any wireless service provider, the phone 10 need not prefer either wireless system over the other when placing a 911 call. Thus, when the phone 10 is activated by pressing the first activation button 20, the phone 10 may seek an available channel in either the A system or the B system.

With reference to Fig. 9A, the receiver 62 of a preferred embodiment proceeds to scan first through B system channels (step 210) looking for a signal of sufficient strength to support a wireless call (step 212). The B system preference is determined by the A/B preference parameter recalled from memory at step 208. If no signal is found in the B system channels having a signal strength greater than a minimum threshold value, the receiver 62 then scans through the A system channels (step 214). If no signal is found in the A system channels having a signal strength greater than the minimum threshold value, the low signal indicator light 22 is illuminated (step 216), and the receiver 62 starts scanning the B system channels again (step 210). This process continues until a signal of sufficient strength is found in the A or B system channels.

When an available channel having sufficient signal strength is found in either the B system channels (step 212) or the A system channels (step 218), the high signal indicator light 24 is illuminated (step 220). If more than one channel having a signal strength greater than the minimum threshold is found, the channel having the highest signal strength is selected for the call (step 222).

As mentioned above, the operator of the phone 10 may wish to determine whether a channel is available for wireless communication, even if the operator does not plan to immediately use the phone 10. In such a case, the operator may press the signal-check button 36. When the signal-check button 36 is pressed, the receiver 62 preferably scans through the preferred and then the non-preferred system channels. If no signal is found in the A or B system channels having a signal strength greater than the minimum threshold value, the low signal indicator light 22 is illuminated. If an available channel is found having sufficient signal strength in either the A or B system channels, the high signal indicator light 24 is illuminated.

It should be appreciated that, depending on the preference parameter stored in the memory 60, the phone 10 could search for an available channel on the A system first, and then search in the B system if a signal of sufficient strength is not found in the A system. Thus, the A/B preference can be set at the time that the phone is manufactured by the selection of the value of the preference

parameter stored in memory 60. As described in more detail below, this parameter may also be reprogrammed after the manufacture of the phone 10.

As shown in Fig. 9B, after channel selection, the microprocessor 46 retrieves from the memory device 60 the telephone number of the call monitoring service (step 224). In one embodiment of the invention, the telephone number of the call monitoring service is "911", which is associated with all public emergency response centers in the United States. However, it should be appreciated that the present invention is not limited to operation with public emergency response centers, such as 911 centers in the United States. Rather, the invention may be used to contact privately-operated call monitoring services, such as those which provide roadside assistance to the caller, driving directions, local hotel or restaurant information, or other such non-emergency information or assistance. When the telephone number of the call monitoring service has been retrieved from memory 60, the wireless transmitter 68 transmits an outgoing wireless signal on the selected wireless channel (step 226) and the in-use indicator light 26 begins flashing (step 228).

Note that all of the events that have occurred thus far in the calling process (steps 206-228) have been initiated by pressing a single activation button 20. Thus, once powered-on, the microprocessor 46 executes its preprogrammed instructions to automatically scan for an available channel, retrieve the telephone number, and place the wireless call without any further action on the part of the user.

At this point, the call monitoring service answers the call from the phone 10 by transmitting a wireless signal referred to herein as an incoming wireless signal. As shown in Fig. 9B, the receiver 62 receives the incoming wireless signal (step 230), and the in-use indicator light 26 remains constantly on (step 232) to indicate to the user that communication with the call monitoring service has been established. Preferably, the microphone 66 and the speaker 64 are then enabled (step 234).

Based on the incoming wireless signal from the call monitoring service, the receiver 62 produces an incoming voice signal (step 236), which is preferably an electrical audio signal. The incoming voice signal is provided to the speaker 64 to produce audible sound (step 238). Typically, the audible sound produced by the speaker at this juncture will be the voice of a person at the call monitoring service inquiring as to the nature of the assistance needed.

With continued reference to Fig. 9B, the user of the phone 10 speaks into the microphone 66 to relay the nature of the assistance needed (step 240). The microphone 66 receives the audible sound of the user's voice and produces an outgoing voice signal based thereon (step 242). The outgoing voice signal is provided to the wireless transmitter 68 (step 244), and the transmitter 68

transmits an outgoing wireless signal to the call monitoring service based on the outgoing voice signal (step 246).

When the user wishes to terminate the call to the call monitoring service, the user presses the button 20 for a second time, and holds the button 20 for a minimum period of time, such as one second. When the microprocessor 46 determines that the button 20 is pressed and held while the phone 10 is powered up, the microprocessor 46 causes the phone 10 to power down. Requiring that the button 20 be held down for a minimum time prevents accidental termination of the call due to an inadvertent pressing of the button 20.

Thus, as indicated by the flow chart of Figs. 9A and 9B, all of the steps involved in making a telephone call to a call monitoring service are accomplished by a single press of a single activation button 20 on the phone 10. This makes it much simpler for a person who is distracted by a stressful situation, or who may be in some way incapacitated, to place an emergency call.

By comparison, using a conventional wireless phone to place a call to a call monitoring service requires that a user press at least four separate control buttons: the power button once, the "9" button once, the "1" button twice, and the "SEND" button (or equivalent) once. To end a call and power-down a conventional wireless phone, the user must typically press the "END" button (or equivalent) once, and then the power button once. Thus, establishing and ending a call using a conventional wireless phone requires at least seven presses of five different buttons. Only two presses of a single activation button 20 are required with the phone 10 of the present invention: one press to place the call, and one press to terminate the call.

