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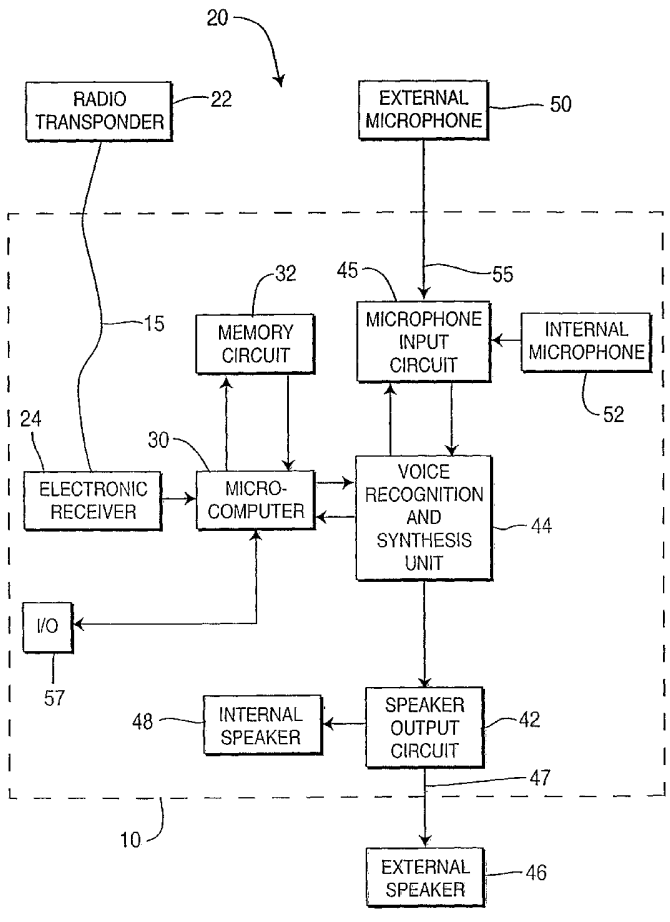
(54) Title: VOICE-CONTROLLED SECURITY SYSTEM WITH PROXIMITY DETECTION




(57) Abstract: A control system (20) for permitting voice control of at least one device (10) by at least one user includes a transponder (22) which outputs an electronic RF signal (15) which includes an identification code; an electronic receiver (24) for receiving said electronic RF signal (15) and downconverting said received RF signal (15) to output the identification code; an external microphone (50) and an internal microphone (52) for receiving an audible signal spoken by a user; an accessile memory circuit (32) for storing at least one voiceprint and a command instruction for controlling at least one function of the device (10); and a microcomputer (30) for determining whether the identification code is valid and for analyzing the audible signal to determine whether it matches the voiceprint stored in memory circuit (32). The microcomputer (30) executes the command instruction to control the function of the device (10) if a match has been found.

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*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

[0001] # VOICE-CONTROLLED SECURITY SYSTEM WITH PROXIMITY DETECTION

[0002] ## BACKGROUND

[0003] The present invention relates to security systems. In particular, the invention relates to a security device or system which incorporates both voice-control and proximity detection to provide enhanced security.

[0004] Voice recognition has been, and continues to be, developed to provide control of electronic systems using spoken commands. Spoken commands may not only facilitate easier use of a system, but also enhance the security aspects of a system. For instance, the voice pattern of the user may be part of the security system which authenticates a user's authorization for access. U.S. Patent No. 4,856,072 discloses a vehicle security system which can be voice actuated by any authorized person. In this manner, voice activated control systems are known which control various functions within an automobile.

[0005] Electronic identification devices which incorporate radio transponders are also known in the art. Transponders are generally categorized as either active or passive, based upon the power source used to power the transponder. Active transponders periodically transmit encoded data on a selected frequency to a remote receiver located on the item to which access is desired. For example, U.S. Patent No. 3,772,668 discloses a freight security system comprising a base station and active transponders, each of which include a self-contained power supply.

[0006] In contrast, for passive transponders, the RF carrier signal received from an interrogating unit is the source of operating power. Accordingly, passive transponders are not activated until they come within the vicinity of the interrogating unit. U.S. Patent No. 5,153,583 discloses a portable passive transponder having a single inductive coil for simultaneous reception and transmission of signals to and from an interrogating unit.

[0007] The security system according to the present invention increases security while eliminating the need for a key and/or a multiplicity of control buttons.

[0008] SUMMARY

[0009] The present invention is a security device or system which permits enhanced security and control using a voice signal in combination with a transponder unit. A user who desires the ability to control an object, such as an automobile, or to access and control an area, such as a building, carries a small portable radio transponder unit. The transponder unit is preferably incorporated into a plastic card, such as a credit card, but can also be incorporated in a wristband, watch, wallet or piece of jewelry. When the transponder comes within a predetermined range of a base unit located on the object to be controlled, the transponder transmits an RF signal including an identification code and interfaces with a base unit. The base unit receives the RF signal and verifies if that particular identification code is valid. If the identification code is valid, the base unit instructs the security device or system to await a vocal command.

[0010] Upon receiving a voice command, the security device or system authenticates the voice command by matching it with a voiceprint template that is previously stored. If there is a match, the device or system performs the function that was requested. For example, an authorized user may direct an automobile security system to perform various functions such as "unlock and open driver door" or "unlock and open all doors." If both the transponder signal and voice command are approved, the system will perform the function accordingly. The present invention increases security by ensuring that the transponder and voice command are authentic and are within a predefined distance from each other and the base unit.

[0011] BRIEF DESCRIPTION OF THE DRAWING(S)

[0012] Figure 1 is a block diagram of a security system according to the present invention.

[0013] Figure 2 is a flow diagram which illustrates the method of the present invention.

[0014] Figure 3 is a block diagram of the correlator.

[0015] Figure 4 is an alternative embodiment of the present invention utilizing the GPS.

[0016] Figure 5 is a flow diagram which illustrates an alternative method of the present invention.

[0017] DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

[0018] The present invention will be described with reference to the drawing Figures where like numerals represent like elements throughout.

[0019] To facilitate understanding of the present invention, the invention will be described with reference to an automobile security system 20. However, those of skill in the art realize that the teachings of the present invention are equally applicable to a security system for a building such as a residence, commercial establishment or professional office building. The present invention is also adaptable to be installed as a security device on an individual door, window, any type of machinery; any type of computer or electronic equipment; any type of recreational equipment, or even individual pad or combination locks.

[0020] A block diagram of an automobile security system 20 embodying the present invention is shown in Figure 1. A dashed line 10 graphically represents a vehicle, in which all of the components located within the area defined by the dashed line 10 are typically internal to the vehicle. The system 20 includes a portable radio transponder 22, an electronic receiver 24, a microcomputer 30 including an accessible memory circuit 32, a voice-recognition and synthesis unit 44, a microphone input circuit 45, external and internal microphones 50, 52, a speaker output circuit 42 and external and internal speakers 46, 48. The

transponder 22 continually transmits an identification signal 15 which is unique to that user or that particular transponder 22.

[0021] Although the present invention may refer to radio frequency (RF) signals, it is also applicable to any wireless medium or protocol. For example, the sections of the specification which refer to RF, could equally refer to infrared (IR), ultraviolet (UV) or any other type of electro-magnetic energy or wireless medium.

[0022] As aforementioned, there are two types of transponders: 1) active transponders; and 2) passive transponders. Active transponders include a power source such as a battery and a transmitter, and periodically transmit an identification signal. A passive transponder is inactive until it comes within a predetermined range of an activation unit. The passive transponder is activated when it receives an RF signal from an activating unit; whereupon the transponder is energized and begins to transmit an identification signal. Although the present invention is being described with reference to an active transponder, it is equally applicable to the use of a passive transponder.

