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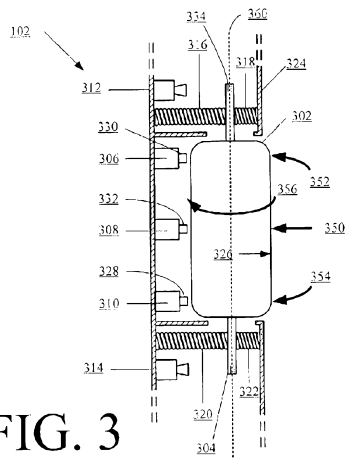

FIG. 3

(57) Abstract: Systems (100) and methods (400) for controlling functions of a Radio Transceiver (206, 208). At least one function is controlled in response to: a depression of a center of an elongated roller of a control element (102, 300); a depression of a first peripheral edge portion (FPEP) of the elongated roller (302) for a first period of time; a depression of a second peripheral edge portion (SPEP) of the elongated roller for a second period of time; a rotation of the elongated roller around a central axis thereof; a depression of the FPEP (352) for a third period of time that is longer than the first period of time; and/or a depression of a SPEP (354) for a fourth period of time that is longer than the second period of time.

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COMMUNICATION DEVICE WITH A MULTI-FUNCTIONAL CONTROL

The inventive arrangements relate to communication systems, and more particularly to systems and methods for controlling a radio transceiver using a multi-functional elongated roller.

There are various communication networks known in the art. Such communication networks include a Land Mobile Radio (LMR) network, a Wideband Code Division Multiple Access (WCDMA) based network, a Code Division Multiple Access (CDMA) based network, a Wireless Local Area Network (WLAN), an Enhanced Data rates for GSM Evolution (EDGE) based network and a Long Term Evolution (LTE) based network. Each of these communication networks comprises a plurality of communication devices and network equipment configured to facilitate communications between the communication devices. Each communication network often provides a group call service to service users. The group call service is a service by which a service user (e.g., first responder) is able to simultaneously talk to other service users (e.g., other first responders) associated with a particular talk group or social media profile. The group call service can be implemented by a Push-To-Talk (PTT) group call service. The PTT group call service is an instant service by which the PTT service user is able to immediately talk to other PTT service users of a particular talk group or social media profile by pushing a PTT button of a communication device

In some scenarios, the communication devices include land mobile radios. Each of the radios typically comprises a plurality of rotary knobs and a PTT button for controlling a radio transceiver thereof. The rotary knobs are disposed on top panels of the radios. A first one of the rotary knobs is provided for selecting an individual or a talk group to which a PTT call is to be made. A second one of the rotary knobs is provided for controlling an audio volume of a radio. The PTT button is disposed on a side panel of the radio. Consequently, a user of the radio is unable to use one finger alone for controlling the radio receiver of the radio. Also, two hands

are undesirably required to hold the radio and change functional settings of the radio through the plurality of rotary knobs.

Embodiments of the present invention concern methods for controlling a radio transceiver. The methods generally involve controlling a first function of the radio transceiver in response to a depression of a center of an elongated roller of a control element. A second function of the radio transceiver is controlled in response to the depression of a first peripheral edge portion of the elongated roller for a first period of time (e.g., less than two seconds). A third function of the radio transceiver is controlled in response to a depression of a second peripheral edge portion of the elongated roller for a second period of time (e.g., less than two seconds). The second peripheral edge portion is opposed from the first peripheral edge portion. A fourth function of the radio transceiver is controlled in response to the rotation of the elongated roller around a central axis thereof. A fifth function of the radio transceiver is controlled in response to the depression of the first peripheral edge portion for a third period of time (e.g., greater than two seconds) that is longer than the first period of time. A sixth function of the radio transceiver is controlled in response to the depression of the second peripheral edge portion for a fourth period of time (e.g., greater than two seconds) that is longer than the second period of time. Each of the first, second, third, fourth, fifth and sixth functions can include, but is not limited to, an audio volume function, a channel selection function, a mute function, a brightness selection function, an "on/off" function, a play function, a rewind function, a fast forward function, a pause function, a channel recall function, a camera function, a talk group selection function, a media profile selection function, an individual call function, a group call function, an emergency call function, a map selection function, a priority selection function, a user interface selection function and/or a PTT function.

Embodiments of the present invention also concern apparatus and systems for controlling a device. The device can include, but is not limited to, a radio, a mobile phone, a cellular phone, a personal digital assistant, a global positioning device, a personal computer, a television, a vehicular communication device and accessories that work together with these devices. Notably, the apparatus and systems

implement the above described method. As such, the apparatus and systems include a control element and at least one controller. The control element comprises an elongated roller. The controller is configured to control the first function of the device in response to the depression of the center of the elongated roller. The controller is also configured to control the second function of the device in response to the depression of the first peripheral edge portion of the elongated roller for the first period of time. The controller is further configured to control the third function of the device in response to the depression of the second peripheral edge portion of the elongated roller for the second period of time. The fourth function of the device is controlled by the controller in response to a rotation of the elongated roller around it's central axis. The fifth function of the device is controlled by the controller in response to the depression of the first peripheral edge portion for the third period of time that is longer than the first period of time. The sixth function of the device is controlled by the controller in response to the depression of the second peripheral edge portion for the third period of time that is longer than the second period of time.

Embodiments will be described with reference to the following drawing figures, in which like numerals represent like items throughout the figures, and in which:

FIG. 1 is a schematic illustration of an exemplary communication device that is useful for understanding the present invention.

FIG. 2 is a more detailed block diagram of the exemplary communication device shown in FIG. 1 that is useful for understanding the present invention.

FIG. 3 is schematic illustration of an exemplary embodiment of a control element that is useful for understanding the present invention.

FIG. 4 is a schematic illustration showing the control element of the communication device of FIG. 3 in a first actuated position.

FIG. 5 is a schematic illustration showing the control element of the communication device of FIG. 3 in a second actuated position.

FIG. 6 is a schematic illustration showing the control element of the communication device of FIG. 3 in a third actuated position.

FIG. 7 is a schematic illustration showing the control element of the communication device of FIG. 3 in a fourth actuated position.

FIG. 8 is a flow diagram of an exemplary method for controlling a radio transceiver of a communication device that is useful for understanding the present invention.

The present invention is described with reference to the attached figures. The figures are not drawn to scale and they are provided merely to illustrate the instant invention. Several aspects of the invention are described below with reference to example applications for illustration. It should be understood that numerous specific details, relationships, and methods are set forth to provide a full understanding of the invention. One having ordinary skill in the relevant art, however, will readily recognize that the invention can be practiced without one or more of the specific details or with other methods. In other instances, well-known structures or operation are not shown in detail to avoid obscuring the invention. The present invention is not limited by the illustrated ordering of acts or events, as some acts may occur in different orders and/or concurrently with other acts or events. Furthermore, not all illustrated acts or events are required to implement a methodology in accordance with the present invention.

Referring now to FIG. 1, there is provided a block diagram of an exemplary communication device **100** that implements one or more method embodiments of the present invention. Although the communication device **100** is shown in FIG. 1 to be a portable land mobile radio, embodiments of the present invention are not limited in this regard. For example, the communication device **100** can alternatively include, but is not limited to, a mobile phone, a cellular phone, a personal digital assistant, a global positioning device, a personal computer, a television, a vehicular communication device or other communication device. In each of these scenarios, the communication device **100** generally includes a housing **104**, an antenna **106** and internal circuitry (not shown in FIG. 1). The communication

device **100** also includes a control element (e.g., a PTT button or switch) **102** and other user interface components **108**.