With reference to Fig. 6, the interface port 38, such as an RS232 interface, allows the processor 46 of the phone 10 to communicate with an external device. In one embodiment of the invention, the external device is a geographical locating device, such as an external GPS unit 74. In this embodiment, the GPS unit 74 provides positional coordinate data to the phone 10 by way of the interface port 38. This positional data may then be transmitted to the public or private call monitoring service to give the response personnel an exact position of the phone 10. Preferably, the GPS unit 74 communicates with the interface port 38 by way of an interface cable.

As shown in Fig. 6, the GPS unit 74 preferably includes a modular mapping card 76. The mapping card 76 is a memory device which correlates latitude/longitude coordinates, as typically provided by a GPS system, to X-Y (rectangular) coordinates in feet or miles. Preferably, the X-Y coordinates provided by the mapping card 76 are relative to some local landmark. In this manner, the

positional information that the phone 10 transmits to the call monitoring service may be more easily used by response personnel in mapping the exact position of the phone 10.

The interface port 38 is also useful in providing access to the microprocessor 48 and memory 60 for programming purposes. For example, the interface port 38 may be used to change or update the telephone number stored in the memory 60. This function is especially important since there is no keypad such as is typically used on conventional wireless phones for reprogramming purposes. As shown in Fig. 6, a phone number programming unit 78, such as a palm-top or lap-top computer, may be connected to the interface port 38 to provide commands to the processor 46 to store the telephone number to the memory 60.

One skilled in the art will appreciate the interface port 38 may also be used to update the software instructions that are executed by the processor 46 when the activation button 20 is pressed. For example, the sequence of A/B wireless system scanning as described above could be updated to take advantage of future changes in wireless service provider procedures or future FCC rulings that may affect how 911 calls are handled by service providers. Also, system parameters that are stored in the memory 60 may be updated by way of the interface port 38. For example, the A/B system preference parameter may be changed to prefer the A system channels over the B system channels, such that the A system channels are scanned first.

As shown in Fig. 5, one preferred embodiment of the invention includes a battery compartment 80. Within the battery compartment 80 are preferably four batteries 44a, 44b, 44c, and 44d, such as AAA alkaline batteries, which may comprise the power supply 44 (see Fig. 6). In addition to the advantages discussed previously, these types of batteries are preferred to power the phone 10 because they are so easy to find for purchase at most department stores, hardware stores, grocery stores, and convenience stores. In contrast, consider that conventional wireless phones require custom-sized battery packs that are typically compatible only with one model of phone. Replacement battery packs for conventional wireless phones typically may only be found at specialty stores, such as phone accessory stores or electronic supply stores. Thus, because of the relative ease in finding replacement batteries, the phone 10 offers yet another significant advantage over conventional wireless phones.

A preferred embodiment of the phone 10 includes an audible alarm or siren that alerts individuals in the immediate area that an emergency exists. Preferably, the audible alarm is activated using a portable alarm activation unit 82, such as depicted in Figs. 7 and 8. The unit 82 includes a housing 84 having a loop 86 for attaching the unit 82 to a key-ring. On the housing 84 is an alarm

button 88. As depicted in Fig. 8, when the alarm button 88 is pressed, power is provided by a power supply 92 to a radio frequency transmitter 94 within the housing 84. The transmitter 94 generates an alarm-activation signal which is transmitted via the antenna 96. Power is also provided to an indicator light 90, such as an LED, when the alarm button 88 is pressed.

With reference again to Fig. 6, the phone 10 includes a radio-frequency receiver 100 and an associated antenna 98. Upon receipt of the alarm-activation signal from the alarm activation unit 82, the receiver 100 generates an internal alarm-activation signal which is provided to the microprocessor 46. Upon receipt of the internal alarm-activation signal, the microprocessor 46 activates the audible alarm 48. As mentioned above, when activated, the audible alarm 48 generates a siren-like audio alarm signal. Preferably, the audible alarm 48 is driven by the audio driver circuit 50. The number of different sounds that could be produced by the alarm 48 is limitless, but the sound produced is preferably similar to that produced by a car alarm. In the preferred embodiment, the audible alarm is deactivated by pressing the alarm button 88 a second time for some minimum period of time, such as one second.

The foregoing description of preferred embodiments for this invention have been presented for purposes of illustration and description. They are not intended to be exhaustive or to limit the invention to the precise form disclosed. Obvious modifications or variations are possible in light of the above teachings. The embodiments are chosen and described in an effort to provide the best illustrations of the principles of the invention and its practical application, and to thereby enable one of ordinary skill in the art to utilize the invention in various embodiments and with various modifications as is suited to the particular use contemplated. All such modifications and variations are within the scope of the invention as determined by the appended claims when interpreted in accordance with the breadth to which they are fairly, legally, and equitably entitled.

CLAIMS

What is claimed is:

1. A communication apparatus for mounting in a vehicle to provide full-duplex communication between an occupant of the vehicle and personnel associated with a call monitoring service, the apparatus comprising:

a rigid housing operable for semi-permanent attachment within a recess of an occupant-accessible structure of the vehicle, the housing having a front panel accessible to the occupant of the vehicle when the housing is attached within the recess;

a wireless transmitter disposed within the housing that is operable to transmit outgoing wireless signals for establishing a full-duplex communication session only with the call monitoring service, thereby reducing or eliminating costs associated with conventional full-service wireless phone services;

a wireless receiver disposed within the housing for receiving incoming wireless signals only from the call monitoring service during the full-duplex communication session, the wireless receiver being inoperable to receive an incoming wireless telephone call; and

a wireless activation button in the front panel of the housing which, when pressed a first time, causes the electrical power to be provided to the wireless transmitter and receiver, initiates activation of the wireless receiver to search for an available wireless system channel, and initiates activation of the wireless transmitter to transmit the outgoing wireless signals to establish full-duplex wireless communication with the call monitoring service, thereby simplifying communication with the call monitoring service in a stressful situation.

