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## SYSTEMS AND METHODS FOR PROTECTING RETAIL DISPLAY MERCHANDISE FROM THEFT

InVue Security Products Inc.

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# **SYSTEMS AND METHODS FOR PROTECTING RETAIL DISPLAY MERCHANDISE FROM THEFT**

## **FIELD OF THE INVENTION**

**[0001]** The present invention relates to merchandise security, and, more particularly, to systems and methods for protecting retail display merchandise from theft.

## **BACKGROUND OF THE INVENTION**

**[0002]** Fully functioning mobile devices are typically displayed live in a retail environment to demonstrate features and capabilities to drive sales. These devices are at risk of theft because demo units can be factory reset into useable devices that thieves can resell. Live demo units (LDUs) are one option to help retailers solve this problem. LDUs are non-retail units that are used for demonstration purposes only. They look and feel like real devices but may not have all the features and hardware required in an actual retail device sold to a consumer. If a thief steals an LDU, the unit cannot be reset into a fully functional device given its limited functionality. Use of LDU's cause business level problems for retailers since they are special items that need to be ordered for display purpose only. They are harder to obtain, and retail stores generally do not have inventory available for back up units. If an LDU is stolen because it looks like a real device, the retail store may not have a replacement for this special device.

**[0003]** Retail demo units (RDUs) are actual retail inventory that is put out on display and available for sale to consumers as a sellable unit. RDU's may have special applications installed that deliver marketing content and provide some protection of the device so customers do not change settings or install unwanted apps that might disrupt the consumer's experience when exploring the device while it is on display in the store. Use of RDU's is easier for the retailer as each retail store would typically have inventory of these devices, and store personnel is trained in how to install demo apps to create display units. Store employees are also trained how to remove the apps to revert a RDU back to a sellable unit.

**[0004]** Since much of retail theft involves complicit employee involvement, it is likely that a thief may obtain the retail store's reset instructions and passcodes allowing them to reset devices just like the store does. Software-based methods of protection exist, but many use security passwords. If the passwords are known by any employee, it is possible for the information to be shared with a thief and thus defeat the intended protection.

## **BRIEF DESCRIPTION OF THE DRAWINGS**

**[0005]** FIG. 1 is a schematic view depicting an exemplary embodiment of a security system in accordance with the present invention for protecting retail display merchandise from theft.

**[0006]** FIG. 2 is an enlarged plan view of an item of electronic merchandise configured for operation with the security system of FIG. 1.

**[0007]** FIG. 3 is a flowchart illustrating an exemplary embodiment of a system and method in accordance with the present invention for operating the security system of FIG. 1 with the item of electronic merchandise of FIG. 2.

**[0008]** FIG. 4 is a perspective view of another exemplary embodiment of a security system in accordance with the present invention for protecting retail display merchandise from theft configured for operation with an item of electronic merchandise.

**[0009]** FIG. 5 is an elevation view of the security system and the item of electronic merchandise of FIG. 4.

**[0010]** FIG. 6 is a flowchart illustrating another exemplary embodiment of a system and method in accordance with the present invention for operating the security system of FIG. 4 with the item of electronic merchandise.

**[0011]** FIG. 7 is a perspective view of another exemplary embodiment of a security system in accordance with the present invention for protecting retail display merchandise from theft configured for operation with an item of electronic merchandise.

**[0012]** FIG. 8 is a flowchart illustrating another exemplary embodiment of a system and method in accordance with the present invention for operating the security system of FIG. 7 with the item of electronic merchandise.

**[0013]** FIG. 9 is a flowchart illustrating another exemplary embodiment of a system and method in accordance with the present invention for operating one or more of the security systems of FIG. 7 with a security monitoring device.

## **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

**[0014]** The present invention will now be described more fully hereinafter with reference to the accompanying drawings, in which exemplary and preferred embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are

provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. Like numbers refer to like elements throughout, and prime notation and multiple prime notations are used to indicate similar elements in alternative embodiments.

**[0015]** Referring initially to FIGS. 1-3, in one embodiment a retail display security system **10** according to the invention is configured for operation with an item or article of electronic merchandise **20**, which is illustratively shown herein as a mobile wireless communications device, and more specifically, a cellular telephone. The item of electronic merchandise **20** includes a portable (i.e. movable) housing **21** and a substrate **22**, for example, a printed circuit board (PCB) comprising wireless communications circuitry that is carried by the housing. The substrate **22** may be a rigid PCB, or alternatively, may be a flexible substrate or flexible PCB. In some embodiments, the PCB may be replaced by or used in conjunction with a metal chassis or other structural substrate, as will be appreciated by those skilled in the art.

**[0016]** The wireless communications circuitry **23** carried by the housing **21** may include, for example, one or more wireless transceivers for transmitting and receiving cellular, WiFi, and/or Bluetooth communications. The item of electronic merchandise **20** also illustratively includes a satellite positioning signal receiver **43**, for example, a Global Positioning System (GPS) satellite receiver, as is known in the art. The item of electronic merchandise **20** further includes a display **24**, and a plurality of input devices **25**, illustratively keys, for accepting user inputs, as will also be appreciated by those skilled in the art. Input devices **25** may also be buttons or the like, or may be embodied by a touch screen, as is known in the art.

**[0017]** The item of electronic merchandise **20** also includes an orientation sensor **26** carried by the housing **21**. The orientation sensor **26** may be a gyroscope, for example, and more particularly, may be a 3-axis gyroscope. The orientation sensor **26** may also be embodied by a digital compass, for example, as will be appreciated by those skilled in the art.

**[0018]** The item of electronic merchandise **20** also includes an output device **27**. In particular embodiments, the output device **27** is an audio output transducer, or speaker. The output device **27** may be another type of audio output device and other output devices may also be used, for example, a haptic output device or a visual output device, alone or in combination with an audio output device.

[0019] In the illustrated embodiments, the item of electronic merchandise **20** also includes an accelerometer **31** carried by the housing **21**. The accelerometer **31** may be a multi-axis accelerometer, or alternatively, the item of electronic merchandise **20** may include multiple directional accelerometers.

[0020] The item of electronic merchandise **20** also includes a battery pack **32** that is likewise carried by the housing **21**. The battery pack **32** includes battery management circuitry **33**, such as power management circuitry, and one or more battery cells **34** operably coupled to the power management circuitry. The battery cells **34** may be rechargeable battery cells, such as a nickel-metal hydride or lithium ion battery cells. In some embodiments, the battery cells **34** may be replaced by or used in conjunction with another power source, such as a fuel cell, as will be appreciated by those skilled in the art. When not operating in conjunction with the retail display security system **10** of the present invention, the item of electronic merchandise **20** may be powered by an external power source through a conventional power cord or charger.

[0021] The item of electronic merchandise **20** also includes a controller **35** carried by the housing **21** and operably coupled to the wireless communications circuitry **23**, the accelerometer **31**, the orientation sensor **26**, and the output device **27**. The controller **35** advantageously cooperates with the wireless communications circuitry **23** to coordinate and control operations of the item of electronic merchandise **20**, namely wireless communications functions and capabilities of the cellular telephone. Operations may include mobile voice and data operations, including email and Internet data, for example.

[0022] The controller **35** cooperates with the orientation sensor **26** to determine a reference direction of the item of electronic merchandise **20**. For example, when the electronic merchandise **20** is held by a potential purchaser **36** in an operational position with the display **24** and input devices **25** facing the customer, the orientation sensor **26** may cooperate with the controller **35** to determine the direction that the customer and the electronic merchandise are facing, for example, North (FIG. 1). The controller **35** also cooperates with the accelerometer **31** to measure and monitor an acceleration of the item of electronic merchandise **20**.

[0023] According to one embodiment, based upon the orientation and measured accelerations of the item of electronic merchandise **20**, as well as the elapsed time of any movements of the electronic merchandise, the controller **35** determines a distance from a given location, such as a designated retail display “home” position. The “home” position may, for example, be

established by the item of electronic merchandise **20** being in contact with or in close proximity to a holder, platform or the like, generically referred to herein as a cradle **37**. Cradle **37** may stand alone, or alternatively, may be permanently attached to, removably attached to, or otherwise operably coupled with a display stand, alarm module, base or the like **38**. More particularly, the controller **35** may be programmed directly, for example, via the input devices **25**, or alternatively, may be programmed indirectly by an external system or device, so that the location of the cradle **37** is the “home” position of the item of electronic merchandise **20**. The controller **35** may determine the distance the item of electronic merchandise **20** is moved from the “home” position (e.g. cradle **37**), when the item of merchandise is removed from the “home” position by a customer considering whether to purchase the merchandise. As used herein, the term “distance traveled” refers to the absolute value of the radial distance that the item of electronic merchandise **20** is moved away from the “home” position. In particular examples, the controller **35** utilizes conventional motion processing algorithms to determine the distance traveled by the item of electronic merchandise **20** away from the “home” position.

