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(54) **WIRELESS ADAPTER AND HANDHELD ELECTRONIC DEVICE TO WIRELESSLY CONTROL THE WIRELESS ADAPTER**

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(51) **Int. Cl.**

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H01R 13/66	(2006.01)
G06J 1/00	(2006.01)
H01R 12/71	(2011.01)
H01R 12/70	(2011.01)

(52) **U.S. Cl.**

CPC ***H01R 33/90*** (2013.01); ***G06J 1/00*** (2013.01); ***H01R 12/716*** (2013.01); ***H01R 13/6691*** (2013.01); *H01R 12/7011* (2013.01); *H01R 2201/04* (2013.01)

(58) **Field of Classification Search**

CPC H01R 33/90; H01R 13/6691; H01R 12/7011; H01R 2201/04; H01R 12/716; G06J 1/00; H05K 11/00

See application file for complete search history.

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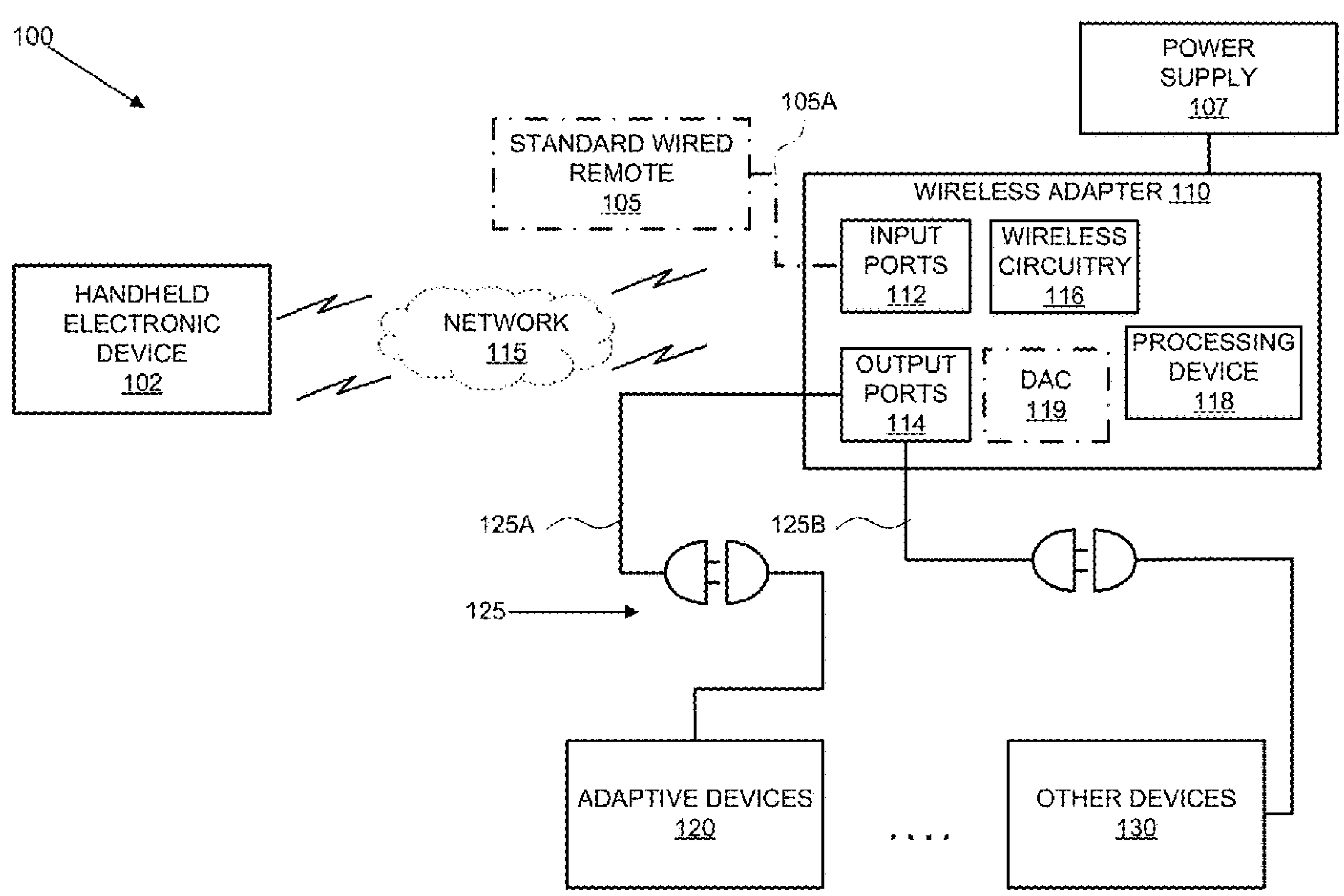
(57) **ABSTRACT**

An adapter device includes a printed circuit board (PCB), an output port disposed on the PCB and having first pins, where the output port is to be connected to an output harness that is connected to an adaptive device. The adapter also includes wireless circuitry one of disposed on or coupled to the PCB and a processing device disposed on the PCB and coupled to the output port and wireless circuitry. The processing device is to: identify, via the wireless circuitry, an actuation command from a wireless signal received from a handheld electronic device; translate the actuation command to one or more actuation bits that match one of analog-converted bits receivable over an input harness or digital control bits receivable over a wireless controller associated with the adaptive device; and provide the actuation bits to the first pins, the actuation bits causing the adaptive device to perform a specific action.

10 Claims, 15 Drawing Sheets



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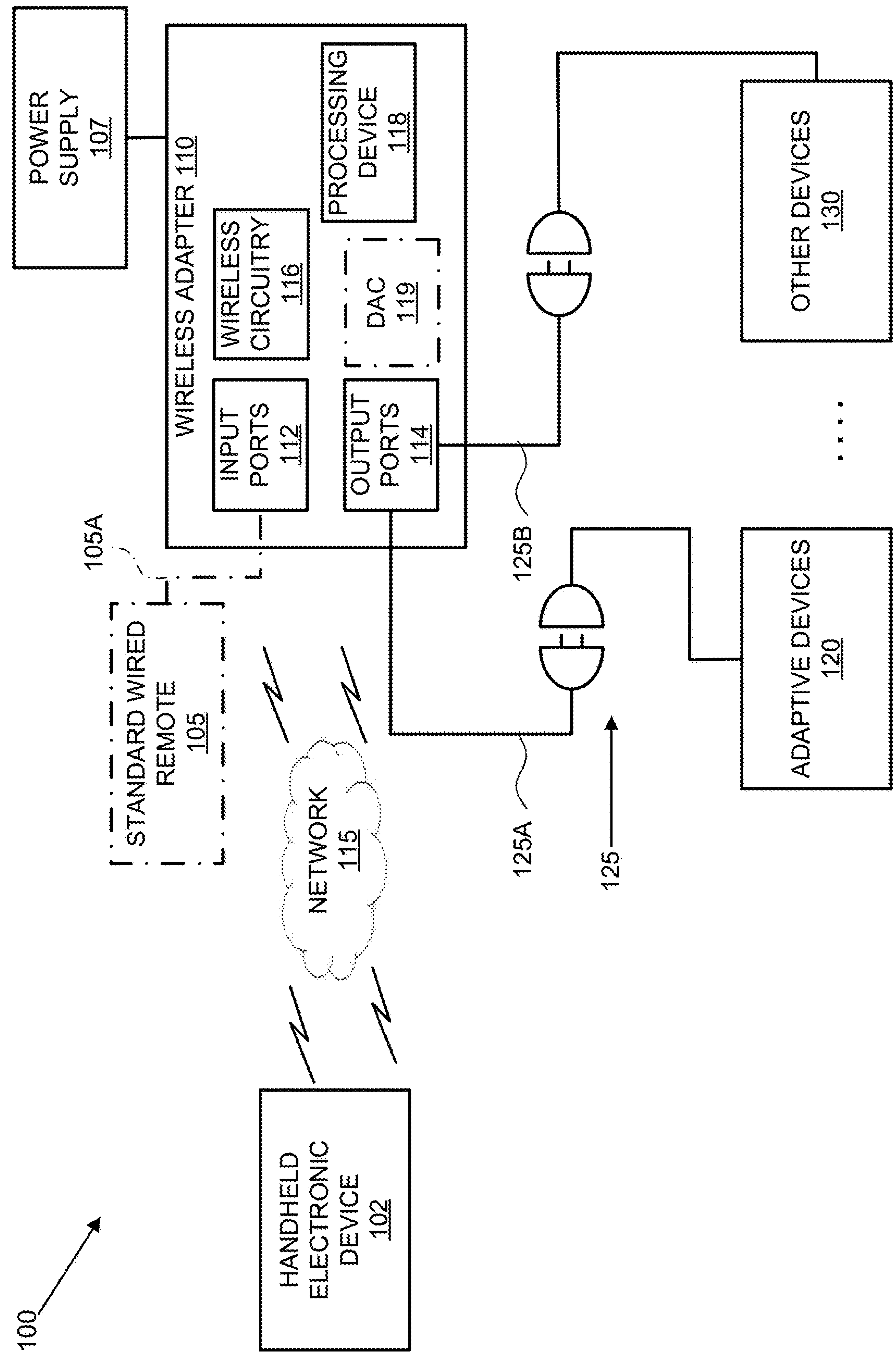

POWER SUPPLY 107
WIRELESS ADAPTER 110
INPUT PORTS 112
WIRELESS CIRCUITRY 116
OUTPUT PORTS 114
DAC 119
PROCESSING DEVICE 118
OTHER DEVICES 130
ADAPTIVE DEVICES 120
STANDARD WIRED REMOTE 105
105A
NETWORK 115
125A
125B
125
HANDHELD ELECTRONIC DEVICE 102
100

FIG. 1

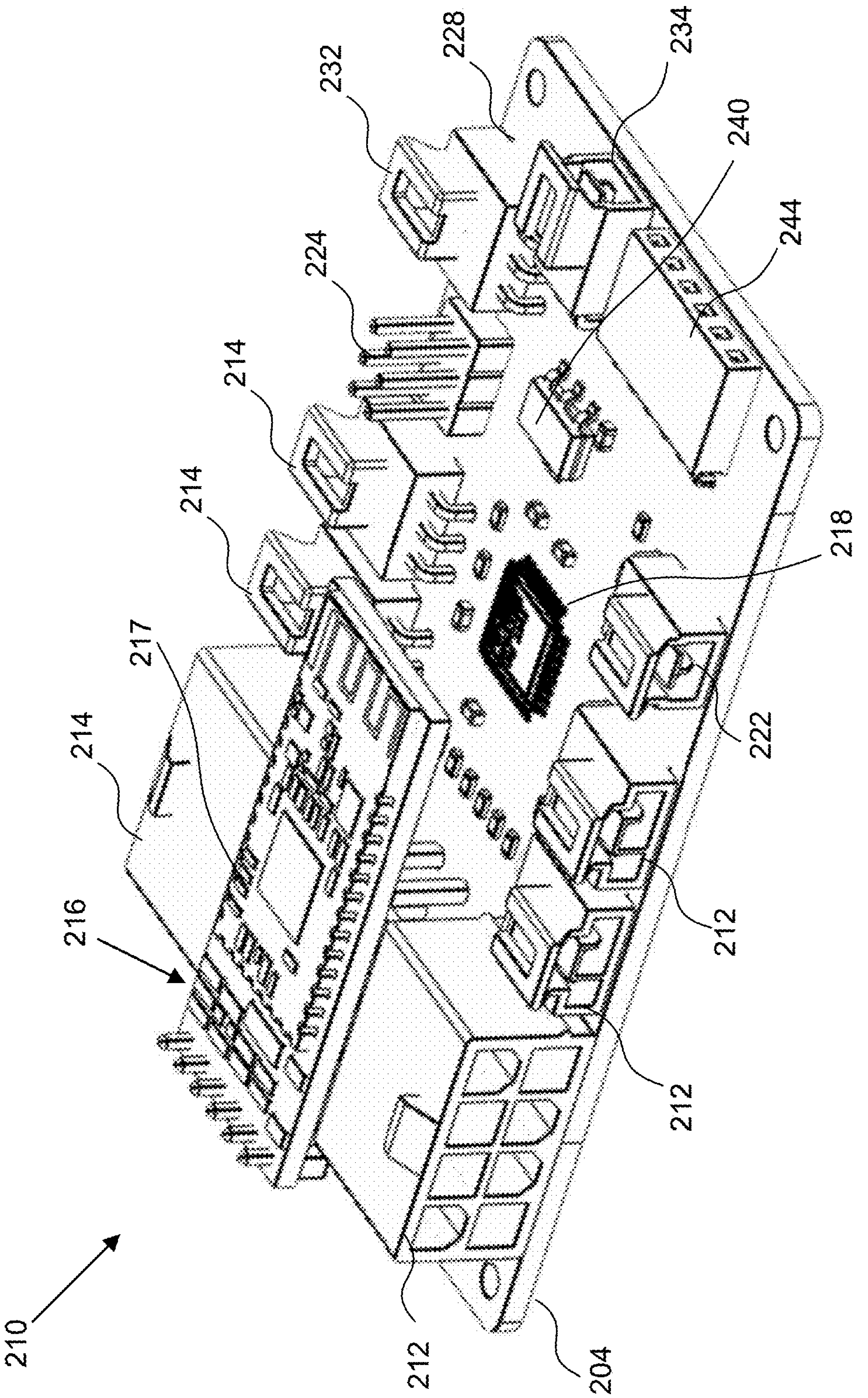
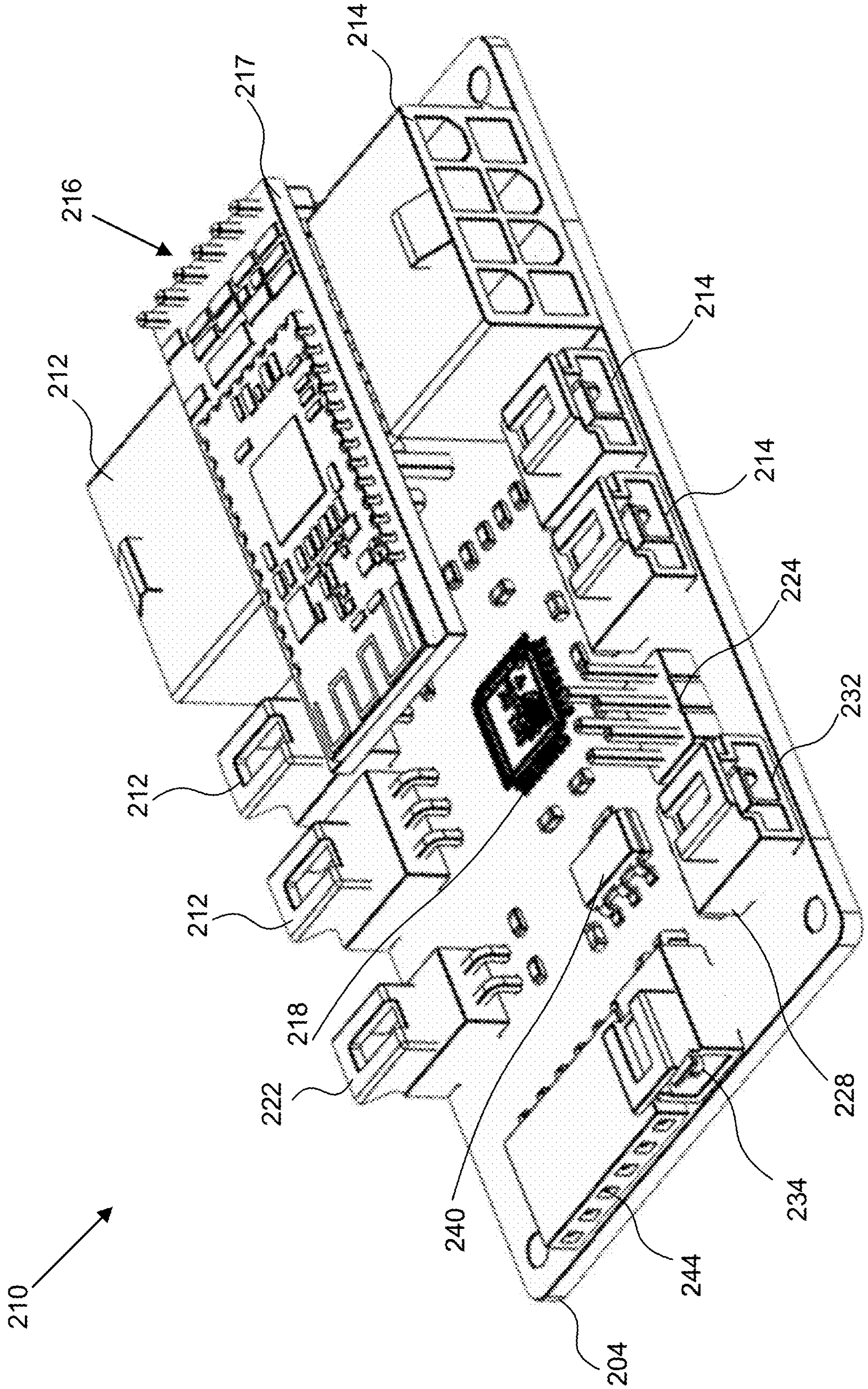