[0023] When a user carrying the active transponder 22, (which continually transmits an RF signal including an identification code 15), comes within a predetermined range of the receiver 24 which is mounted on the vehicle 10, the receiver 24 receives the RF signal 15. The receiver 24 then feeds the identification code to the microcomputer 30 which processes the identification code to determine whether the identification code matches the identification data previously stored in the memory circuit 32.

[0024] Once a positive identification has been made, the microcomputer 30 generates a control signal to activate the voice recognition and synthesis unit 44. The voice recognition and synthesis unit 44, which is connected to a microphone input circuit 45 and a speaker output circuit 42, sends a signal to the microphone input circuit 45 to begin detecting all audible signals within the range of the microphone 50.

[0025] Voice commands are recognized by either an external or internal microphone 50, 52 and are input signals 55 to the microphone input circuit 45.

The microphone input circuit 45 converts the input signals 55 to digital format. The voice recognition and synthesis unit 44 then receives the digital input signal from the microphone input circuit 45 and sends it to the microcomputer 30, which analyzes the digital input signal.

[0026] The microcomputer 30 has an associated memory (not shown) which includes a plurality of "templates" for each potential spoken command as spoken by the user. Each spoken command will have at least one action for the system to initiate. For example, the template for the command "unlock driver's door" includes an entry in memory which comprises a recording of the user's voice speaking the command "unlock driver's door", which was digitized, processed and stored in memory. As those skilled in the art should realize, there are many different signal processing techniques which may be utilized to process and store a voice signal. These voice recognition and processing techniques are being increasingly used for word processing (such as Dragon Naturally Speaking and Via Voice typing software), VCR programming and in many other types of consumer applications. It is intended that the present invention be utilized in conjunction with any current or future type of voice recognition. Accordingly, a voiceprint template in digital format for the words "unlock driver's door" as spoken by the user is stored in memory.

[0027] The system 20 permits errors in the commands within a predetermined tolerance. The system 20 is configurable to tailor the spoken commands particularly to a single user's voice, may be programmed for several or many users, or may include a large error tolerance such that it is generalized to any person's spoken commands. If a particular command is not tailored to a specific user's voice, the received voice command voiceprint template stored in memory will permit a greater degree of error than with the templates which are customized to a particular user's voice.

TABLE 1

| COLUMN | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ROW | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | | VOICE COMMAND | SECURITY LEVEL | USER | VOICEPRINT TEMPLATE | ENABLED | ACTION | HIERARCHY |
| | 1 | Unlock Driver's Door | 1 | Richard | 01101111... | Yes | Unlock Door | 1 |
| | | | | Victoria | 01110110... | Yes | Unlock Door | 2 |
| | 2 | Turn On Stereo | 2 | Richard | 10101110... | Yes | Turn On 1060 AM Volume Setting 2 | 1 |
| | | | | Victoria | 11011011... | Yes | Turn On 100.3 FM Max Volume | 2 |
| | 3 | Turn Off Stereo | 10 | Richard | 11101110... | Yes | Turn Off | 1 |
| | | | | Victoria | 01101110... | Yes | Turn Off | 2 |
| | 4 | Turn On Wipers Low | 10 | Richard | 11111000... | Yes | Turn On Setting 3 | 1 |
| | | | | Victoria | 10101010... | No | XXXX | X |
| | 5 | Turn On Wipers High | 10 | Richard | 10111110... | Yes | Turn On Setting 9 | 1 |
| | | | | Victoria | 10100001... | No | XXXX | X |
| | 6 | Sunny Day | 5 | Richard | 10111011... | Yes | 1) Open All Windows 2) Open Sunroof 3) Turn On Stereo To 100.3FM Max Volume 4) Turn On Fan High | 1 |

[0028] Table 1 shows the voiceprint templates as stored in memory. As shown, each voice command is associated with at least six additional fields of information as shown by columns 2-7 in Table 1: security level, user, voiceprint template, enabled, action, hierarchy. For example, if the voice command is "unlock driver's door", as shown in column 1, row 1 there are two associated voiceprint templates as shown in column 4, row 1. The first template is associated with the user Richard, and the second template is associated with the user Victoria. In this example, Richard and Victoria can each create their own

voiceprint template by speaking the command "unlock driver's door" into the internal or external microphones 50, 52. This information is processed as described hereinbefore and stored in memory as a voiceprint template.

[0029] The user may also customize the particular action associated with the voice command. As shown in column 6, row 1, the only action associated with "unlock driver's door" is to unlock the door. In a second example, however, for the voice command "turn on stereo" the user Richard has customized the action associated with turning on the stereo to the following: turn on 1060 am, volume setting 2. In contrast, the user Victoria has customized the action associated with her voiceprint template for turn on stereo to: turn on 100.3 fm, max volume. In this manner, each voice command is customized in accordance with the user's specific requirements.

[0030] There may be situations where different users' commands may conflict. In the aforementioned example regarding turning on the stereo, the actions associated with the voice command "turn on stereo" as shown in column 6 conflict regarding both the station selection and the volume setting. In this case, the hierarchy field shown in column 7 gives priority to the user Richard. The user Victoria has second priority. If additional users were specified, they can in turn have their own priority under the hierarchy.

[0031] The security level column, shown as column 2, permits the system 20 to accept varying thresholds for voiceprint template identification. This enables certain voice commands to have a higher level of security than other commands. For example, the voice command "unlock driver's door" has a security level of 1, indicating that it is a highly secure function. For a higher security level, the threshold for voiceprint template identification will be extremely high; i.e., the voiceprint template must be highly correlated with the received voice command. However, other voice commands may have lower security levels. For some commands such as "turn on wipers low" or "turn on wipers high", a security level of 10 permits an almost "generic" user to perform the command. This is a particularly useful feature, such as when valet personnel require access to

certain functions and have not previously entered a voiceprint template into the system 20. It should be noted that, as shown in row 5 for the voice command "turn on wipers high", although a "generic" user may operate the wipers, the system 20 may detect the voiceprint template for Victoria and refuse to grant access to that command since the enabling feature shown in column 5 is "no". This will "lock out" the user Victoria and keep the user Victoria from performing that particular command. A user with a higher hierarchy can modify, override or disable any commands executed by a user with a lower hierarchy.

[0032] In the same manner, the system 20 may be utilized to create certain "mood" voice commands. For example, as shown in row 6, the user Richard may create a "sunny day" voice command with a plurality of associated actions to be undertaken by the system 20, such as:

1) open all windows;
2) open sun roof;
3) turn on stereo to 100.3 fm, max volume; and
4) turn on fan high.

In this matter, the system 20 may be customizable for any type of mood, weather or driving condition, and may also be tailored to plurality of individual users in a predetermined hierarchical basis.

[0033] Referring to Figure 3, the voiceprint template correlator 100 is shown. The correlator 100 is executed via the microcomputer 30 and the associated memory 32, (shown in Figure 1), and includes a bitwise XNOR 106, an adder 108 a comparator 110 and a register 112. The voiceprint template 104 is compared to the received voiceprint 102 in a bitwise XNOR 106. The bitwise XNOR 106 compares a received voiceprint 102 to the voiceprint template 104 on a bit-by-bit basis. Each bit match is output as a logical one, and each bit mismatch is output as a logical zero. The adder 108 adds up all of the matching bits and the comparator 110 compares the total number of matching bits to a threshold stored in the register 112. If the total number of matching bits exceeds the threshold as output by the register 112, a "hit" is registered and the received

voiceprint 102 is considered to be the same as the voiceprint template 104. If the total number of matching bits is less than the threshold, a "miss" is output and the received voiceprint 102 is considered not to be the same as the voiceprint template 104. As aforementioned, the threshold set in register 112 is variable depending upon the security level shown in column 2 of Table 1. Although a specific correlator 100 is shown in Figure 3, it should be recognized that there are many types of correlators and comparators that perform the same type of function which are known to those skilled in the art. The correlator 100 as shown in Figure 3 is intended to be illustrative and not exclusive.

