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(54) **WIRELESS TRANSFER STATION WITH DISPLAY**

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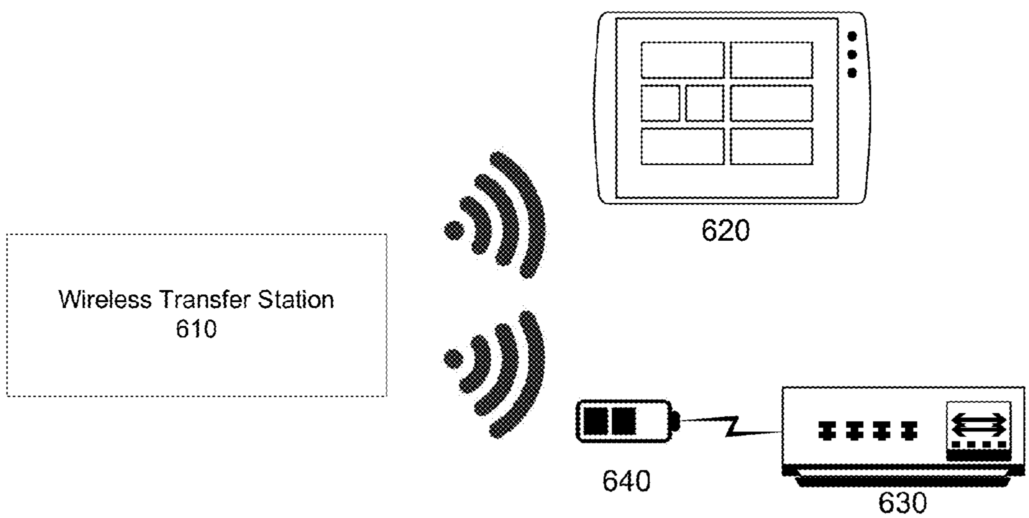
H02J 5/00	(2006.01)

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

CPC ***H04Q 9/00*** (2013.01); ***H02J 5/005*** (2013.01); ***H02J 7/025*** (2013.01); ***H02J 7/0047*** (2013.01)

(57) **ABSTRACT**

A technology for a wireless transfer station that is operable to display information. The wireless transfer station can include a wireless transfer station housing with an outer surface, wherein the outer surface includes an optically viewable portion integrated into the outer surface of the wireless transfer station housing. The wireless transfer station can also include an energy information module that can be located within the wireless transfer station housing. The energy information module can be configured to provide selected energy information for display. The wireless transfer station can also include a display integrated into the wireless transfer station housing and located beneath the optically viewable portion of the outer surface, wherein the display is viewable to a user through the optically viewable portion. The display can be configured to display the energy information from the energy information module.