In some embodiments, the communication device **100** shown in FIG. 1 is generally configured to facilitate the provision of data communication services, individual call services or group call services to a service user. A data communication service is generally a service by which a service user is able to send and/or receive data messages. An individual call service is generally a service by which a service user is able to talk with one other service user. The group call service is a service by which a service user is able to talk to one or more service users associated with a particular talk group or social media profile. The group call service can be implemented by a PTT group call service. The PTT group call service is an instant service by which the PTT service user is able to immediately talk to other PTT service users of a particular talk group or social media profile by actuating the control element **102** of the communication device **100**.

Notably, the communication device **100** is configured to operate in a Land Mobile Radio (LMR) based communication system, a Global Positioning System (GPS), a cellular based communication system or other wireless communication system. The cellular based system can include, but is not limited to, a second generation (2G) compatible system and/or a third generation (3G) compatible system and/or a fourth generation (4G) compatible system. The phrase "second generation (2G)", as used herein, refers to second-generation wireless telephone technology. The phrase "third generation (3G)", as used herein, refers to third-generation wireless telephone technology. The phrase "fourth generation (4G)", as used herein, refers to fourth generation wireless telephone technology. In this scenario, the communication device **100** can support various 2G data services (e.g., text messaging), 3G data services (e.g., video calls) and/or 4G data services (e.g., ultra-broadband internet access). Embodiments of the present invention are not limited in this regard.

The communication device **100** can employ a single communication protocol or multiple communication protocols. For example, if the communication

device **100** is an LMR radio, then it can employ one or more of the following communication protocols: a Terrestrial Trunked Radio (TETRA) transport protocol; a P25 transport protocol; an OPENSKY® protocol; and an Enhanced Digital Access Communication System (EDACS) protocol. If the communication device **100** is a cellular phone, then it can employ one or more of the following communication protocols: a Wideband Code Division Multiple Access (WCDMA) based protocol; a Code Division Multiple Access (CDMA) based protocol; a Wireless Local Area Network (WLAN) based protocol; an Enhanced Data rates for GSM Evolution (EDGE) network based protocol; and a Long Term Evolution (LTE) network based protocol. Embodiments of the present invention are not limited in this regard.

A more detailed block diagram of the communication device **100** is provided in FIG. 2. Notably, the communication device **100** may include more or less components than those shown in FIG. 2. However, the components shown are sufficient to disclose an illustrative embodiment implementing the present invention. The hardware architecture of FIG. 2 represents one embodiment of a representative communication device configured to facilitate the provision of a group call service to a user thereof.

As shown in FIG. 2, the communication device **100** comprises an antenna **106** for receiving and transmitting Radio Frequency (RF) signals. A receive/transmit (Rx/Tx) switch **204** selectively couples the antenna **106** to the transmitter circuitry **206** and receiver circuitry **208** in a manner familiar to those skilled in the art. The receiver circuitry **208** demodulates and decodes the RF signals received from a network (not shown in FIG. 2) to derive information therefrom. The receiver circuitry **208** is coupled to a controller **210** via an electrical connection **234**. The receiver circuitry **208** provides the decoded RF signal information to the controller **210**. The controller **210** uses the decoded RF signal information in accordance with the function(s) of the communication device **100**.

The controller **210** also provides information to the transmitter circuitry **206** for encoding and modulating information into RF signals. Accordingly, the controller **210** is coupled to the transmitter circuitry **206** via an electrical

connection **238**. The transmitter circuitry **206** communicates the RF signals to the antenna **202** for transmission to an external device (e.g., network equipment not shown in FIG. 2).

An antenna **106** is coupled to Global Positioning System (GPS) receiver circuitry **214** for receiving GPS signals. The GPS receiver circuitry **214** demodulates and decodes the GPS signals to extract GPS location information therefrom. The GPS location information indicates the location of the communication device **100**. The GPS receiver circuitry **214** provides the decoded GPS location information to the controller **210**. As such, the GPS receiver circuitry **214** is coupled to the controller **210** via an electrical connection **236**. The controller **210** uses the decoded GPS location information in accordance with the function(s) of the communication device **100**.

The controller **210** stores the decoded RF signal information and the decoded GPS location information in a memory **212** of the communication device **100**. Accordingly, the memory **212** is connected to and accessible by the controller **210** through an electrical connection **232**. The memory **212** may be a volatile memory and/or a non-volatile memory. For example, the memory **212** can include, but is not limited to, a Random Access Memory (RAM), a Dynamic Random Access Memory (DRAM), a Static Random Access Memory (SRAM), Read-Only Memory (ROM) and flash memory.

As shown in FIG. 2, one or more sets of instructions **250** are stored in the memory **212**. The instructions **250** can also reside, completely or at least partially, within the controller **210** during execution thereof by the communication device **100**. In this regard, the memory **212** and the controller **210** can constitute machine-readable media. The term "machine-readable media", as used here, refers to a single medium or multiple media that store the one or more sets of instructions **250**. The term " machine-readable media", as used here, also refers to any medium that is capable of storing, encoding or carrying the set of instructions **250** for execution by the communication device **100** and that cause the communication device **100** to perform one or more of the methodologies of the present disclosure.

The controller **210** is also connected to a user interface **230**. The user interface **230** is comprised of input devices **216**, output devices **224**, and software routines (not shown in FIG. 2) configured to allow a user to interact with and control software applications (not shown in FIG. 2) installed on the computing device **100**. Such input and output devices respectively include, but are not limited to, a display **228**, a speaker **226**, a keypad **220**, a directional pad (not shown in FIG. 2), a directional knob (not shown in FIG. 2), a microphone **222** and a control element (e.g., a PTT button or switch) **102**. The display **228** may be designed to accept touch screen inputs.

The user interface **230** is operative to facilitate a user-software interaction for launching group call applications (not shown in FIG. 2), PTT call applications (not shown in FIG. 2), social media applications, internet applications and other types of applications installed on the computing device **100**. The group call and PTT call applications (not shown in FIG. 2) are operative to provide a group call service to a user of the communication device **100**.

According to one embodiment of the present invention, the control element **102** is configured to function as a PTT switch. As such, the control element **102** provides a user with a single switch or button to initiate a call application. For example, the call application can be initiated in response to a depression of a center of the control element **102**. The call application facilitates the provision of a call service to a user of the communication device **100**. As such, the call application is operative to perform communication operations. The communication operations can include, but are not limited to, message generation operations, message communication operations, voice packet recording operations, voice packet queuing operations and voice packet communication operations.

The control element **102** is advantageously configured as a multi-function device for controlling various operations other than PTT functions. As such, the control element **102** has various switch positions that can be used for controlling these various other operations. For example, the control element **102** provides the user with a secondary switch or button means for selecting and/or controlling

particular functions of the communication device **100**. More particularly, a function of the communication device **100** is controlled by the control element **102** in response to the depression of a peripheral edge portion thereof for a pre-defined period of time (e.g., less than or greater than two seconds). The function can include, but is not limited to, an audio volume function, a channel selection function, a mute function, a brightness selection function, an "on/off" function, a play function, a rewind function, a fast forward function, a pause function, a channel recall function, a camera function, a talk group selection function, a media profile selection function, an emergency call function, a map selection function, a priority selection function and a user selection function. Embodiments of the present invention are not limited in this regard.