[0034] All received voice commands are analyzed to determine whether they correspond to one of the voiceprint templates stored in memory. If there is no match, the system 20 will prompt the user to reinput the voice command by re-speaking the command. Once a predetermined number of attempts has been permitted, the system 20 will enter a "safe mode" and will refuse to accept any more voice commands for a predetermined period of time, which may be set by an authorized user upon initial system setup.

[0035] If the voice command corresponds to a selected one of the voiceprint templates stored in the memory circuit 32, the microcomputer 30 generates a control signal to the voice recognition and synthesis unit 44. The voice recognition and synthesis unit 44 provides a digital output signal to the speaker output circuit 42, which converts the digital output signal to an audible output signal and supplies the output instruction signal 47 to the external or internal speakers 46, 48. These speakers 46, 48 generate alarm signals as well as audible announcements to inform the user of the present operating status of the automobile security system 20. Additionally, the microcomputer 30 implements the actions associated with the particular voiceprint template via the input/out (I/O) interface 57. The I/O interface 57 interfaces with many of the vehicles electrical and electro-mechanical systems to implement the associated actions. In such a manner, the system 20 may confirm that the instruction contained

within the voice command is being carried out, or whether additional security information or clarification is necessary.

[0036] Voice commands can be used in this manner to control the functions of the vehicle. The functions include turning the ignition switch on/off, locking/unlocking doors, opening/closing (i.e. power) doors and windows, controlling turn signals, hazard lights, head lights, parking lights, interior lights, horn, radio (on, off, scan, set and other specific settings), defroster, temperature controls, wipers (including variable speeds), mirrors and all other basic functions of a vehicle. The system also permits voice activation or deactivation of the alarm system.

[0037] The transponder 22 and receiver 24 are also capable of using various platforms including, but not limited to, Bluetooth technology. A security system equipped with a Bluetooth radio establishes instant connection to another Bluetooth radio as soon as it comes into range. Since the Bluetooth technology supports both point-to-point and point-to-multipoint connections, several piconets can be established and linked together ad hoc. Bluetooth topology is best described as a multiple piconet structure. Using a technology such as Bluetooth allows transponders 22 and receivers 24 to communicate through other transponders 22 and receivers 24 (i.e. repeaters).

[0038] Optionally, the system 20 may allow the processing of the transponder signal 15 and voice command simultaneously. When both the transponder signal 15 and voice command are approved, the system 20 will perform the function being requested.

[0039] It is to be emphasized that the vehicle security application depicted in Figure 1 is only exemplary of one of the many and varied applications with which the present invention may be used. For instance, the present invention can permit a user in a work environment to have access through locked doors, cabinets or computers, etc. Another use of this system 20 can be for hotels, whereby a guest can be given a plastic card having a transponder 22. The voice of the guest can be programmed at the front desk, upon registration such that the

guest can open the door to selective hotel rooms. Further, various functions inside the hotel room may also be voice-controlled. This security system of the present invention can also secure electronic and other equipment, if a user's voice and identification data contained in the transponder unit have been pre-programmed. For instance, in order to use phones, computers other electronic devices, or have access to various web sites, the transponder 22 can include a memory and these devices can be programmed into the transponder 22 along with the user's voice. This permits one to use the particular electronic device or surf the web using their voice, and the transponder 22 can control the access.

[0040] Referring to Figure 2, a method of voice-controlling a security system with a proximity detector is described in accordance with the present invention. The method includes the steps of: positioning a radio transponder within a predetermined range from the activation unit (step 200); detecting an RF signal generated by the radio transponder including the identification code (step 201); verifying if the identification code detected is the identification code assigned to an authorized transponder (step 202); detecting all audible signals within range of the activation unit (step 203); converting the audible signal to a digital signal (step 204); verifying if the digital signal matches that of an authorized user (step 205); generating a digital instruction signal (step 206); and converting the digital instruction signal to an audible instruction signal (step 207).

[0041] An alternative embodiment 201 of the present invention is shown in Figure 4. This embodiment is similar to the embodiment shown in Figure 1, except that the radio transponder 122 includes a GPS locator 158 and the vehicle includes a GPS receiver 160 and a detector 162, which have outputs fed to the microcomputer 30. In this embodiment, the transponder 122 also sends a location signal to the receiver 24 as output by the GPS receiver 158. The microcomputer 30 also receives a signal from the onboard GPS receiver 160. The detector 162 detects the location of a user. Although the user and the transponder 122 are generally intended to be co-located, i.e., the transponder 122

is within the possession of the user, this may not necessarily be the case. Accordingly, the system 201 determines with precise accuracy where the transponder 22 is located and where the user is located. The detector 162 may utilize infrared, microwave, radar or any other known or future systems for locating objects, or detecting the proximity of one object to another object. If both the user and the transponder 122 are within a predetermined distance from each other, the microcomputer 30 proceeds with the authentication process as previously described hereinbefore. This provides an extra level of security.

[0042] The transponder 122 can also be programmed to advise the security device or system of the exact location of the transponder 122 and the distance between the origin of the voice command and the transponder 122. For example, if the security system 201 described above can require that the user must be in the driver's seat to activate those controls that pertain to operating the vehicle, then the commands spoken by the user will be valid only when the user is positioned in the driver's seat. In other words, the system validates that the transponder 122 is located at an exact location within the "driver's space" and then confirms the voice command is "X" distance (in a predefined range) from the transponder 122, calculating that it is also within the driver's space.

[0043] Reiterating, the microcomputer 30 may not permit certain actions to be taken depending upon the location of the transponder 122 and the proximity of the user. For example, the microcomputer 30 may refuse to engage the transmission from "park" to "drive" until the transponder 122 and the user are both in the "driver's space". In the same manner, if the vehicle is in motion, the microcomputer will disallow an otherwise authorized voice command to open the doors.

[0044] The present invention may take the place of existing remote keyless entry systems whereby a button on a keyfob may be depressed and then the voice command entered into a speaker located on the keyfob. This provides certain functions, such as those performed by the microphone, within the keyfob rather than within the vehicle. In this manner, a user may from a distance, for example

in inclement weather, start up the car, turn on the windshield wipers, set the rear defroster on, and set the heat for 80°.

[0045] As aforementioned, although the present invention was described with reference to a vehicle, it should be recognized that this is equally applicable to any other individually controllable items. For example, the components shown in Figures 1 or 4 may not be located and interfaced with a vehicle, but rather they may comprise a security system for a computer, a robot, or any electrical, electronic or electro-mechanical device. Additionally, the system of the present invention may comprise a stand-alone control system which is coupled via an interface to a computer, electrical, electronic or electro-mechanical system; or may be fully integrated into such systems, thereby providing the same functionality without being a separate entity.

[0046] This system, if combined or integrated with any network system or computer using a standardized or uniform interface, can also transmit an encrypted user password (or passwords). Accordingly, this not only identifies the user, but by providing the password (or passwords), allows the network or computer system to automatically log in the user (when they arrive) and set the level of access being provided to that particular user. The system also automatically logs out the user when they depart. In this manner, the I/O interface 57 may interface with a computer system either electro-mechanically or via software. The particular levels of security may permit or restrict access to the computer, or even access to certain websites. These security levels and specific actions were implemented and described with reference to Table 1.