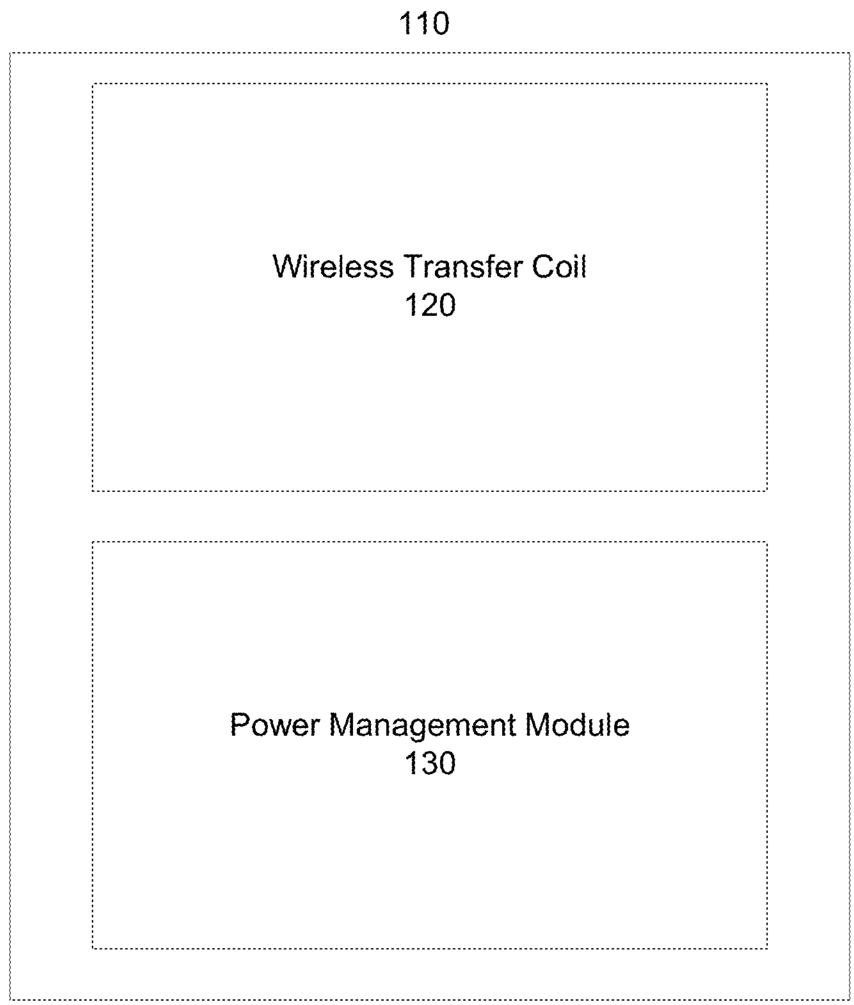

110
Wireless Transfer Coil
120
Power Management Module
130

FIG. 1

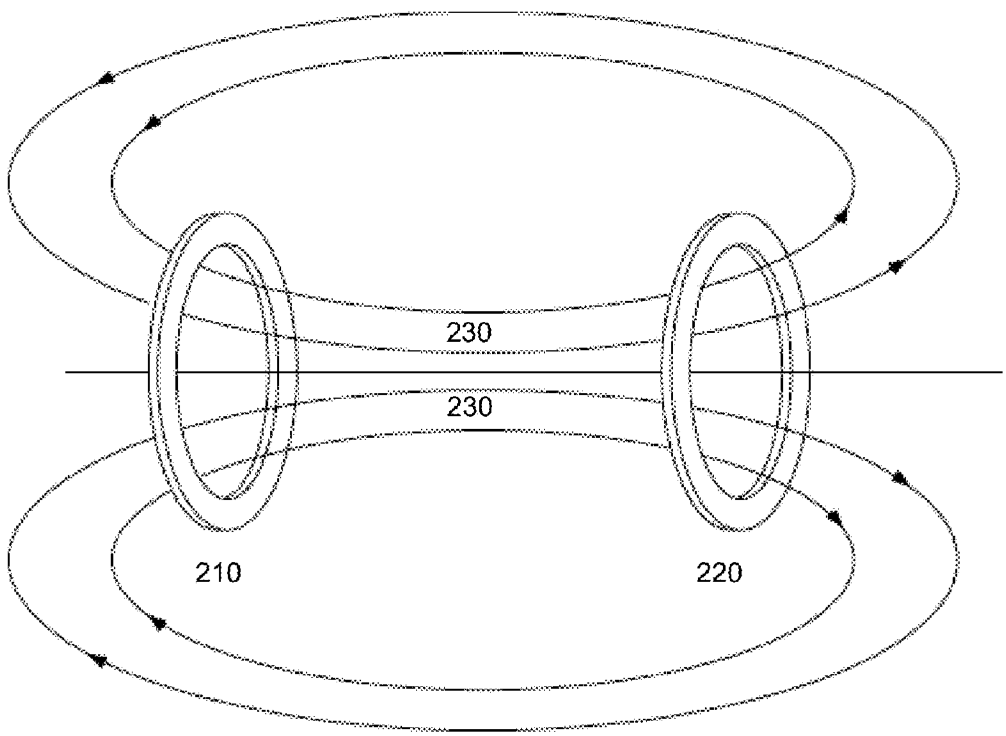


FIG. 2

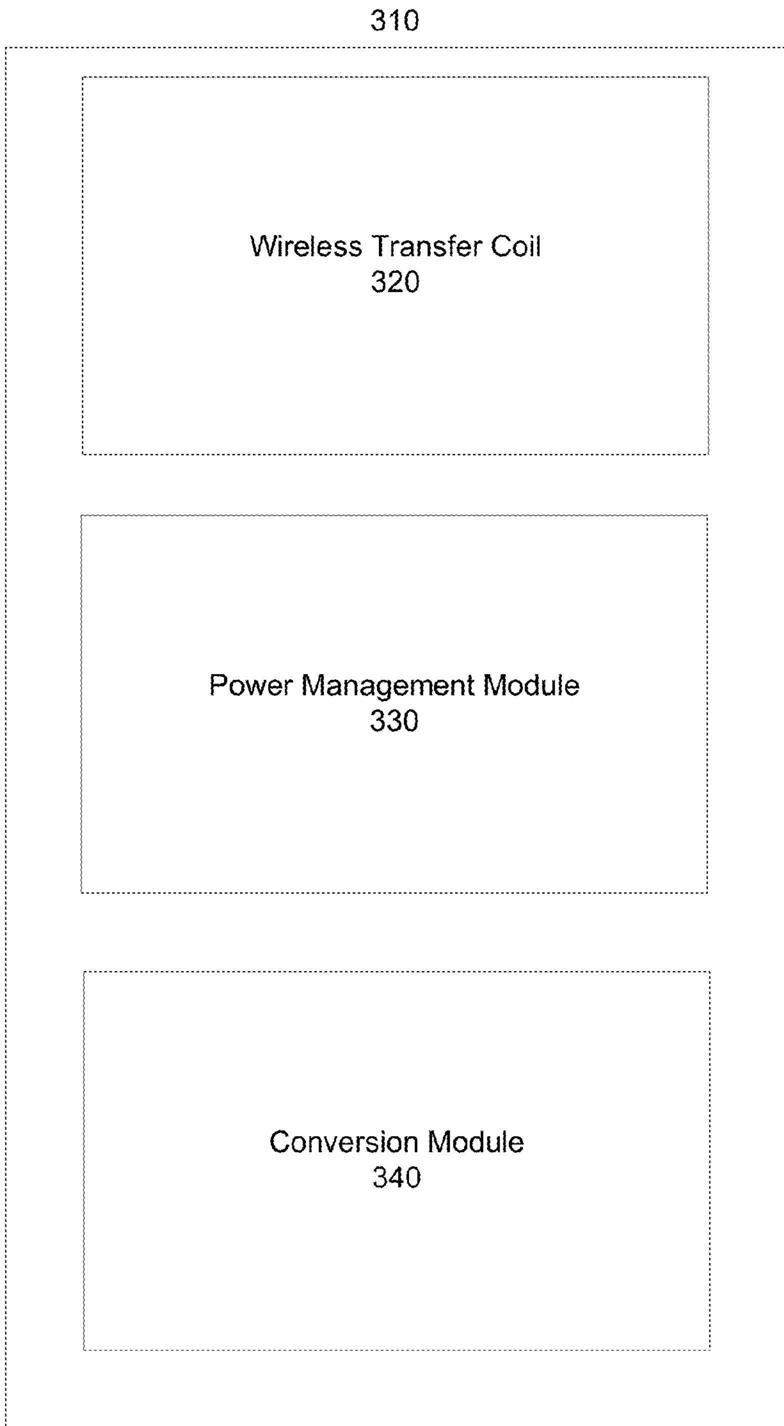

310
Wireless Transfer Coil
320
Power Management Module
330
Conversion Module
340

FIG. 3a

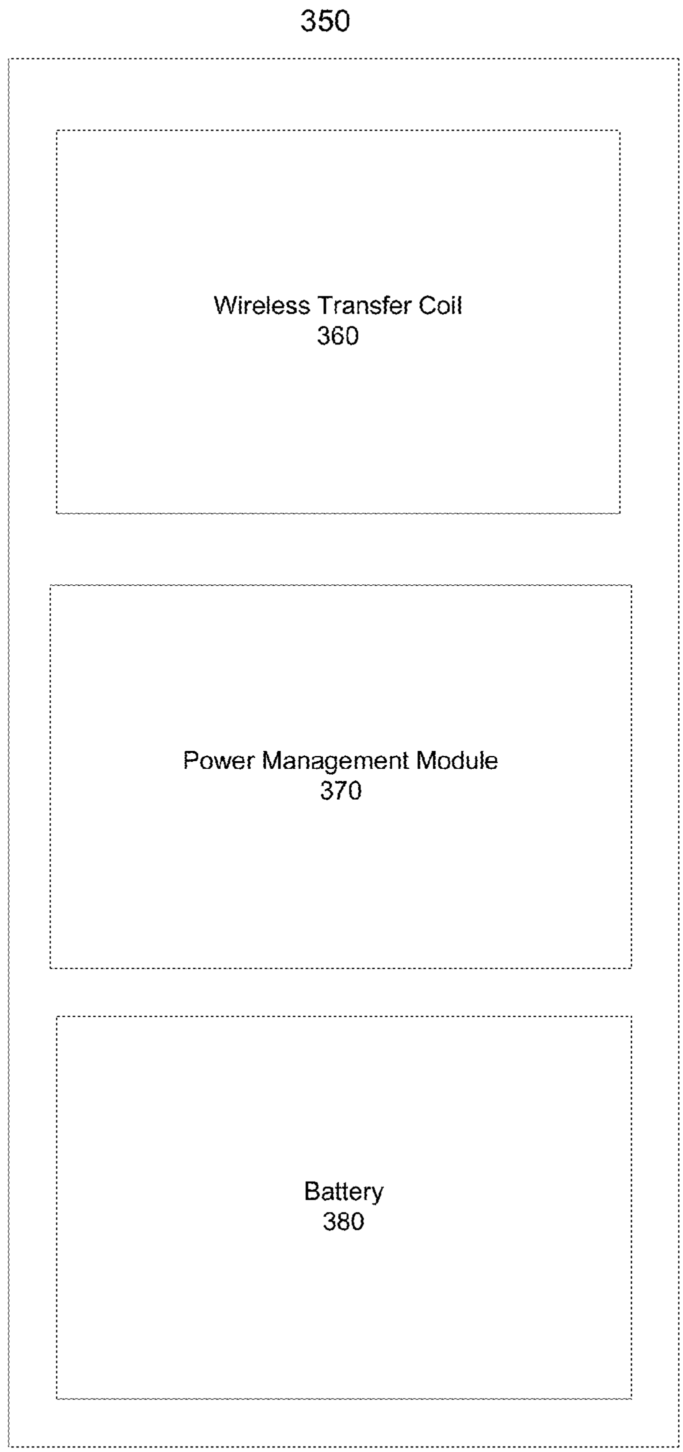

350
Wireless Transfer Coil
360
Power Management Module
370
Battery
380

FIG. 3b