**[0024]** It should be noted that the “home” position need not be the same location each time. Additionally, or alternatively, there may be more than one “home” position. For example a “home” position may be a battery charging station or any number of a plurality of “power hotspots,” such as inductive power transfer charging stations. Alternatively, or additionally, the “home” position may be a location at which the item of electronic merchandise **20** remains motionless for a period of time and the wireless communications circuitry **23** indicates a minimum threshold power signal. In other words, a “home” position may be established when the item of electronic merchandise is motionless and charging for a predetermined period of time. Alternatively, or in conjunction with establishing one or more “home” positions, the controller **35** may use one or more motion sensors and motion processing algorithms to establish (i.e. map) a “safe” zone (also boundary, perimeter or area) with or without reference to one or more “home” positions. The controller can then determine, based on subsequent motion processing, whether an item of merchandise is moved from a location within the “safe” zone to a location outside or beyond the established “safe” zone.

**[0025]** In particular embodiments, the controller **35** determines the distance traveled from the “home” position based upon inertial navigation system (INS) techniques, for example, dead reckoning, as will be appreciated by those skilled in the art. As such, in this example

embodiment, no external references, for example, a GPS determined position or RF communication, are required to determine the distance traveled by the item of electronic merchandise **20** from the “home” position. As a result, the security system **10** configured for operation with an item of electronic merchandise **20** in accordance with this embodiment of the invention is particularly advantageous for use in an indoor environment, for example, a display area of a retail store, where a GPS position cannot always be determined and where RF communications can be obstructed. However, it is understood that in other embodiments discussed herein, external references may be employed.

**[0026]** The item of electronic merchandise **20** illustratively includes a memory **41** for storing computer-executable instructions and data for processing. The controller **35** may cooperate with the computer-executable instructions in the memory **41**, for example, an algorithm embodied in a software application, to perform the functions described herein. As will be appreciated by those skilled in the art, the controller **35** may be embodied as a hardware component or as a combination of hardware and application software.

**[0027]** Based upon the distance traveled by the item of electronic merchandise **20** from the cradle **37**, the controller **35** may determine whether the distance traveled exceeds at least one threshold distance. For example, the controller **35** may determine whether the item of electronic merchandise **20** has been moved more than ten feet in any radial direction from the cradle **37**. Of course, the threshold distance may be set to any desired distance, or alternatively, to another variable, such as time, acceleration, orientation, etc. In particular, the threshold variable may be set to any desired value of any suitable variable via programming using the input devices **25**, or wirelessly via the wireless communications circuitry **23**. Alternatively, the memory **41** of the item of merchandise **20** may be pre-programmed with one or more predetermined threshold variables and/or values.

**[0028]** Regardless, when the threshold distance has been exceeded the controller **35** activates the output device **27** with a visual, an audible or haptic alarm. For example, the alarm may be an audible voice message requesting that the item of electronic merchandise **20** be returned to the cradle **37** within a limited period of time. The voice message may be customizable in that it may be set to be a male or female voice, and/or may be set to speak in a predetermined language or to speak in one or more of multiple languages. The controller **35** alternatively or additionally may

activate other output devices **27**, for example, a haptic (e.g. vibration) device or a visual (e.g. flashing LED) device.

**[0029]** In particular embodiments, there may be more than one threshold, for example a first threshold and a second threshold. When the controller **35** determines that a first threshold distance has been exceeded, the controller may activate an initial “warning” via the output device **27**. The warning may be a voice, as noted above, and may indicate for example that unless the item of electronic merchandise **20** is returned to the “home” position or is brought back within the first threshold distance, an alarm will be activated.

**[0030]** If the item of electronic merchandise **20** is not timely returned to the “home” location or to a location within the first threshold distance, and instead, the second threshold distance is exceeded, the controller **35** may activate a subsequent alarm, such as an audible siren, via the output device **27**. As previously mentioned, a time-based threshold may also be used alone or in combination with one or more distance-based thresholds. If the controller **35** activates an alarm indication, the controller may advantageously cooperate with the wireless communications circuitry **23** to transmit the location of the item of electronic merchandise **20** to another component of the security system or device. For example, if the item of electronic merchandise **20** is removed from the display area of the retail store to a location where GPS reception is possible, the controller **35** may transmit GPS coordinates via the wireless communication circuitry **23** to a remote server or central monitoring station based upon the satellite positioning signal receiver **43**. The controller **35** may also cooperate with the wireless communications circuitry **23** to call a telephone number and/or send an email or text message to security or “loss prevention” personnel. In particular embodiments, if the item of electronic merchandise **20** includes a camera or camcorder, the controller **35** may activate the camera to take still photographs and/or activate the camcorder to record video footage. Regardless, the controller **35** may then further cooperate with the wireless communications circuitry **23** to transmit the video data to security or “loss prevention” personnel to be used to identify an alleged shoplifter.

**[0031]** Still further, the controller **35** may cooperate with the wireless communications circuitry **23** to wirelessly transmit instructions to activate another output device **27**, such as a store alarm remote from the item of electronic merchandise **20** and the display area. As will be appreciated by those skilled in the art, the controller **35** may cooperate with the wireless communications circuitry **23** to likewise communicate instructions to other security systems and/or devices to

perform additional operations. In one advantageous example, the controller **35** may cooperate with the wireless communications circuitry **23** to instruct adjacent cradles **37** supporting other items of merchandise to enter a “lockdown mode” so that the other items of merchandise supported thereon cannot be removed and stolen. Lockdown may be achieved by mechanical, magnetic, electrical, electromechanical or electromagnetic locks, as will be understood by those skilled in the art.

**[0032]** Moreover, in some embodiments, the controller **35** may determine whether the location of the item of electronic merchandise **20** is within a given geographical area based upon the distance traveled as determined by the movements of the merchandise. The controller **35** may cooperate with the wireless communications circuitry **23** to wirelessly transmit instructions to perform a further function based upon this distance. For example, the controller **35** may cooperate with the wireless communications circuitry **23** to send instructions to activate a remote audio and/or video presentation terminal when the user is adjacent the remote terminal. The remote terminal may provide sales or technical product information to the user related to the item of electronic merchandise **20**, for example. The controller **35** may cooperate with the wireless communications circuitry **23** to transmit other instructions based upon a position, location, orientation or distance from a reference location of the merchandise **20**, as will be appreciated by those skilled in the art. In other embodiments, the controller **35** may simply be configured to transmit instructions and/or activate the output device **27** based on a communication failure, such as a failure to receive a signal from an external reference.

**[0033]** The controller **35** may deactivate the output device **27** upon the item of electronic merchandise **20** being returned (i.e. moved back) within the first or second threshold distance, for example. Alternatively or additionally, the controller **35** may disable the output device **27** based upon an input from the input devices **25**, for example, a security code entered via a keypad. The controller **35** may also deactivate the output device **27** wirelessly via the wireless communications circuitry **23**, or via a key, such as a mechanical, magnetic, electrical, optical or infrared key fob device. Of course, the controller **35** may perform additional and/or other communications functions upon an alarm condition, as will be appreciated by those skilled in the art, including for example, disabling one or more functions, capabilities or operations of the merchandise **20**.

[0034] A further sensor **42** may be carried by the housing **21** adjacent the battery packs **32** and coupled to the controller **35**. The controller **35**, based upon an unauthorized entry into the housing **21**, such as an attempted access to the battery pack **32** through the battery door, may activate an alarm from the output device **27**. The further sensor **42** may be any type of sensor, for example, a magnetic sensor, an optical sensor, a pressure or limit switch, or a contact switch. Activation of the alarm may advantageously indicate an unauthorized attempt to remove the battery pack **32** in an effort to disable the security system **10**, and thereby provide an increased time for a response from security personnel. The controller **35** may perform other actions, for example, communications via the wireless communications circuitry **23** as previously described, based upon input from the further sensor **42**.

[0035] The security system **10** configured for operation with the item of electronic merchandise **20** may advantageously be calibrated when it is placed on the cradle **37** at the “home” position in the display area. More particularly, the controller **35** of the item of electronic merchandise **20** may receive a wireless signal or other signal from the cradle **37** indicating that the location of the cradle is the desired “home” position. Since position errors may accumulate each time the item of electronic merchandise **20** is moved, the security system **10** and/or the cradle **37** may be equipped with a suitable sensor and associated circuitry to reset the “home” position when the item of electronic merchandise **20** is supported on the cradle. In a particular embodiment, the cradle **37** is a charging station and the controller **35** resets the “home” position of the item of electronic merchandise **20** based upon the merchandise being in a motionless state for a predetermined period of time and/or being charged by the charging station. Alternatively, or in addition, other continuous or periodic calibration techniques applicable to inertial navigation systems, inertial guidance units and the like may be used.