2. The apparatus of claim 1 further comprising a battery compartment disposed within the housing for receiving replaceable batteries for supplying electrical power to the apparatus.

3. The apparatus of claim 1 wherein:

the rigid housing includes a retractable door movable between open and closed positions; and

the wireless activation button is accessible when the retractable door is in the open position and inaccessible when the retractable door is in the closed position, thereby preventing inadvertent activation of the apparatus when the retractable door is in the closed position.

4. The apparatus of claim 3 wherein:
the wireless activation button is recessed below the front panel; and
the retractable door is substantially flush with the front panel when in the closed position, and recessed within the housing when in the open position.

5. The apparatus of claim 1 further comprising:
an audio driver circuit for generating audio signals based upon the incoming wireless signals received by the wireless receiver;
a speaker port in the front panel of the housing; and
a speaker disposed within the housing adjacent the speaker port and electrically coupled to the audio driver circuit, the speaker for generating audible sound based upon the audio signals from the audio driver circuit.

6. The apparatus of claim 5 further comprising:
at least one volume control disposed on the front panel; and
the audio driver circuit coupled to the at least one volume control and operable to change an amplitude level of the audio signals based upon operation of the at least one volume control.

7. The apparatus of claim 1 further comprising:
a signal-check button disposed on the front panel;
the wireless receiver electrically coupled to the signal-check button and operable to scan for an available wireless signal channel when the signal-check button is pressed; and
a channel-available light disposed in the front panel for visually indicating availability of a wireless signal channel.

8. The apparatus of claim 1 further comprising an audible alarm circuit disposed within the housing for generating an audible alarm to alert individuals in the vicinity of the vehicle that an emergency situation exists.

9. The apparatus of claim 8 further comprising:
a radio-frequency remote control unit for remotely activating the audible alarm circuit, the remote control including:

a portable housing having means for attaching the portable housing to a key-ring;

a radio-frequency transmitter disposed within the portable housing for generating a radio-frequency alarm-activation signal; and

an alarm activation button disposed on the portable housing and coupled to the radio-frequency transmitter, which when pressed causes activation of the radio-frequency transmitter to generate the radio-frequency alarm-activation signal;

a radio-frequency receiver disposed within the rigid housing for receiving the radio-frequency alarm-activation signal generated by the radio-frequency transmitter and generating an internal alarm-activation signal based thereon; and

the audible alarm circuit for generating the audible alarm based upon the internal alarm-activation signal.

10. The apparatus of claim 1 further comprising:

a microprocessor disposed within the housing for controlling the apparatus based on execution of a set of operational instructions; and

the wireless activation button, when pressed a first time, causing the electrical power to be provided to the microprocessor, thereby energizing the microprocessor to begin executing the set of operational instructions.

11. The apparatus of claim 10 further comprising:

the microprocessor for controlling the wireless receiver based on execution of the set of operational instructions; and

the wireless receiver for scanning for a strongest wireless signal from among available wireless system channels based on the set of operational instructions executed by the microprocessor when the activation button is pressed.

12. The apparatus of claim 11 further comprising the microprocessor and wireless receiver for determining a strongest B system wireless signal from among wireless signals found in B system wireless channels when the activation button is pressed the first time, for determining whether the strongest B system wireless signal has a signal strength greater than a minimum threshold, and for determining a strongest A system wireless signal from among wireless signals found in A system wireless channels when the strongest B system wireless signal has a signal strength less than the minimum threshold.

13. The apparatus of claim 11 further comprising the microprocessor and wireless receiver for determining a strongest A system wireless signal from among wireless signals found in A system wireless channels when the activation button is pressed the first time, for determining whether the strongest A system wireless signal has a signal strength greater than a minimum threshold, and for determining a strongest B system wireless signal from among wireless signals found in B system wireless channels when the strongest A system wireless signal has a signal strength less than the minimum threshold.

14. The apparatus of claim 11 further comprising:
a memory device for storing a telephone number associated with the call monitoring service;
the microprocessor for accessing the telephone number from the memory device and for activating the wireless transmitter, if the signal strength of the strongest signal is greater than the minimum threshold when the activation button is pressed the first time;
the wireless transmitter for transmitting the outgoing wireless signals when activated by the microprocessor to attempt to establish wireless communication with the call monitoring service associated with the telephone number.

15. The apparatus of claim 1 further comprising the activation button for causing the apparatus to terminate communication with the call monitoring service when the wireless activation button is pressed a second time subsequent to the first time.

16. The apparatus of claim 1 further comprising a locator circuit for determining geographic coordinates of the apparatus.

17. The apparatus of claim 16 wherein the locator circuit further comprises a global positioning satellite system receiver disposed within the housing.

18. A communication apparatus for mounting in a vehicle to provide full-duplex communication between an occupant of the vehicle and personnel associated with a call monitoring service, the apparatus comprising:
a rigid housing operable for semi-permanent attachment within a recess of an occupant-accessible structure of the vehicle, the housing having:

a front panel accessible to the occupant of the vehicle when the housing is attached within the recess;

a retractable door movable between open and closed positions, the retractable door substantially flush with the front panel when in the closed position, and recessed within the housing when in the open position; and

a speaker port in the front panel of the housing;

a wireless transmitter disposed within the housing that is operable to transmit outgoing wireless signals for establishing a full-duplex communication session only with the call monitoring service, thereby reducing or eliminating costs associated with conventional full-service wireless phone services;

a wireless receiver disposed within the housing for receiving incoming wireless signals only from the call monitoring service during the full-duplex communication session, the wireless receiver being inoperable to receive an incoming wireless telephone call;

a battery compartment disposed within the housing for receiving replaceable batteries for supplying electrical power to the apparatus; and

a wireless activation button recessed below the front panel of the housing which, when pressed a first time, causes the electrical power from the batteries to be provided to the wireless transmitter and receiver, initiates activation of the wireless receiver to search for an available wireless system channel, and initiates activation of the wireless transmitter to transmit the outgoing wireless signals to establish full-duplex wireless communication with the call monitoring service, thereby simplifying communication with the call monitoring service in a stressful situation, the wireless activation button accessible when the retractable door is in the open position and inaccessible when the retractable door is in the closed position, thereby preventing inadvertent activation of the apparatus when the retractable door is in the closed position;

an audio driver circuit for generating audio signals based upon the incoming wireless signals received by the wireless receiver; and

a speaker disposed within the housing adjacent the speaker port and electrically coupled to the audio driver circuit, the speaker for generating audible sound based upon the audio signals from the audio driver circuit.