The control element **102** further provides a rotatable means for selecting and/or controlling particular functions of the communication device **100**. For example, a particular function of the communication device **100** is controlled by the control element **102** in response to the rotation of the control element **102** around a central axis thereof. The function can include, but is not limited to, an audio volume function, a channel selection function, a mute function, a brightness selection function, an "on/off" function, a play function, a rewind function, a fast forward function, a pause function, a channel recall function, a camera function, a talk group selection function, an emergency call function, a map selection function, a priority selection function, a user interface selection function and a media profile selection function. Embodiments of the present invention are not limited in this regard. An exemplary embodiment of the control element **102** will now be described in relation to FIG. 3.

Referring now to FIG. 3, there is provided a schematic illustration of an exemplary embodiment of control element **102** that is useful for understanding the present invention. It should be understood that there are numerous ways of implementing the control element **102**. As such, the present invention is not limited to the specific arrangement shown in FIG. 3.

As shown in FIG. 3, the control element **102** includes an elongated roller **302**, a shaft **304**, switches **306**, **308**, **310**, optical position detectors **312**, **314**,

and resilient members **316**, **318**, **320**, **322**. The elongated roller **302** is disposed in the housing **104** of a communication device **100** so as to at least partially project outward therefrom. In this way, the elongated roller **302** is easily accessible to a user of the communication device **100**. However, embodiments of the present invention are not limited in this regard. For example, the elongated roller **302** can alternatively be recessed or flush with a surface of the housing **104**.

According to one aspect of the present invention, the elongated roller **302** has a generally cylindrical form. As such, the elongated roller **302** advantageously is arranged so that it is somewhat elongated along the length of its central axis **360**. In some embodiments, the elongated roller **302** can have a form that deviates somewhat from a conventional cylindrical shape. Thus, for example, the elongated roller **302** can have convex or concave sides. Also, the surface of the elongated roller **302** can be smooth or knurled.

The elongated roller **302** is configured to be transitioned from a rest position shown in FIG. 3 to a plurality of actuated positions, such as those shown in FIGS. 4-7. In each of the actuated positions, a particular function of the communication device **100** is selected or controlled. According to one embodiment, shaft **304** or elongated roller **302** can be guided within a channel (not shown in FIG. 3) formed in the housing **104** of a communication device **100**.

The elongated roller **302** can be transitioned from the rest position shown in FIG. 3 to a first actuated position shown in FIG. 4 for controlling a particular function of the communication device. As shown in FIG. 4, the position transition can be achieved by depressing a bottom peripheral edge portion **354** of an exposed surface **326** of the elongated roller **302** for a short period of time (e.g., less than two seconds) or a long period of time (e.g., greater than two seconds). In the first actuated position, an actuator **328** of the switch **310** is depressed by the elongated roller **302** as shown in FIG. 4. As a result of the depression of the actuator **328**, the switch **310** is placed in a closed or open position so as to indicate that the elongated roller **302** is in the first actuated position. In some embodiments, the communication device **100** performs operations to: (a) track the amount of time the elongated roller

302 is depressed; and (b) change an operational parameter of the communication device **100** based on the duration of the button depression.

Similarly, the elongated roller **302** is configured to be transitioned from the rest position shown in FIG. 3 to a second actuated position shown in FIG. 5 for controlling a particular function of the communication device **100**. As shown in FIG. 5, the position transition can be achieved by depressing a top peripheral edge portion **352** of an exposed surface **326** of the elongated roller **302** for a short period of time (e.g., less than two seconds) or a long period of time (e.g., greater than two seconds). In the second actuated position, an actuator **330** of the switch **306** is depressed by the elongated roller **302** as shown in FIG. 5. As a result of depression of the actuator **330**, the switch **306** is placed in a closed or open position so as to indicate that the elongated roller **302** is in the second actuated position. In some embodiments, the communication device **100** performs operations to: (a) track the amount of time the elongated roller **302** is depressed; and (b) change an operational parameter of the communication device **100** based on the duration of the button depression.

The elongated roller **302** can also be transitioned from the rest position shown in FIG. 3 to a third actuated position shown in FIG. 6 for controlling a particular function of communication device **100**. As shown in FIG. 6, the position transition can be achieved by depressing a center portion **350** of an exposed surface **326** of the elongated roller **302**. In the third actuated position, the actuators **328**, **330, 332** of the switches **306, 308, 310** are depressed by the elongated roller **302** as shown in FIG. 6. As a result of the depression of the actuators **328**, **330, 332**, the switches **306, 308, 310** are placed in their closed or open positions so as to indicate that the elongated roller **302** is in the third actuated position. In some embodiments, the communication device **100** performs operations to place a call to an individual or members of a selected talk group. The call can be terminated by releasing the elongated roller **302**.

The elongated roller **302** can also be transitioned from the rest position shown in FIG. 3 to a fourth position shown in FIG. 7 for selecting or controlling an operational parameter of the communication device **100**. As shown in FIG. 7, the

position transition can be achieved by rotating the elongated roller **302** around a central axis **360** thereof. According to one embodiment of the present invention, a suitable sensing means can be provided for the detection of such rotation. The sensing means can detect a rate of rotation and/or an amount of rotation by communicating sensor information to the controller **210**. The sensing means can be a mechanical sensing means (not shown), an electrical sensing means (not shown), an electro-mechanical sensing means (not shown), or an electro-optical sensing means (shown in FIG. 3). For example, in one embodiment of the present invention, a shaft **304** of the elongated roller **302** has a plurality of scan lines **334** formed on one or more ends thereof. The optical position detector(s) **312**, **314** is(are) configured for scanning the scan lines to determine the occurrence of button rotation from the rest position (shown in FIG. 3). The information is provided to controller **210** to evaluate the amount and/or rate of rotation. Thereafter, the communication device **100** performs operations to change an operational parameter of the communication device **100** based on the amount and/or rate of button rotation. It should be noted that there are many known techniques for measuring and/or detecting rotation of a shaft, and any such technique can be used herein without limitation.

As noted above, the elongated roller **302** is configured to be transitioned from a rest position shown in FIG. 3 to a plurality of actuated positions, such as those shown in FIGS. 4-7. In each of the actuated positions, a particular function of the communication device **100** is selected or controlled. The particular actuated position can be advantageously detected by the controller **210** that is operatively connected to the control element **102**. The controller **210** will then determine a device function or control to be activated based on the switch position. Alternatively or in addition to detecting an actuated position, the controller **210** is advantageously configured to determine a period of time that the control element remains in one or more actuated positions. Alternative control functions can be detected based on such timing information as explained below in further detail. The functions associated with the various actuated positions include, but are not limited to, an audio volume function, a channel selection function, a mute function, a brightness

selection function, an "on/off" function, a play function, a rewind function, a fast forward function, a pause function, a channel recall function, a camera function, a talk group selection function, a media profile selection function, an individual call function, a group call function, an emergency call function, a map selection function, a priority selection function, a user interface selection function and a PTT function. Embodiments of the present invention are not limited in this regard.