210
216
214
217
214
214
224
232
228
234
240
244
218
222
212
212
212
204

FIG. 2A


210
212
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212
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214
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216
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218
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228
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240
244
204

FIG. 2B

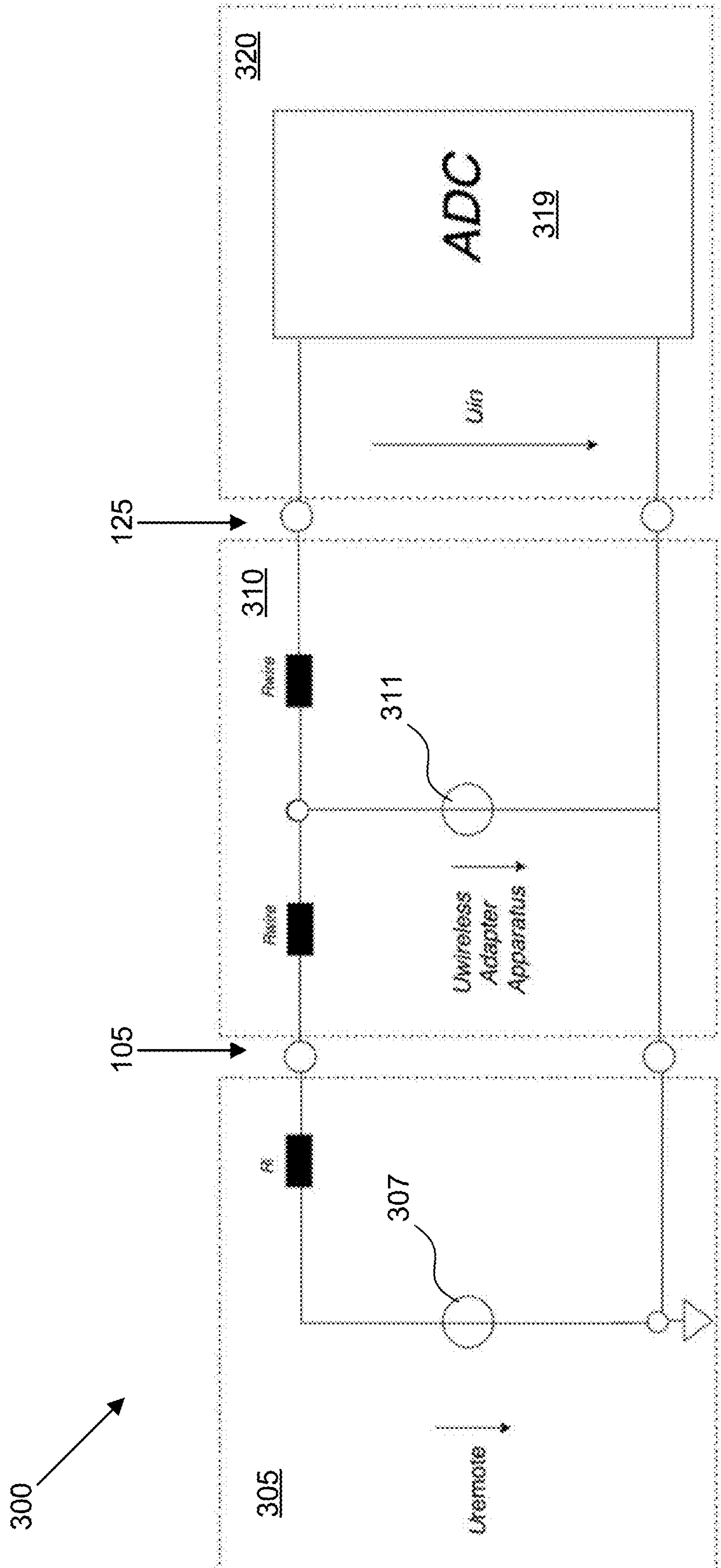

320
ADC
319
Uin
125
310
311
Uwireless
Adapter
Apparatus
105
307
300
305
Uremote

FIG. 3A

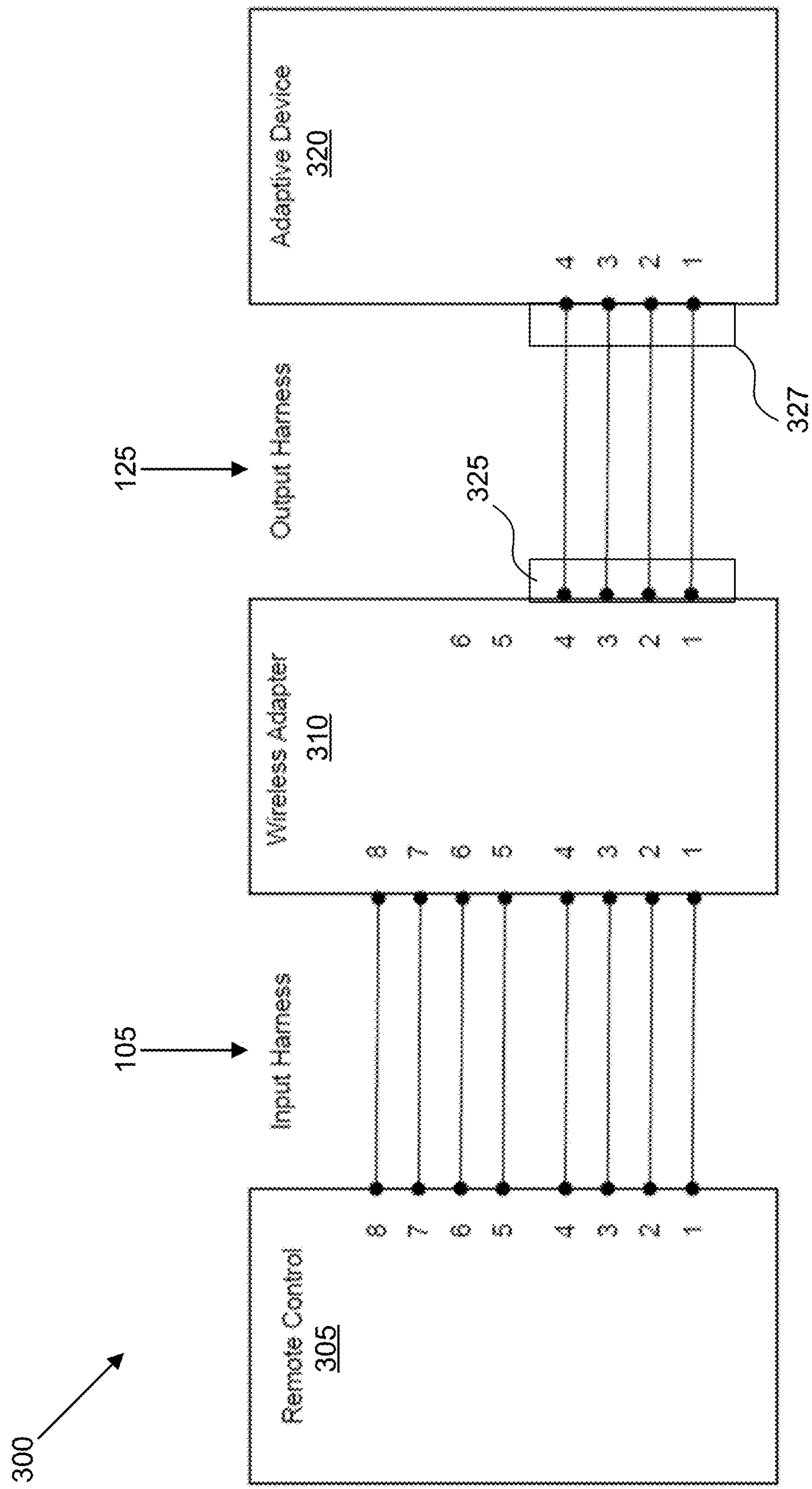

300
Remote Control
305
Input Harness
105
Wireless Adapter
310
Output Harness
125
325
327
Adaptive Device
320
8
7
6
5
4
3
2
1

FIG. 3B

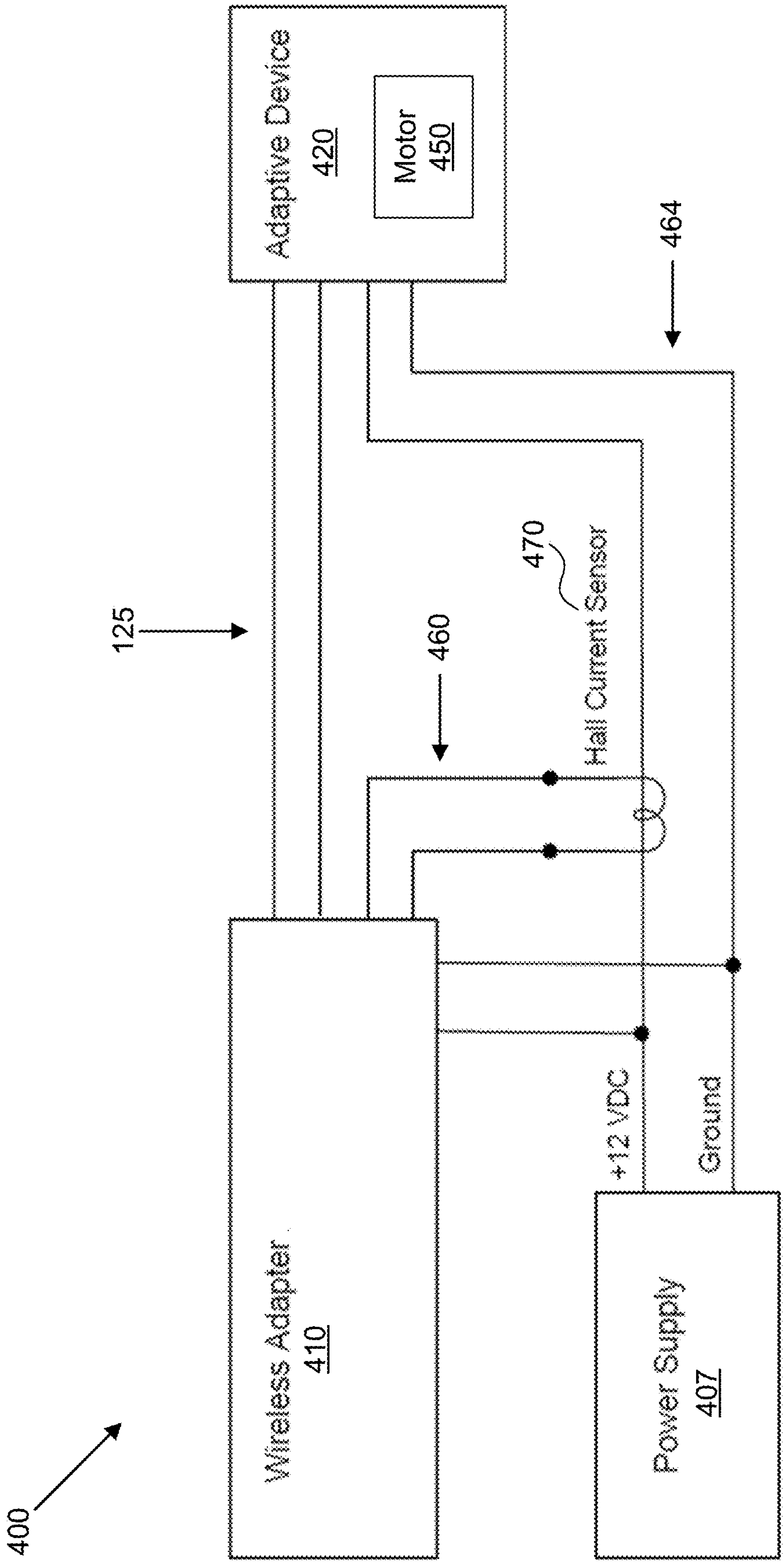

Adaptive Device
420
Motor
450
464
125
460
470
Hall Current Sensor
+12 VDC
Ground
Wireless Adapter
410
Power Supply
407
400