19. A communication apparatus for mounting in a vehicle to provide full-duplex communication between an occupant of the vehicle and personnel associated with a call monitoring service, the apparatus comprising:

a rigid housing operable for semi-permanent attachment within a recess of an occupant-accessible structure of the vehicle, the housing having a front panel accessible to the occupant of the vehicle when the housing is attached within the recess;

a wireless transmitter disposed within the housing that is operable to transmit outgoing wireless signals for establishing a full-duplex communication session only with the call monitoring service, thereby reducing or eliminating costs associated with conventional full-service wireless phone services;

a wireless receiver disposed within the housing for receiving incoming wireless signals only from the call monitoring service during the full-duplex communication session, the wireless receiver being inoperable to receive an incoming wireless telephone call;

a battery compartment disposed within the housing for receiving replaceable batteries for supplying electrical power to the apparatus;

a wireless activation button in the front panel of the housing which, when pressed a first time, causes the electrical power from the batteries to be provided to the wireless transmitter and receiver, initiates activation of the wireless receiver to search for an available wireless system channel, and initiates activation of the wireless transmitter to transmit the outgoing wireless signals to establish full-duplex wireless communication with the call monitoring service, thereby simplifying communication with the call monitoring service in a stressful situation;

an audible alarm circuit disposed within the housing for generating an audible alarm to alert individuals in the vicinity of the vehicle that an emergency situation exists;

a radio-frequency remote control unit for remotely activating the audible alarm circuit, the remote control including:

a portable housing having means for attaching the portable housing to a key-ring;

a radio-frequency transmitter disposed within the portable housing for generating a radio-frequency alarm-activation signal; and

an alarm activation button disposed on the portable housing and coupled to the radio-frequency transmitter, which when pressed causes activation of the radio-frequency transmitter to generate the radio-frequency alarm-activation signal;

a radio-frequency receiver disposed within the rigid housing for receiving the radio-frequency alarm-activation signal generated by the radio-frequency transmitter and generating an internal alarm-activation signal based thereon; and

the audible alarm circuit for generating the audible alarm based upon the internal alarm-activation signal.