According to embodiments of the present invention, the control element **102** is disposed in an LMR radio or cellular phone. In this scenario, an audio volume function, a talk group selection function and/or a social media profile selection function is(are) controlled by controller **210** (or other processing device) in response to the depression of the peripheral edge portion **352**, **354** of elongated roller **302** for a short period of time (e.g., less than two seconds) or a long period of time (e.g., greater than two seconds). In this regard, controller **210** performs operations to: (a) detect an actuated position of elongated roller **302**; (b) track the amount of time the elongated roller **302** is depressed; and (c) change an operational parameter of the communication device based on the particular actuated position of elongated roller **302** and the duration of the button press. The operational parameter includes an audio volume parameter, a talk group parameter and/or a social media profile parameter. Additionally or alternatively, the audio volume function, talk group selection function, and/or the social media profile function is(are) controlled by controller **210** in response to the rotation of the elongated roller **302** around a central axis **360** thereof. In this regard, controller **210** performs operations to change the operational parameter based on the amount and/or rate of rotation of the elongated roller **302**. Also in this scenario, a call application is initiated by controller **210** in response to the depression of a center portion **350** of the elongated roller **302**. In this regard, controller **210** performs operations to place a call to an individual or members of a selected talk group. The call is terminated in response to a release of the elongated roller **302**. Embodiments of the present invention are not limited in this regard.

According to other embodiments of the present invention, the control element **102** is disposed in a television (not shown in FIGS. 1-7) or a television

remote controller (not shown in FIGS. 1-7). In this scenario, an audio volume function, a channel selection function, a play function, a rewind function, a fast forward function and/or a pause function is(are) controlled by controller **210** (or other processing device) in response to the depression of the peripheral edge portion **352**, **354** of elongated roller **302** for a short period of time (e.g., less than two seconds) or a long period of time (e.g., greater than two seconds). In this regard, controller **210** performs operations to: (a) detect an actuated position of the elongated roller **302**; (b) track the amount of time the elongated roller **302** is depressed; and (c) change an operational parameter of the television (not shown in FIGS. 1-7) based on the particular actuated position of elongated roller **302** and duration of the button press. The operational parameter includes an audio volume parameter, a channel parameter, a play parameter, a rewind parameter, a fast forward parameter, and/or a pause parameter. Additionally or alternatively, the audio volume function, channel selection function, play function, rewind function, fast forward function and/or pause function is(are) controlled by controller **210** in response to the rotation of the elongated roller **302** around a central axis **360** thereof. In this regard, controller **210** performs operations to change the operational parameter based on the amount and/or rate of rotation of the elongated roller **302**. Also in this scenario, an "on/off" function, a mute function, or a channel recall function of the television (not shown in FIGS. 1-7) is controlled by controller **210** in response to the depression of a center portion **350** of the elongated roller **302**. In this regard, controller **210** performs operations to turn the television (not shown in FIGS. 1-7) on or off, mute an audio output of the television (not shown in FIGS. 1-7) or change a channel to a previously selected channel. Embodiments of the present invention are not limited in this regard.

Referring now to FIG. 8, there is provided a flow diagram of an exemplary method **800** for controlling a radio transceiver of a communication device (e.g., the communication device **100** of FIG. 1) that is useful for understanding the present invention. As shown in FIG. 8, the method **800** begins with step **802** and continues with step **804** where the communication device (e.g., communication device **100** of FIG. 1) is turned on.

In a next step **806**, a talk group is selected using a control element (e.g., the control element **102** of FIG. 1 or the control element **300** of FIG. 3). For example, the talk group can be selected by transitioning the control element from a rest position to a particular actuated position, such as that shown in FIGS. 4, 5 and 7. As shown in FIG. 4, the position transition of the control element can be achieved by depressing a bottom peripheral edge portion **354** of an exposed surface **326** of the elongated roller **302** for a short period of time (e.g., less than two seconds) or a long period of time (e.g., greater than two seconds). As shown in FIG. 5, the position transition of the control element **300** can be achieved by depressing a top peripheral edge portion **352** of the exposed surface **326** of the elongated roller **302** for a short period of time (e.g., less than two seconds) or a long period of time (e.g., greater than two seconds). As shown in FIG. 7, the position transition of the control element **300** can be achieved by rotating the elongated roller **302** around a central axis **360** thereof.

Referring again to FIG. 8, the method **800** continues with step **807** where a call is initiated to an individual or members of the selected talk group. The call initiation and channel resource allocation can be accomplished by transitioning the control element from the rest position to a particular actuated position, such as that shown in FIG. 6. As shown in FIG. 6, the position transition is achieved by depressing a center portion **350** of an exposed surface **326** of the elongated roller **302**.

After initiating the call, step **808** is performed where the user of the communication device (e.g., communication device **100** of FIG. 1) speaks into one or more microphones thereof. In effect, speech signals are received at the communication device (e.g., communication device **100** of FIG. 1). The communication device (e.g., communication device **100** of FIG. 1) processes the speech signals to generate voice packets. The voice packets are then communicated from the communication device (e.g., communication device **100** of FIG. 1) to one or more other communication devices via a network. The communication devices can be members of the selected talk group.

In a next step **810**, the user of the communication device (e.g., communication device **100** of FIG. 1) releases the control element. Consequently, the

call remains open for another speech item request by a member of a group call or a member of an individual call until the call is terminated by expiration of one or more call timers or when the call is closed by the call initiator or one of the call members.

When the control element is released from the communication device (e.g., communication device **100** of FIG. 1), it can receive a voice communication from a second communication device in step **812**. Thereafter, step **814** is performed where speech is output from the communication device (e.g., communication device **100** of FIG. 1). The speech is defined by the voice communication received in the previous step **812**.

In a next step **816**, an audio volume is increased or decreased by transitioning the control element from a rest position to a particular actuated position, such as that shown in FIGS. 4, 5 and 7. As shown in FIG. 4, the position transition of the control element can be achieved by depressing a bottom peripheral edge portion **354** of an exposed surface **326** of the elongated roller **302** for a short period of time (e.g., less than two seconds) or a long period of time (e.g., greater than two seconds). As shown in FIG. 5, the position transition of the control element **300** can be achieved by depressing a top peripheral edge portion **352** of the exposed surface **326** of the elongated roller **302** for a short period of time (e.g., less than two seconds) or a long period of time (e.g., greater than two seconds). As shown in FIG. 7, the position transition of the control element **300** can be achieved by rotating the elongated roller **302** around a central axis **360** thereof.

Subsequent to completing step **816**, step **818** is performed where the method **800** returns to step **802** or other processing is performed by the communication device (e.g., communication device **100** of FIG. 1).

As evident from the above discussion, the present invention provides communication devices with certain advantages over conventional communication devices. For example, a plurality of actions or functions of a communication device can be selected or controlled using the single control element of the present invention. In effect, a user only needs one hand to hold the communication device and change functional settings thereof through the single control element of the present invention.

The control elements of the present invention advantageously facilitate the decrease in overall sizes of communication devices. The relatively small sized communication devices of the present invention are less expensive to manufacture as compared to conventional communication devices including a plurality of rotary knobs and buttons for controlling functions thereof.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A method for controlling a radio transceiver, comprising:

controlling a first function of said radio transceiver in response to an actuation of at least a first switch by a depression of a center of an elongated roller of a control element, said first switch disposed adjacent to said center of said elongated roller;

controlling a second function of said radio transceiver in response to an actuation of a second switch by a depression of a first peripheral edge portion of said elongated roller for a first period of time, said second switch disposed adjacent to a first end of said elongated roller;

controlling a third function of said radio transceiver in response to an actuation of a third switch by a depression of a second peripheral edge portion of said elongated roller for a second period of time, said second peripheral edge portion opposed from said first peripheral edge portion, and said third switch disposed adjacent to a second end opposed from said first end of said elongated roller; and

controlling a fourth function of said radio transceiver in response to a rotation of said elongated roller around a central axis of said elongated roller.