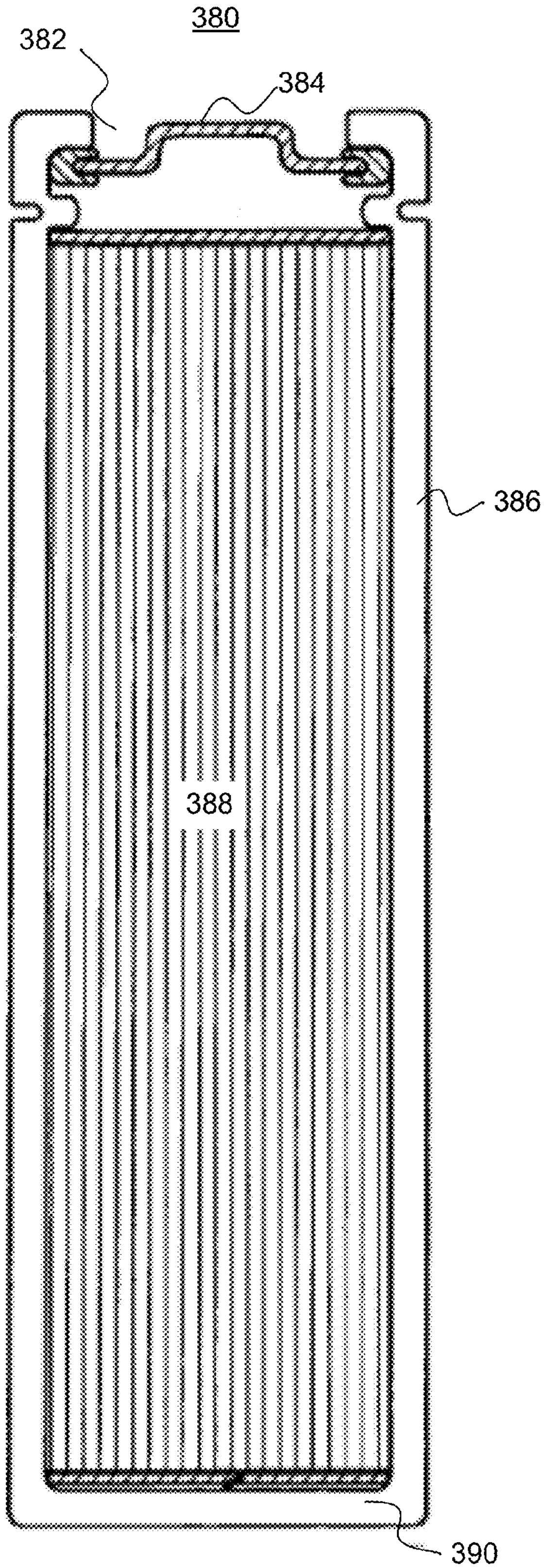


FIG. 3c

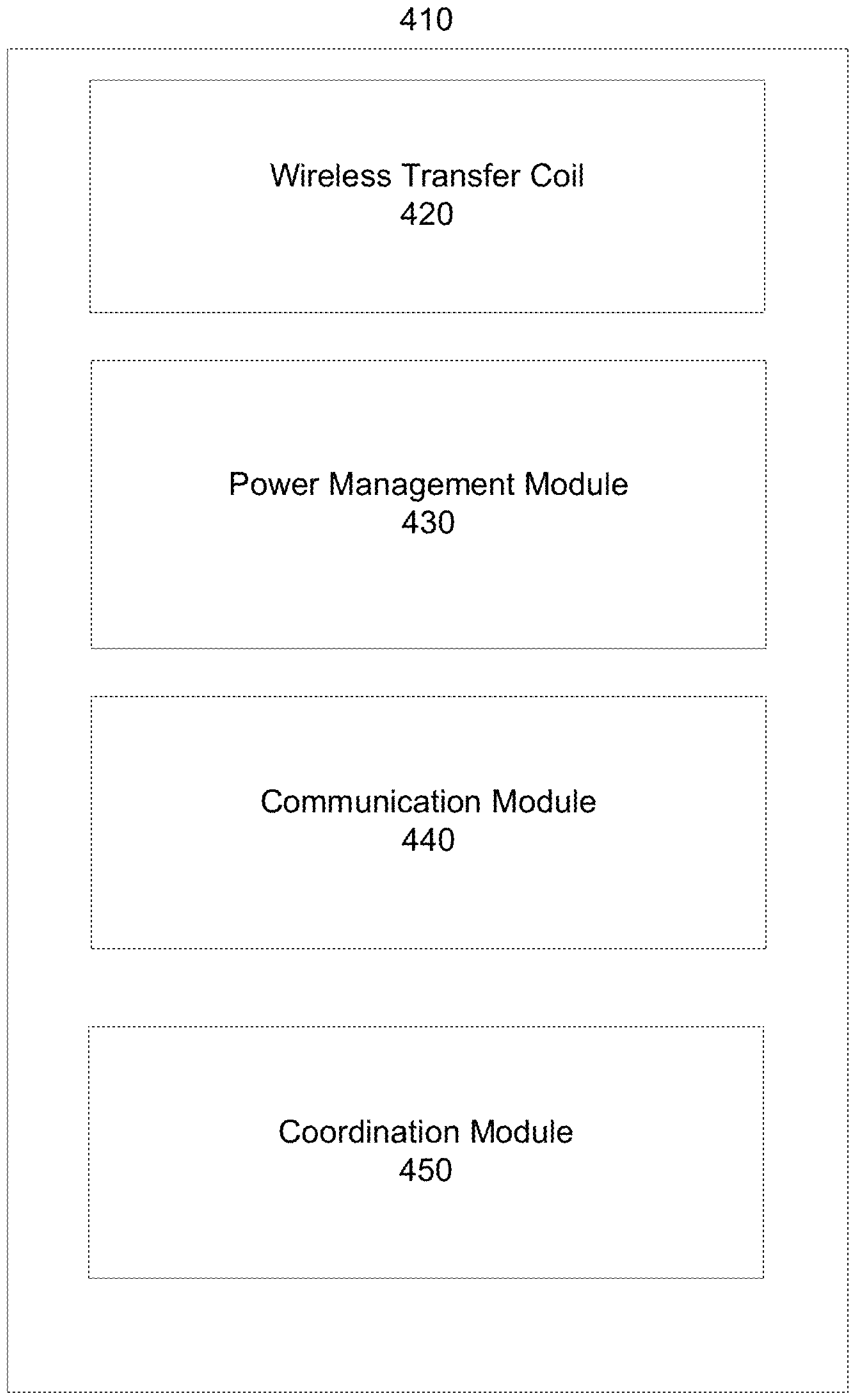

410
Wireless Transfer Coil
420
Power Management Module
430
Communication Module
440
Coordination Module
450

FIG. 4

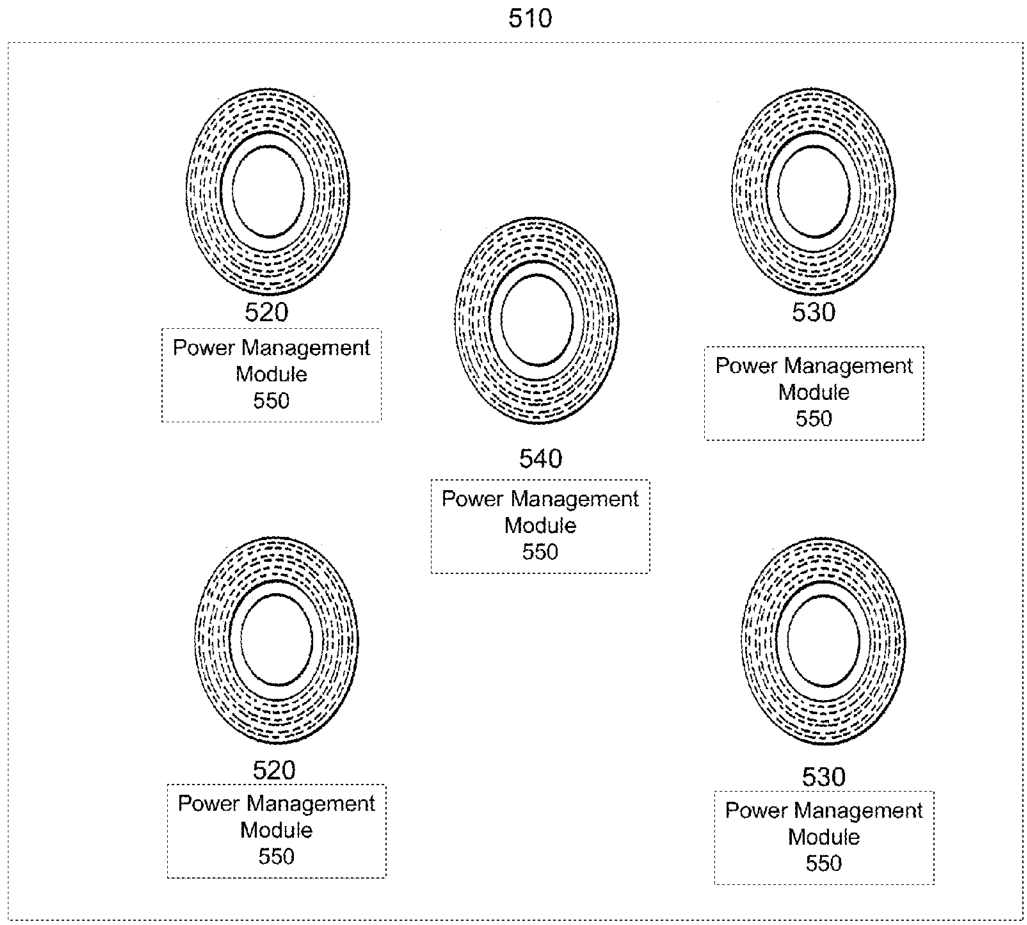

510
520
Power Management Module 550
540
Power Management Module 550
530
Power Management Module 550
520
Power Management Module 550
530
Power Management Module 550