[0036] Referring now to FIGS. 4-6, another exemplary embodiment of a security system **10'** according to the present invention is configured for operation with an item of merchandise **20'** that includes a housing **21'** having a display **24'** and input devices **25'** carried by the housing. In addition, an externally mounted security module **50'** is secured to the item of merchandise **20'**. The security module **50'** includes its own housing **51'** that carries an orientation sensor **26'** and accelerometer **31'**. The security module **50'** also includes an output device **27'**, and may optionally include wireless communications circuitry **23'**, for example, NFC, Bluetooth or other protocol communications circuitry. A power source **32'**, for example an internal battery pack, is

also carried by the housing 51' to provide power to a controller 35' and related circuitry, as will be appreciated by those skilled in the art. In one embodiment, the security module 50' is attached to the cradle 37 with a tether or cable, which would be a mechanical tether or a tether having one or more conductors for defining a detectable sense loop for detecting disconnection or cutting of the tether.

[0037] An adhesive layer 44' (FIG. 5) may be used to mount or attach the housing 51' of the security module 50' to the housing 21' of the item of merchandise 20'. For example, the adhesive layer 44' may be a pressure sensitive adhesive (PSA). Other types of adhesives may be used, and other mounting or attachment elements may be used, such as interlocking features, magnetically attractive strips, etc. as will be appreciated by those skilled in the art. The temporary (i.e. releasable) coupling permits the security module 50' to be installed for retail display and subsequently removed upon sale of the item of merchandise 20' or in order to reuse the security module 50' with a different item of merchandise.

[0038] The above-noted components are operably coupled to the controller 35' that is carried within the housing 51'. The controller 35' is advantageously configured to operate similarly to the embodiment of the security system 10 configured for operation with the item of electronic merchandise 20 described above with respect to FIGS. 1-3. In other words, the security module 50' with controller 35' is a stand-alone security system 10' that may be externally mounted or attached to a housing 21' of the item of merchandise 20', or to any other high value merchandise. It should be noted that since the security module 50' is a stand-alone security system, the item of merchandise 20' need not be an electronic item of merchandise. For example, the item of merchandise 20' may be an article of jewelry, an article of clothing, an item of pre-recorded media (e.g. CD, DVD, etc.) or the like. Alternatively or additionally, the item of merchandise 20' may include electronics, such as the cellular telephone illustratively shown herein with respect to the exemplary embodiments of the invention.

[0039] The security module 50' may also include a further sensor 42', for example, a mechanical limit or pressure sensor, that may be operably coupled to the controller 35'. The further sensor 42' may be configured to sense a separation between the housing 51' and the housing 21' that would occur if the security module 50' is removed (detached) from the item of merchandise 20'. Other sensors may cooperate with the controller 35' to sense tampering with the security module 50', for example, an electrical sensor, optical (i.e. light) sensor, or a magnetic sensor.

Regardless, the controller **35'** may be operable to activate an alarm based on an indicated state of the further sensor **42'**, as previously described.

**[0040]** The security module **50'** may be used to protect an item of merchandise **20'** that does not include wireless communications circuitry, an accelerometer, and/or a gyroscope, for example, a stand-alone camera or a stand-alone portable media player, electronic reader or the like. In other words, the security module **50'** may be considered an “add-on” to the item of merchandise **20'**. However, if the item of merchandise **20'** includes wireless communications circuitry, the wireless communications circuitry **23'** of the security module **50'** may communicate with the wireless communications circuitry of the item of merchandise to control operation thereof, such as to shut off the item of merchandise or to restrict (disable) its operation. At least some of the above-noted components, for example, the output device **27'** may be carried by the housing **21'** of the item of merchandise **20'** in further embodiments.

**[0041]** In an embodiment, the security module **50'** is an external sensor that is temporarily attached, for example via a pressure sensitive adhesive (PSA), to an item of merchandise **20'** and is removably positioned or supported on a display stand, alarm module, base or the like **38** having battery charging capability. Preferably, both the sensor **50'** and the base **38** have wireless “qi” compliant battery charging capability that incorporates magnetic inductive coils to transfer electrical power from the base to the sensor in a known manner. Furthermore, the base **38** and/or the sensor **50'** include voltage regulator electronics and circuitry for providing a proper charging and/or operating voltage to an electronic item of merchandise **20'** attached to the sensor. For example, the base **38** and/or the sensor **50'** may include electronics and circuitry for identifying an electronic item of merchandise **20'** and its charging and operating power requirements. Consequently, the base **38** is operable to provide electrical power to the sensor **50'** and/or an electronic item of merchandise **20'** attached to the sensor when the sensor is positioned or supported on the base.

**[0042]** Regardless, the sensor **50'** operates in the manner previously described to determine a distance travelled by the item of merchandise **20'** away from a retail display “home” position **37'** (i.e. base **38**) and to activate an output device **27'** in the event that the distance travelled from the base **38** exceeds a threshold distance. In a particular embodiment, the wireless communications circuitry **23'** of the sensor **50'** communicates with wireless communications circuitry disposed within the base **38** to activate an additional output device, such as a visual indicator (e.g. LED) or

an audio alarm, at the “home” location and/or a remote location. As such, the orientation sensor **26'** and the accelerometer **31'** previously described may be carried by the base **38** instead of the sensor **50'**. Furthermore, the sensor **50'** and/or the base **38** may be provided with a communications port for programming as well as for enabling and subsequently disabling the security system **10'**. In still other embodiments, the base **38** may be configured via the wireless “qi” compliant battery charging capability to automatically determine the charging and/or operating power requirements for another electronic item of merchandise **20'** attached to a different sensor **50'** in the event that the different sensor is inadvertently positioned or supported on the base.

**[0043]** Referring now to FIGS. 7-8, yet another exemplary embodiment of a security system **10''** according to the present invention is configured for operation with an item of electronic merchandise **20''**. The security system **10''** is embodied in the form of a display battery pack **55''**. The display battery pack **55''** includes a housing **56''** that is sized to be disposed within the housing **21''** of the item of electronic merchandise **20''** in place of the service battery pack. In other words, the display battery pack **55''** has the same size and shape (planform) as the service battery pack normally provided for the item of electronic merchandise **20''**. As such, the display battery pack **55''** may be inserted into the battery compartment of the item of electronic merchandise **20''** to temporarily replace the standard service battery pack. Thus, the display battery pack **55''** may be integrated with the item of electronic merchandise **20''**.

**[0044]** Similar to the embodiments of the security system described above with respect to FIGS. 1-3 and FIGS. 4-6, the display battery pack **55''** also includes an orientation sensor **26''** carried by the housing **56''** and an accelerometer **31''** also carried by the housing **56''**. The display battery pack **55''** also includes an output device **27''**, and may also optionally include wireless communications circuitry **23''**, for example, Bluetooth or other protocol communications circuitry. A reduced power source **32''** (e.g. battery cell **34''**) and related battery circuitry **33''**, is also carried by the housing **56''** to power the controller **35''** and other components of the display battery pack **55''**, as will be appreciated by those skilled in the art. However, the configuration of the battery cell **34''** is physically more compact than a standard-sized battery cell typically provided with the service battery pack for the item of electronic merchandise **20''**, since the above-noted electronic components of the display battery pack **55''** also require space within the housing **56''**.

**[0045]** The display battery pack **55''** may be configured to be charged inductively or capacitively from a charging station (not shown), which may be the “home” position, as previously described. For example, the display battery pack **55''** may include the standardized Wireless Power Consortium’s “qi” compliant charging capabilities. Alternatively, the display battery pack **55''** may be compliant with other charging standards or may be operable for charging via a proprietary charging protocol. Advantageously, the display battery pack **55''** being “qi” compliant does not require the item of electronic merchandise **20''** itself to be “qi” compliant, and further, requires no additional hardware on the item of electronic merchandise **20''** for charging in the retail display environment (e.g. a power adapter cable). Of course, the display battery pack **55''** may be charged using any other charging method without departing for the intended scope of the security systems and methods of the present invention. Regardless, the above mentioned components are operably coupled to the controller **35''** that is carried within the housing **56''**. The controller **35''** is advantageously configured to operate similarly to the embodiments described above with respect to FIGS. 1-3 and FIGS. 4-6.

**[0046]** The display battery pack **55''** is also particularly advantageous for protecting an item of electronic merchandise **20''** that does not include wireless communications circuitry, an accelerometer, and/or a gyroscope, for example a conventional camera, portable media player, electronic reader or the like. Advantageously, the display battery pack **55''** does not increase the size or footprint of the item of electronic merchandise **20''**, and furthermore, does not protrude or extend outwardly from the housing **21''** of the electronic merchandise.

**[0047]** Moreover, if the item of electronic merchandise **20''** includes wireless communications circuitry, the wireless communications circuitry **23''** of the display battery pack **55''** may communicate with the wireless communications circuitry of the electronic merchandise to control operation thereof, for example, to shut-off the item of electronic merchandise or to restrict (i.e. disable) its operation. At least some of the above-noted components, for example, the output device **27''** may be carried by the housing **21''** of the item of electronic merchandise **20''**.

**[0048]** A further sensor **42''**, such as, for example, a mechanical limit or pressure sensor, or other sensor or sensors (e.g. electrical, magnetic, optical, etc.) may cooperate with the controller **35''** to determine when the battery compartment door of the housing **21''** is being opened. This may be indicative of tampering, or more particularly, an attempt to remove the display battery pack **55''**.