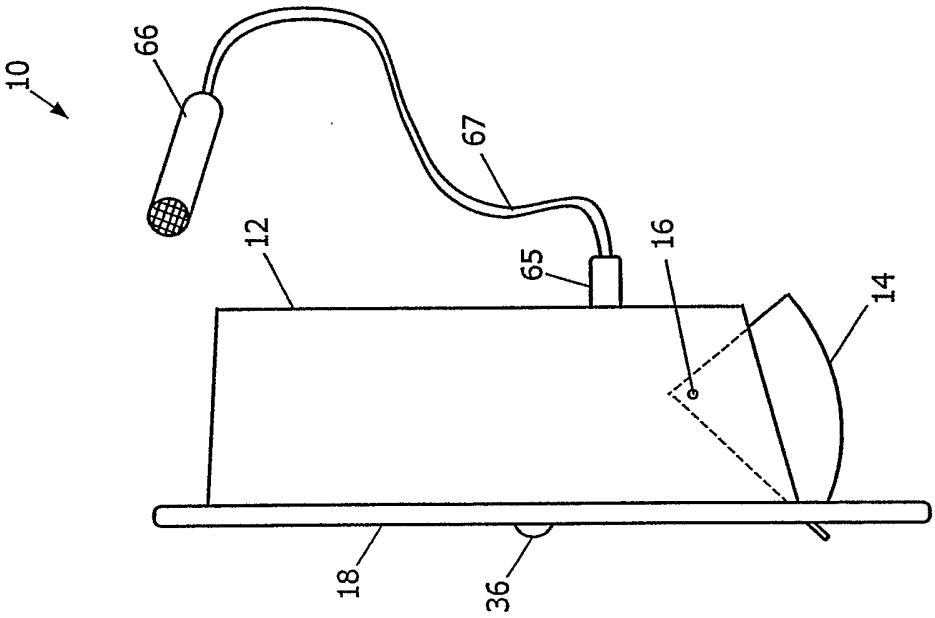

Fig. 2

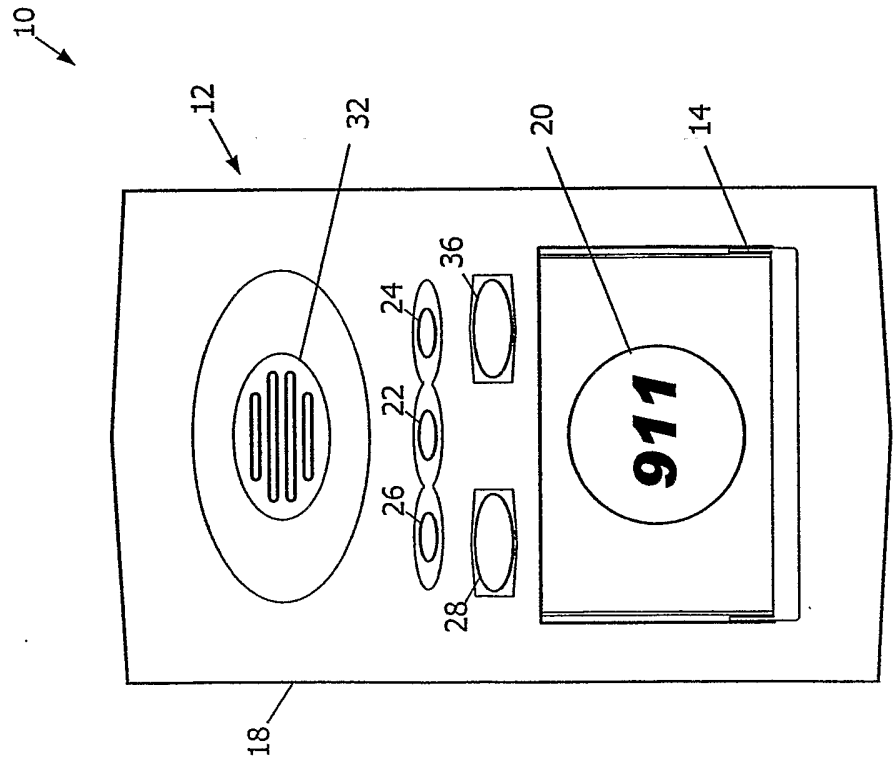

Fig. 1

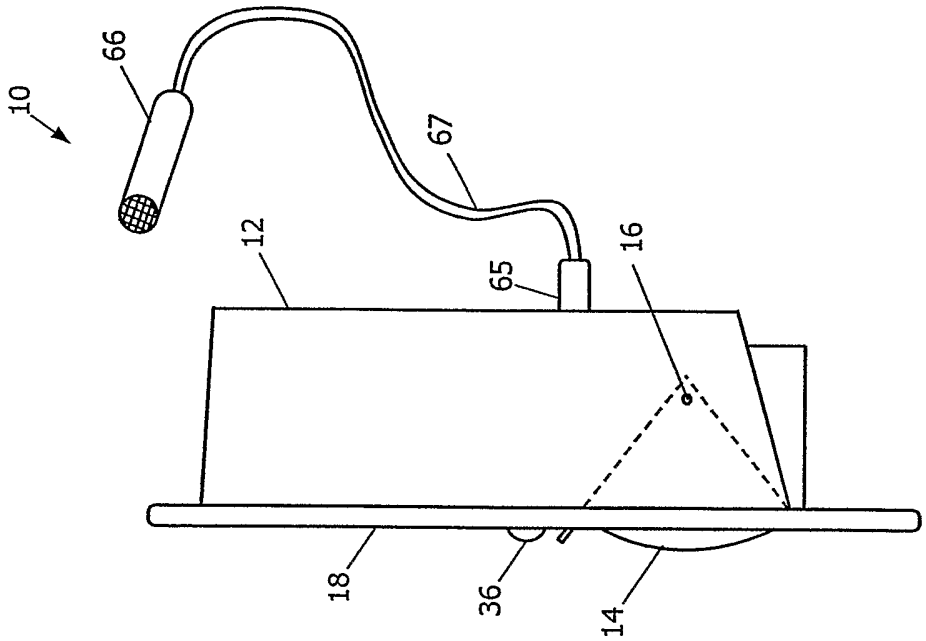

Fig. 4

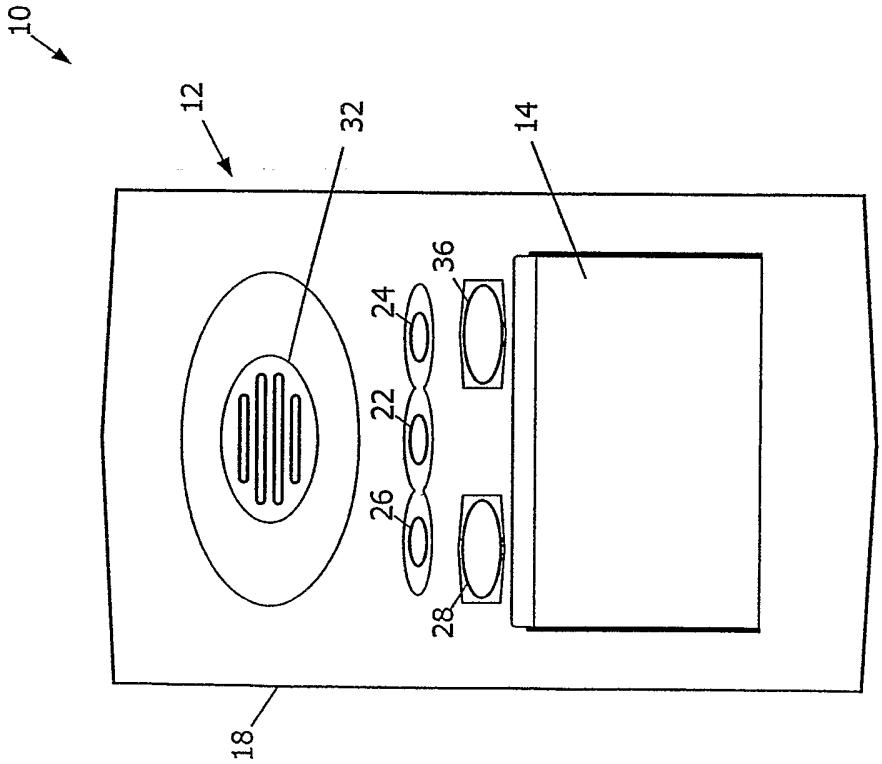

Fig. 3

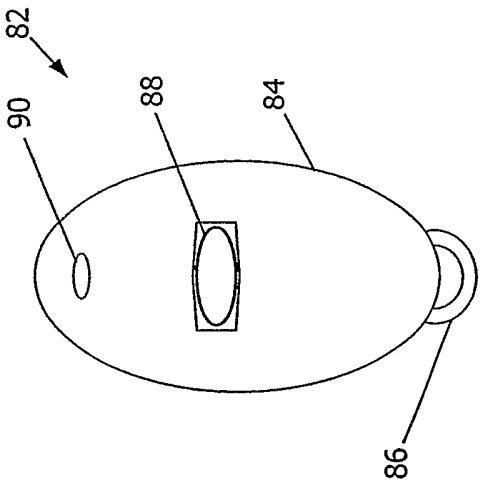

Fig. 7

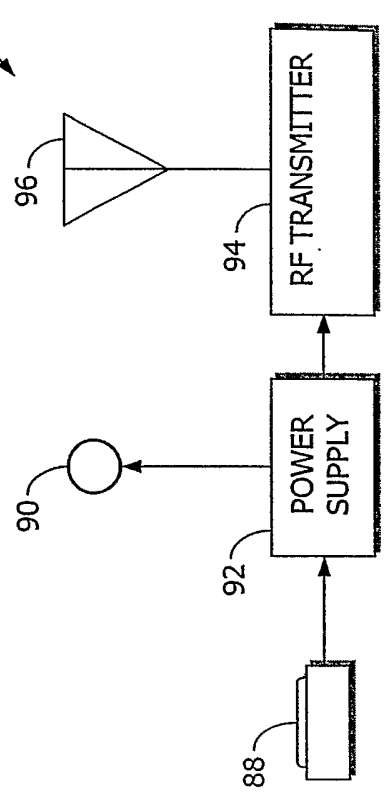

Fig. 8

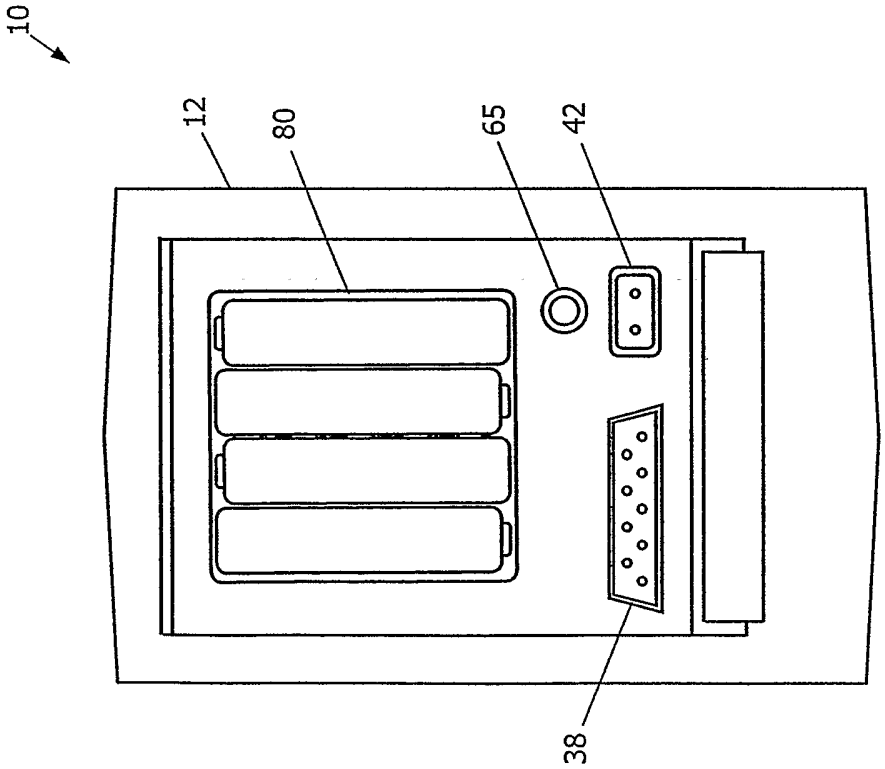

Fig. 5

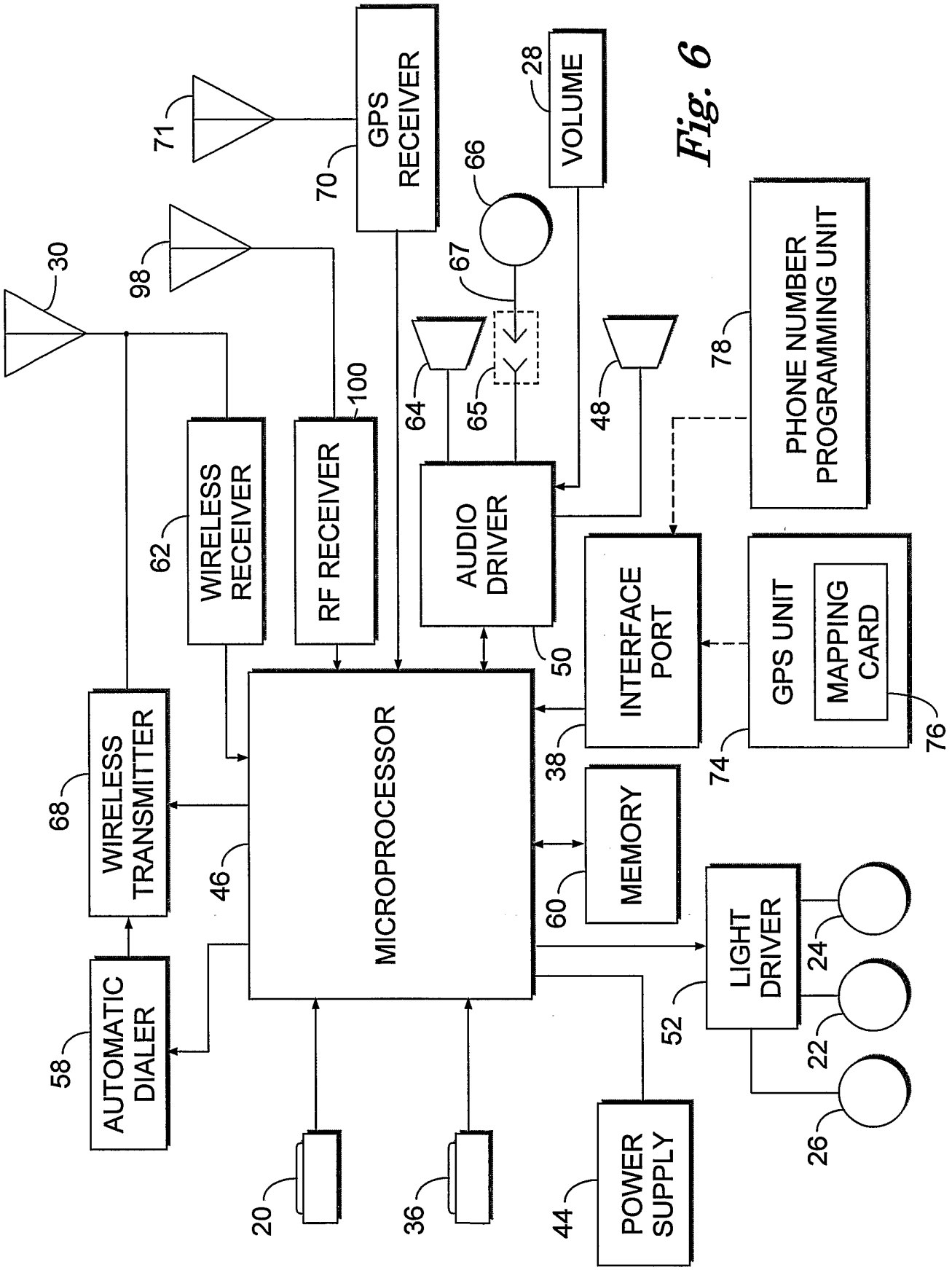
GPS RECEIVER
VOLUME