[0047] If the present invention is utilized with the doors and windows of a residence or a business, the invention may be embodied in a complete "system" whereby all of the security of the windows and doors is centrally located. In contrast, each window and door may include a separate security device as shown in Figures 1 and 4. In this manner, each window and door is preprogramable to receive the user's voiceprint templates. Upon initially setting up the security of each individual window and door, a security system may record an individual's

voice command, and then replay those voice commands to each individual security device. These voiceprint templates can also be stored in the central files of the security company for even greater identification levels.

[0048] An alternative method of voice-controlling a security system with a proximity detector and GPS locating is described in Figure 5. The method includes the steps of: positioning a radio transponder within a predetermined range from the activation unit (step 600); detecting an RF signal generated by the radio transponder including the identification code and location (step 601); verifying if the identification code detected is the identification code assigned to an authorized transponder (step 602); detecting all audible signals within range of the activation unit (step 603); converting the audible signal to a digital signal (step 604); verifying if the digital signal matches that of an authorized user and validating that transponder, and voice are within a predefined distance from each other and the receiver for the requested function (step 605); generating a digital instruction contained within the voice command is being carried out, or whether additional security information or clarification is necessary.

[0049] In an alternative embodiment of the present invention, systems 20 and/or 201 can act as a smart virtual assistant, using artificial intelligence to interact with and/or provide services and support to each user in control of a transponder.

[0050] In a manner well known in the art, in accordance with this embodiment of the present invention, artificial intelligence is programmed into the memory 32 and microcomputer 30 of systems 20 and/or 201. Artificial intelligence provides the systems with the ability to receive, interpret and respond to complex commands and requests from a user. Artificial intelligence systems are known that enable a user to request, and systems to provide, numerous complex functions, for example but not limited to booking airline tickets for a user's upcoming vacation, including finding and booking the best fare, browsing the Web for a specific product or service within a specific price

range, tracking packages to ensure they arrive on time or order another item should a critical product or service be delayed.

[0051] Artificial Intelligence Enterprises N.V. (Ai), for example and without limitation, is one company that is developing systems with extensive artificial intelligence capabilities. They are using cutting-edge mathematical and cognitive theories and techniques. Ai's technology will be able to conduct a conversation that is not discernable from a conversation with a human being.

[0052] Using known artificial intelligence techniques, the systems 20, 201 of the present invention can perform numerous other tasks such as maintaining a schedule, taking phone calls, typing dictated memos, receiving charges from 3rd party systems, (such as a car at a gas station or going thru a toll booth), and authorizing payment via a credit or debit card or requesting authorization by the user to pay, etc. Systems incorporating artificial intelligence do not have to wait for a user command. Rather, they can be proactive in initiating a request or action as long as a user is in control of a transponder. A multitude of applications, supported by artificial intelligence as incorporated in the systems of the present invention, too numerous to set out herein, will now occur to those skilled in the art.

[0053] In accordance with another embodiment of the present invention, one or more transponders 22 and/or 122 can constitute the controlling or master transponder, operable to allow new transponders to be added to the system. When new transponders are added, the user in possession of the master transponder can select from various options, chosen verbally or thru a graphic user interface, relating to the functionality of a newly added transponder. Once a new transponder is programmed, the system may require the user of that particular transponder to walk thru selected commands or other voice prompts to obtain the voiceprints of the user and to refine the commands with respect to what function the system is to perform when each command is spoken. Optionally, the system may initiate questions using the user's response to refine

each command in real time and may parse the user's answers to create the voiceprint templates for future reference and command execution.

[0054] In another embodiment of the system, different voices and different personalities may be used by systems 20 and/or 201, depending on which transponder is present and which user is speaking. These different voices and personalities may be identified by, and respond to, specific names. This allows the system to represent itself differently to each user. For example, the system may be setup to have a "motherly" or a " fatherly" voice and/or personality for a child. The system may be set up to simulate another user's voice. As an alternative, the system can have an attractive male or female voice. The system can be programmed to evidence one or more moods, (i.e. be grumpy, sad, happy, etc). A master transponder operator may be able to speak to or elicit multiple system voices and /or identities by speaking their name(s).

[0055] In yet another embodiment of the invention, when a plurality of transponders are present, the system may respond to a command with questions eliciting clarification of a user's command. For example, if the command spoken by a user is "Open door", the system responds by asking which door is to be opened or if more than one door is to be opened. If a child with a transponder is detected getting into a car, the system may ask the user with the master transponder, (or otherwise determined highest hierarchy), if that user wants any other doors opened; or it may ask the child with the transponder which door she wants opened. The system can retain previous results to user answers and can respond to future commands in a similar fashion based upon which transponders/users are present. The system can retain and record previous conversations. The system may summarize or replay conversations to the user in possession of a master transponder.

[0056] In yet another embodiment of the invention, the system may interface with other systems and/or modules. The system may modify or change its standard operating procedure based upon detectable variations in circumstances. For example, a system contained in a vehicle with a power door

and door sensor device may determine through the operation of the door sensor device that the door can only be opened a limited distance before it strikes an object. In this embodiment of the invention, the power door is only opened as far as the sensor permits, with the system optionally informing the user of these circumstances.

[0057] In another embodiment of the invention, a transponder 22 and/or 122 contains memory. A system 20 and/or 201 sends information back to a transponder memory. For example and without limitation, the system may modify the password or identifying information associated with the system and/or a transponder and may send this updated information to the transponder. The system may update the transponder so that it can retain and replay previous recorded conversations or commands made by one or more users. One significant benefit provided by this embodiment of the invention is that by updating a transponder the system can create an appearance of continuity between locations. For example, if multiple such systems were installed on a laptop, car, house and office, the user can have a conversation with the system anytime the user is within a detectable distance from each of these locations or items. The transponder sends the previous conversation to the system at each of these locations or items, thereby updating the system "on the fly" so that there is a seamless transparency or continuity between a user and the multiple systems.

* * *

# CLAIMS

What is claimed is:

1. A control system for permitting voice control of at least one device by at least a first user, the system comprising:

a transponder unit for outputting an electronic signal including an identification code;

an electronic receiver for receiving said electronic signal and downconverting said received signal to output said identification code;

a microphone for receiving a first audible signal spoken by said first user, said first audible signal being specific to said first user and corresponding to at least one function of said at least one device;

a memory for storing at least one voiceprint and a command instruction for controlling said at least one function of said at least one device; and

a microprocessor for determining whether said identification code is valid and, if said identification code is valid, for analyzing said first audible signal to determine whether it matches said at least one voiceprint stored in memory, and for executing said command instruction to control said at least one function of said at least one device if a match has been found.

2. The control system of claim 1, wherein said electronic signal is an RF signal.

3. The control system of claim 1, wherein said microphone is located on said transponder.

4. The control system of claim 1, further including a detection unit, for detecting the location of said first user.

5. The control system of claim 4, wherein said microprocessor executes said command instruction only after detecting the location of the user.

6. The control system of claim 4, wherein the microprocessor executes said command instruction if it detects that the user is in a first location, and does not execute said command instruction if it detects the user is in a second location.

7. The control system of claim 1, wherein said associated command instruction has a predetermined security level, and said microprocessor uses said security level during said analysis.

8. The control system of claim 7, wherein if said predetermined security level is high, said audible signal must match said voiceprint to a high degree.

9. The control system of claim 1, wherein said first audible signal corresponds to a plurality of functions of said at least one device, and wherein said functions are selected by said user.