Based upon the sensor detecting an unsecured state or condition, the controller **35''** may activate an alarm and/or communicate, via the wireless communications circuitry **23''**, to control or disable the item of electronic merchandise **20''**. In addition, the display battery pack **55''** may be more securely retained within the battery compartment of the housing **21''** of the item of electronic merchandise **20''** with an attachment element, such as an adhesive, anchors or functionally similar hardware, or a press fit. Securely retaining the display battery pack **55''** may advantageously increase the amount of time required for a potential thief to remove the display battery pack from the item of electronic merchandise **20''**.

**[0049]** While the security system described above with respect to FIGS. 7-8 may be in the form of a display battery pack **55''**, it will be appreciated by those skilled in the art that the same functionality and components of the display battery pack may be embodied in any form factor. For example, the security system may be embodied in the form of a secure-digital (SD) memory card or subscriber identity module (SIM) card that is coupled with a camcorder, camera, electronic reader, personal computer, tablet or other item of electronic merchandise. Furthermore, the security system may take other forms where it is embodied in a replacement module or component for an existing module or component of an item of merchandise.

**[0050]** FIG. 9 illustrates an exemplary embodiment of a system and method **100''** according to the present invention for operating one or more of the security modules **50'** and/or display battery packs **55a''-55d''** with a security monitoring device **60''**. As shown, the security monitoring device **60''** includes a controller **61''** and wireless communications circuitry **62''** coupled to the controller **61''** of the security monitoring device. Advantageously, the security monitoring device **60''** is paired, for example, by wireless communication (e.g. Bluetooth, RF, etc.), with each of the security modules **50'** and/or display battery packs **55a''-55d''**. As such, each of the security modules **50'** and/or display battery pack **55a''-55d''** communicates, via its respective wireless communications circuitry **23''**, with the security monitoring device **60''** via its wireless communications circuitry **62''**. In some cases, each of the security modules **50'** and/or display battery pack **55a''-55d''** is paired with the security monitoring device **60''** by way of wireless communications. The security monitoring device **60''**, via its controller **61''**, monitors communications to each of the security modules **50'** and/or display battery packs **55a''-55d''**, for example, for an indication that each security system **10''** is active.

[0051] The security monitoring device **60**” may be conceptually thought of as a “watch tower.” If the security monitoring device **60**” detects, for example, via a received “distress” signal from a the security modules 50’ and/or display battery pack **55a**”-**55d**”, or determines that communication with a security system has been lost (i.e. decoupled or de-linked), the security monitoring device’s controller **61**” may activate an output device **63**” indicative of an unsecured state or condition, for example, an audio, visual, and/or haptic alarm. The controller **61**” may also communicate, via the wireless communications circuitry **62**”, to each of the security modules 50’ and/or display battery pack **55a**”-**55d**” to activate a respective output device 27’, **27**” (i.e. a dual alarm condition) so that security personnel are able to identify the security module 50’ or display battery pack **55**” of a particular item of electronic merchandise **20**” communicating a distress signal. The security monitoring device **60**” may also be activated based upon any of the further sensors described above, or manually, as will be appreciated by those skilled in the art. Moreover, the security monitoring device **60**” may also include charging circuitry **64**” coupled to the controller **61**” and configured to function as a charger for the security modules 50’ and/or display battery packs **55a**”-**55d**”, and may be “qi” compliant as described above.

[0052] While the security modules 50’ and display battery packs **55**” have been described as being used with the security monitoring device **60**”, it will be appreciated that the security monitoring device **60**” may be used in conjunction with any of the above exemplary embodiments of security systems according to the present invention. In particular, the security monitoring device **60**” may be used in conjunction with a retail display cradle **37**”, as previously described, and may likewise define a “home” position for an item of electronic merchandise **20**”. In another exemplary embodiment, the security monitoring device **60**” is paired to a security system according to the present invention by a wireless communication link (e.g. Bluetooth; RF; etc.) and acts as a “watch tower” with a “dead man’s switch” to activate an alarm at the security monitoring device based upon a failure to receive a return signal from the security system or if the security modules and/or display battery packs lose communication with the security monitoring device. Alternatively or additionally, the security monitoring device **60**” may activate an alarm at a remote location or transmit a security signal (e.g. send a text or email notification) to security personnel, as previously described. In some embodiments, the security monitoring device **60**” is integrated or otherwise part of a cradle 37.

**[0053]** Additionally, it will be appreciated by those skilled in the art that any of the above-described exemplary embodiments may be used either alone or in conjunction with one another to provide a "multi-layered" security system that provides increased overall security. For example, as a "first layer," the controller of an item of electronic merchandise may cooperate with the memory of the merchandise to provide increased security as described above with respect to FIGS. 1-3. The same item of electronic merchandise may also include, as a "second layer," a display battery pack, as described with respect to FIGS. 7-8. As a "third layer," the security monitoring device, (i.e. watch tower), may also be used with wireless communications circuitry in the manner described with respect to FIG. 9.

**[0054]** A related method according to the present invention is provided for protecting a retail display item of electronic merchandise to be evaluated and operated by a customer when considering whether to purchase the merchandise. As described above, the item of electronic merchandise includes a portable housing, at least one sensor carried by the portable housing, at least one output device carried by the portable housing, and a controller carried by the portable housing and coupled to the at least one sensor and to the at least one output device. The method may include determining a distance, for example an absolute radial distance, traveled by the item of electronic merchandise from a retail display "home" position using the controller and the at least one sensor. The method may further include using the controller to activate the at least one output device based upon the distance traveled by the item of electronic merchandise from the "home" position exceeding at least one threshold distance.

**[0055]** In one embodiment, a security system employs Mobile Device Management (MDM) and/or Enterprise Mobility Management (EMM) platforms to secure items of merchandise in retail or commercial installations from theft, tampering, or unauthorized access, as well as to manage content and function of the items. In this embodiment, the security system may include an item of merchandise according to any of the aforementioned embodiments, including embodiments where the item of merchandise has an external sensor, security module, or battery pack, as well as the embodiments where the item of merchandise leverages its own internal capabilities such that no external hardware is required for the item of merchandise. In this embodiment, a means for retailers to prevent any device user from converting an RDU into a fully functional item of merchandise, while allowing the retailer to have the ability to repurpose the merchandise if authorized. However, it is understood that the security system according to

this embodiment may be used with any number of security systems, including security systems having external sensors, cables, and/or support bases, such as that disclosed in U.S. Patent No. 9,761,101, entitled Recoiler for a Merchandise Security System, the contents of which are hereby incorporated in its entirety.

**[0056]** For example, in one example, the item of merchandise may be an Android RDU. The Android operating system has a feature where, if the device has a Google account, when factory reset, requires the user to input the Google account password to complete the reset process. If this is not done, the device is rendered unusable. This is helpful in some cases, but not effective for protecting devices on retail display. If the account is manually set up by an employee, the passcode is known and can be exposed. If the RDU is stolen and lacks additional protection, a thief could create an additional Google account prior to resetting the device and enter his or her own password to unlock on reset.

**[0057]** This particular embodiment provides utilizes hardware and software to create a new capability for retailers to protect multiple items of merchandise. The embodiment provides means of establishing a single Google account on a device where the password is undiscoverable by anyone and cannot be recovered. This is not the normal purpose or use of the Google account, but using this method provides retailers with a means of remotely protecting their Android devices by ensuring they cannot be successfully factory reset by anyone with access to the item of merchandise alone, without additional authorization from an administrator.

**[0058]** In one embodiment, the security system includes an item of merchandise (e.g., a mobile device (MD)) to be protected by the system and displayed as an RDU. The security system also includes a software application residing on the RDU to allow for communication and configuration with a protection device (PD). A protection device (PD) is configured to assert ownership (e.g., impart or transfer ownership) of the RDU and assist with Google account setup. The security system further includes a Google account residing on the RDU.

**[0059]** In one embodiment, the PD may be the owner of the item of merchandise in some cases, but not in the simplest use case where the retailer utilizes the PD for its RDUs. In some instances, the PD includes a controller configured to generate an unknown passcode, communications circuitry configured to communicate the passcode to the item of merchandise, and a user interface (UI) configured to provide instructions to the retailer on steps to protect the RDU. It is understood that the PD may be configured to generate passcodes in different

manners, such as randomly, as long as the passcode is unknown to the user of the PD. The Google account may be a single account for the retailer, separate accounts for specific locations (e.g., retail stores), or separate accounts per item of merchandise. In all cases, the method and PD ensure the password of the Google account is unknown. The communications circuitry may utilize various communications protocols, such as wireless means discussed above. In one example, the PD is a mobile device or tablet configured to communicate with the RDU via NFC. In addition to the various wireless communications protocols discussed in various embodiments above, it is understood that the PD may alternatively communicate with the RDU using wired means (e.g., USB connection).