FIG. 5a

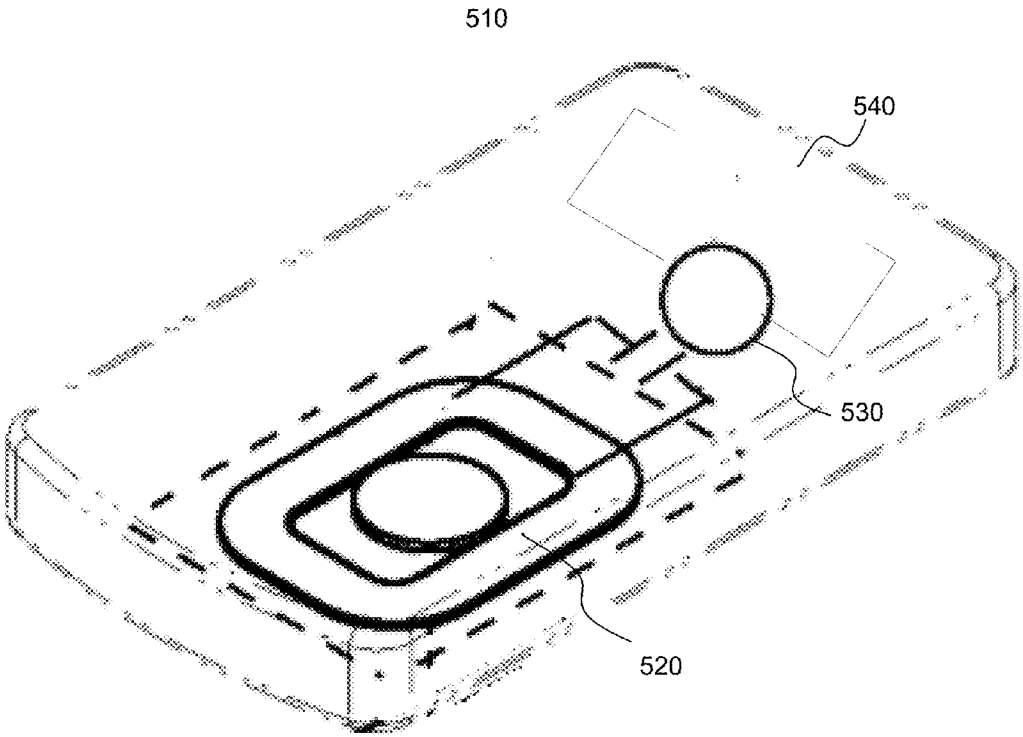


FIG. 5b

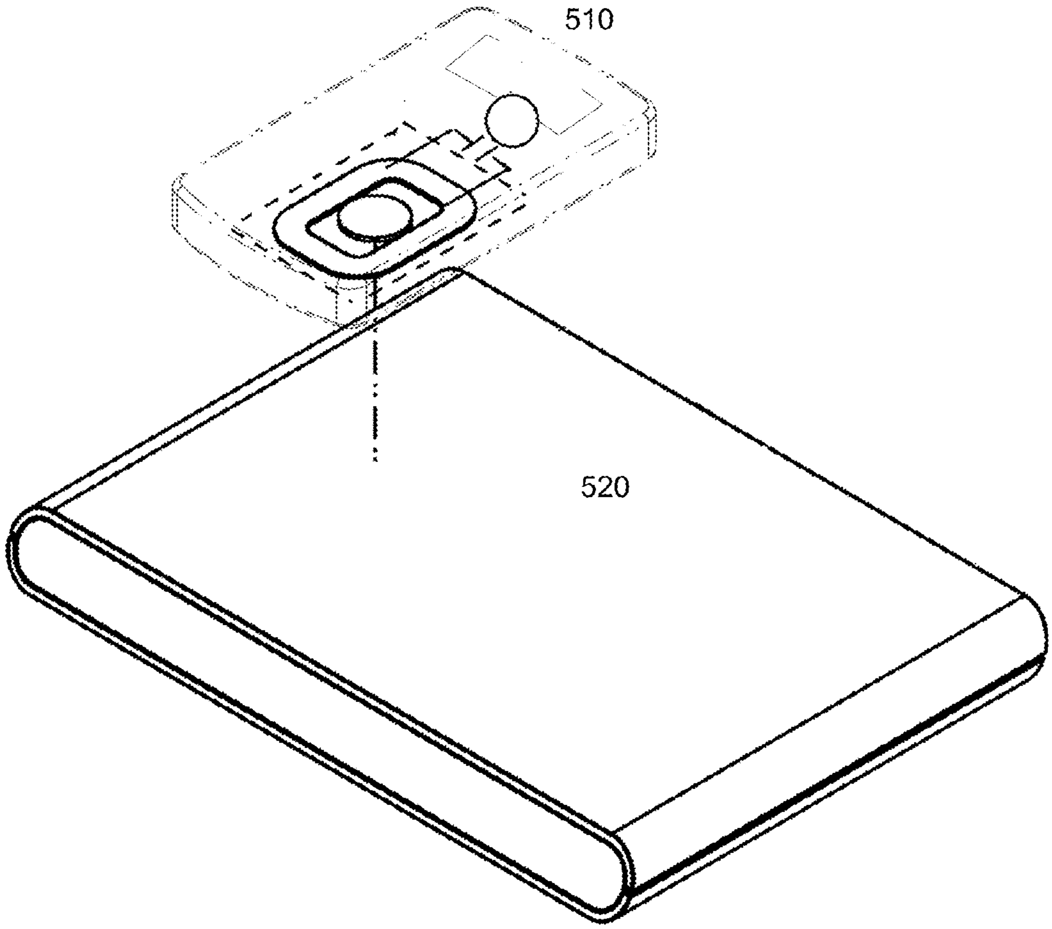


FIG. 5c

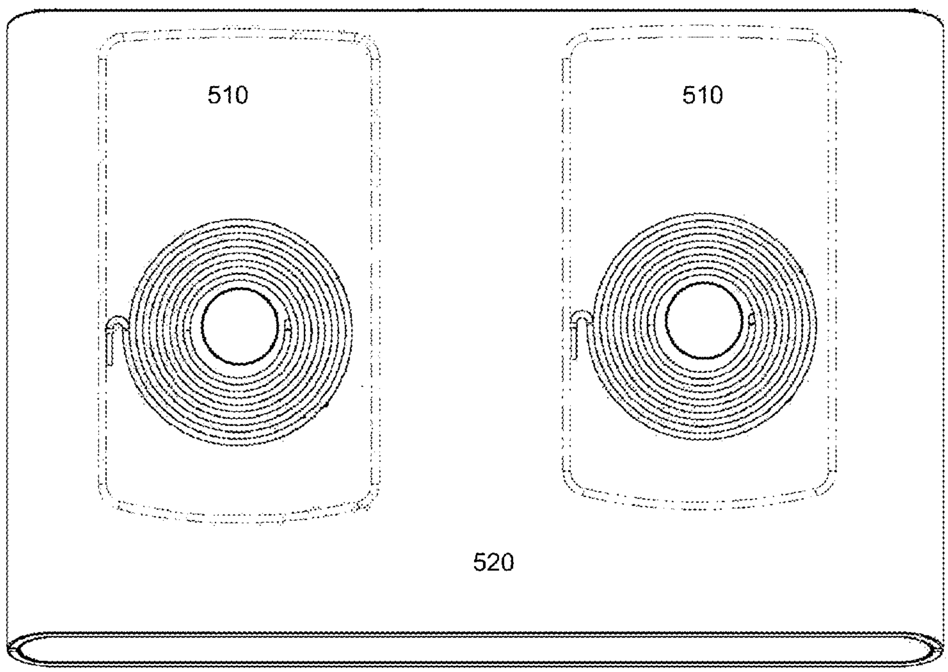


FIG. 5d

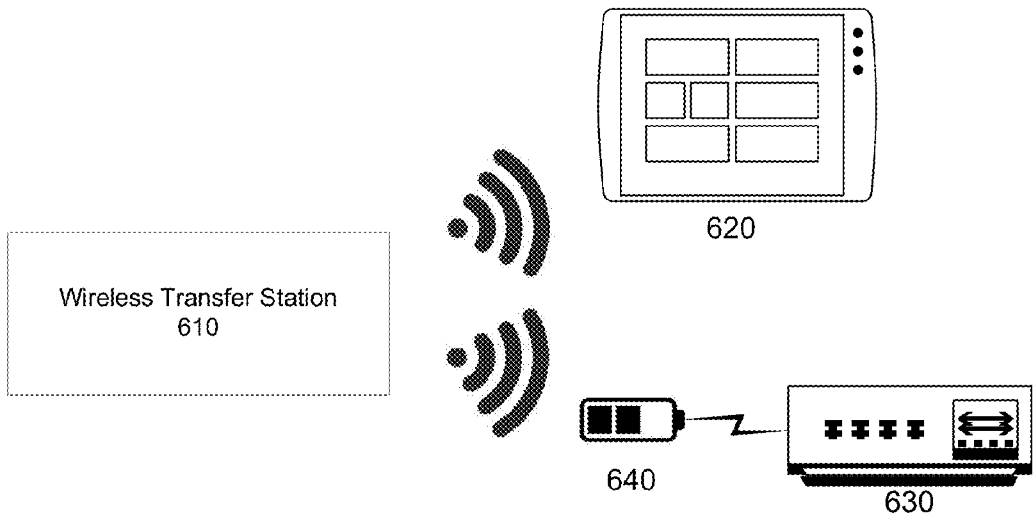