FIG. 4

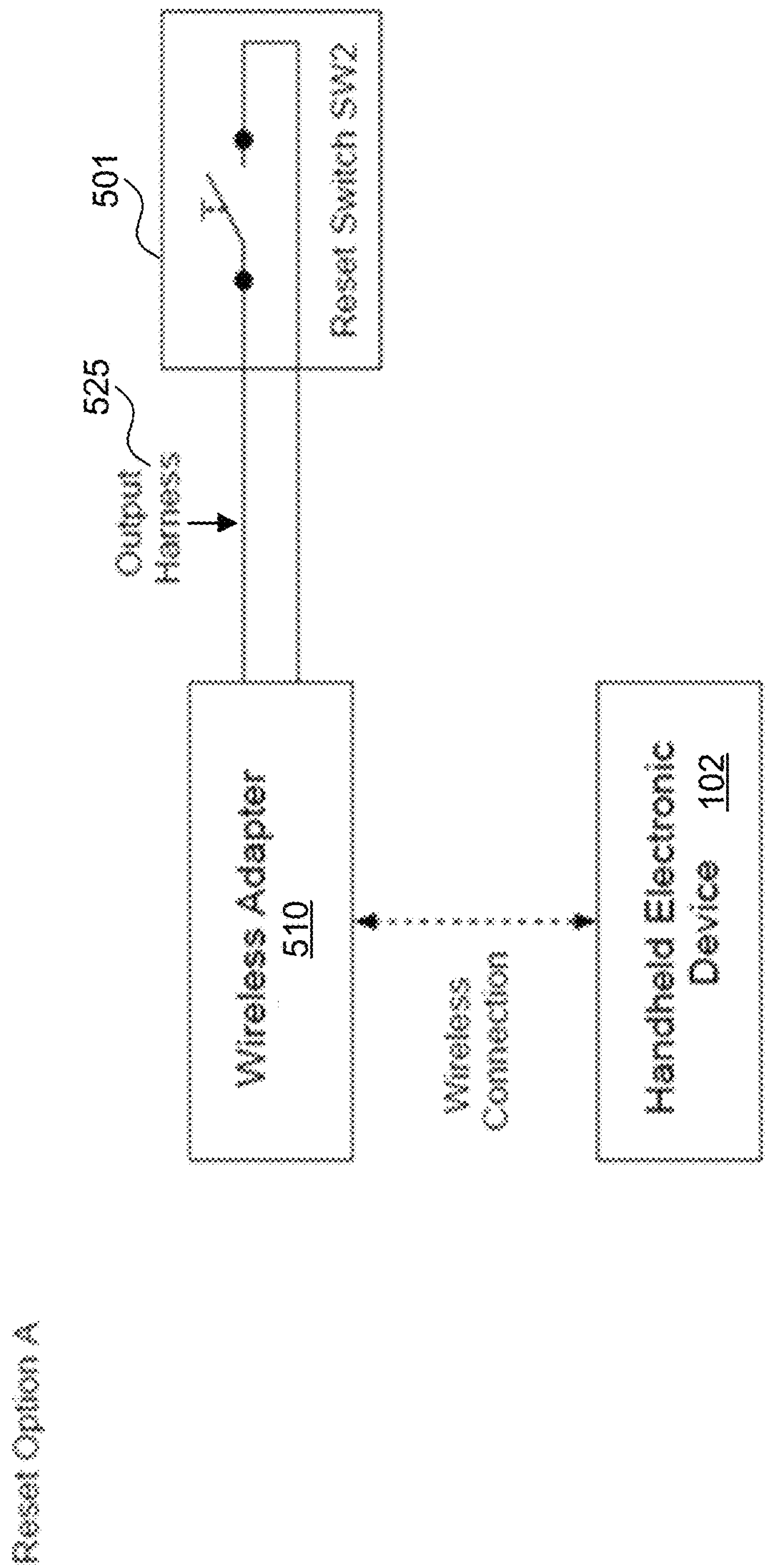

Reset Option A
Wireless Adapter
510
Output Harness
525
501
Reset Switch SW2
Wireless Connection
Handheld Electronic Device 102

FIG. 5A

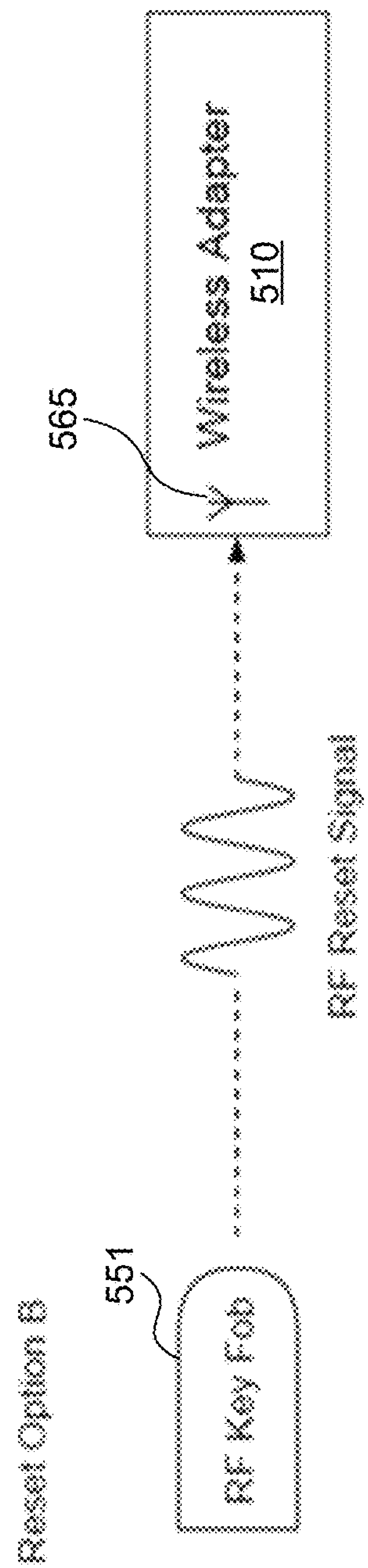

Reset Option B
RF Key Fob
551
RF Reset Signal
565
Wireless Adapter
510

FIG. 5B

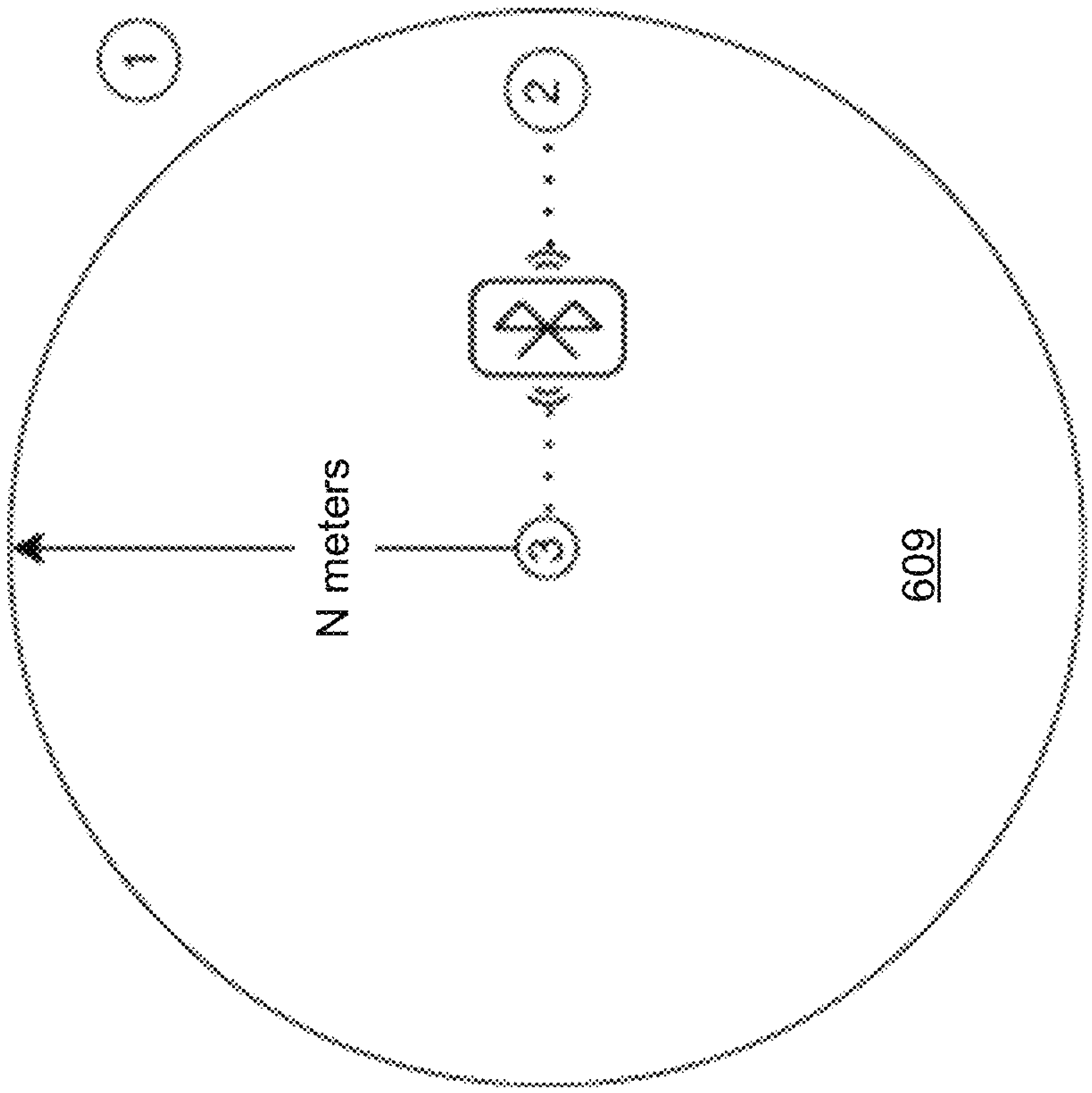


FIG. 6

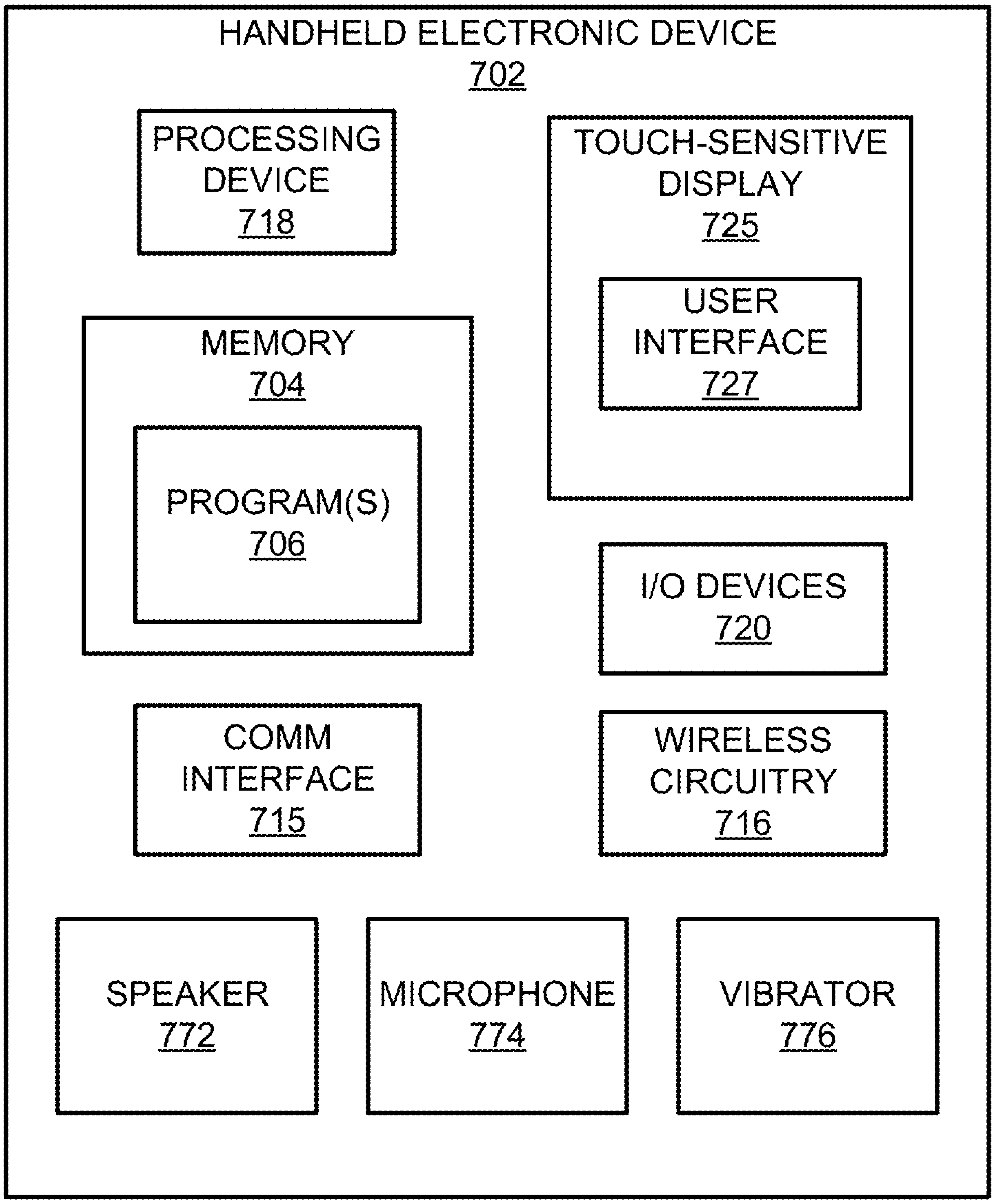

HANDHELD ELECTRONIC DEVICE
702
PROCESSING DEVICE
718
TOUCH-SENSITIVE DISPLAY
725
USER INTERFACE
727
MEMORY
704
PROGRAM(S)
706
I/O DEVICES
720
COMM INTERFACE
715
WIRELESS CIRCUITRY
716
SPEAKER
772
MICROPHONE
774
VIBRATOR
776