**[0060]** In other embodiments, the PD may be a software application added to the item of merchandise for securing the item from theft where the controller resides in the RDU and the communication method is an API interface and the user interface is the screen of the RDU. In other forms, the PD may be a cloud-based MDM/EMM platform where the controller is a cloud computer, the communication method is wireless IP interface, and the user interface is a web based user portal.

**[0061]** In one particular example embodiment, a method for securing an item(s) of merchandise from theft is provided. According to this method, a factory fresh mobile device is registered with the PD allowing MDM/EMM owner level access rights for installing a software application that converts the MD into an RDU. Owner level rights may include both Device Owner and Profile Owner levels. During the setup process, a Google account is installed on the item of merchandise with an unknown password using the PD. To install the Google account, an authorized user engages the item of merchandise with the PD or otherwise initiates communication. When it is time for the Google account passcode to be entered, the PD fills in the passcode field for the authorized user and the user accepts the value. At this point, the item of merchandise becomes an RDU and has a Google account with a password unknown to any person and cannot be shared for any future access. It is understood that other optional retailer demo software application may then be installed on the RDU. The retailer may use the installed software application on the RDU to indicate that the item is ready to be secured. In addition, the PD may then assert a protection profile on the RDU to prevent changes, addition, and/or removal of the Google account. Using only this much of the process will effectively render the RDU as a permanent demo unit as no person, including retail employees, will have the ability to factory

reset the device back to a sellable unit. Furthermore, using only this much of the process will deny a thief the ability to factory reset a device back into a sellable unit and will deny a complicit employee the ability to share passcodes for later use. If the retailer would like the additional benefit of returning the RDU to a sellable unit, the PD may be used to initiate a factory wipe or reset which includes removing the Google account. Only the PD can issue this command. A user attempting to factory reset the RDU without the PD will result in a wiped device requesting the Google password to complete the reset process. Since the Google password is unknown, the factory reset process fails at that step.

**[0062]** In one embodiment, a method for releasing the RDU to a sellable until includes the steps of engaging or interfacing with the UI on the PD, identifying the RDU to be reset, and requesting the reset of the device. The PD communicates the request to the RDU and the software application residing on the RDU manages account removal and successful factory reset.

**[0063]** In yet further embodiments, an item of electronic merchandise may include a software application for “smart” electronic merchandise that is capable of executing a software application for performing any of the functionality discussed herein. In some embodiments, the security system leverages the sensors, controller, audio components and/or capabilities of the item of electronic merchandise, such as for example, the host “smart” consumer electronics device. As will be appreciated by those skilled in the art, the term “smart” consumer electronics device as used herein refers to any device that is capable of executing a software application, for example, a cellular telephone, e-Reader, I-Pad, I-Pod, Tablet computer, tablet device, laptop computer, notebook computer, digital camera, SLR, media (audio/video) player, or other electronics device including processing capability and an executable memory.

**[0064]** It should be noted that the operations in instructions executed by the controller for any of the exemplary embodiments disclosed herein may be provided by a computer-program product, computer-readable medium, memory, or other storage medium. Many modifications and other embodiments of the invention will be readily apparent to one skilled in the art having the benefit of the teachings presented in the foregoing descriptions and the associated drawings. Therefore, it is understood and appreciated that the invention is not to be limited to the specific exemplary embodiments disclosed herein, and that modifications to the disclosed embodiments and other undisclosed embodiments are intended to be included within the scope of the appended claims.

**THAT WHICH IS CLAIMED IS:**

1. A security system for retail display, the security system comprising:  
a mobile device comprising:  
a memory storing computer-executable instructions;  
a controller; and  
communication circuitry;  
a protection device configured to generate an unknown passcode and to communicate with the communication circuitry,  
wherein the computer-executable instructions are configured to cause the controller to communicate with the protection device for receiving the unknown passcode and converting the mobile device into a retail demonstration unit.
2. The security system of Claim 1, wherein the protection device is configured to factory reset the mobile device such that the mobile device is converted from the retail demonstration unit to a sellable unit.
3. The security system of Claim 1, wherein the mobile device is incapable of being factory reset without use of the protection device.
4. The security system of Claim 1, wherein the protection device is configured to randomly generate the passcode.
5. The security system of Claim 1, wherein the communication circuitry is wireless communication circuitry.
6. The security system of Claim 1, wherein the computer-executable instructions are configured to cause the controller to communicate with the protection device for receiving security protocols that limit the functionality of the mobile device.
7. The security system of Claim 1, wherein the protection device is configured to install the computer-executable instructions on the mobile device.
8. The security system of Claim 1, wherein the computer-executable instructions comprises a software application.

## **ABSTRACT**

Embodiments of the present invention are directed towards methods and systems for protecting items of merchandise from theft. In one example, a security system includes a mobile device comprising a memory storing computer-executable instructions, a controller, and communication circuitry. The security system also includes a protection device configured to generate an unknown passcode and to communicate with the communication circuitry, wherein the computer-executable instructions are configured to cause the controller to communicate with the protection device for receiving the unknown passcode and converting the mobile device into a retail demonstration unit.