FIG. 6

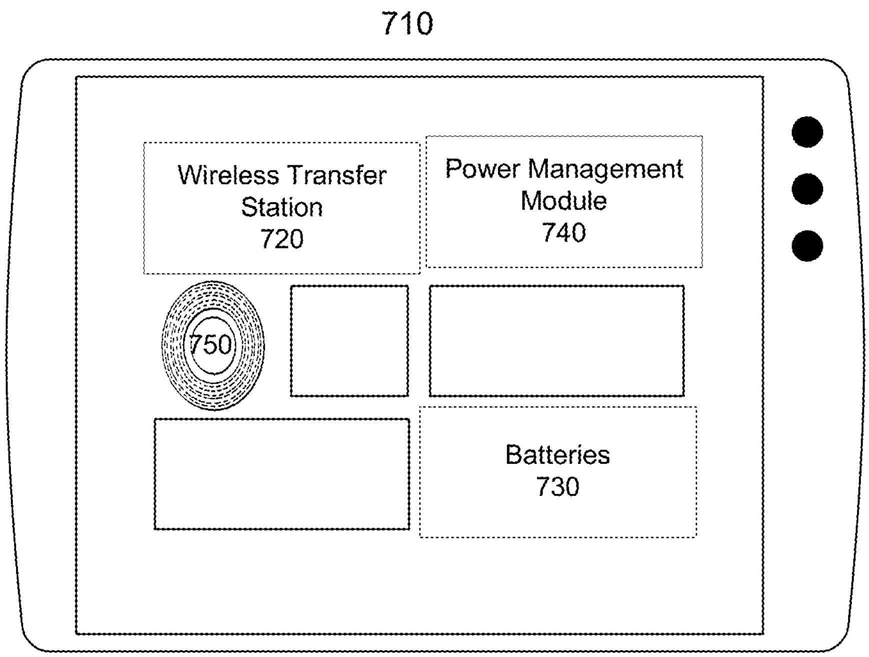

710
Wireless Transfer Station 720
Power Management Module 740
750
Batteries 730

FIG. 7a

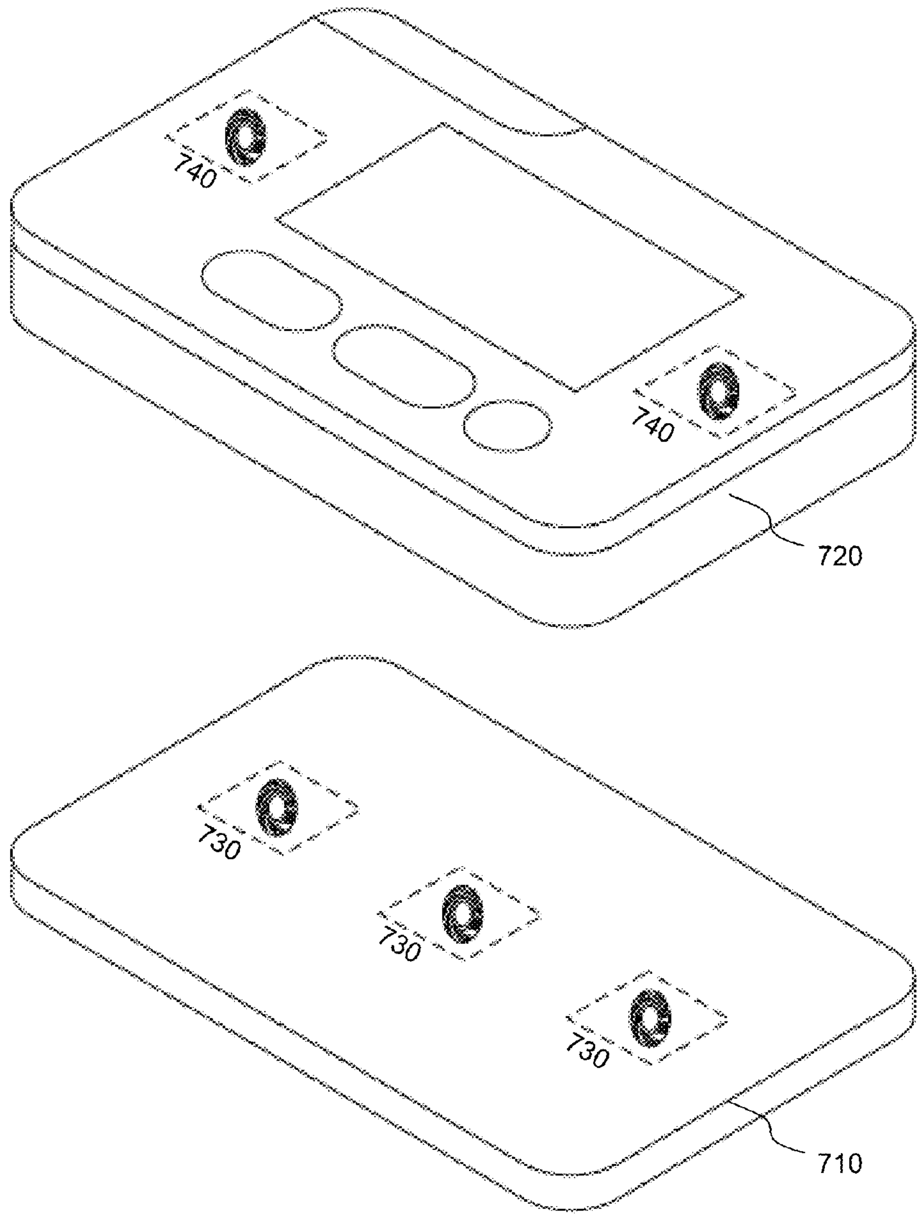