PHONE NUMBER PROGRAMMING UNIT
WIRELESS RECEIVER
RF RECEIVER
AUDIO DRIVER
INTERFACE PORT
GPS UNIT
MAPPING CARD
WIRELESS TRANSMITTER
MICROPROCESSOR
MEMORY
AUTOMATIC DIALER
LIGHT DRIVER
POWER SUPPLY
71
70
28
66
67
30
98
64
65
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Fig. 6

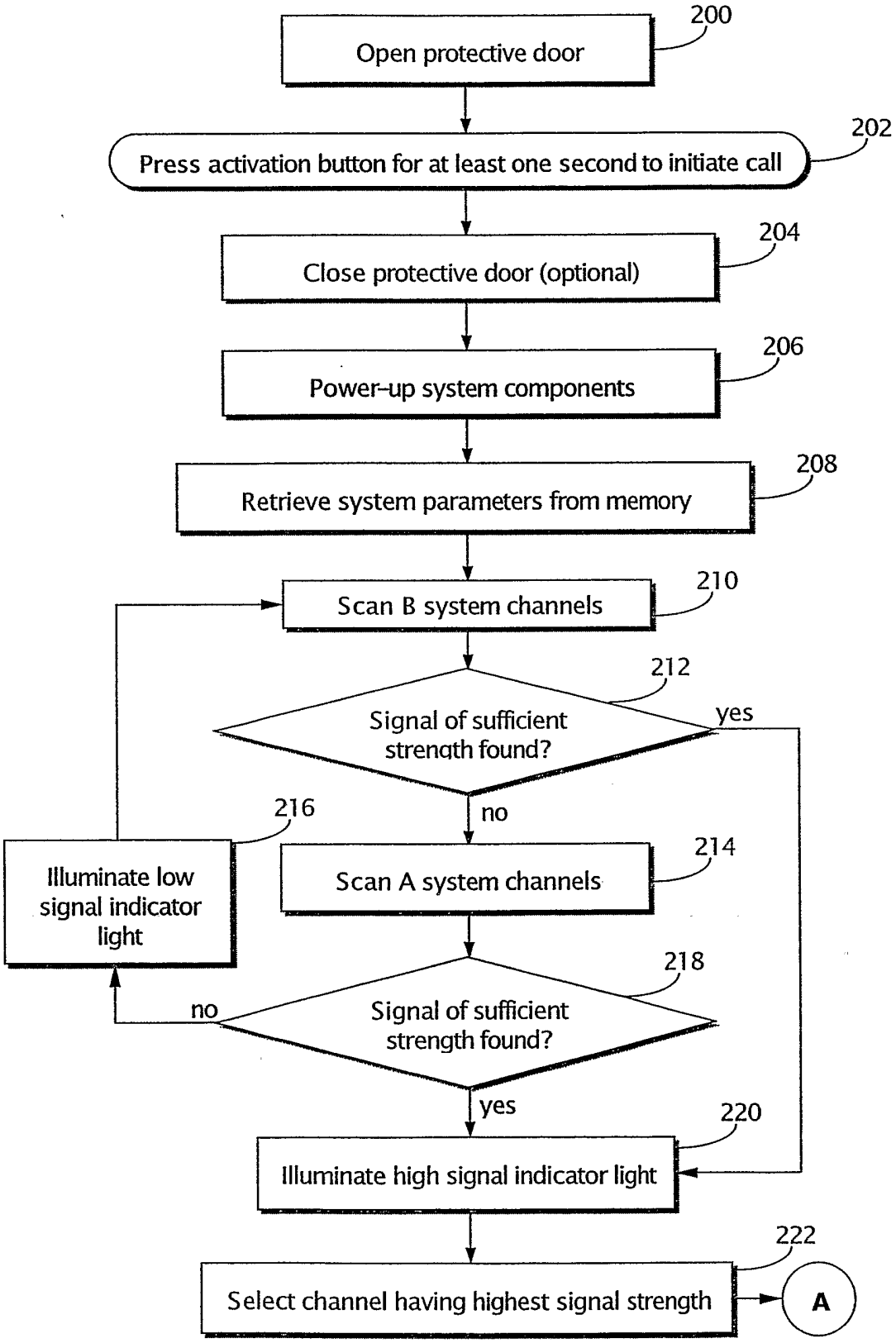
Open protective door
200
Press activation button for at least one second to initiate call
202
Close protective door (optional)
204
Power-up system components
206
Retrieve system parameters from memory
208
Scan B system channels
210
Signal of sufficient strength found?
212
yes
no
Illuminate low signal indicator light
216
Scan A system channels
214
Signal of sufficient strength found?
218
no
yes
Illuminate high signal indicator light
220
Select channel having highest signal strength
222
A