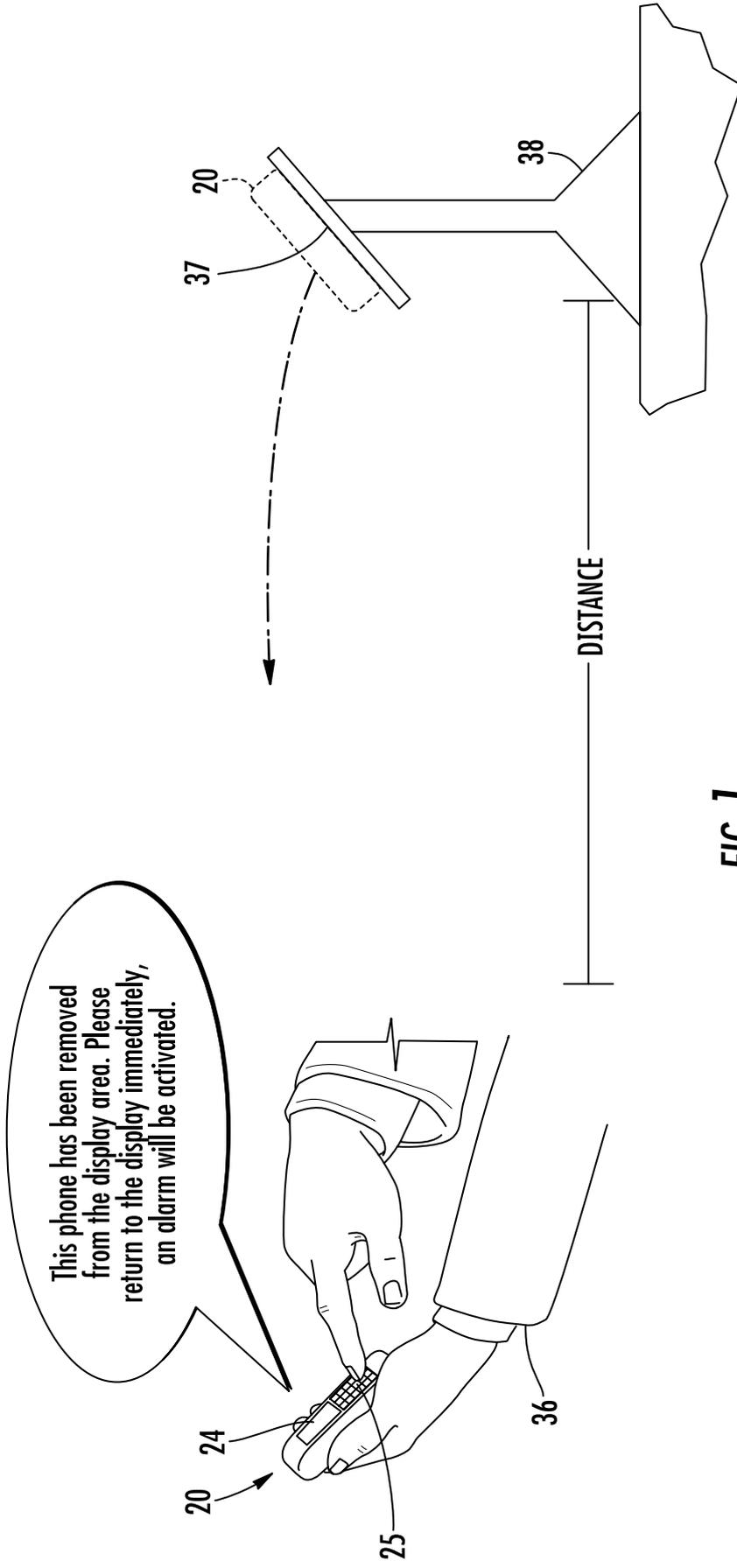
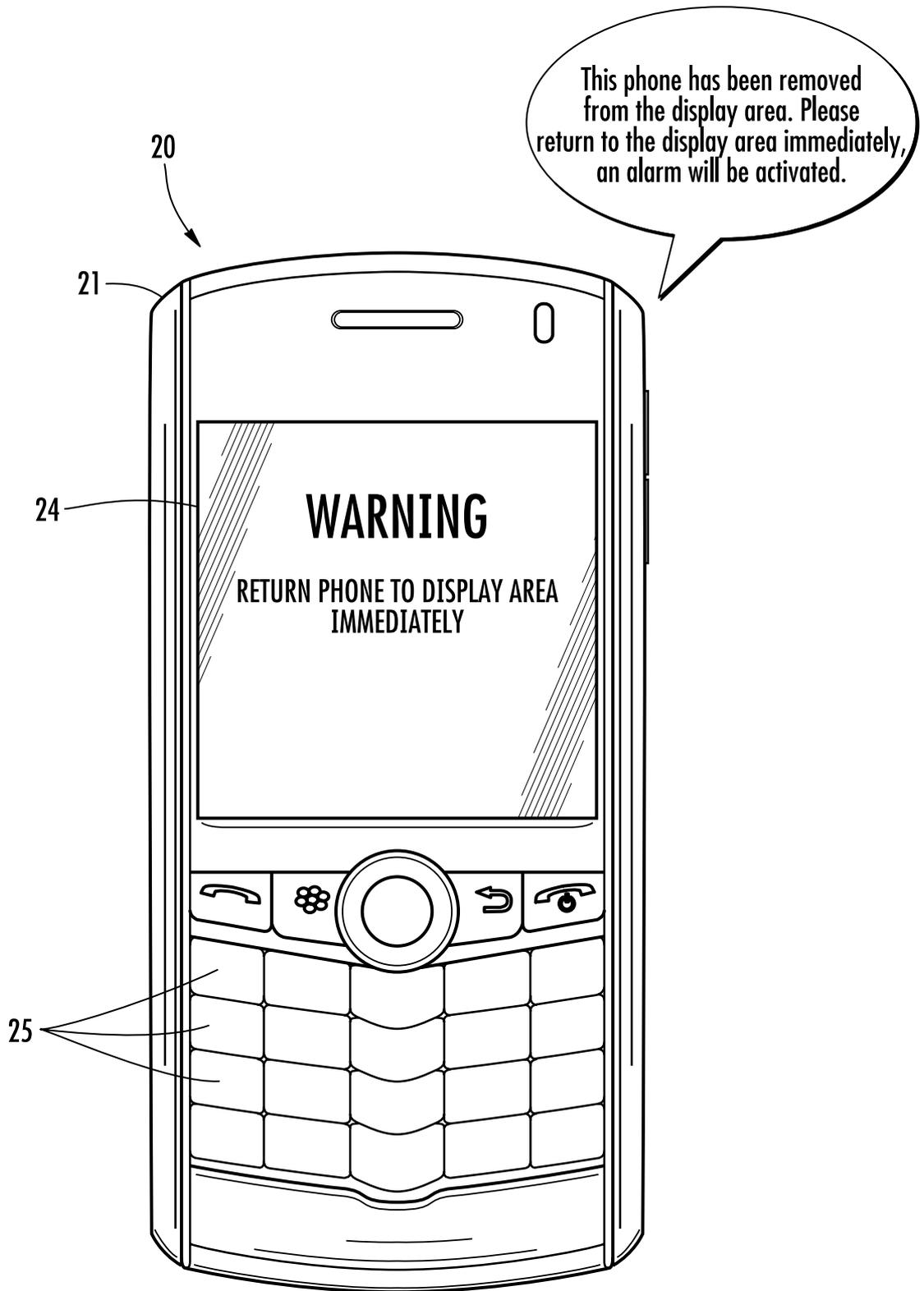
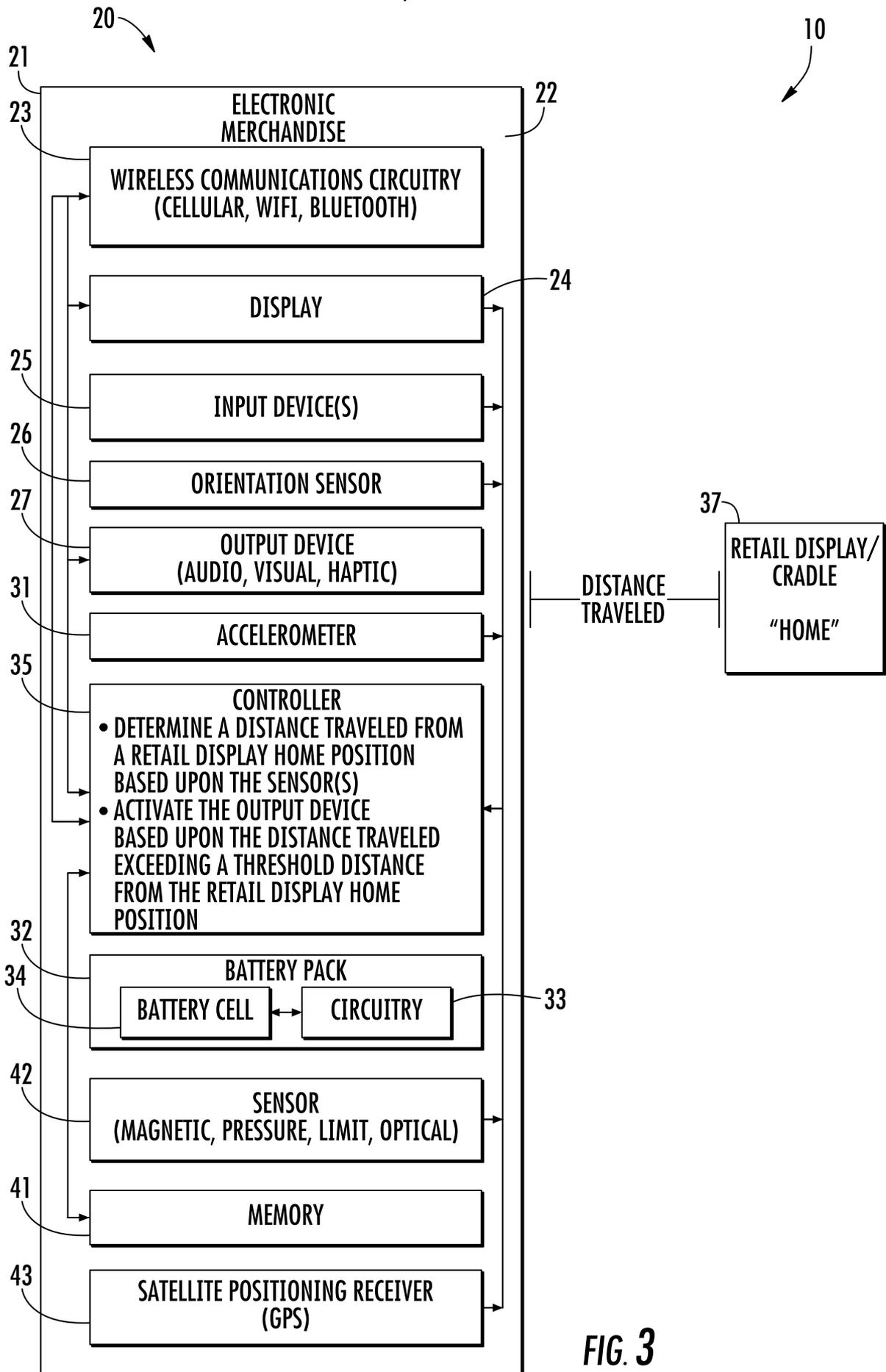