10. The control system of claim 1, wherein said first audible signal corresponds to a plurality of functions of a plurality of devices.

11. The control system of claim 1, further comprising a speaker, and wherein said microprocessor provides a signal to said speaker to audibly inform the user of the status of the system.

12. The control system of claim 1, wherein said audible signal includes a password, and said microprocessor compares said password to a password stored in memory.

13. The control system of claim 12, wherein said password is encrypted and said microprocessor decrypts said password.

14. The control system of claim 1, wherein said at least one device is a cell phone.

15. The control system of claim 1, wherein said at least one device is a computer.

16. The control system of claim 1, wherein said at least one device is an electronic lock.

17. The control system of claim 1, wherein said at least one device is a computer access to a website.

18. The control system of claim 1, wherein said memory stores artificial intelligence instructions operable by said microprocessor, and whereby said control system provides an artificial intelligence interface to said first user.

19. The control system of claim 18, wherein said artificial intelligence interface is operative to receive complex instructions from said first user and to interact with a third-party in accordance with said complex instructions.

20. The control system of claim 1 wherein:

said first transponder unit is a master transponder unit operative to control one or more secondary transponder units; and

said control system further includes at least one secondary transponder unit including at least one function controllable by said master transponder unit.

21. The control system of claim 11 wherein:

said control system stores a plurality of voice signals operable through said speaker, each of said plurality of voice signals representative of a corresponding personality; and

said signal comprises a selected one of said plurality of voices.

22. The control system of claim 21 wherein the selected voice varies for different users of said control system.

23. The control system of claim 1 wherein said microprocessor is further operative to:

elicit, prior to executing said command instruction, clarification of the command instruction from the user; and

execute said command instruction in accordance with the clarification.

24. The control system of claim 23 wherein said microprocessor elicits clarification through the steps of generating a query audible by said user and receiving an audible answer to said query through said microphone.

25. The control system of claim 1 wherein said microprocessor is further operative to:

in cooperation with the execution of said command instruction, receive input from at least one electronic sensor relating to the execution of said command instruction; and

executing said command instruction in accordance with said input from said electronic sensor.

26. The control system of claim 1 wherein:

said transponder unit includes portable memory contained therein; said portable memory storing data usable by other systems operable by said first user.

27. The control system of claim 11 wherein said microprocessor performs the steps of operating said microphone to record audio signals and operating said speaker to replay said audio signals.

28. A control system for permitting voice control of at least one device by at least a first user, the system comprising:

a microphone for receiving a first audible signal spoken by said first user, said first audible signal being specific to said first user and corresponding to at least one function of said at least one device;

a radio transponder unit for receiving said audible signal and for outputting an RF signal including an identification code and said audible signal;

an electronic receiver for receiving said RF signal and downconverting said received signal to output said identification code and said audible signal;

a memory for storing at least one voiceprint of said first user and an associated command instruction for controlling said at least one function of said at least one device; and

a microprocessor for determining whether said identification code is valid and, if said identification code is valid, for analyzing said first audible signal to determine whether it matches said at least one voiceprint stored in memory, and for executing said command instruction to control said at least one function of said at least one device if a match has been found.

29. A vehicle, comprising:

at least one device affecting the operation of said vehicle;

a control system for permitting voice control of said at least one device;

a transponder unit for outputting a signal including an identification code;

a receiver for receiving said signal and downconverting said received signal to output said identification code;

a microphone for receiving a first audible signal spoken by said first user, said first audible signal being specific to said first user and corresponding to at least one function of said at least one device;

a memory for storing at least one voiceprint and a command instruction for controlling said at least one function of said at least one device; and

a microprocessor for determining whether said identification code is valid and, if said identification code is valid, for analyzing said first audible signal to determine whether it matches said at least one voiceprint stored in memory, and

for executing said command instruction to control said at least one function of said at least one device if a match has been found.

30. The control system of claim 29, further including a detection unit, for detecting the location of said first user.

31. The control system of claim 30, wherein said microprocessor executes said command only after detecting the location of the user.

32. The control system of claim 31, wherein said microprocessor executes said command instruction if it detects that the user is in a first location, and does not execute said command instruction if it detects the user is in a second location.

33. The control system of claim 29, wherein said associated command instruction has a predetermined security level, and said microprocessor uses said security level during said analysis.

34. The control system of claim 33, wherein if said predetermined security level is high, said audible signal must match said voiceprint to a high degree.

35. The vehicle of claim 29, wherein said memory stores artificial intelligence instructions operable by said microprocessor to provide an artificial intelligence interface to said first user.

36. The control system of claim 35, wherein said artificial intelligence interface is operative to receive complex instructions from said first user and to interact with a third-party in accordance with said complex instructions.

37. The control system of claim 29 wherein:

said transponder unit is a master transponder unit operative to control one or more secondary transponder units; and

said control system further includes at least one secondary transponder unit including at least one function controllable by said master transponder unit.

38. The control system of claim 29 wherein:

said vehicle further includes a speaker;

said memory stores a plurality of voice signals operable by said microprocessor through said speaker, each of said plurality of voice signals representative of a corresponding personality; and

said signal comprises a selected one of said plurality of voices.

39. The control system of claim 38, wherein the selected voice varies for different users of said vehicle.

40. The control system of claim 29, wherein said microprocessor is further operative to:

elicit, prior to executing said command instruction, clarification of the command instruction from the user; and

execute said command instruction in accordance with the clarification.

41. The control system of claim 40, wherein said microprocessor elicits clarification through the steps of generating a query audible by said user and receiving an audible answer to said query through said microphone.

42. The control system of claim 29, wherein said microprocessor is further operative to:

in cooperation with the execution of said command instruction, receive input from at least one electronic sensor relating to the execution of said command instruction; and

execute said command instruction in accordance with said input from said electronic sensor.

43. The control system of claim 29, wherein:

said transponder unit includes portable memory contained therein; said portable memory storing data usable by other systems operable by said first user.

44. The control system of claim 29, wherein the vehicle further includes a speaker, and said microprocessor is further operative to perform the steps of:

operating said microphone to record audio; and

operating said speaker to replay said audio.

45. A process for operating a vehicle, comprising:

carrying by a first user a radio transponder unit into the vicinity of said vehicle, said radio transponder outputting a signal which includes an identification code recognizable by a receiver in said vehicle;

vocalizing by said first user a spoken signal into a microphone within said vehicle, said spoken signal being specific to said first user and operative with said identification code to control at least one function of at least one device associated with the operation of said vehicle; and

operating said vehicle in a manner responsive to said at least one function of said at least one device.

46. A method for permitting voice control of at least one device by at least a first user, the method comprising:

receiving an electronic signal including an identification code;

downconverting said received signal to output said identification code;

receiving a first audible signal spoken by said first user, said first audible signal being specific to said first user and corresponding to at least one function of said at least one device;

determining whether said identification code is valid;

analyzing, if said identification code is valid, said first audible signal to determine whether it matches at least one voiceprint stored in memory; and

executing, if said first audible signal matches at least one voiceprint stored in memory, a command instruction to control at least one function of at least one device.

47. The method of claim 46, further including the steps of:

detecting the location of said first user; and

executing said command instruction only after detecting the location of the user.

48. The method of claim 47, wherein the step of executing the command instruction is performed only if the user is in a first location, and not if the user is in a second location.

49. The method of claim 46, and further including the steps of:

determining a predetermined security level; if said predetermined security level is high, executing said command instruction if said audible signal matches said voiceprint to a high degree; and if said predetermined security level is low, executing said command instruction if said audible signal matches said voiceprint to at least a low degree.