2. The method according to claim 1, further comprising controlling a fifth function of said radio transceiver in response to a depression of said first peripheral edge portion for a third period of time that is longer than said first period of time.

3. The method according to claim 1, further comprising controlling a fifth function of said radio transceiver in response to a depression of said second

peripheral edge portion for a third period of time that is longer than said second period of time.

4. The method according to claim 1, further comprising changing an operational parameter of said radio transceiver based on a rotation of said elongated roller around said central axis.

5. The method according to claim 4, wherein said operational parameter is selected from the group consisting of a talk group parameter and an audio volume parameter.

6. The method according to claim 1, further comprising selecting at least one of said first, second, third and fourth functions from the group consisting of an audio volume function, a channel selection function, a mute function, a brightness selection function, an "on/off" function, a play function, a rewind function, a fast forward function, a pause function, a channel recall function, a camera function, a talk group selection function, a media profile selection function, an individual call function, a group call function, an emergency call function, a map selection function, a priority selection function, a user interface selection function and a PTT function.

7. An apparatus for controlling a device, comprising:

an elongated control element comprising an elongated roller; and

at least one controller operable with said elongated roller and configured to:

(a) control a first function of said device in response to an actuation of at least a first switch by a depression of a center of said

elongated roller, said first switch disposed adjacent to a first end of said elongated roller;

(b) control a second function of said device in response to an actuation of a second switch by a depression of a first peripheral edge portion of said elongated roller for a first period of time, said second switch disposed adjacent to a first end of said elongated roller;

(c) control a third function of said device in response to an actuation of a third switch by a depression of a second peripheral edge portion of said elongated roller for a second period of time, said second peripheral edge portion opposed from said first peripheral edge portion, and said third switch disposed adjacent to a second end opposed from said first end of said elongated roller; and

(d) control a fourth function of said device in response to a rotation of said elongated roller around a central axis of said elongated roller.

8. The apparatus according to claim 7, wherein said controller is further configured to control a fifth function of said device in response to a depression of said first peripheral edge portion for a third period of time that is longer than said first period of time.

9. The apparatus according to claim 7, wherein said controller is further configured to control a fifth function of said device in response to a depression of said second peripheral edge portion for a third period of time that is longer than said second period of time.

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10. The apparatus according to claim 7, wherein said controller is further configured to change an operational parameter of said device responsive to a rotation of said elongated roller around said central axis.

11. The apparatus according to claim 10, wherein said operational parameter is selected from the group consisting of a talk group parameter and an audio volume parameter.

12. The apparatus according to claim 7, wherein at least one of said first, second, third and fourth functions is selected from the group consisting of an audio volume function, a channel selection function, a mute function, a brightness selection function, an "on/off" function, a play function, a rewind function, a fast forward function, a pause function, a channel recall function, a camera function, a talk group selection function, a media profile selection function, an individual call function, a group call function, an emergency call function, a map selection function, a priority selection function, a user interface selection function and a PTT function.

13. The apparatus according to claim 7, wherein said device is selected from the group consisting of a radio, a mobile phone, a cellular phone, a personal digital assistant, a global positioning device, a personal computer, a television and a vehicular communication device.

14. A system for controlling a radio transceiver device, comprising:

an elongated control element comprising an elongated roller; and

at least one controller operable with said elongated roller and configured to

(a) select a talk group or social media profile in response to a rotation of said elongated roller around a central axis of said elongated control element,

(b) initiate a call to members of said selected talk group or social media profile in response to an actuation of at least a first switch by a depression of a center of said elongated roller, and

(c) control an audio volume of said radio transceiver device in response to an actuation of second switch by a depression of a first peripheral edge portion of said elongated roller for a first period of time.

15. The system according to claim 14, wherein said controller is further configured to control said audio volume of said radio transceiver device in response to a depression of said first peripheral edge portion of said elongated roller for a second period of time that is longer than said first period of time.

16. The system according to claim 14, wherein said controller is further configured to control said audio volume of said radio transceiver device in response to a depression of a second peripheral edge portion of said elongated roller for a second period of time, said second peripheral edge portion opposed from said first peripheral edge portion.

17. The system according to claim 16, wherein said controller is further configured to control said audio volume of said radio transceiver device in response to a depression of a second peripheral edge portion of said elongated roller for a third period of time that is longer than said second period of time.

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18. The system according to claim 14, wherein said controller is further configured to change an operational parameter of said radio transceiver device responsive to a rotation of said elongated roller.

19. The system according to claim 18, wherein said operational parameter is selected from the group consisting of a talk group parameter and an audio volume parameter.

20. The system according to claim 14, wherein said radio transceiver device is selected from the group consisting of a radio, a mobile phone, a cellular phone, a personal digital assistant, a global positioning device, a personal computer, a television and a vehicular communication device.

21. A radio transceiver, comprising;

a Push-To-Talk (PTT) switch comprising an elongated roller; and

at least one controller operable with said elongated roller and configured to

select a talk group in response to a rotation of said elongated roller around a central axis of said elongated roller, and

initiate a PTT call to members of said selected talk group in response to an actuation of at least a first switch by a depression of a center of said elongated roller, said first switch disposed adjacent to said center of said elongated roller.

22. The radio transceiver according to claim 21, wherein said controller is further configured to control an audio volume of said radio transceiver in

response to a depression of a peripheral edge portion of said elongated roller for a pre-defined period of time.

23. The radio transceiver according to claim 21, wherein said controller is further configured to change a talk group parameter of said radio transceiver based on an amount of rotation of said elongated roller from a rest position.

24. The radio transceiver according to claim 21, wherein said radio transceiver is selected from the group consisting of a radio, a mobile phone, a cellular phone, a personal digital assistant, a personal computer and a vehicular communication device.

Dated this 6th day of August 2013

Harris Corporation
Patent Attorneys for the Applicant
PETER MAXWELL AND ASSOCIATES