Fig. 9A

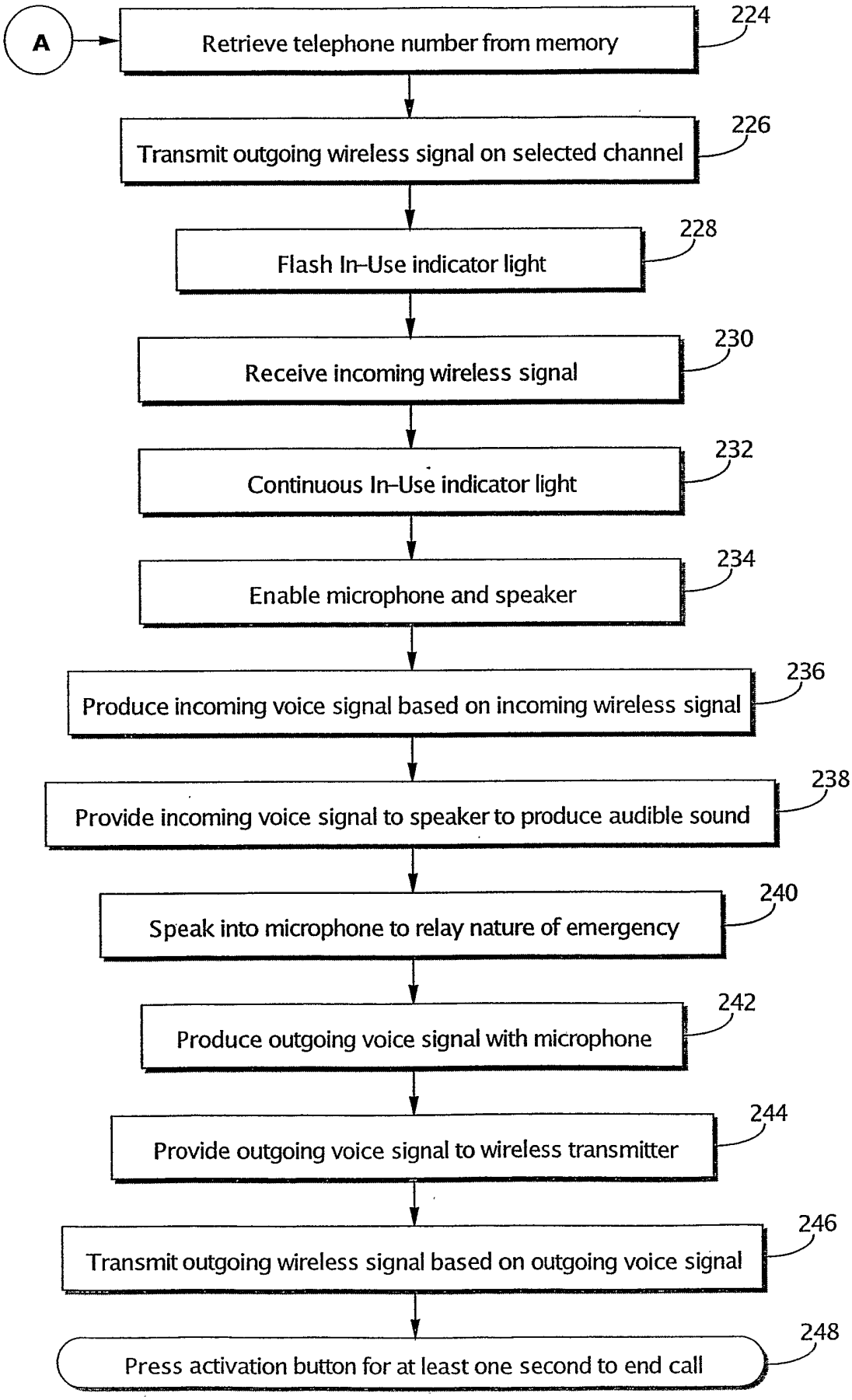
A
Retrieve telephone number from memory
224
Transmit outgoing wireless signal on selected channel
226
Flash In-Use indicator light
228
Receive incoming wireless signal
230
Continuous In-Use indicator light
232
Enable microphone and speaker
234
Produce incoming voice signal based on incoming wireless signal
236
Provide incoming voice signal to speaker to produce audible sound
238
Speak into microphone to relay nature of emergency
240
Produce outgoing voice signal with microphone
242
Provide outgoing voice signal to wireless transmitter
244
Transmit outgoing wireless signal based on outgoing voice signal
246
Press activation button for at least one second to end call
248

Fig. 9B