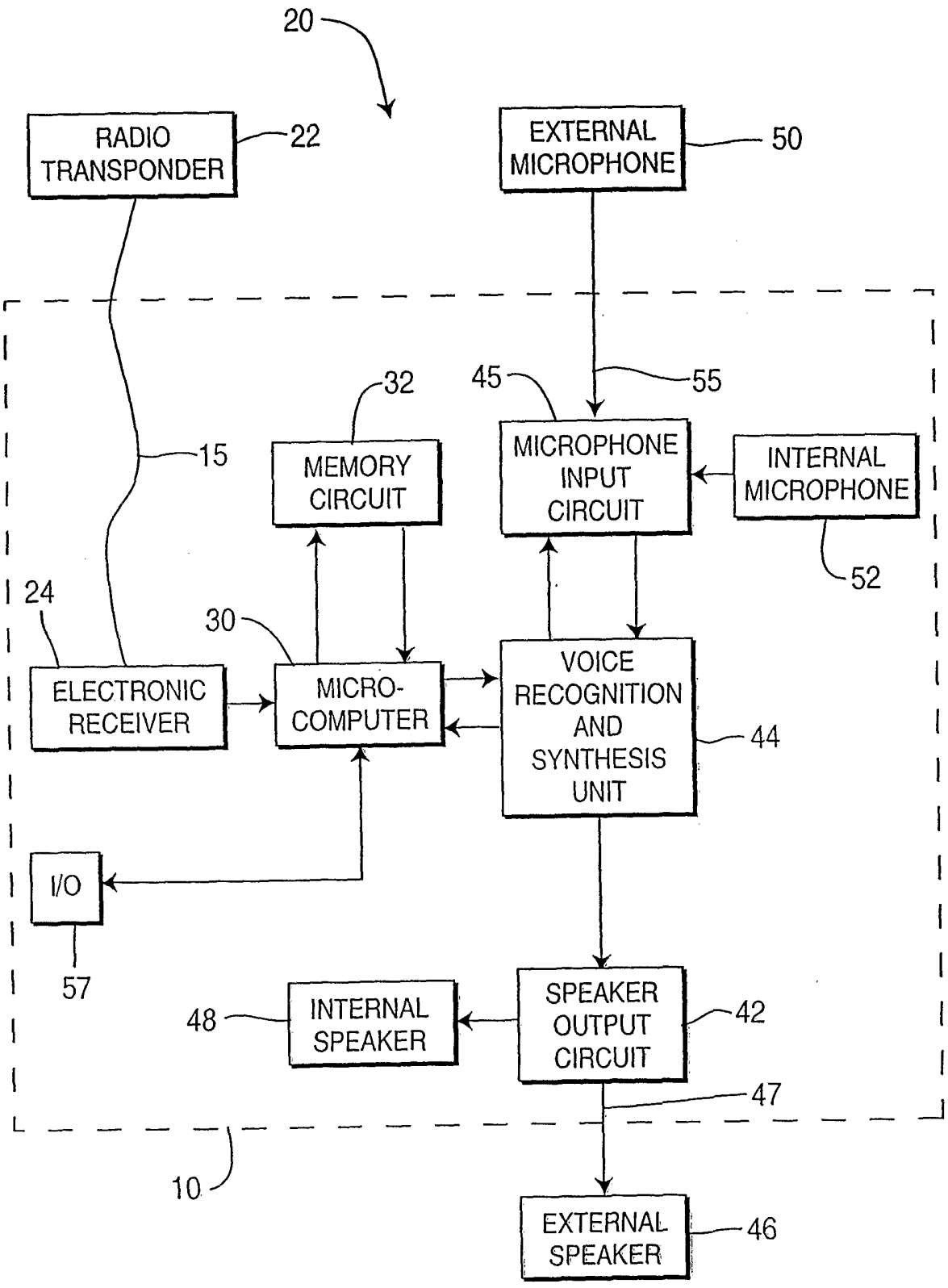
20
RADIO TRANSPONDER
22
EXTERNAL MICROPHONE
50
15
32
MEMORY CIRCUIT
45
55
MICROPHONE INPUT CIRCUIT
INTERNAL MICROPHONE
52
24
30
ELECTRONIC RECEIVER
MICRO-COMPUTER
VOICE RECOGNITION AND SYNTHESIS UNIT
44
I/O
57
48
INTERNAL SPEAKER
SPEAKER OUTPUT CIRCUIT
42
47
10
EXTERNAL SPEAKER
46

FIG. 1

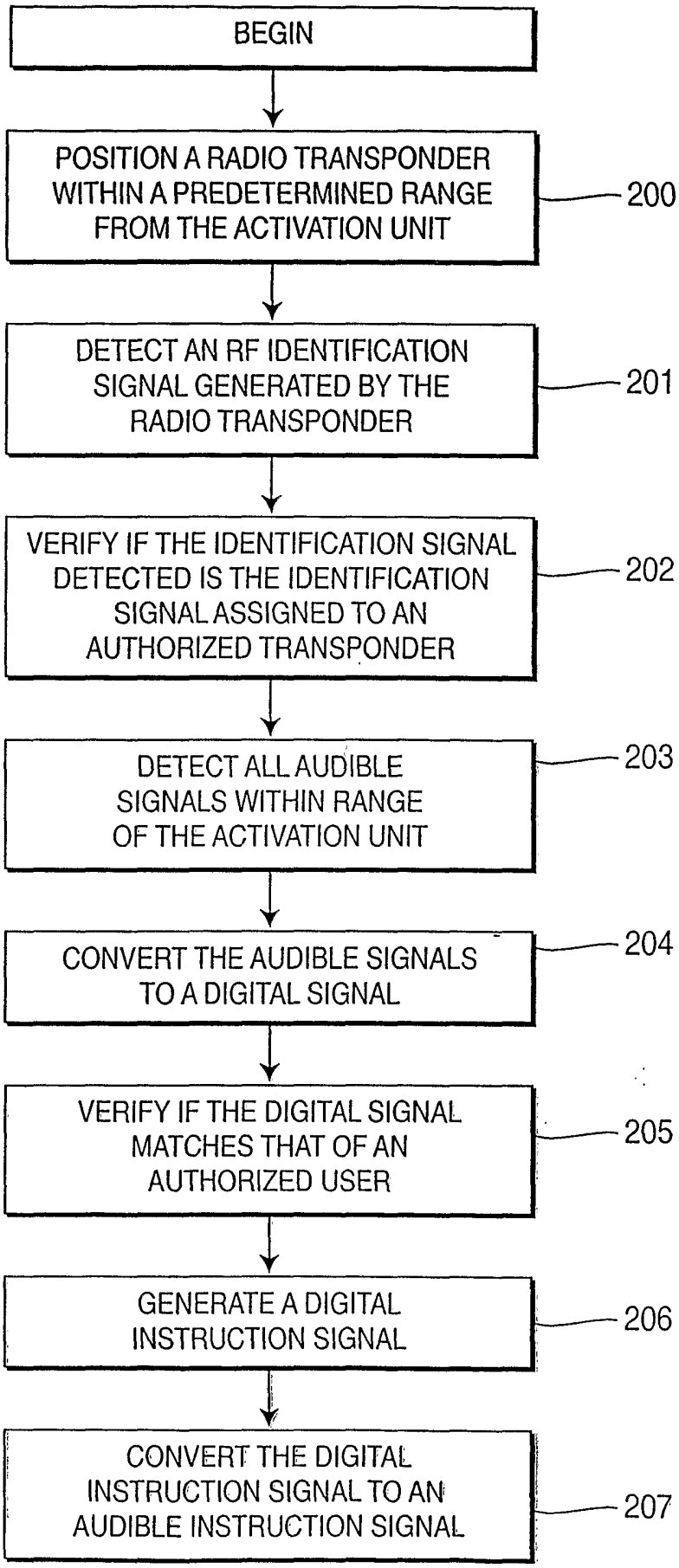
BEGIN
POSITION A RADIO TRANSPONDER WITHIN A PREDETERMINED RANGE FROM THE ACTIVATION UNIT
200
DETECT AN RF IDENTIFICATION SIGNAL GENERATED BY THE RADIO TRANSPONDER
201
VERIFY IF THE IDENTIFICATION SIGNAL DETECTED IS THE IDENTIFICATION SIGNAL ASSIGNED TO AN AUTHORIZED TRANSPONDER
202
DETECT ALL AUDIBLE SIGNALS WITHIN RANGE OF THE ACTIVATION UNIT
203
CONVERT THE AUDIBLE SIGNALS TO A DIGITAL SIGNAL
204
VERIFY IF THE DIGITAL SIGNAL MATCHES THAT OF AN AUTHORIZED USER
205
GENERATE A DIGITAL INSTRUCTION SIGNAL
206
CONVERT THE DIGITAL INSTRUCTION SIGNAL TO AN AUDIBLE INSTRUCTION SIGNAL
207