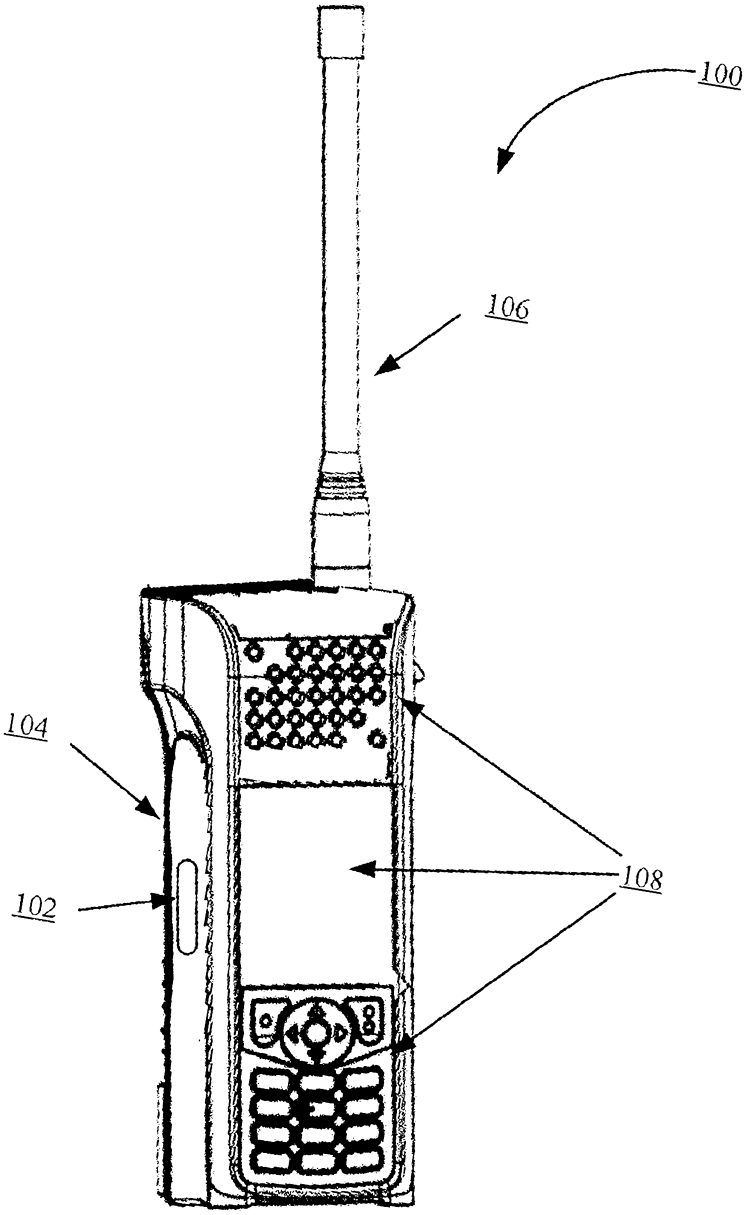
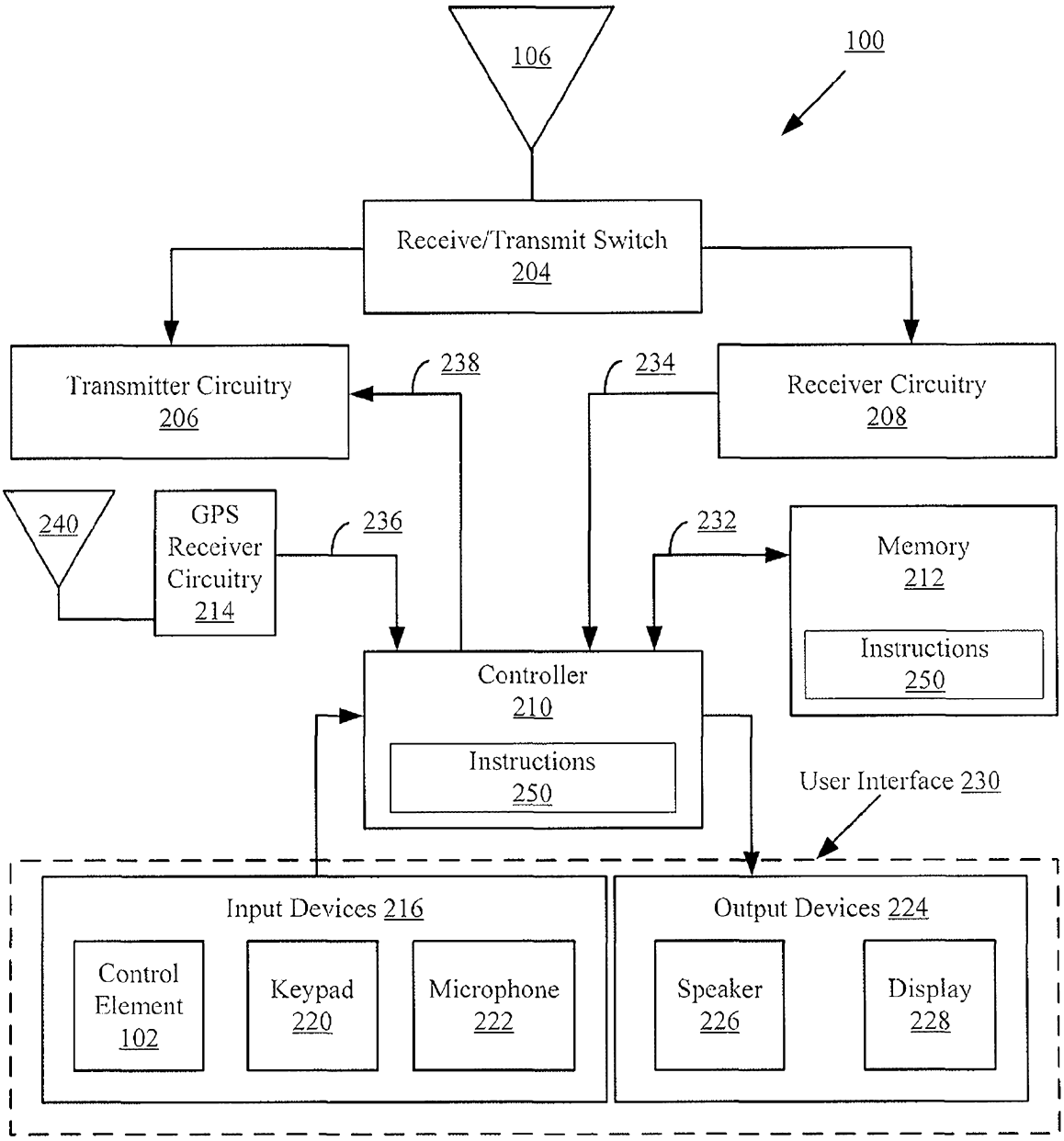


FIG. 1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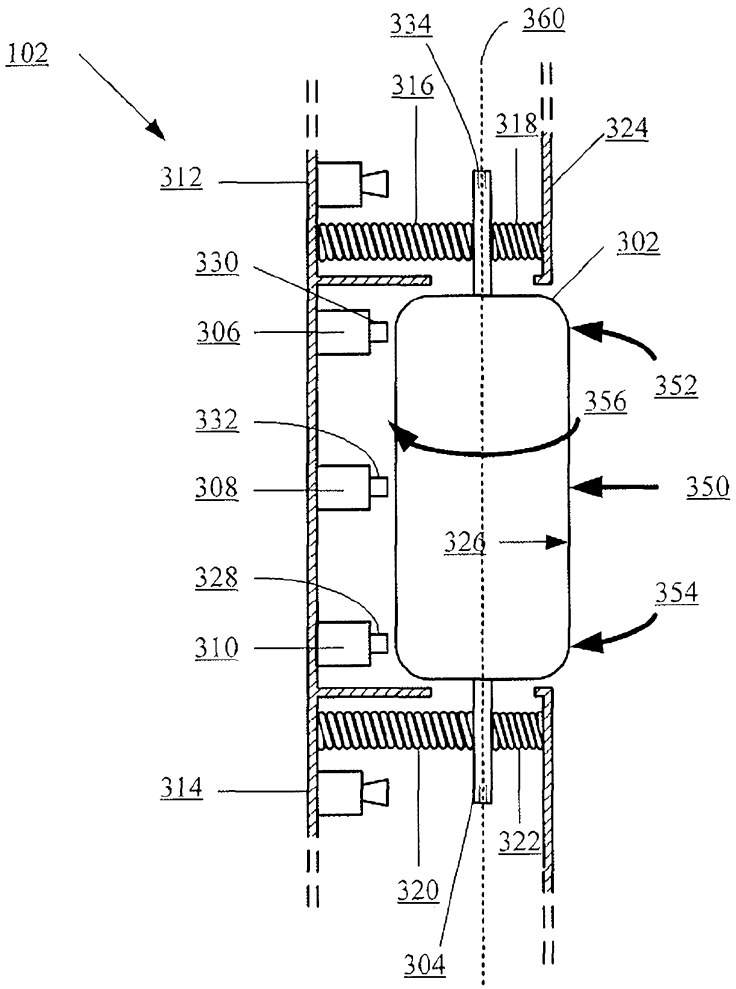
Receive/Transmit Switch
204
Transmitter Circuitry
206
238
234
Receiver Circuitry
208
240
GPS
Receiver
Circuitry
214
236
232
Memory
212
Instructions
250
Controller
210
Instructions
250
User Interface 230
Input Devices 216
Control
Element
102
Keypad
220
Microphone
222
Output Devices 224
Speaker
226
Display
228