FIG.7b

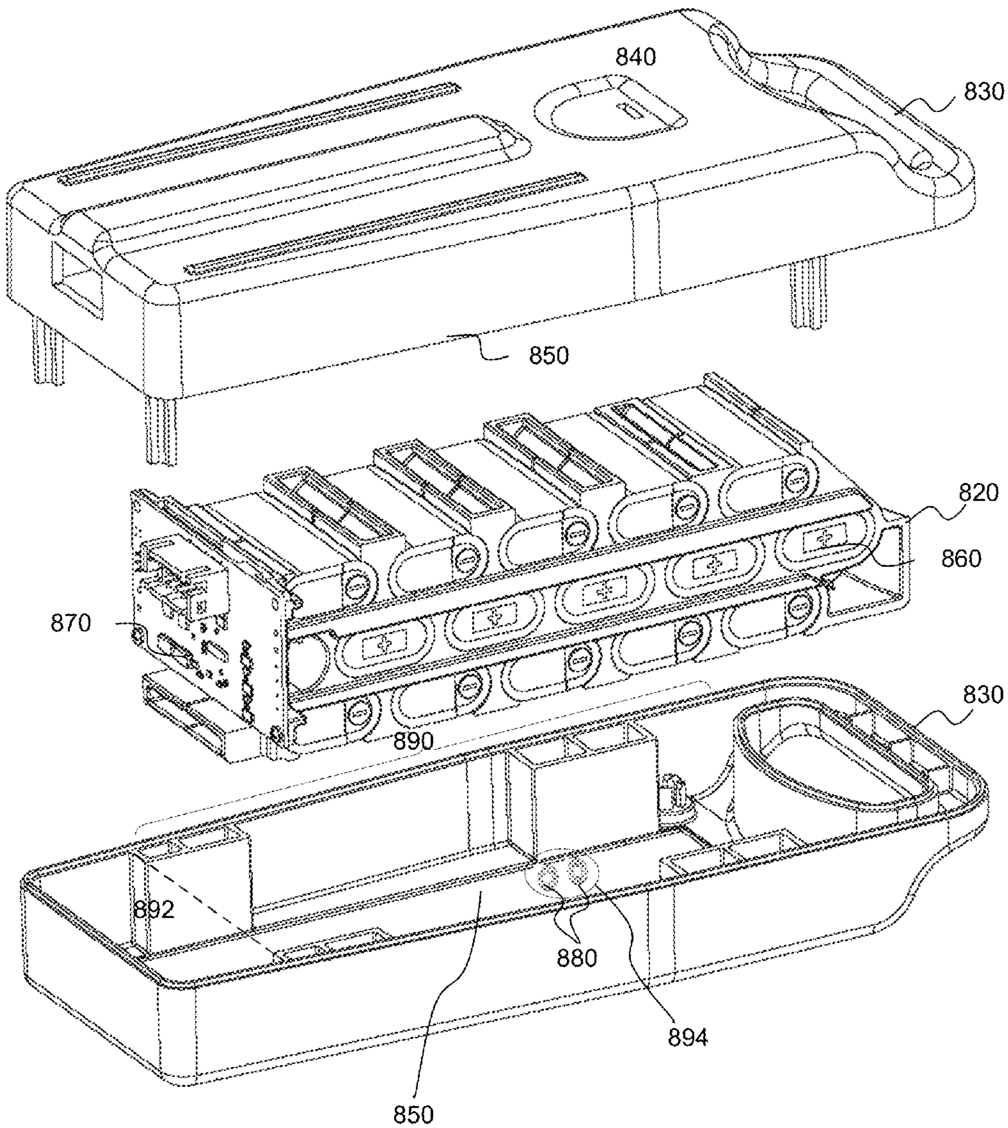


FIG. 8

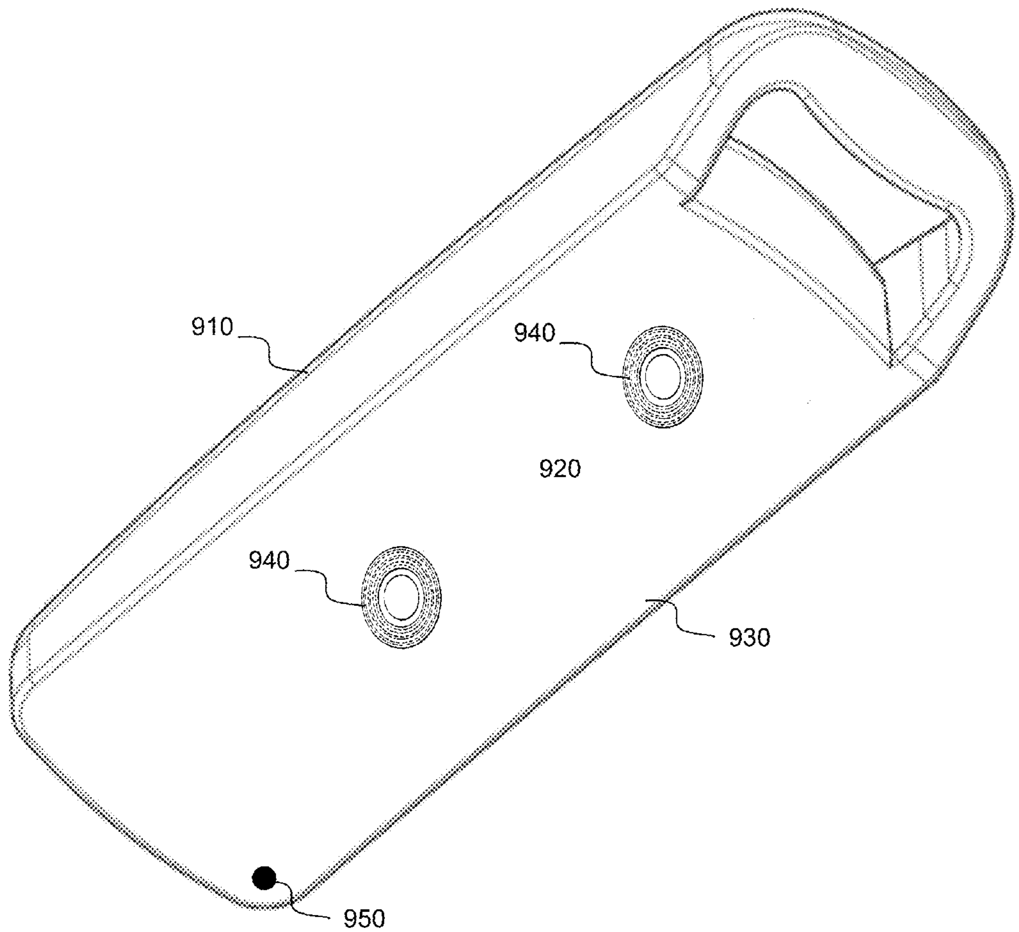


FIG. 9

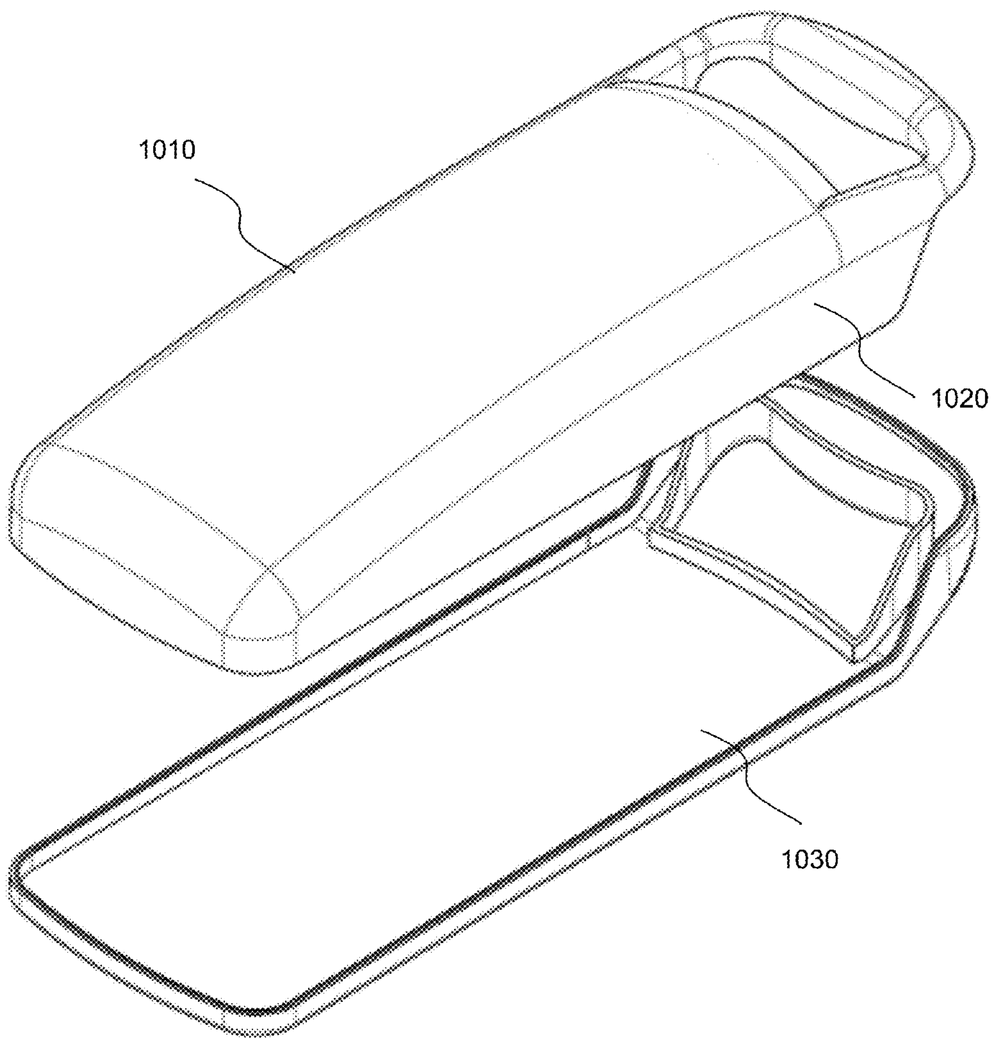


FIG. 10

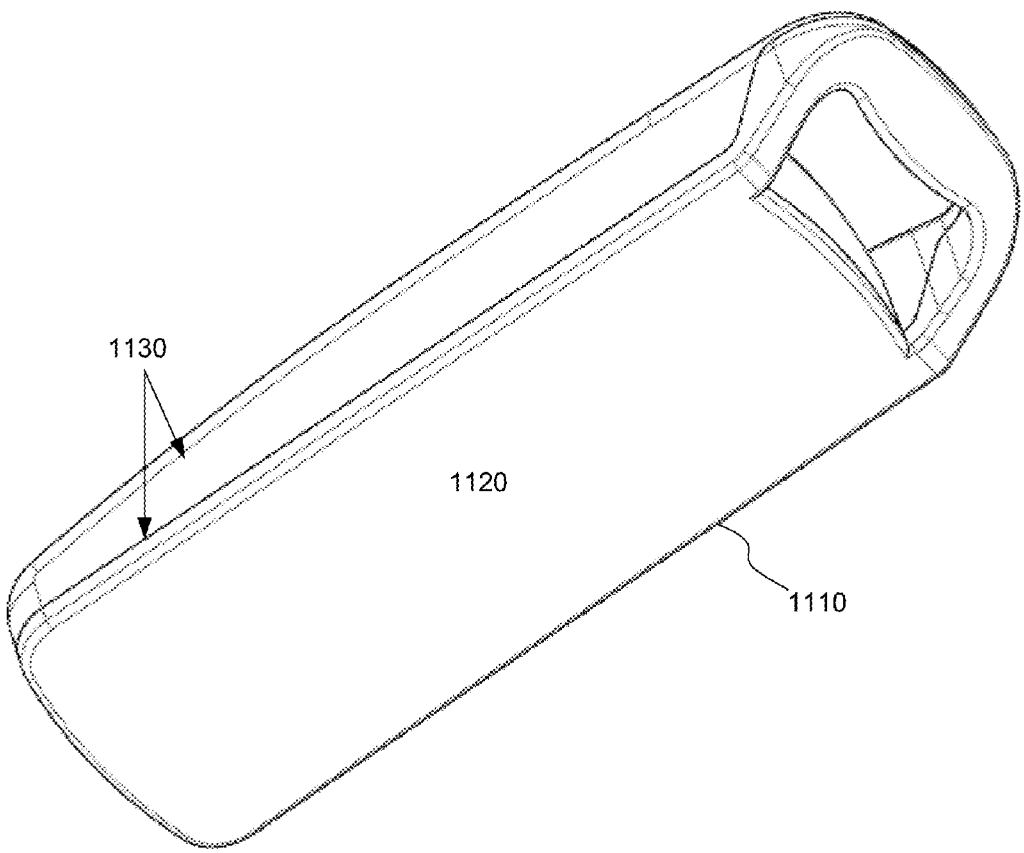