FIG. 2

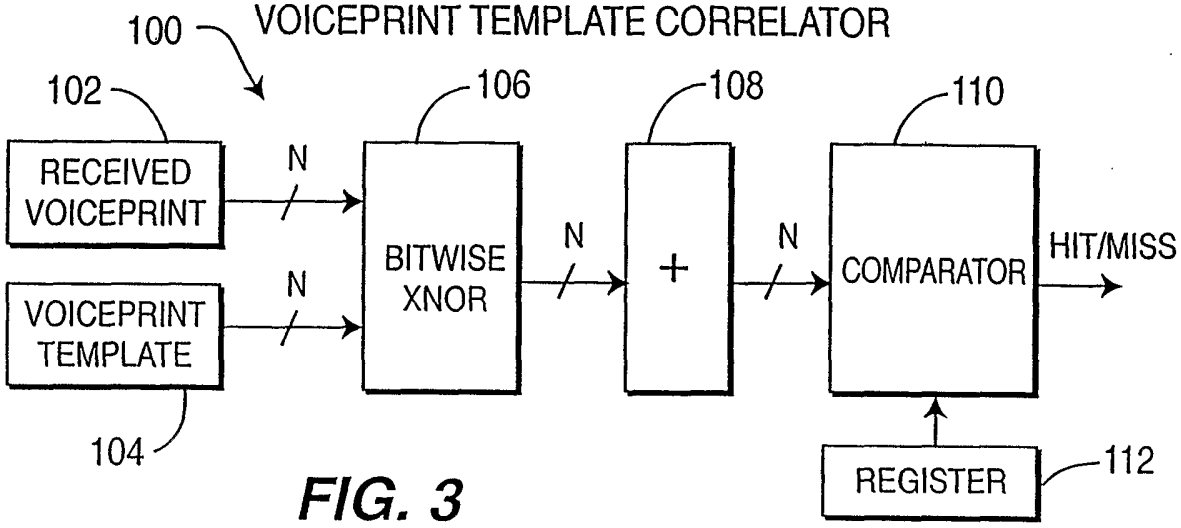
100
VOICEPRINT TEMPLATE CORRELATOR
102
RECEIVED VOICEPRINT
N
106
BITWISE XNOR
N
108
+
N
110
COMPARATOR
HIT/MISS
VOICEPRINT TEMPLATE
N
104
REGISTER
112

FIG. 3

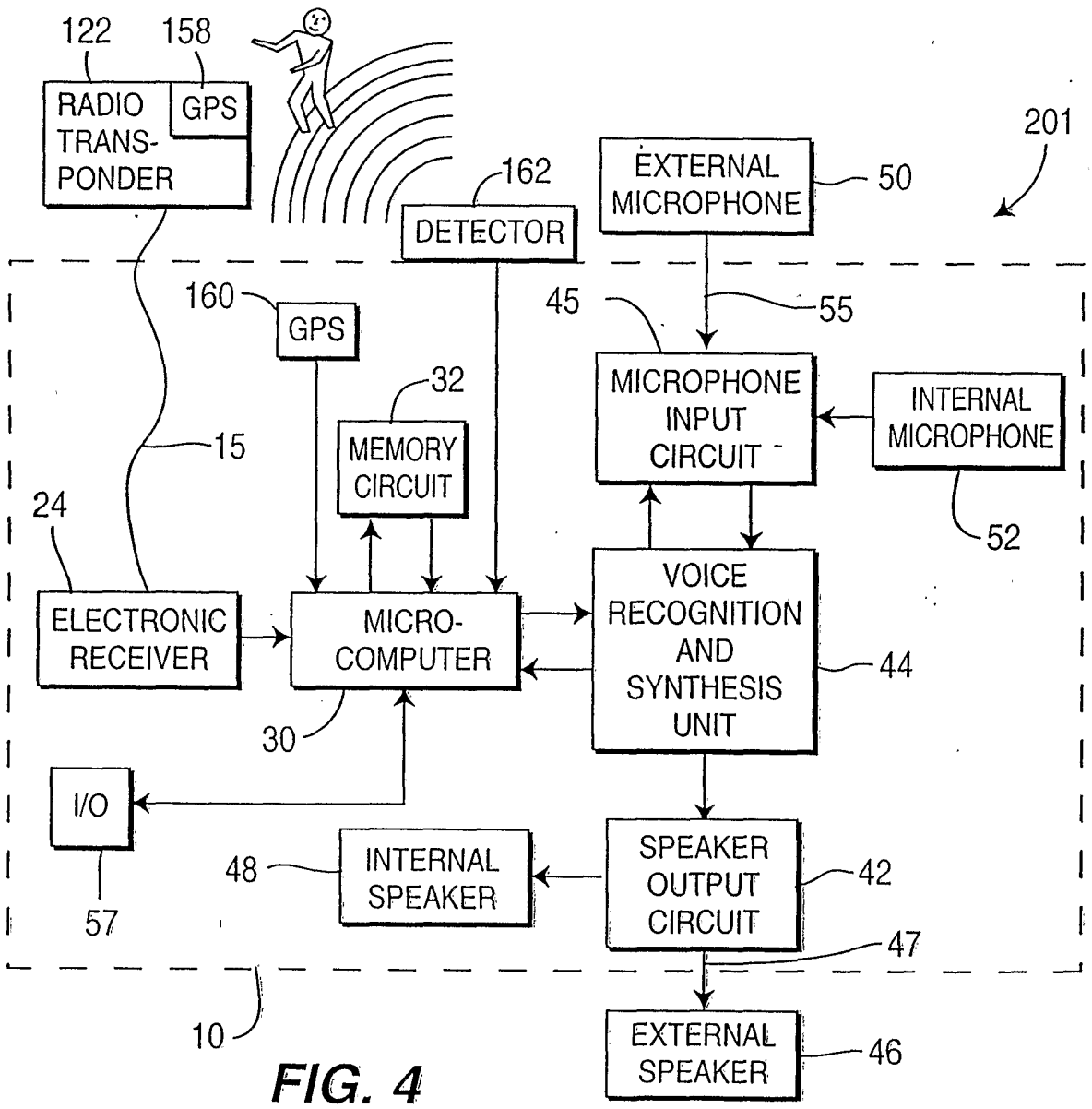
122
158
RADIO TRANS-PONDER
GPS
162
DETECTOR
201
EXTERNAL MICROPHONE
50
160
GPS
45
55
MICROPHONE INPUT CIRCUIT
INTERNAL MICROPHONE
52
32
MEMORY CIRCUIT
15
24
ELECTRONIC RECEIVER
MICRO-COMPUTER
VOICE RECOGNITION AND SYNTHESIS UNIT
44
30
I/O
57
48
INTERNAL SPEAKER
SPEAKER OUTPUT CIRCUIT
42
47
10
EXTERNAL SPEAKER
46