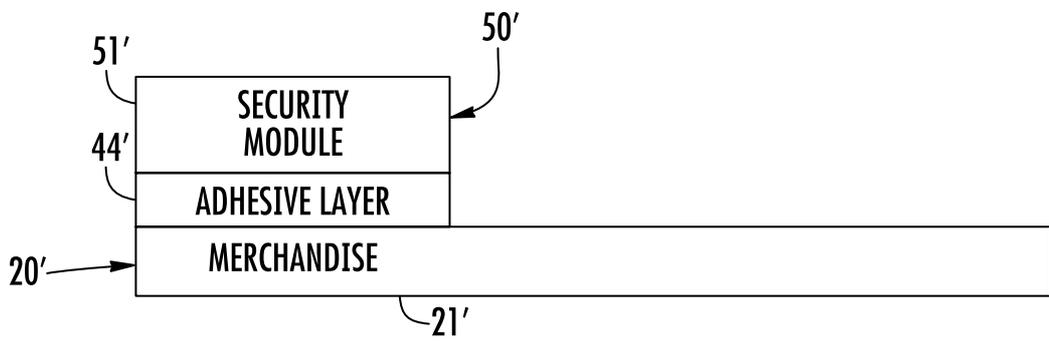
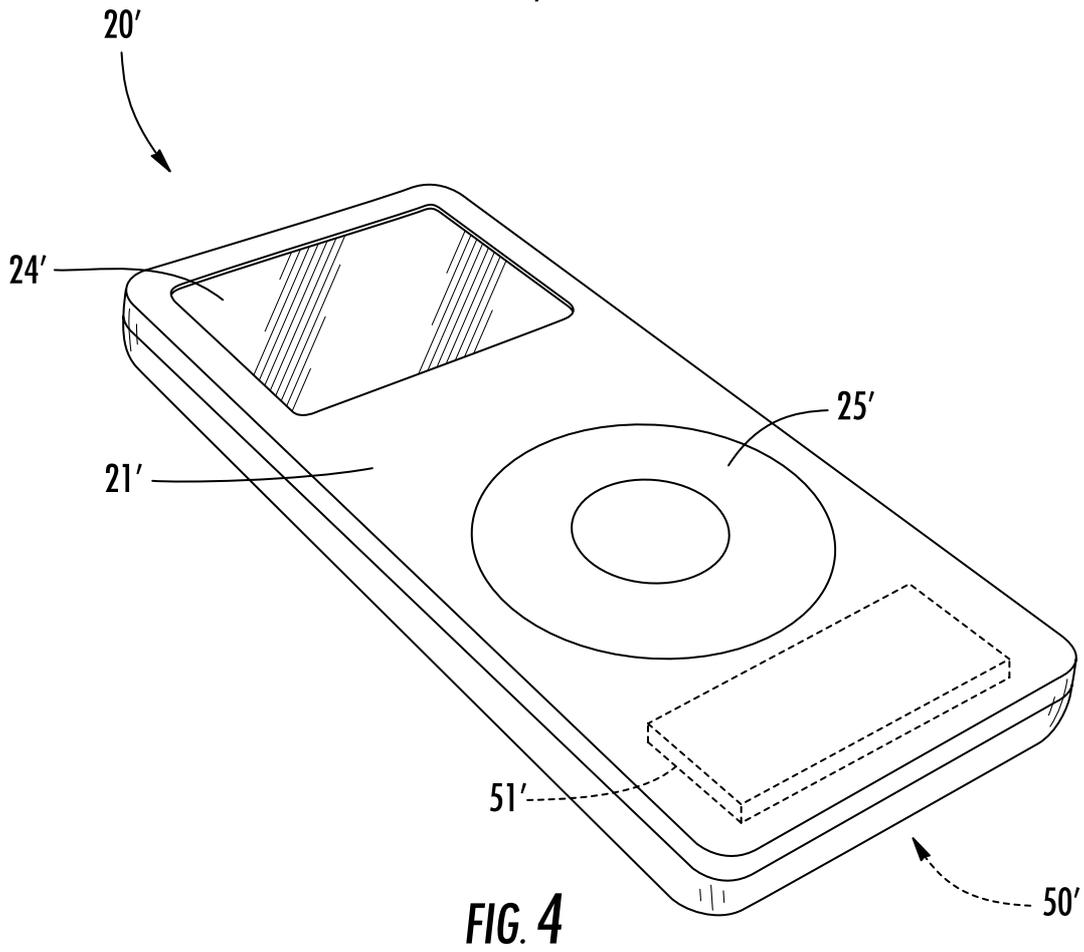