FIG.11a

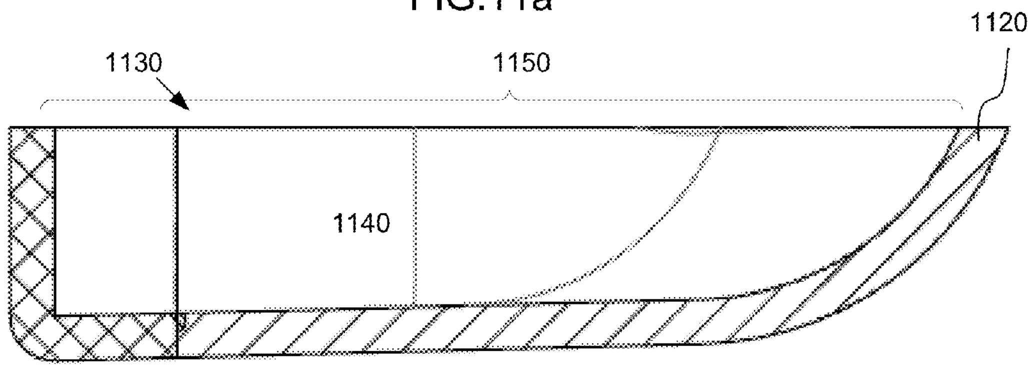


FIG. 11b

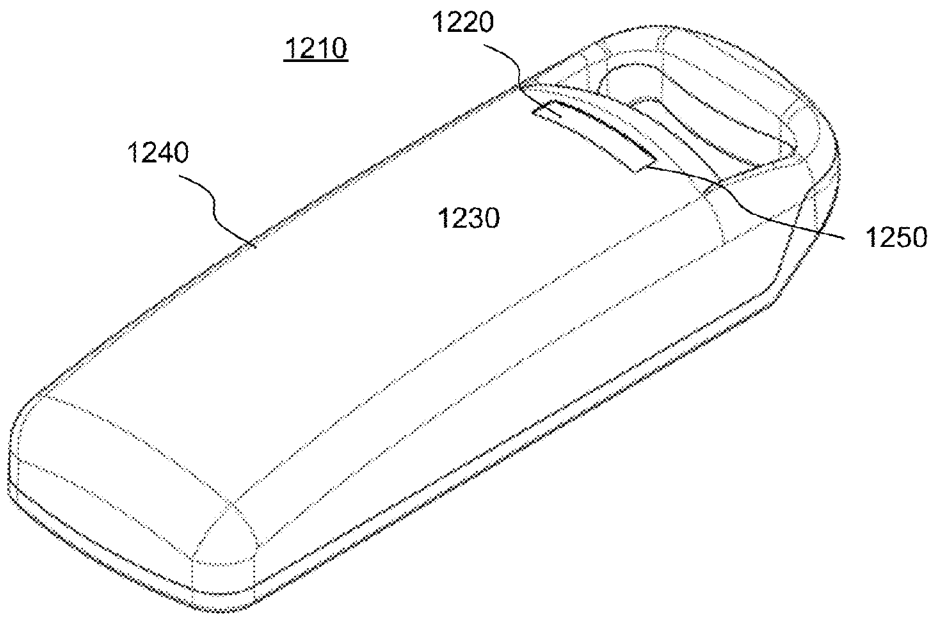


FIG. 12a

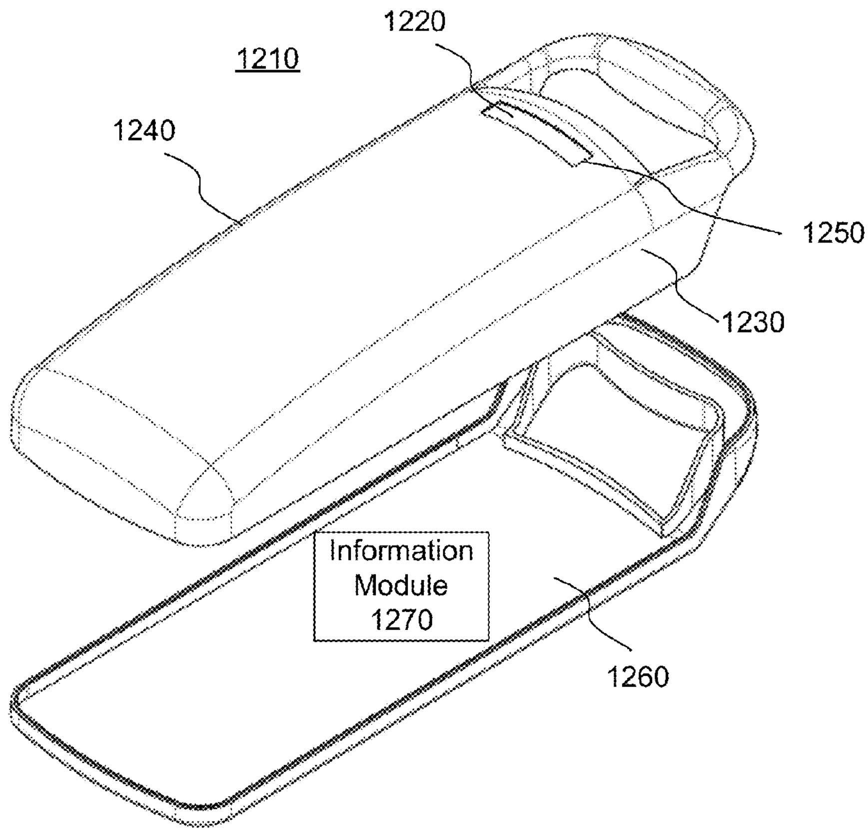


FIG. 12b

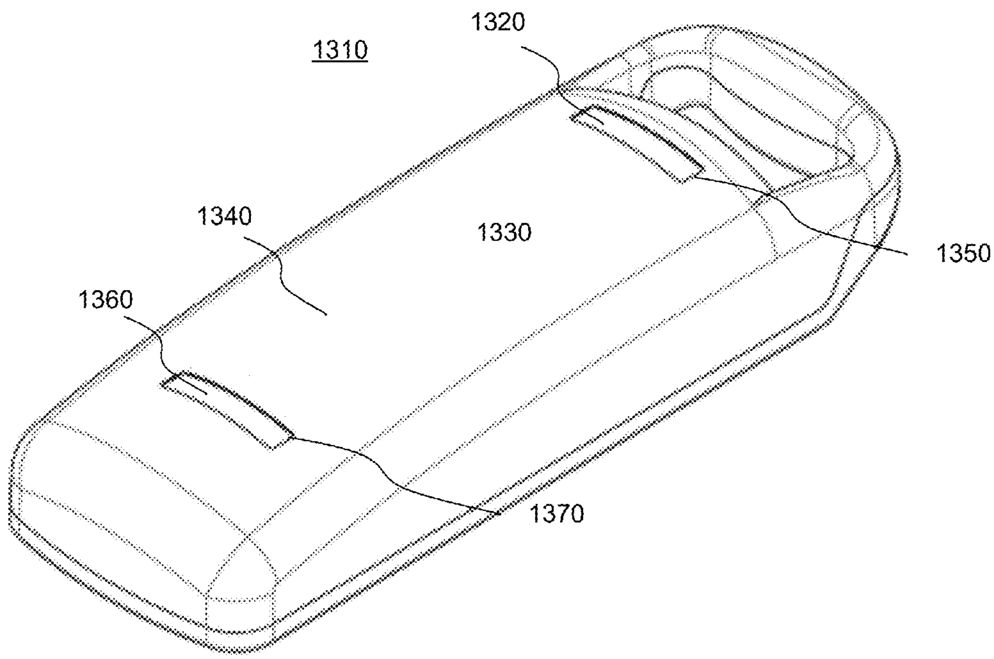