FIG. 7

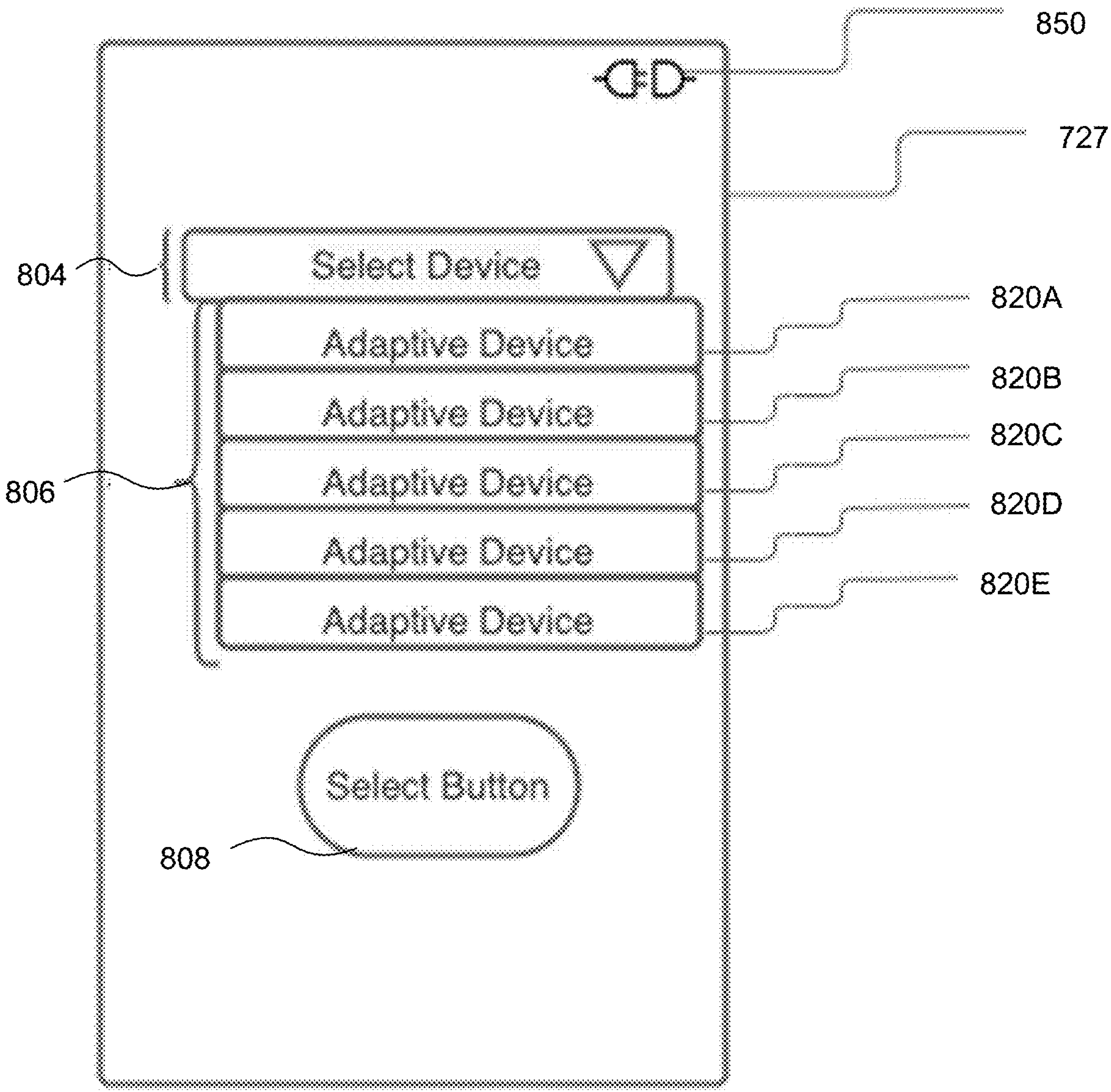

850
727
804
Select Device
806
Adaptive Device
820A
Adaptive Device
820B
Adaptive Device
820C
Adaptive Device
820D
Adaptive Device
820E
Select Button
808

FIG. 8A

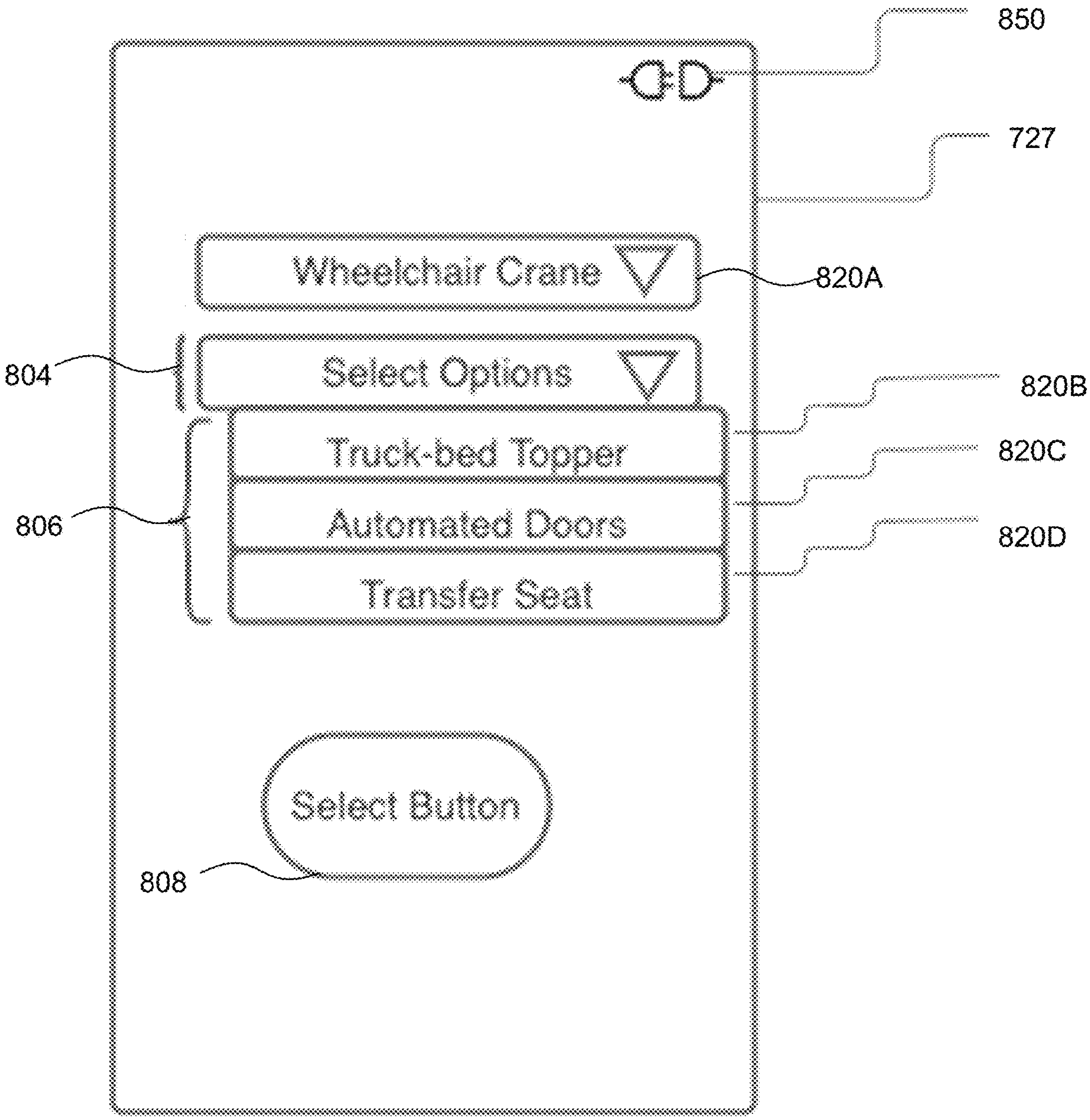

850
727
Wheelchair Crane
820A
804
Select Options
820B
Truck-bed Topper
820C
806
Automated Doors
820D
Transfer Seat
Select Button
808

FIG. 8B

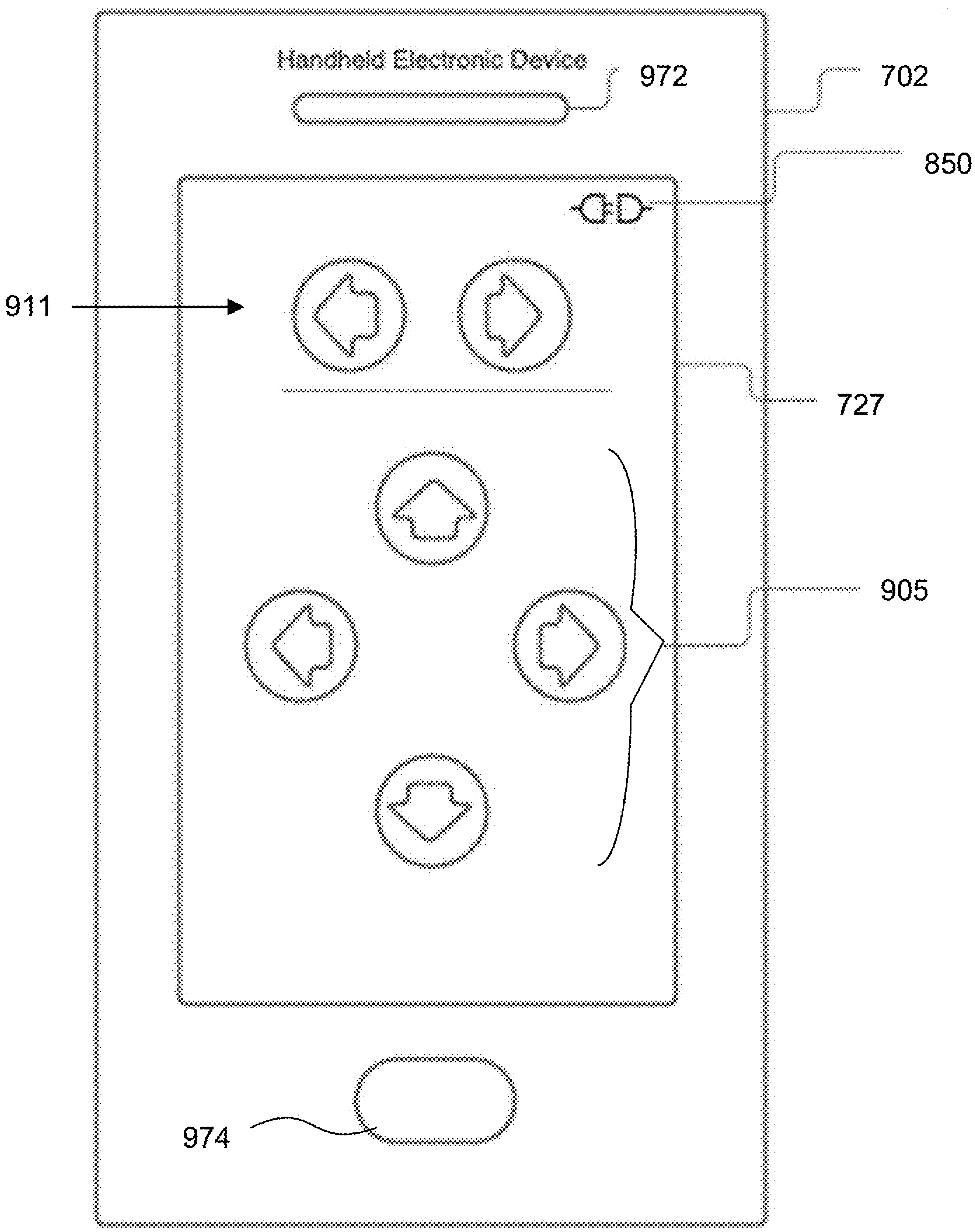
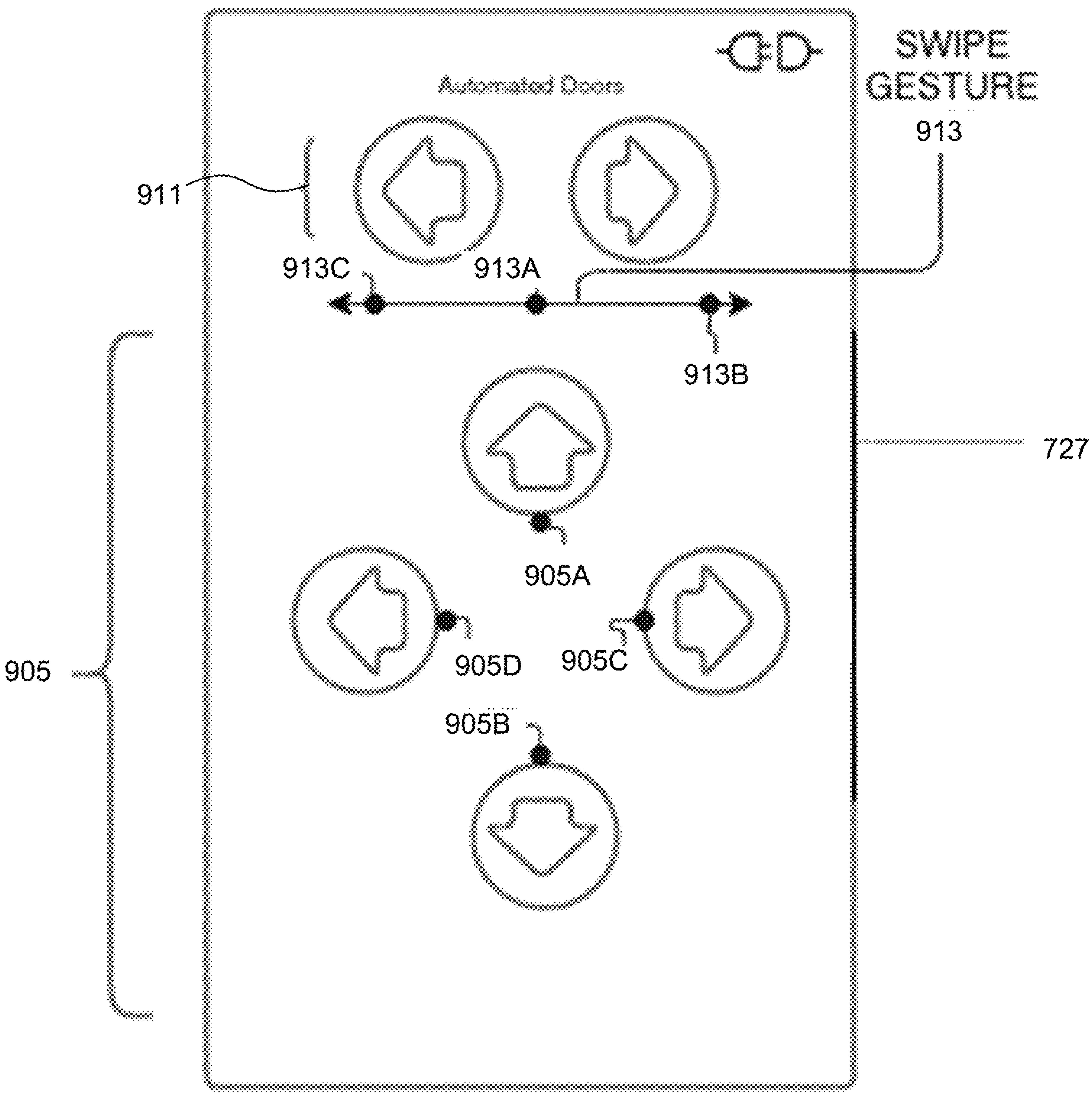