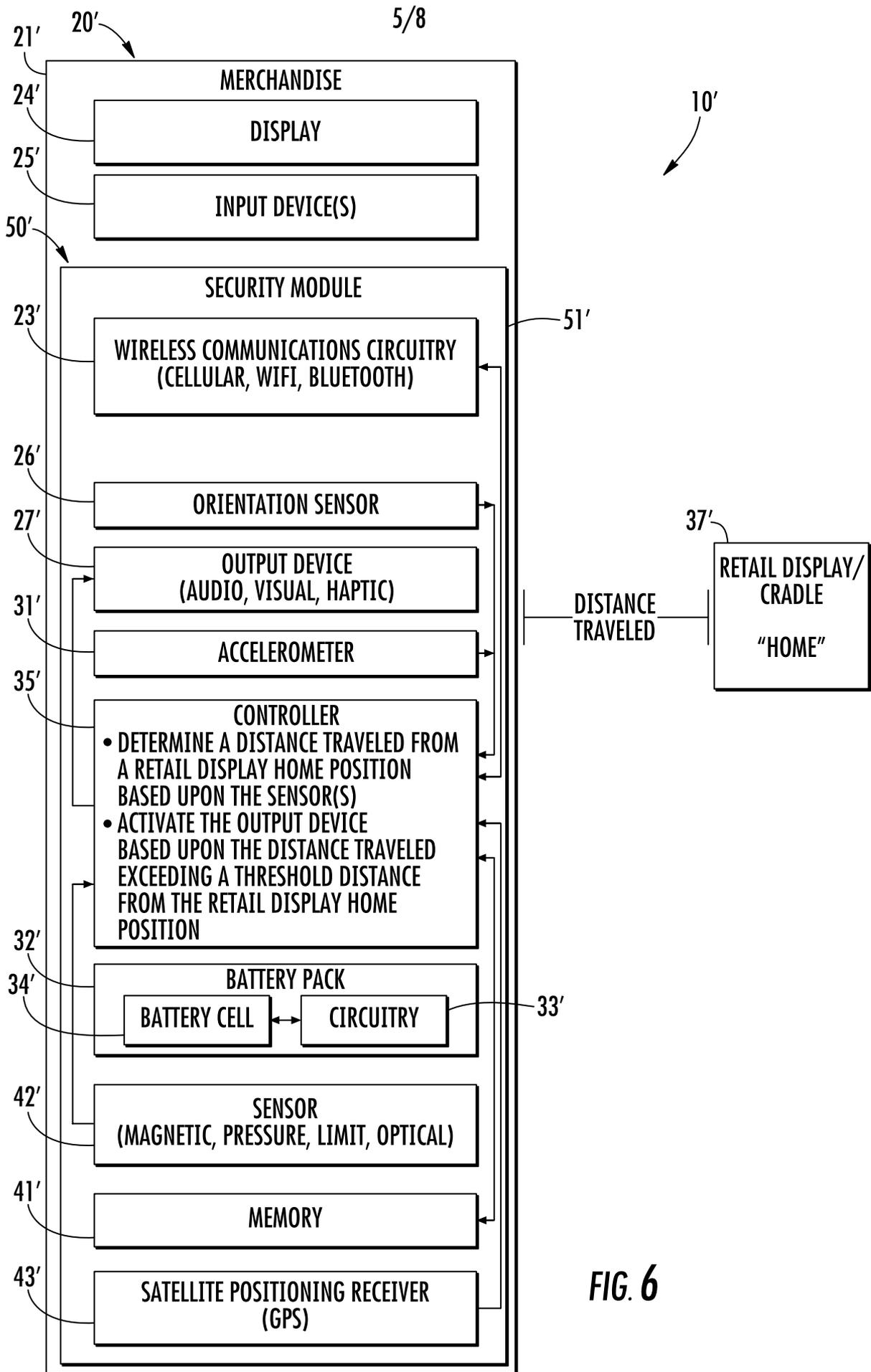
FIG. 1



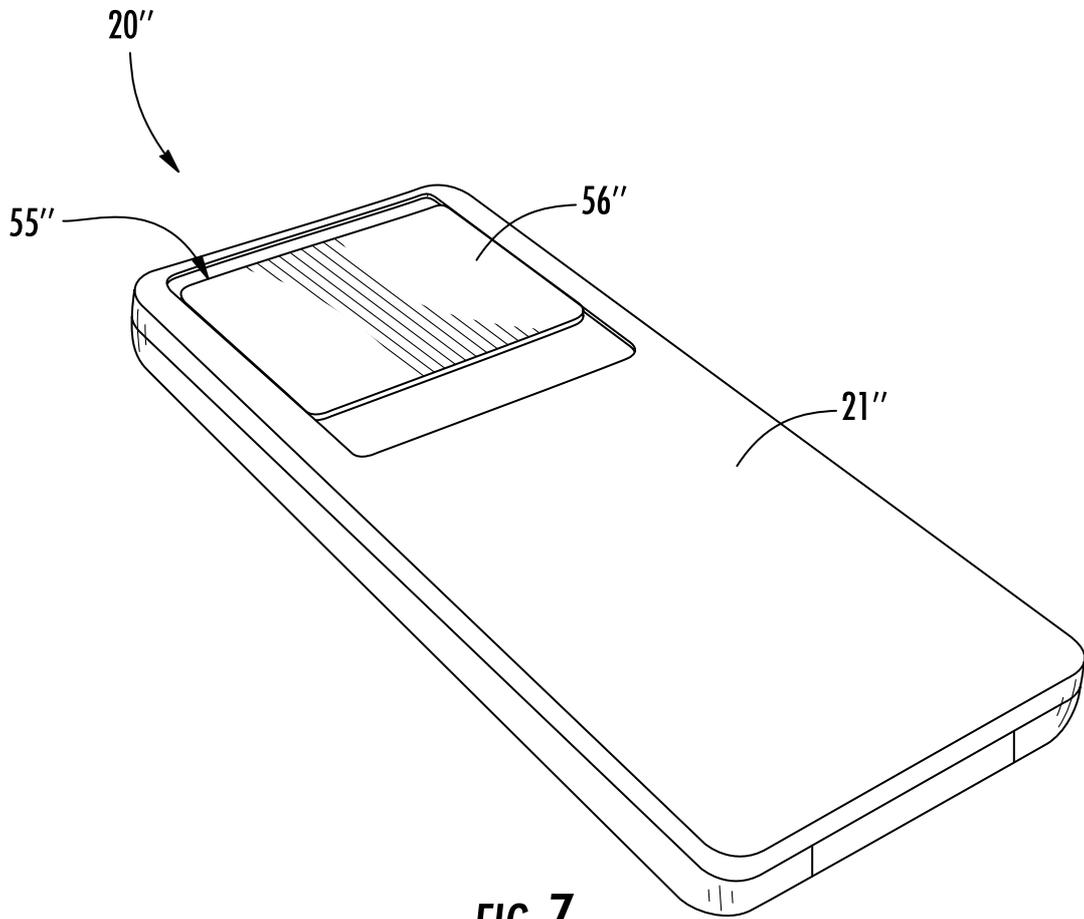
**FIG. 2**







**FIG. 6**



**FIG. 7**

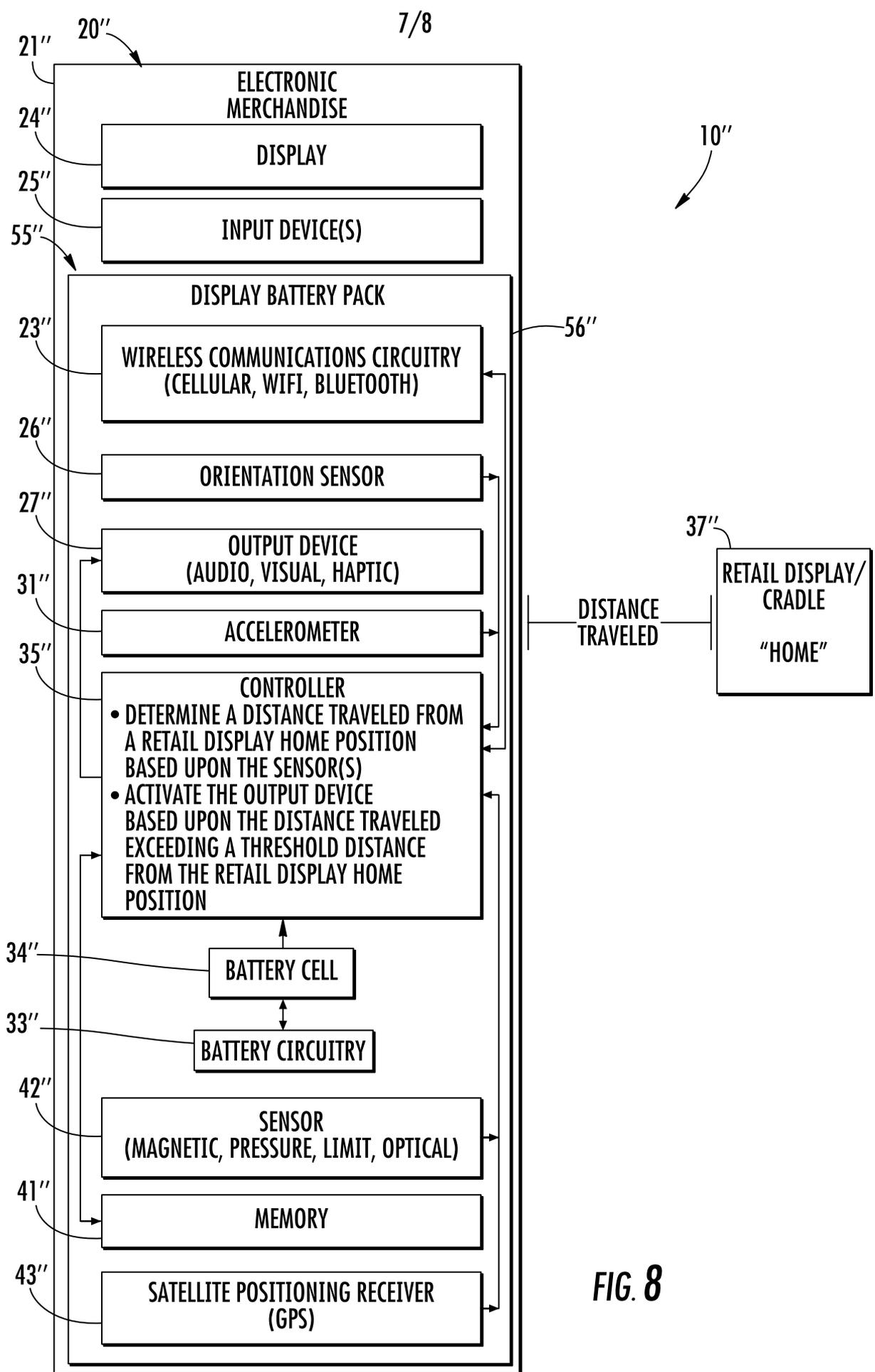


FIG. 8

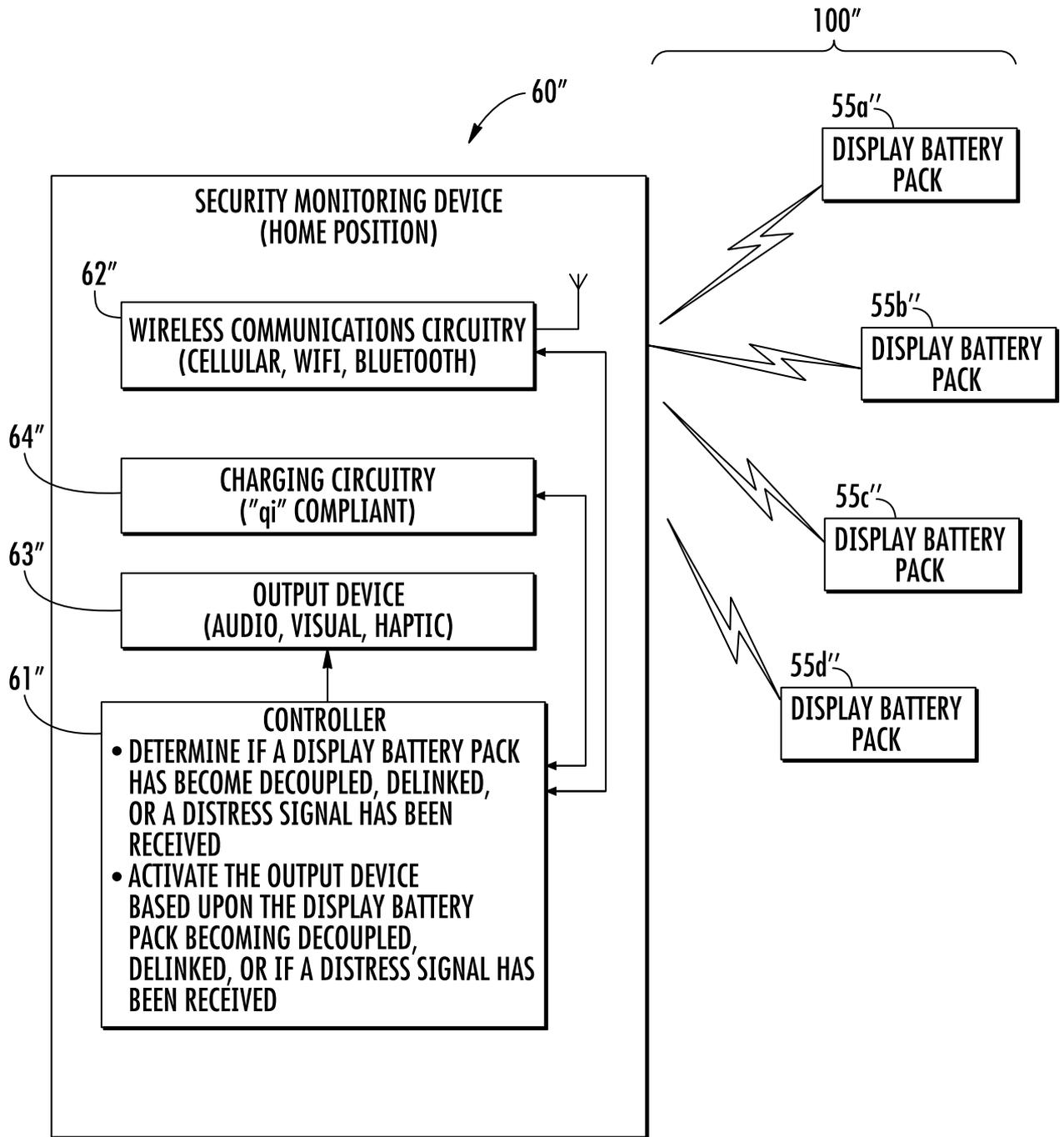


FIG. 9