FIG. 4

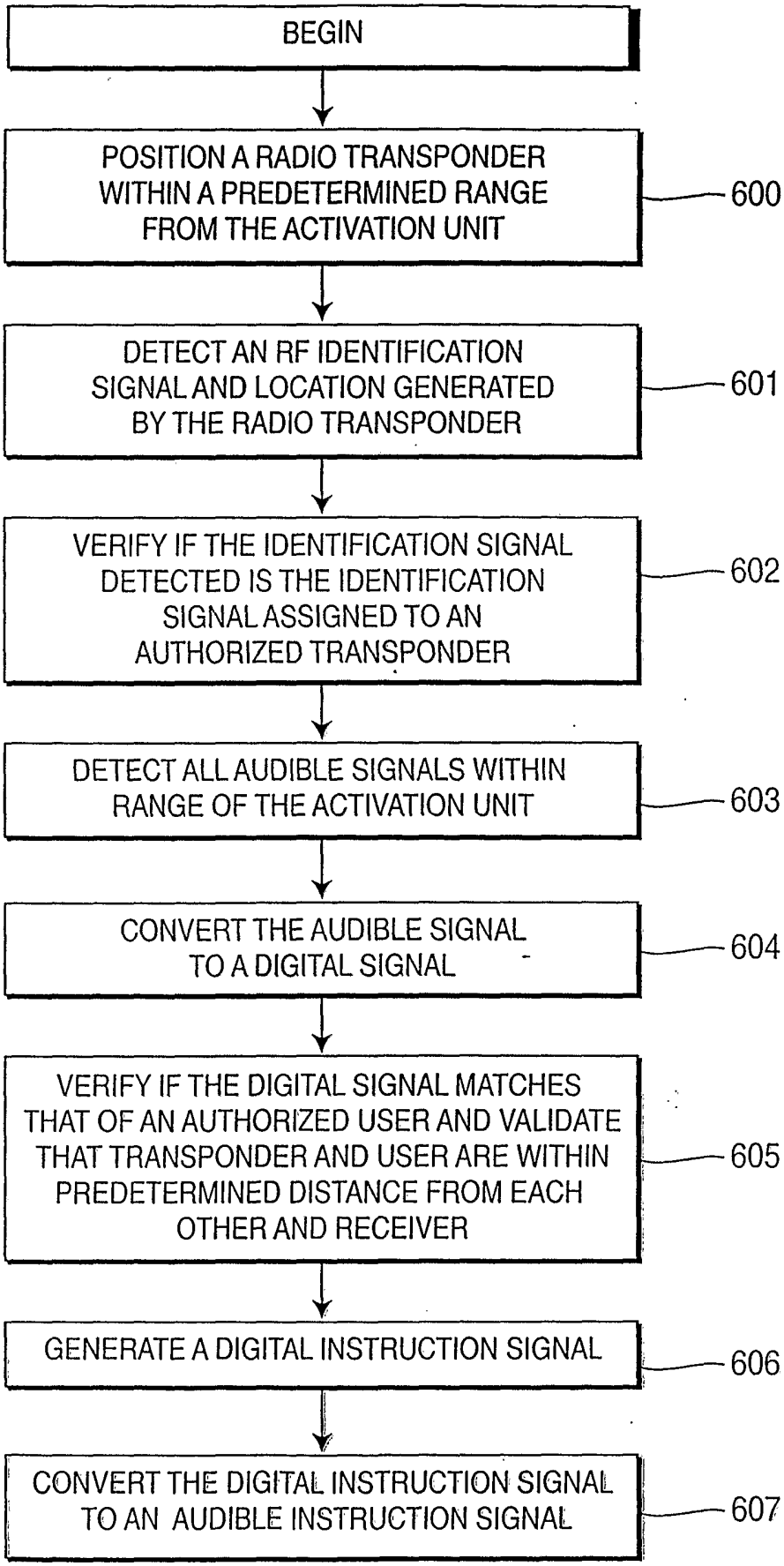
BEGIN
POSITION A RADIO TRANSPONDER WITHIN A PREDETERMINED RANGE FROM THE ACTIVATION UNIT
600
DETECT AN RF IDENTIFICATION SIGNAL AND LOCATION GENERATED BY THE RADIO TRANSPONDER
601
VERIFY IF THE IDENTIFICATION SIGNAL DETECTED IS THE IDENTIFICATION SIGNAL ASSIGNED TO AN AUTHORIZED TRANSPONDER
602
DETECT ALL AUDIBLE SIGNALS WITHIN RANGE OF THE ACTIVATION UNIT
603
CONVERT THE AUDIBLE SIGNAL TO A DIGITAL SIGNAL
604
VERIFY IF THE DIGITAL SIGNAL MATCHES THAT OF AN AUTHORIZED USER AND VALIDATE THAT TRANSPONDER AND USER ARE WITHIN PREDETERMINED DISTANCE FROM EACH OTHER AND RECEIVER
605
GENERATE A DIGITAL INSTRUCTION SIGNAL
606
CONVERT THE DIGITAL INSTRUCTION SIGNAL TO AN AUDIBLE INSTRUCTION SIGNAL
607

FIG. 5

# INTERNATIONAL SEARCH REPORT

International application No.
PCT/US02/40114

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(7) : G05B 19/00,23/00; G06F 7/00,7/04 ; G08B 29/00
US CL : 340/5.84

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

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)
U.S. : 340/5.84, 5.8, 5.81, 5.82, 5.83

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
Please See Continuation Sheet

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | US 6,140,939 A (FLICK) 31 October 2000 (2000-10-31), column 4 line 31 to column 5 line 31. | 1-12, 18-19, 21-49 |
| Y | US 5,199,080 A (KIMURA et al. ) 30 March 1993 (1993-3-30). column 3 line 15 to column 4 line 6. | 1-12, 28-49 |
| Y | US 6,175,922 B1 (WANG) 16 January 2001 (2001-1-16), column 5 lines 40 to 59. | 13 |
| Y | US 6,161,005 A (PINZON) 12 December 2000 (2000-12-12), column 5 lines 9 to 53. | 14-17 |
| Y | US 5,673,034 A (SALIGA) 30 September 1997 (1997-9-30), column 6 line 63 to column 7 line 41. | 20 |
| Y | US 5,812,067 A (BERGHOLZ et al.) 22 September 1998 (1998-9-22), entire document. | 1-12, 28-49 |
| Y | US 5,777,571 A (CHUANG) 07 July 1998 (1998-7-7), entired document. | 1,28,29, 45-49 |

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 09 April 2003 (09.04.2003) | 22 APR 2003 |
| Name and mailing address of the ISA/US<br>Commissioner of Patents and Trademarks<br>Box PCT<br>Washington, D.C. 20231<br>Facsimile No. (703)305-3230 | Authorized officer<br>Michael Horabik<br>Telephone No. 703-305-3900 |

Form PCT/ISA/210 (second sheet) (July 1998)

INTERNATIONAL SEARCH REPORT

PCT/US02/40114

**Continuation of B. FIELDS SEARCHED Item 3:**
USPAT EAST, EPO. Search terms: remote control system with voiceprint; decryption and encryption; cellular telephone.