FIG. 9A



SWIPE GESTURE
913
Automated Doors
911
913C
913A
913B
727
905A
905
905D
905C
905B

FIG. 9B

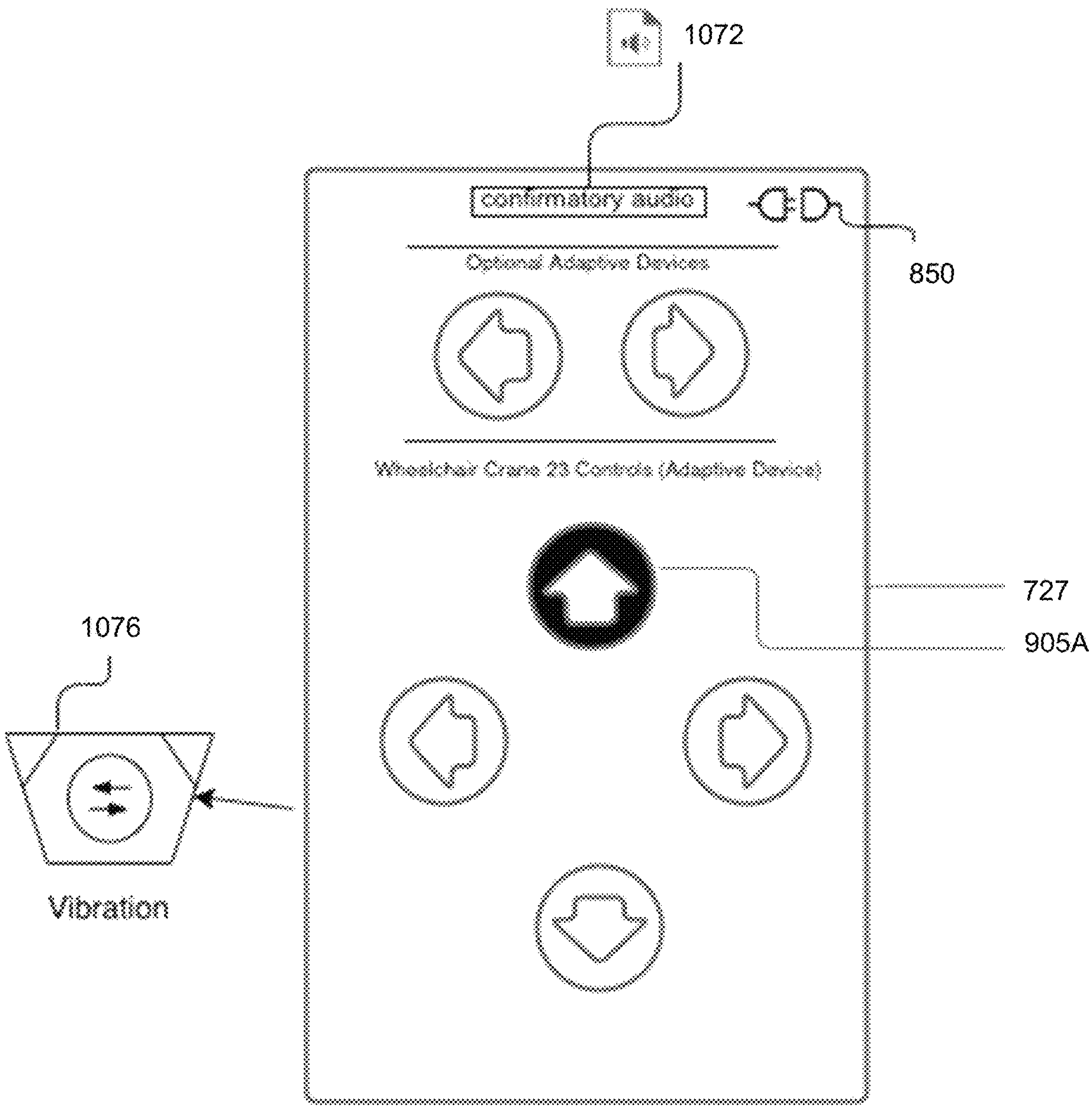

1072
confirmatory audio
850
Optional Adaptive Devices
Wheelchair Crane 23 Controls (Adaptive Device)
727
905A
1076
Vibration

FIG. 9C

1000

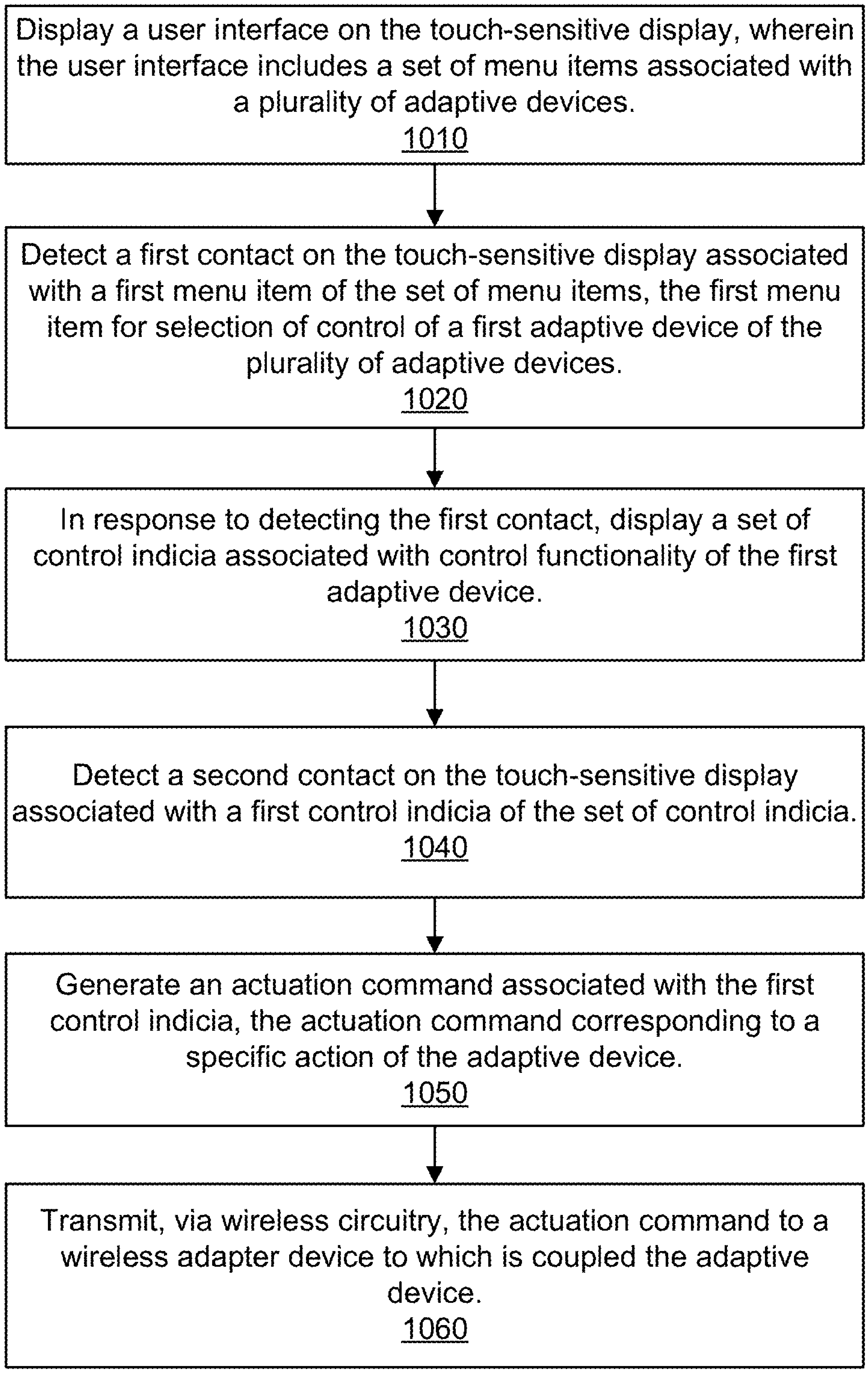

Display a user interface on the touch-sensitive display, wherein the user interface includes a set of menu items associated with a plurality of adaptive devices.
1010
Detect a first contact on the touch-sensitive display associated with a first menu item of the set of menu items, the first menu item for selection of control of a first adaptive device of the plurality of adaptive devices.
1020
In response to detecting the first contact, display a set of control indicia associated with control functionality of the first adaptive device.
1030
Detect a second contact on the touch-sensitive display associated with a first control indicia of the set of control indicia.
1040
Generate an actuation command associated with the first control indicia, the actuation command corresponding to a specific action of the adaptive device.
1050
Transmit, via wireless circuitry, the actuation command to a wireless adapter device to which is coupled the adaptive device.
1060

FIG. 10

WIRELESS ADAPTER AND HANDHELD ELECTRONIC DEVICE TO WIRELESSLY CONTROL THE WIRELESS ADAPTER

RELATED APPLICATION

This application is a continuation-in-part of U.S. patent application Ser. No. 17/306,487, filed May 3, 2021, which claims the benefit of priority to U.S. Provisional Patent Application No. 63/044,324, filed Jun. 25, 2020, both of which are incorporated herein by these references in their entireties.

BACKGROUND

Remote controls are used for controlling televisions and other electronic devices such as garage door openers, door closers, lights, fans, window shades, and fireplaces. However, no wireless remote controls are known to be available for a combination of wheelchair lifts, cranes, workout equipment, and other such adaptive devices employed by individuals with disabilities to help them be more mobile and functional in their daily lives.

These adaptive devices instead rely on conventional wired remotes controls. Traditional wired remote controls have many limitations. These wired remotes are designed to work only for the device to which the wired remote is connected, e.g., due to unique analog signals sent over bulky harness cables. Over time, the wired remotes can wear-out, break, or become unserviceable. No solutions currently provide wireless controls of a vehicular wheelchair lift, crane, or other adaptive devices combined. Any known wireless controller for an adaptive devices fails to meet industry needs because such wireless controllers are designed for a particular model and cannot be used on any other model or adaptive device. These wireless remotes are thus merely a simple wireless version of the old wired remote for such devices.

Because of the variety of devices that use remote controls, universal remote controls have been developed in conventional electronics. For example, a universal remote control can be programmed to control more than one device, such as a television, disc player, and receiver. These devices, however, do not translate into the world of adaptive devices that have a broad array of technology used, and thus no standard, for harness communications or remote control connections that could make a universal remote possible for use on multiple adaptive devices.

BRIEF DESCRIPTION OF THE DRAWINGS

Various exemplary implementations of the present disclosure will be understood more fully from the detailed description given below and from the accompanying drawings of various exemplary implementations of the disclosure.

FIG. **1** is a block diagram of a remote control system including a wireless adapter and a handheld electronic device that can function as a wireless remote controller according to at least one embodiment.

FIG. **2**A is a first side perspective view of a wireless adapter according to an embodiment.

FIG. **2**B is a second side perspective view of the wireless adapter according to an embodiment.

FIG. **3**A is a schematic block diagram of a system including a wired remote control coupled to a cable adapter that is to actuate an adaptive device through a typical harness according to at least one embodiment.

FIG. **3**B is a schematic block diagram associated with the wired remote control of FIG. **3**A, to illustrate pin connections according to at least one embodiment.

FIG. **4** is a schematic block diagram of a system that includes wireless adapter that employs Hall effect current sensing to prevent an over-current condition with reference to an adaptive device according to at least one embodiment.

FIG. **5**A is a schematic block diagram of a wired reset switch operatively coupled to the wireless adapter according to an embodiment.

FIG. **5**B is a schematic block diagram of a wireless reset switch operatively coupled to the wireless adapter according to an embodiment.

FIG. **6** is a diagram that illustrates zones of communication between the handheld electronic device and the wireless adapter when using a personal area network (PAN) for communication according to at least one embodiment.

FIG. **7** is a block diagram of a handheld electronic device that can function as a wireless remote according to at least one embodiment.

FIG. **8**A is an interface diagram of a user interface for selection of an adaptive device according to at least one embodiment.

FIG. **8**B is an interface diagram of a user interface for selection of an additional adaptive device according to at least one embodiment.

FIG. **9**A is an interface diagram of an handheld electronic device illustrating a set of control indicia on a touch-sensitive display according to at least one embodiment.

FIG. **9**B is the interface diagram of FIG. **9**A with additional swipe gesture functionality according to at least one embodiment.

FIG. **9**C is the interface diagram of FIG. **9**A with additional confirmatory indicia according to at least some embodiments.