FIG. 2


102
334
360
316
318
324
312
302
330
306
352
356
332
308
350
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328
354
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322
320
304

FIG. 3

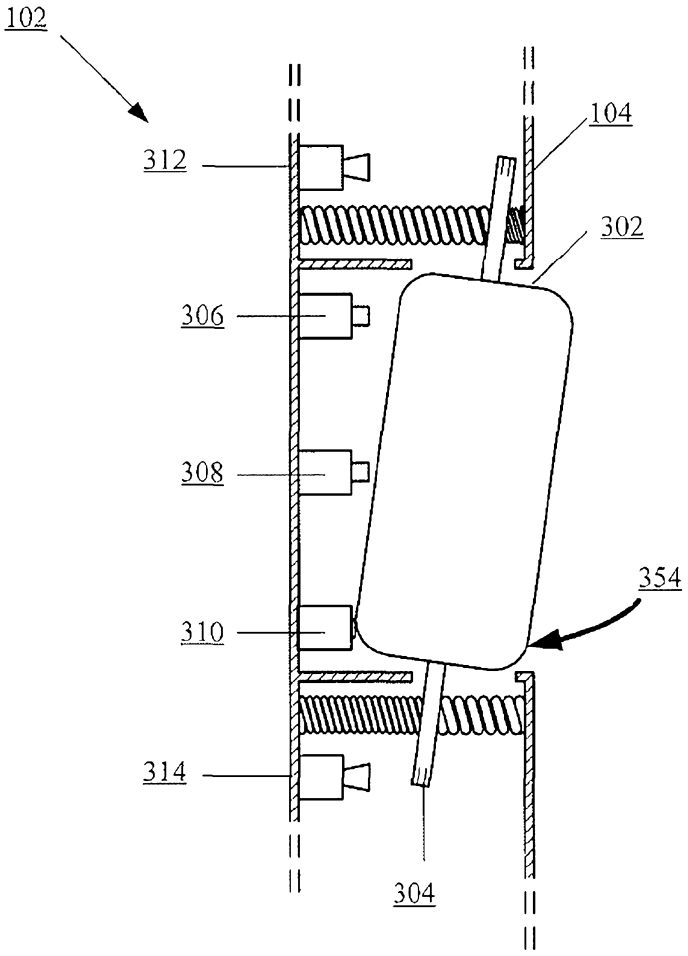

FIG. 4

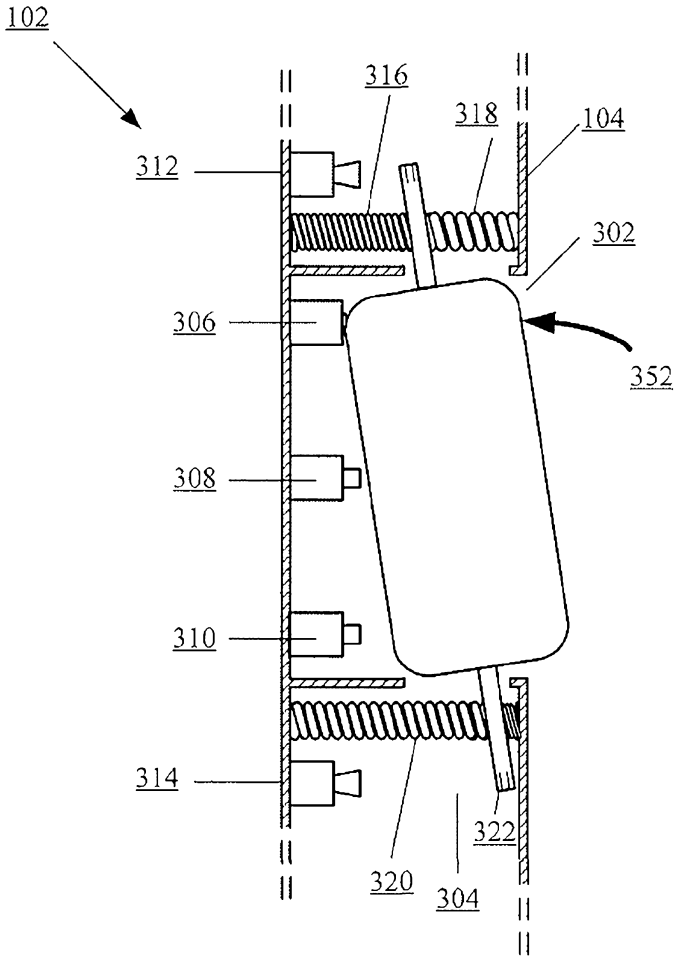

FIG. 5

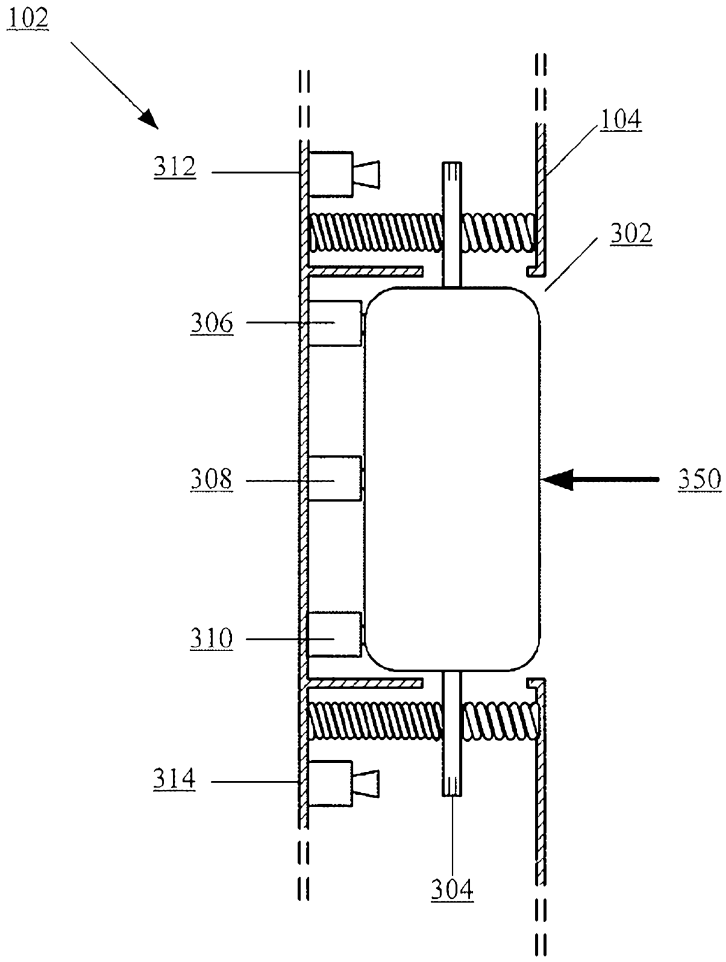

FIG. 6

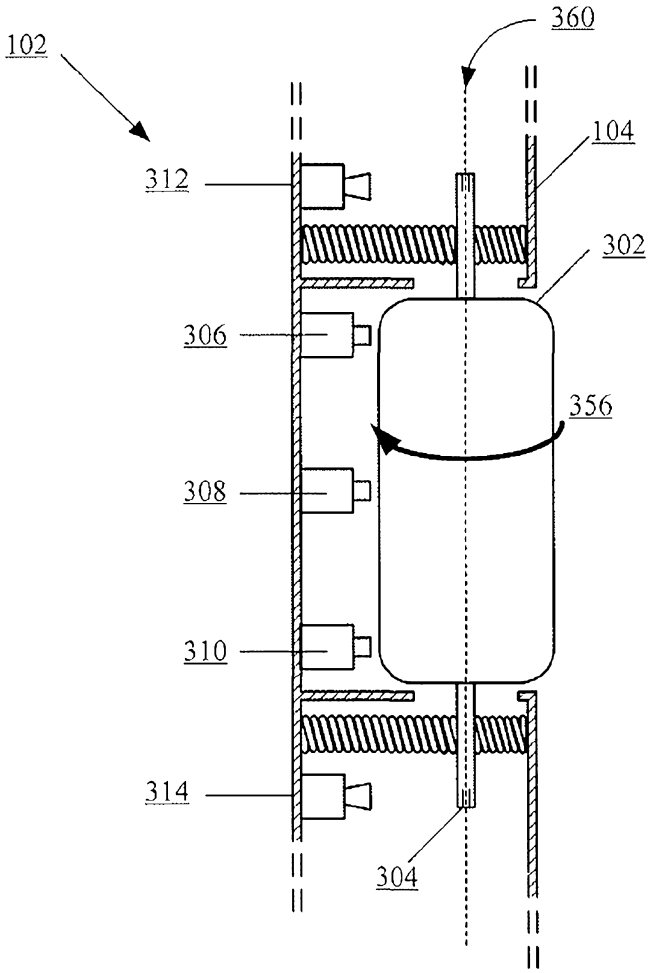

FIG. 7

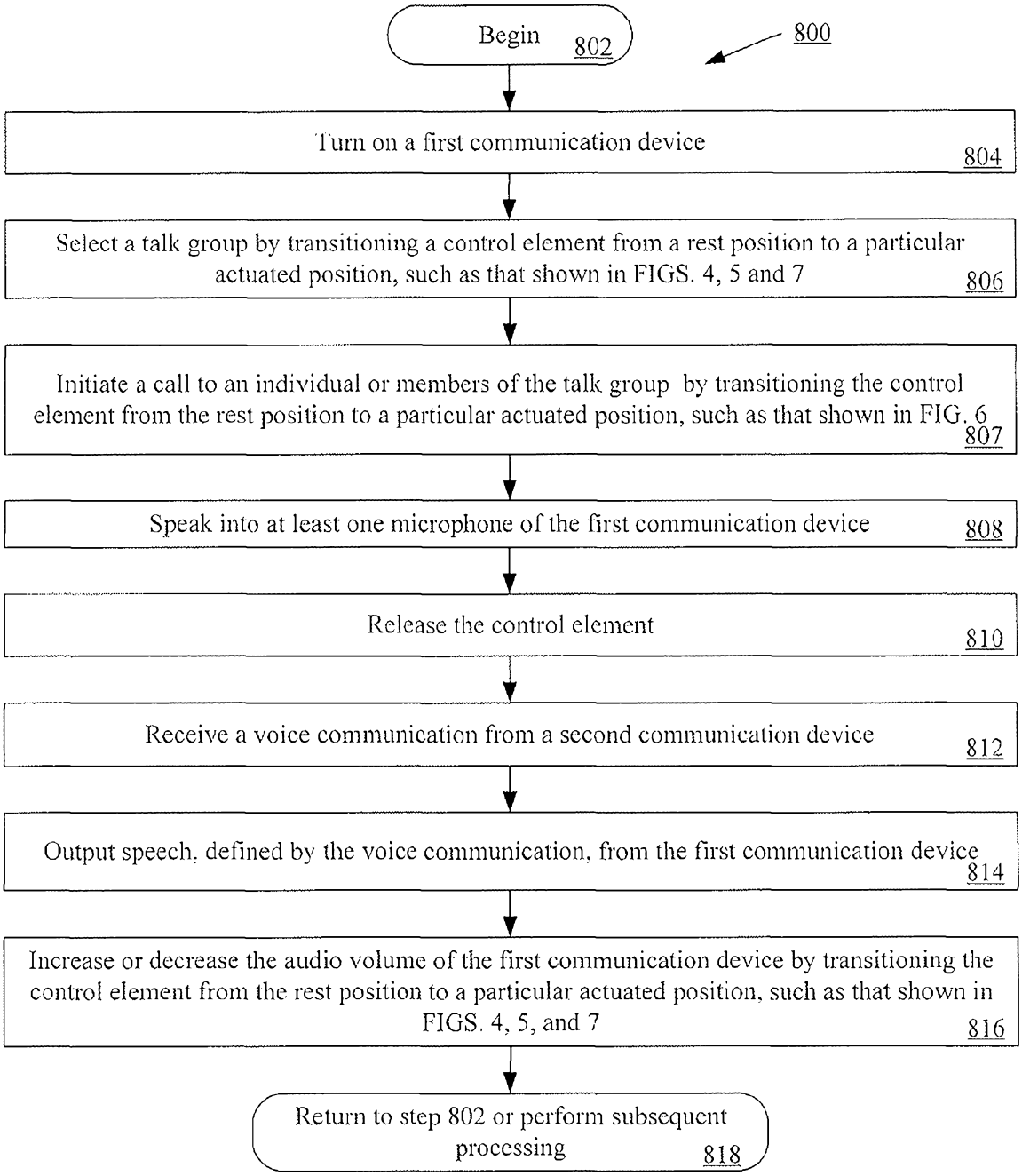
Begin 802
800
Turn on a first communication device 804
Select a talk group by transitioning a control element from a rest position to a particular actuated position, such as that shown in FIGS. 4, 5 and 7 806
Initiate a call to an individual or members of the talk group by transitioning the control element from the rest position to a particular actuated position, such as that shown in FIG. 6 807
Speak into at least one microphone of the first communication device 808
Release the control element 810
Receive a voice communication from a second communication device 812
Output speech, defined by the voice communication, from the first communication device 814
Increase or decrease the audio volume of the first communication device by transitioning the control element from the rest position to a particular actuated position, such as that shown in FIGS. 4, 5, and 7 816
Return to step 802 or perform subsequent processing 818

FIG. 8