FIG. **10** is a flow chart of a method for selecting and controlling an adaptive device of multiple adaptive devices from a handheld electronic device, according to various embodiments.

DETAILED DESCRIPTION

Aspects of the present disclosure address the above and other deficiencies through a wireless adapter (also referred to as a wireless adapter device or apparatus) and a corresponding handheld electronic device specially adapted to function as a wireless remote controller for the wireless adapter. In various embodiments, a number of adaptive devices can be electronically coupled with the wireless adapter, such as through a harness for each adaptive device. The handheld electronic device can then be wirelessly coupled with the wireless adapter in way that the handheld electronic device can wirelessly control each of the adaptive devices despite that normally, each adaptive device could only be controlled be its own separate wired or wireless controller. These adaptive devices can include, but not be limited to, wheelchair cranes, lifts (for individuals or wheelchairs), wheelchair elevator, transfer seats, automated doors, truck bed toppers, gate openers, physical therapy equipment such as exercise machines for those with spinal (or similar immobilizing) injuries, and the like. The handheld electronic device can be any number of handheld devices such as smart phones, mini-computers, tablets or other mobile device, media players, intelligent headsets, or adaptive screens that are connected to and receive data from body-attached computing devices for the disabled.

In at least one embodiment, an adapter device (e.g., wireless adapter) includes a printed circuit board (PCB). An output port can be disposed on the PCB that includes a set of first pins, where the output port is to be connected to an output harness that is connected to an adaptive device. Wireless circuitry is one of disposed on or coupled to the PCB and a processing device is disposed on the PCB and coupled to the output port and the wireless circuitry. As used herein, the term "coupled to" can be understood to mean connected directly to or connected indirectly through one or more intervening components. The processing device can identify, via the wireless circuitry, an actuation command from a wireless signal received from a handheld electronic device, such as the handheld electronic device discussed herein. The processing device can further translate the actuation command to one or more actuation bits that match one of analog-converted bits receivable over an input harness or digital control bits receivable over a wireless controller associated with the adaptive device. The processing device can further provide the actuation bits to one or more of the set of first pins, the actuation bits to cause the adaptive device to perform a specific action. Upon receipt of the actuation bits, the adaptive device can perform the specific action and continue to respond to additional actuation bits received from the adapter device.

In this way, the actuation bits match what the adaptive device is accustomed to receiving as control bits and no additional hardware is required except to ensure the harness between the adapter device and the adaptive device has the correct connectors with the correct pin-outs, which will be discussed in more detail. Thus, some adaptation of such a harness may be required or a new custom harness can be designed to work with the adapter device and each different adaptive device that may have different connectors on the original harness for the adaptive device. In some embodiments, the adapter device can receive many different kinds of actuation signals and translate these actuation signals into additional, but different, actuation bits for controlling multiple adaptive devices that are connected to multiple output ports.

In some embodiments, the handheld electronic device can automatically communicate with the wireless adapter and a user when the user comes within a threshold distance of the wireless adapter with the handheld electronic device. For example, the wireless circuitry can be adapted for use with personal area network (PAN) technology that can detect coming into range of the wireless adapter and, in response to coming into range, prompt the user (e.g., via audio and/or video) through a user interface of the handheld electronic device asking whether the user would like the adaptive device prepared. In response to a positive reply, the handheld electronic device can automatically send the actuation bits, thus facilitating preparation of the adaptive device knowing the user is within range and likely to need the adaptive device or other adaptive equipment.

In at least one embodiment, a handheld electronic device includes a processing device, memory, and wireless circuitry coupled to the processing device. A touch-sensitive display is coupled to the processing device. One or more programs can be stored in the memory and configured to be executed by the processing device, where the one or more programs include instructions for performing a number of operations, including displaying a user interface, on the touch-sensitive display, that includes a set of menu items associated with a set of adaptive devices. The operations further include detecting a first contact on the touch-sensitive display associated with a first menu item of the set of menu items, the first menu item for selection of control of a first adaptive device of the set of adaptive devices. The operations further include, in response to detecting the first contact, displaying a set of control indicia associated with control functionality of the first adaptive device. The operations further include detecting a second contact on the touch-sensitive display associated with a first control indicia of the set of control indicia. The operations further include generating an actuation command associated with the first control indicia, the actuation command corresponding to a specific action of the adaptive device. The operations further include transmitting, using the wireless circuitry, the actuation command to a wireless adapter device to which is coupled the adaptive device.

Therefore, advantages of the systems and methods implemented in accordance with some embodiments of the present disclosure include, but are not limited to, the design of a universal remote technology (to include the wireless adapter and the handheld electronic device) for multiple adaptive devices in a normally non-compatible technology environment. Those who are disabled or have impaired function and/or mobility can easily and seamlessly work through a single handheld electronic device to control many different adaptive devices. This interaction for purposes of controlling the adaptive device can be made even easier by using voice communication and other visual, audio, and tactile confirmatory signals generated by the handheld electronic device. Other advantages will be apparent to those skilled in the art of control technology associated with adaptive electronic equipment, as will discussed hereinafter.

FIG. **1** is a block diagram of a remote control system **100** including a wireless adapter **110** (also referred to as a wireless adapter device or apparatus) and a handheld electronic device **102** that can function as a wireless remote controller according to at least one embodiment. The remote control system **100** can further include a network **115** over which the handheld electronic device **102** and the wireless adapter **110** communication wirelessly, an optional standard wired remote **105**, a power supply **107** to provide power to the wireless adapter **110**, two or more adaptive devices **120**, and one or more other devices **130**.

As discussed, the adaptive devices **120** can include, but not be limited to, wheelchair cranes, lifts (for individuals or wheelchairs), transfer seats, automated doors, truck bed toppers, gate openers, physical therapy equipment, and the like. A wheelchair lift or crane can lift a wheelchair into the back of a pickup truck, a van, or up and down a stairwell or set of stairs. A transfer seat can function to lift an individual up or down to position the individual to enter or exit a vehicle. A truck bed topper can automate opening and closing a topper or other cover to the truck bed. Automated doors can open and close a vehicle, home, or other location that the individuals frequent. Physical therapy equipment can include different types of exercise machines or negative resistance machines for injured individuals that are doing exercises to return mobility to limbs and joints or strength to the body generally. Such physical therapy equipment can also be specially adapted for those with spinal cord injuries and for whom it is especially difficult to operate conventional handheld remote control devices. The adaptive device **120** can also be an elevator that lifts or lowers a wheelchair. These are merely illustrative examples, where individual users can interact with a variety of different devices that are classifiable as electronic equipment with a combination of hardware and software to control that hardware. The other devices **130** can include other automated devices that may not necessarily be "adaptive," such as lights, air conditioning, heat, and the like.

In some embodiments, the wireless adapter **110** further includes, but is not limited to, a set of input ports **112**, a set of output ports **114**, wireless circuitry **116**, a processing device **118**, and one or more digital-to-analog converter (DAC) **119**. The standard wired remote **105** can be connected to one of the input ports **112**, e.g., via an input harness **105**A such as an 8-way Molex cable. The term "harness" can be understood to refer to a set of bundled wires with a connector at each end of the bundle of wires, e.g., to form a multi-wire cable. For an 8-way Molex cable, each connector can include eight pins. Each adaptive device **120** and each other device **130** can be connected to one of the output ports **114** via an output harness **125**. For example, each adaptive device **120** can be connected to an output port **114** via an output harness **125**A and each other device can be connected to an output port **114** via an output harness **125**B. In some embodiments, one or more adaptive device **120** can be daisy-chained (e.g., via another output harness **125**A or **125**B) to another adaptive device **120**.

In these embodiments, the one or more DAC **119** can be coupled between the processing device **118** and one or more of the output ports **114**. Each DAC **119** can convert the actuation bits generated by the processing device **118** to an analog signal before being sent over the output harness **125**. The one or more DAC **119** is indicated as optional because each DAC **119** can alternatively be including within the processing device **118** or integrated with the one or more output ports **114**.

In embodiments, some of the output harnesses **125** can be customized so that a first connector at the output port end (e.g., an input connector) is sized to fit within an output port **114** and that has a set of pins that is compatible with a set of first pins of the output port **114**. A second connector (e.g., an output connector) of the first harness can be sized to fit within an input port (e.g., a control port) of the adaptive device **120** and that has a set of pins that is compatible with a set of second pins of the input port. Each output harness **125** can be an 8-way Molex cable or some other type of harness cable. At least the connector that connects into the adaptive devices **120** or **130** can further be a Molex 6-pin connector, a Molex 3-pin connector, a 5-pin straight connector, a 5-pin quick connector, a 6-position circular connector plug, and the like.

In various embodiments, the network **115** can be any number of communications networks, such as, for example, a cellular network, a radio frequency (RF) network, a personal area network (PAN), a local area network (LAN), or a portion of a wide area network (WAN). For example, the cellular network can be based on different generations of telecommunications technology, such as 3G, 4G, 5G, data services such as Universal Mobile Telecommunications System (UMTS), or a combination thereof. The RF network can be based on WiFi (of the WiFi Alliance®), e.g., with particular use of 2.4 GHz and/or 5 GHz links, or infrared technology. The PAN can be based on Bluetooth® (of the Bluetooth Special Interest Group), Zigbee™ technology, other wireless PANs, which can also be a wireless mesh network. The LAN can be based on a combination of Ethernet and RF wireless technology, to include IEEE 802.11 or similar protocols, and can be connected to the Internet or a cloud. Thus, the wireless circuitry **116** can be adapted to communicate with the handheld electronic device **102** using circuitry that is compatible with at least one of cellular, RF, LAN, PAN, or WAN technology associated with the network **115**.

In various embodiments, the processing device **118** can be a microprocessor, a programmed processor, such as an application-specific integrated circuit (ASIC), a digital signal processor (DSP), a combination thereof, or other control logic or processing circuitry capable of performing the operations disclosed herein with reference to the wireless adapter **110**. These operations can include interfacing with or including the wireless circuitry **116** and having a local memory (not illustrated) sufficient to execute any number of instructions in software and/or firmware.

FIG. **2**A is a first side perspective view of a wireless adapter **210** according to an embodiment. FIG. **2**B is a second side perspective view of the wireless adapter **210** according to an embodiment. In one embodiment, the wireless adapter **210** is the wireless adapter **110** of FIG. **1**, except now adding some additional detail, where similarly numbered components can be considered to be the same or similar to the component of the wireless adapter **110**.

In various embodiments, the wireless adapter **210** includes a printed circuit board (PCB) **204** or other electrical board such as a control board. These embodiments further include a set of input ports **212** (some of which can vary in size and number of pins), a set of output ports **214** (some of which can vary in size and number of pins), and a processing device **218** disposed on the PCB **204**. The wireless adapter **210** can further include wireless circuitry **216**, which can be disposed on a separate communication board **217**, be disposed on the PCB **204** itself, or optionally integrated within the processing device **218**. One of the output ports **214** can have a set of first pins and be coupled to the adaptive device **120** via the output harness **125**A (FIG. **1**).

In these embodiments, the processing device **218** can identify, via the wireless circuitry **216**, an actuation command from a wireless signal received from the handheld electronic device **102** over the network **115**. The processing device **218** can further translate the actuation command to one or more actuation bits that match one of analog-converted bits receivable over the input harness **125**A (FIG. **1**) or digital control bits receivable over a wireless controller associated with the adaptive device (e.g., like the standard wired remote **105**, only which is wireless). The processing device **218** can further provide the actuation bits to one or more of the first pins of one of the output ports **214**, the actuation bits to cause the adaptive device to perform a specific action. The actuation bits can correspond to one or more discrete actions, each discrete action being associated with a bit of the actuation bits and a pin of the set of first pins.

In some embodiments, the wireless adapter **210** further includes an in-system programming (ISP) connector **224** disposed on the PCB **204** and coupled to the processing device **218**, a Hall effect chip **228** optionally disposed on the PCB **204** and coupled to the processing device, and a Hall cable connector **232** disposed on the PCB **204** and coupled with the processing device **218**. In these embodiments, the ISP connector **224** (also sometimes known as an in-circuit serial programming (ICSP) connector) can be attached to an external programing cable to enable programming the processing device **218** while installed in a completely assembly wireless adapter **210**. The ISP connector **224** can also enable firmware updates to be delivered to an on-chip memory of the processing device **218**, e.g., microcontroller or related processor without requiring specialist programming circuitry on the board.

In various embodiments, the wireless adapter **210** further includes a power connector **234** disposed on the PCB **204** to receive power from a power supply (FIG. **4**) for the wireless adapter **210**. The wireless adapter **210** can further include a step-down voltage converter **240** coupled to the power connector **234** and which is to step down voltage received from power supply, e.g., so that the power supplied to the components and other circuitry disposed on the PCB **204** is sufficient yet not too high. The wireless adapter **210** can further include a programming interface **244** to receive a further programming connector to facilitate programming of the processing device **218** and/or other circuitry or settings of the disposed electrical components disposed on the PCB, e.g., by loading a boot loader onto the wireless adapter **210** that enables performing a load of the programming.

FIG. **3**A is a schematic block diagram of a system **300** including a wired remote control **305** coupled to a wireless adapter **310** (such as the wireless adapter **110** or **210**) that is to actuate an adaptive device **320** through a typical harness according to at least one embodiment. More specifically, the wired remote control **305** generates an analog signal from a voltage source **307** and input resistance (Ri) that is transmitted through an input harness **105**A to the wireless adapter **310**. The wireless adapter **310** can further boost and protect the analog signal with a second voltage source **311** and some additional wire resistance (Rwire) before sending the refresh analog signal over an output harness **125** to the adaptive device **320**. In this way, the wireless adapter **310** acts as a pass-through device for the analog signal when the wired remote control **305** is employed. The adaptive device **320** can include an analog-to-digital converter (ADC) **319** to convert the analog signal to a digital signal that directs a controller (or some control logic) of the adaptive device **320** in performing a specific action.

FIG. **3**B is a schematic block diagram associated with the wired remote control **305** of FIG. **3**A, to illustrate pin connections according to at least one embodiment. For example, in one embodiment, the input harness **105**A is an 8-pin harness (e.g., 8-way Molex cable), and thus the output port of the remote control **305** and the input port **112** of a wireless adapter (such as the wireless adapter **110** or **210**) can also include eight pins. These ports, and the use of the wired remote control **305**, can provide a back-up that can be connected at time of installation or later if the wireless circuitry **116** or **216** of the wireless adapter **310** happens to fail. Providing the wired remote control **305** as a backup could help avoid the situation where a user is stranded without a way to access a vehicle, a home, or an important means of transportation just because wireless control has went down even if temporarily.

In some embodiments, the output harness **125** is instead a 4-way harness (or some N-way harness other than 8-way) to couple the output port **114** of the wireless adapter **310**. Thus, the N pins (or four pins in this example) of the harness only need to connect to four pins of the output port **114** of the wireless adapter **310** such as pins 1-4 of six available pins. In embodiments, the output harness **125** is customized so that a first connector **325** at the output port end is sized for the output port **114** and that has a set of pins that is compatible with a set of first pins of the output port **114**. A second connector **327** of the output harness **125** can be sized for connection to an input port (e.g., a control port) of the adaptive device **120** and that has a set of pins that is compatible with a set of second pins of the input port. Because the wireless adapter **310** acts as a pass-through for an analog signal from eight pins of the input harness **105**A to four pins of the output harness **125**, the first set of eight pins of the input port **112** can be coupled to the second set of four pins of the output port **114** using a predetermined mapping between the input harness **105**A of the wired remote control and the output harness **125**. This predetermined mapping can ensure that the analog signal properly passed, and serialized if necessary, into the fewer number of pins of the output harness **125**.

FIG. **4** is a schematic block diagram of a system **400** that includes wireless adapter **410** that employs Hall effect current sensing to prevent an over-current condition with reference to an adaptive device according to at least one embodiment. The wireless adapter **410** can be any of the wireless adapters **110**, **210**, or **310** illustrated herein. The system **400** can further include a power supply **407** (such as the power supply **107**) and an adaptive device **420** (such as one of the adaptive devices **120**). The power supply **407** can provide power to both the wireless adapter **410** and the adaptive device **420** over separate power cables. The adaptive device **420** can include a motor **450** that is operatively coupled to one or more linkages to move mechanical structures (such as lifts, arms, pulleys, and the like) that cause the adaptive device **420** to function.

In these embodiments, the system **400** further includes a Hall cable **460** to be connected between the Hall cable connector **232** (FIGS. **2**A-**2**B) and a power cable **464** that runs between the power supply **407** and the motor **450**. The Hall cable **460** includes a Hall effect sensor **470** (e.g., a current sensor) that is coupled to the power cable **464** in order to sense a current within the power signal provided to the motor **450**. In these embodiments, the processing device **218** can use the Hall effect sensor **470** to detect that current supplied to the motor **450** has reached a threshold current value for a predetermined period of time, and, in response to such detection, signal the motor **450** to shut off to protect the motor from an over-current condition.

For example, in the event the Hall effect sensor **470** continues to receive current when motor **450** (and/or motor linkage) has reached its endpoint, the processing device **218** can register a further increase in the current and initiate a fail-safe protocol that shuts down current to the adaptive device **420** by the power supply **407** to avoid damage. Thus, due to an accidental non-release of the button being pushed on the handheld electronic device **102**, the wireless adapter **410** (e.g., by way of the processing device **218**) initiates a "Stop Movement" command to prevent the adaptive device **420** from being damaged. This fail-safe protocol can stop current from flowing to the adaptive device **420** if the current flow reaches the threshold current value for more than a certain number of seconds, for example. This fail-safe protocol can protect the attached adaptive device **420** in the event that something causes the adaptive device **420** to stay in a movement mode or continues to supply a current flow to the adaptive device **420**, e.g., a mobile phone that may have a cracked screen and fails to release from a touch to the control buttons or an object that gets stuck to the screen that initiates movement and fails to release or if the button is accidentally pressed for a period of time beyond the general operating time.

FIG. **5**A is a schematic block diagram of a wired reset switch **501** operatively coupled to a wireless adapter **510** according to an embodiment. The wireless adapter **510** can be any of the wireless adapters **110**, **210**, **310**, or **410** disclosed herein. A harness **525** can be coupled between the wireless adapter **510** and the wired reset switch **501**, thus making the wired reset switch **501** accessible by a user, e.g., that may be positioned in the front of a vehicle and thus out of reach of the wireless adapter **510** that may be installed in the back of a vehicle or closer to the adaptive device(s) being controlled. When the wired reset switch **501** is pushed or otherwise selected, the wires reset switch **501** initiates a reset of the wireless adapter **510**, e.g., which can be understood as, in one embodiment, a reboot where power is disconnected briefly and reconnected again to the PCB **204**. Other resets can be more isolated in being related to reinitiating the processing device **118** and the wireless circuitry **116**, for example.

In the event, the operator of the adaptive device or adaptive equipment is disabled and has limited movement, the operator may be unable to enter the back of the vehicle to reset the equipment if it becomes inoperable. If the adaptive device stops working for any reason, then the user can rely on traditional remote controls or initiate a reset process that will reset and restore the original settings of the wireless adapter **510**. While conflicts related to connected hardware devices are attempted to mitigated, there is always a small probability that the third party adaptive device may interfere with functioning of the wireless adapter **510**, necessitating a reset or reboot. Providing a means by which to reset or reboot the adaptive device without forcing the end-user to exit their vehicle mitigates this issue and provides a safe environment to perform such a reset.

FIG. **5**B is a schematic block diagram of a wireless reset switch **551** operatively coupled to the wireless adapter **510** according to an embodiment. In addition to, or in lieu of, the option of using the wired reset switch **501**, the wireless adapter **510** the wireless reset switch **551** can be paired with a receiver **565** located on the wireless adapter **510**, e.g., being disposed on the PCB **204**. The receiver **565** can be integrated within the wireless circuitry **116** or **216** in some embodiments. In one embodiment, the wireless reset switch **551** is an RF (or other PAN-driven) key fob that can communicate with the receiver **565**, which when selected, may also cause the wireless adapter **510** to be reset or rebooted to reinitiate the wireless adapter **510**. In this way, the user can be enabled to reset/reboot the wireless adapter **510** without the need for tradition wires and switches that take up more room and can create an obstacle to mobility of the user within a vehicle, for example. Further, for individuals that are more severely disabled, being able to reach a key fob or the like that is attached to their person can be more convenient and easily reached than a wired reset switch **501** that might be attached at one location within the vehicle. This wireless option also accommodates the need to reset/reboot the wireless adapter **510** when the individual is outside of the vehicle.

Thus, in at least some embodiments, the system **400** (FIG. **1**) further includes a reset switch coupled to the power supply **407**. The reset switch can be coupled wired (e.g., the wired reset switch **501**) or wirelessly (e.g., the wireless reset switch **551**) to the power supply **407**, which when activated, is to disconnect the PCB **204** from and reconnect the PCB **204** to the power supply **407** to reboot the wireless adapter **510**, e.g., adapter device.

FIG. **6** is a diagram that illustrates zones of communication between the handheld electronic device **102** and the wireless adapter **110** when using a personal area network (PAN) for communication according to at least one embodiment. The wireless adapter **110** can be any of the wireless adapters **110**, **210**, **310**, **410**, and/or **510** as discussed herein with reference to FIGS. **1-5**B, and reference to the wireless adapter **110** should be understood as making reference to the other wireless adapters **210**, **310**, **410**, and **510** as well. As illustrated, the PAN can be Bluetooth®, but others are envisioned such as Zigbee™. In these embodiments, assume the wireless adapter **110** is located at the center of a circular zone **609**, as position **3** while the handheld electronic device **102** can be understood to be located somewhere outside of (e.g., at position **1**) or inside of (e.g., at position **2**) this circular zone **609**. While position **1** may be out of range for connecting, using the PAN technology, to the wireless adapter **110**, position **2** may be within range of connecting to the wireless adapter **110**.

Only by way of example, assume the circular zone **609** can reach a distance of up to N meters in open space, which, consistent with a Bluetooth® 4.0 signal, can be 100 meters. In various embodiments, when the handheld electronic device **102** comes within range of the PAN technology employed for communication with the wireless adapter **110** (e.g., illustrated at position **2**), the handheld electronic device **102** can automatically wirelessly connect with the wireless adapter **110**, assuming a previous pairing between the two that ensures authenticated and secure communication only with paired handheld electronic devices. Because this is an auto-connection, a user with disabilities and limited movement need not take additional action. For example, in at least some embodiments, the wireless adapter **110** remains sufficiently powered to scan for and detect the PAN-based signal from the wireless adapter **110**.

In some embodiments, the wireless adapter **110** (e.g., the processing device **118** in concert with the wireless circuitry **116**) can detect, using the PAN technology, that the handheld electronic device **102** is within a predetermined distance of the wireless circuitry **116**. The wireless adapter **110** can send a signal to the handheld electronic device **102** to initiate a voice prompt through a speaker of the handheld electronic device **102** that requests whether a user desires that the adaptive device be deployed. Further, in response to an affirmative response signal received from of the handheld electronic device **102**, the wireless adapter **110** can provide at least one of the one or more actuation bits to the first set of pins, e.g., of the output port **114**.

FIG. **7** is a block diagram of a handheld electronic device **702** that can function as a wireless remote according to at least one embodiment. In some embodiments, the handheld electronic device **702** is the handheld electronic device **102** of FIG. **1**. The handheld electronic device **702** can include, but not be limited to, a memory **704** to store one or more programs **706** made up of instructions, wireless circuitry **716**, a communication interface **715** (which might be separate from the wireless circuitry **716**), a processing device **718**, input/output (I/O) devices **720** that are not already illustrated, a touch-sensitive display **725** in which to display a user interface **727**, a speaker **772**, a microphone **774**, and a vibrator **776**. The wireless circuitry **716** can be coupled to the processing device **718** and include compatible technology to that of the wireless circuitry **116** and **216** of the wireless adapter **110** and **210**, for example. The touch-sensitive display **725** can be a touch screen, a touch panel, a touch pad, a touch screen monitor, a touch-sensitive screen, or the like. The other I/O devices **720** can include a joystick, click wheels, scrolling wheels, a stylus, key pads, cameras, light emitting diodes (LEDs), and the like.

The memory **104** and the processing device **118** can also include non-transitory computer-readable medium (or media) that store instructions. A "computer-readable medium," "computer-readable storage medium," "machine readable medium," "propagated-signal medium," and/or "signal-bearing medium" can include any device that includes, stores, communicates, propagates, or transports software for use by or in connection with an instruction executable system, apparatus, or device. This machine-readable medium can selectively be, but not limited to, an electronic, magnetic, optical, electromagnetic, infrared, or semiconductor system, apparatus, device, or propagation medium.

In some embodiments, the one or more programs **706** (e.g., software) are stored in the memory **704** and configured to be executed by the processing device **718**. The one or more programs **706** can include instructions for displaying the user interface **727** on the touch-sensitive display **725**. The user interface **727** that is displayed can include a set of menu items associated with a plurality of adaptive devices (see FIG. **8**A). The one or more programs **706** can include instructions for detecting a first contact on the touch-sensitive display **725** associated with a first menu item of the set of menu items. The first menu item can be for selection of control of a first adaptive device of one or more adaptive devices **120**. For example, the first contact can be one of a hover, a tap, or a press-and-hold action on the first control indicia. If a press-and-hold action, the commands that are sequentially generated can terminate upon the pressed contact being released.

In response to detecting the first contact, the instructions can further be executed for displaying a set of control indicia associated with control functionality of the first adaptive device, e.g., as illustrated in FIG. **9**A. The instructions can further be executed for detecting a second contact on the touch-sensitive display **725** associated with a first control indicia of the set of control indicia. For example, the second contact can be one of a hover, a tap, or a press-and-hold action on the first control indicia.

With additional reference to FIG. **7**, the one or more programs **706** can include instructions for generating an actuation command associated with the first control indicia, the actuation command corresponding to a specific action of the adaptive device. For example, the specific action can be one of up, down, in, out, open, or close at least a portion of the adaptive device **120**. The instructions can further be executed for transmitting, using the wireless circuitry **116** or **216**, the actuation command to a wireless adapter **110** (e.g., wireless adapter device) to which is coupled the adaptive device **120** or **130**.

In some embodiments, the one or more programs **706** further include instructions for detecting, using the previously-discussed PAN technology, that the handheld electronic device **702** is within a predetermined distance of the wireless adapter **110**, e.g., within the circular zone **609** illustrated in FIG. **6**. The instructions can further be executed for initiating, through the speaker **772**, a voice prompt that requests whether a user desires that the adaptive device **120** be deployed. Responsive to detecting an affirmative response via the microphone **774**, the instructions can be executed for sending a second actuation command to the wireless adapter **110**. Additional functionality of the handheld electronic device **702** be further described with reference to FIGS. **8**A-**10**.

FIG. **8**A is an interface diagram of the user interface **727** for selection of an adaptive device according to at least one embodiment. The user interface **727**, for example, can display a drop-down menu **804** from which a list or set of menu items **806** is displayed in response to selection of the drop-down menu **804**. For example, the set of menu items **806** can include indicia representing a first adaptive device **820**A, a second adaptive device **820**B, a third adaptive device **820**C, a fourth adaptive device **820**D, a sixth adaptive device **820**E, or more. The user can select, e.g., via a first contact with the touch-sensitive display **825**, any of the adaptive devices directly from the set of menu items **806**, and optionally may need to tap on a select button **808** in order to actually bring up a set of control indicia corresponding to the selected adaptive device.

In some embodiments, the one or more programs **706** include instructions for generating a confirmatory signal associated with successful detection of the first contact, e.g., through the touch-sensitive display device **825**. The confirmatory signal can be one of an audible sound from the speaker **872**, a vibration from the vibrator **876**, or a visual signal **850** via the user interface **727**. This confirmatory signal may therefore confirm for the user that is holding the handheld electronic device **702** that a successful selection of one of the adaptive devices has been made.

FIG. **8**B is an interface diagram of the user **727** interface for selection of an additional adaptive device according to at least one embodiment. For example, further to user interface **727** example of FIG. **8**A, assume the first adaptive device **820**A that was selected is a wheelchair crane, although other lift-based adaptive devices may also be selected. A user can further select an additional adaptive device from the drop-down menu **804**, e.g., from the set of menu items **806**. For example, suppose that the second adaptive device **820**B is a truck bed topper, the third adaptive device **820**C is a set of automated doors, and the fourth adaptive device **820**D is a transfer seat or physical therapy equipment. Upon detecting another contact selective of an additional adaptive device, the instructions can be executed to cause control indicia associated with both or a combination of the first adaptive device **820** and, e.g., the second adaptive device **820**B through the user interface **727**. An example of such control indicia is discussed with reference to FIG. **9**C, discussed below. A further confirmatory signal **850** can be generated to help the user verify that a communication link has been established with the additional adaptive device through the wireless adapter **110**.

FIG. **9**A is an interface diagram of the handheld electronic device **702** (FIG. **7**) illustrating a set of control indicia **905** on the touch-sensitive display **725** according to at least one embodiment. The handheld electronic device **702** can further include a speaker port **972** through which the speaker **772** can emit sound and a microphone port **974** through which the microphone **774** can receive sound, the latter of which can also be an audio jack, a Universal Serial Bus (USB) port, and the like. The set of control indicia can be associated with specific actions to be carried out by at least a portion of (e.g., linkages of) the adaptive device **720**A-**720**E. Assume, for purposes of explanation, that the selected adaptive device is the wheelchair crane of FIG. **8**B. Therefore, the set of control indicia **905** can include in, out, left, right, up, and down. In some embodiments, each control indicia of the set of control indicia, once selected, can cause optional additional control indicia **911** to be displayed in a central or upper portion of the user interface **727**.

In one embodiment, upon successful selection of the "up" control indicia, the handheld electronic device **702** can detect the selection through the touch-sensitive display screen **725**, formulate an actuation command, and send the actuation command (e.g., using the wireless circuitry **716** and the communication interface **715**) to the adaptive device **120**. The adaptive device **120** can then translate the actuation command and thereby force the wheelchair crane to lift up the wheelchair to which it is attached. The user can select the "up" control indicia more than once (e.g., incrementally) or simply touch and hold the "up" control indicia of the set of control indicia **905** until the wheelchair reaches a desired height and then let go. While the "up" control indicia is pressed, the wheelchair crane can lift the wheelchair at a fixed rate determined to be safe for the adaptive device. The user can also then select any number of additional control indicia of the set of control indicia **905** in order to move the wheelchair to a desired position, such as to the back of a pickup truck or a van.

In some embodiments, the handheld electronic device **702** can further receive, via the wireless circuitry **716**, a return signal from the wireless adapter device **710** that indicates successful execution of the actuation command. The handheld electronic device **702** can further generate, responsive to receiving the return signal, a second confirmatory signal including audible sounds or words from the speaker **772**, a second vibration from the vibrator **776**, or the visual signal **850** via the user interface **727**.

In various embodiments, the handheld electronic device **702** also creates a user profile for each specific user that is using the adaptive devices and controlling them with the handheld electronic device **702**. Upon selection and control of certain adaptive devices, the processing device **718** can add the adaptive device to the user profile, which can, for example, further be associated with a mobile application that is one of the programs **706** being executed and that is specially adaptive to interface with and control the adaptive devices. Upon reopening such a mobile application, previous settings and adaptive devices associated with the user profile can automatically be loaded and initiated, enabling the user to get access and control over these adaptive devices via the wireless adapter **110** very quickly. In some embodiments, the user profile and associated settings are stored in the memory **704** or in the cloud, e.g., on a server across the Internet.

FIG. **9**B is the interface diagram of FIG. **9**A with additional swipe gesture **913** functionality according to at least one embodiment. The set of control indicia **905** can further include, for example, an up control indicia **905**A, a down control indicia **905**B, a right control indicia **905**C, and a left control indicia **905**D. The user interface **727** can display a second set of control indicia **911** that is automatically displayed in the user interface **727** in response to selection of an additional adaptive device, e.g., in this example automated doors. In some embodiments, this second set of control indicia **911** includes a swipe region **913** that can also be associated with the additional adaptive device.

The swipe region **913** can include a particular area in which different portions (e.g., middle portion **913**A, right portion **913**B, and left portion **913**C) of the particular area or swipe region **913** can correspond to different general positions of the additional adaptive device. So, for example, with reference to automated doors as the additional adaptive device, the right portion **913**B can be fully closed, the middle portion **913**A can be half-way open, and the left portion **913**C can be fully open, thus providing a continuum of control capability. Once a user swipes to one of these portions (e.g., contacts with a finger and drags the finger in a swiping motion), the handheld electronic device **702** can formulate and send an actuation command that can gradually controls the adaptive device (e.g., automated doors) to the position associated with the swiped portion of the swipe region **913**. If desired, the user can touch a part of the touch-sensitive display **725** and prolong the touch over time. This type of persistent tapping or touching gesture can result in different remote control behavior for adaptive devices.

In one embodiment, the handheld electronic device **702** can detect a fourth contact associated with a swiping gesture within the swipe region **913**, and in response, display one or more control indicia (e.g., the second set of control indicia **911**) in the user interface **727** associated with one of the first adaptive device (e.g., wheelchair crane) or the second adaptive device (e.g., automated doors) corresponding to a location within the swipe region **913** where a fourth contact is detected. If the second set of control indicia **911** are associated with an optional adaptive device, these devices can include, for example, transfer seats, a truck bed topper, or remote doors, for example, in addition to the automated doors. This allows the user to navigate through the various controls related to such optional adaptive devices and access these controls without jeopardizing valuable real estate on the touch-sensitive display **724**. This also allows future devices to be included without modification to the layout of the screen.

FIG. **9**C is the interface diagram of FIG. **9**A with additional confirmatory indicia according to at least some embodiments. As briefly discussed previously, when a contact (e.g., tap gesture) on the up control indicia **905**A, for example, results in a successful upward movement of the wheelchair crane (example of the adaptive device **120**), the handheld electric device **702** can generate a confirmatory signal, e.g., in response to receiving a completion signal back from the wireless adapter **110** that the movement was completed.

In various embodiments, this confirmatory signal is a confirmatory audio sound **1072**, e.g., coming out of the speaker **772** such as the words "UP," "DOWN," "OPEN," "CLOSE," or the like. The confirmatory signal can also be a confirmatory vibration **1076** generated by the vibrator **776**, which can be unique for each separate control indicia that resulted in some kind of successful movement by the adaptive device. For example, the vibration can be pulsed, steady, or a series of pulsed streams of vibrations, each one confirming a different completed movement by the adaptive device. The confirmatory signal can also be a confirmatory visual signal **850**, such as a lit icon (e.g., specific icons for certain types of actions), an LED light, certain colors, pulsated colors signals, or the like.

By generating one or more of these confirmatory signals just discussed, the handheld electronic device **702** can ensure that the user is aware that the actuation command(s) completed successfully, despite the user being blind, deaf, or has some other sensory deprivation that makes it difficult to know whether or to what extent the adaptive device has been deployed. Because the wireless adapter **210** employs the Hall effect chip **228**, the Hall effect sensor **470**, and related technology, even if the user continues hold down a control indicia past an end point, the wireless adapter **210** can still protect from an over-current condition and shut down the adaptive device or at least cause the movement to stop.

FIG. **10** is a flow chart of a method **1000** for selecting and controlling an adaptive device **120** of multiple adaptive devices from a handheld electronic device, according to various embodiments. The method **1000** can be performed by processing logic that can include hardware (e.g., processing device, circuitry, dedicated logic, programmable logic, microcode, hardware of a device, integrated circuit, etc.), software (e.g., instructions run or executed on a processing device), or a combination thereof. In some embodiments, the method **1000** is performed by the handheld electronic device **102** and/or **702** (FIG. **1**; FIG. **7**). Although shown in a particular sequence or order, unless otherwise specified, the order of the processes can be modified. Thus, the illustrated embodiments should be understood only as examples, and the illustrated processes can be performed in a different order, and some processes can be performed in parallel. Additionally, one or more processes can be omitted in various embodiments. Thus, not all processes are required in every embodiment. Other process flows are possible.

At operation **1010**, the processing logic displays the user interface **727** on the touch-sensitive display **725**, where the user interface **727** includes a set of menu items associated with the adaptive devices.

At operation **1020**, the processing logic detects a first contact on the touch-sensitive display associated with a first menu item of the set of menu items, the first menu item for selection of control of a first adaptive device of the plurality of adaptive devices.

At operation **1030**, the processing logic, in response to detecting the first contact, displays a set of control indicia associated with control functionality of the first adaptive device.

At operation **1040**, the processing logic detects a second contact on the touch-sensitive display **725** associated with a first control indicia of the set of control indicia.

At operation **1050**, the processing logic generates an actuation command associated with the first control indicia, the actuation command corresponding to a specific action of the adaptive device.

At operation **1060**, the processing logic transmits, via wireless circuitry, the actuation command to a wireless adapter device to which is coupled the adaptive device. In this way, the actuation command is sent in order to remotely control the adaptive device that is wireless coupled to the wireless adapter device. The wireless adapter device can interpret or otherwise translate the actuation command into bits, which can converted to an analog signal and sent over an output harness to ultimately control the adaptive device.

In the above description, numerous details are set forth. It will be apparent, however, to one of ordinary skill in the art having the benefit of this disclosure, that embodiments may be practiced without these specific details. In some instances, well-known structures and devices are shown in block diagram form, rather than in detail, in order to avoid obscuring the description.

The words "example" or "exemplary" are used herein to mean serving as an example, instance, or illustration. Any aspect or design described herein as "example' or "exemplary" is not necessarily to be construed as preferred or advantageous over other aspects or designs. Rather, use of the words "example" or "exemplary" is intended to present concepts in a concrete fashion. As used in this application, the term "or" is intended to mean an inclusive "or" rather than an exclusive "or." That is, unless specified otherwise or clear from context, "X includes A or B" is intended to mean any of the natural inclusive permutations. That is, if X includes A; X includes B; or X includes both A and B, then "X includes A or B" is satisfied under any of the foregoing instances. In addition, the articles "a" and "an" as used in this application and the appended claims should generally be construed to mean "one or more" unless specified otherwise or clear from context to be directed to a singular form. Moreover, use of the term "an embodiment" or "one embodiment" or "an implementation" or "one implementation" throughout is not intended to mean the same embodiment or implementation unless described as such. Also, the terms "first," "second," "third," "fourth," etc. as used herein are meant as labels to distinguish among different elements and may not necessarily have an ordinal meaning according to their numerical designation.

The above description sets forth numerous specific details such as examples of specific systems, components, methods, and so forth, in order to provide a good understanding of several embodiments. It will be apparent to one skilled in the art, however, that at least some embodiments may be practiced without these specific details. In other instances, well-known components or methods are not described in detail or are presented in simple block diagram format in order to avoid unnecessarily obscuring the present embodiments. Thus, the specific details set forth above are merely exemplary. Particular implementations may vary from these exemplary details and still be contemplated to be within the scope of the present embodiments.

It is to be understood that the above description is intended to be illustrative and not restrictive. Many other embodiments will be apparent to those of skill in the art upon reading and understanding the above description. The scope of the present embodiments should, therefore, be determined with reference to the appended claims, along with the full scope of equivalents to which such claims are entitled.

What is claimed is:

1. An adapter device comprising:

a printed circuit board (PCB);

an output port disposed on the PCB and having a first plurality of pins, wherein the output port is to be connected to an output harness that is connected to an adaptive device;

wireless circuitry one of disposed on or coupled to the PCB; and

a processing device disposed on the PCB and coupled to the output port and the wireless circuitry, wherein the processing device is to:

identify, via the wireless circuitry, an actuation command from a wireless signal received from a handheld electronic device;

translate the actuation command to one or more actuation bits that match one of analog-converted bits receivable over an input harness or digital control bits receivable over a wireless controller associated with the adaptive device; and

provide the actuation bits to one or more of the first plurality of pins, the actuation bits to cause the adaptive device to perform a specific action.

2. The adapter device of claim **1**, wherein the adaptive device comprises one of a wheelchair crane, a wheelchair lift, a transfer seat, an automated door, a truck bed topper, a wheelchair elevator, physical therapy equipment, or a gate opener.

3. The adapter device of claim **1**, wherein the actuation bits correspond to one or more discrete actions, each discrete action being associated with a bit of the actuation bits and a pin of the plurality of first pins, further comprising a digital-to-analog converter (DAC) coupled between the processing device and the output port, the DAC to convert the actuation bits to an analog signal before being sent over the output harness.

4. The adapter device of claim **1**, further comprising the output harness, which comprises:

an input connector sized to fit within the output port and that has a set of pins that is compatible with the first plurality of pins; and

an output connector that is sized to fit within an input port of the adaptive device and that has a set of pins that is compatible with a second plurality of pins of the input port.

5. The adapter device of claim 1, further comprising an input port having a second plurality of pins, the input port to receive the input harness, wherein the second plurality of pins are operatively coupled with the first plurality of pins using a predetermined mapping between the input harness of a wired remote control and the output harness.

6. The adapter device of claim 1, further comprising:

a Hall cable connector disposed on the PCB and coupled with the processing device, the Hall cable connector to be connected to a Hall cable that comprises a Hall effect sensor, wherein the Hall cable is to also be connected to a power cable that is connected between a power supply and a motor of the adaptive device; and

wherein the processing device is to:

detect, using the Hall effect sensor, that current supplied to the motor has reached a threshold current value for a predetermined period of time; and

in response to the detection, signal the motor to shut off to protect the motor from an over-current condition.

7. The adapter device of claim 1, further comprising a plurality of output ports that includes the output port, wherein each output port of the plurality of output ports is adapted to connect to one of the output harness or a second output harness that is to connect to another adaptive device that is different than the adaptive device.

8. The adapter device of claim 1, further comprising:

a power supply to provide power to the PCB; and

a reset switch coupled to a power supply, the reset switch being coupled wired or wirelessly, and which when activated, is to disconnect the PCB from and reconnect the PCB to the power supply to reboot the adapter device.

9. The adapter device of claim 1, wherein the wireless circuitry is compatible with at least one of cellular, radio frequency, local area network (LAN), or personal area network (PAN) technology.

10. The adapter device of claim 9, wherein the processing device is further to:

detect, using the PAN technology, that the handheld electronic device is within a predetermined distance of the wireless circuitry;

send a signal to the handheld electronic device to initiate a voice prompt through a speaker of the handheld electronic device that requests whether a user desires that the adaptive device be deployed; and

in response to an affirmative response signal received from of the handheld electronic device, provide at least one of the one or more actuation bits to the first plurality of pins.

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