FIG. 13

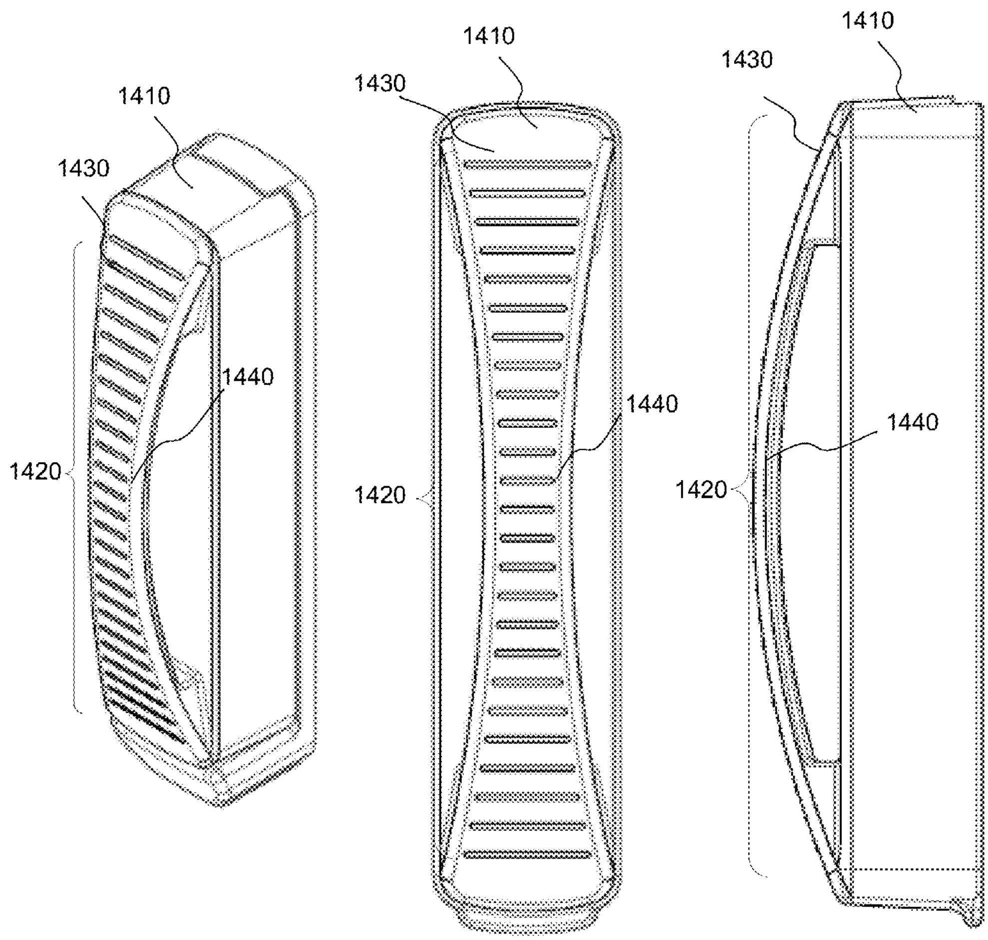


FIG.14a FIG.14b FIG.14c

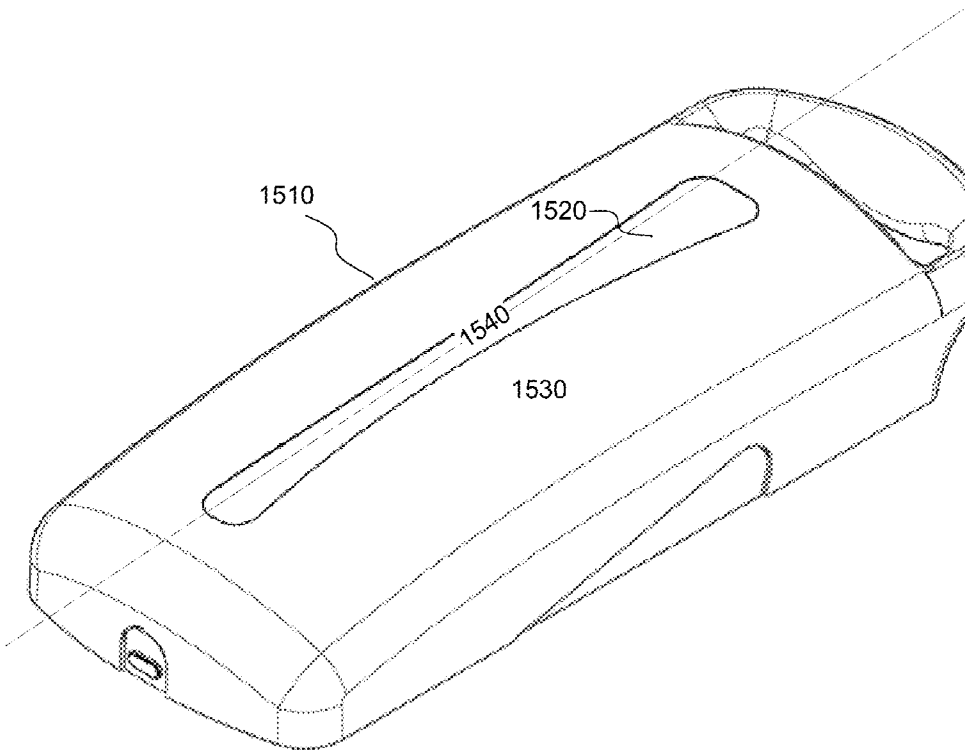


FIG. 15

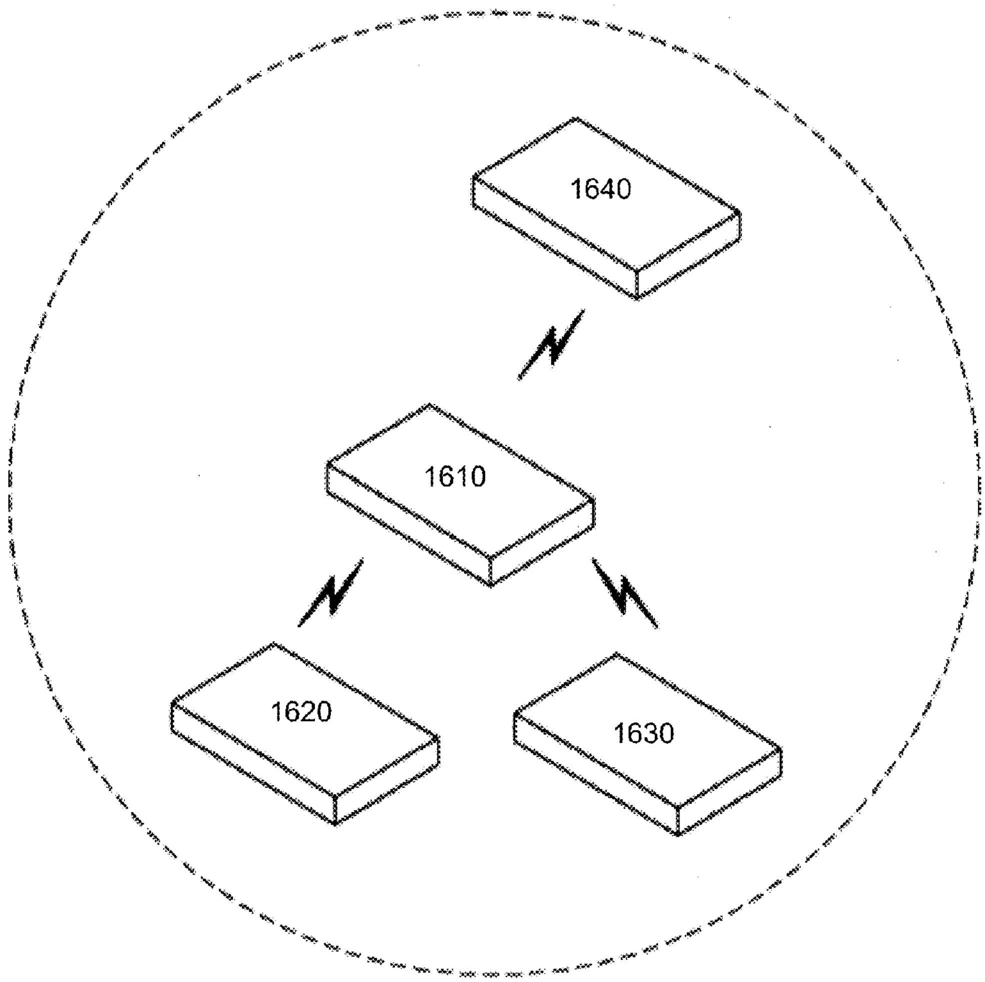


FIG.16

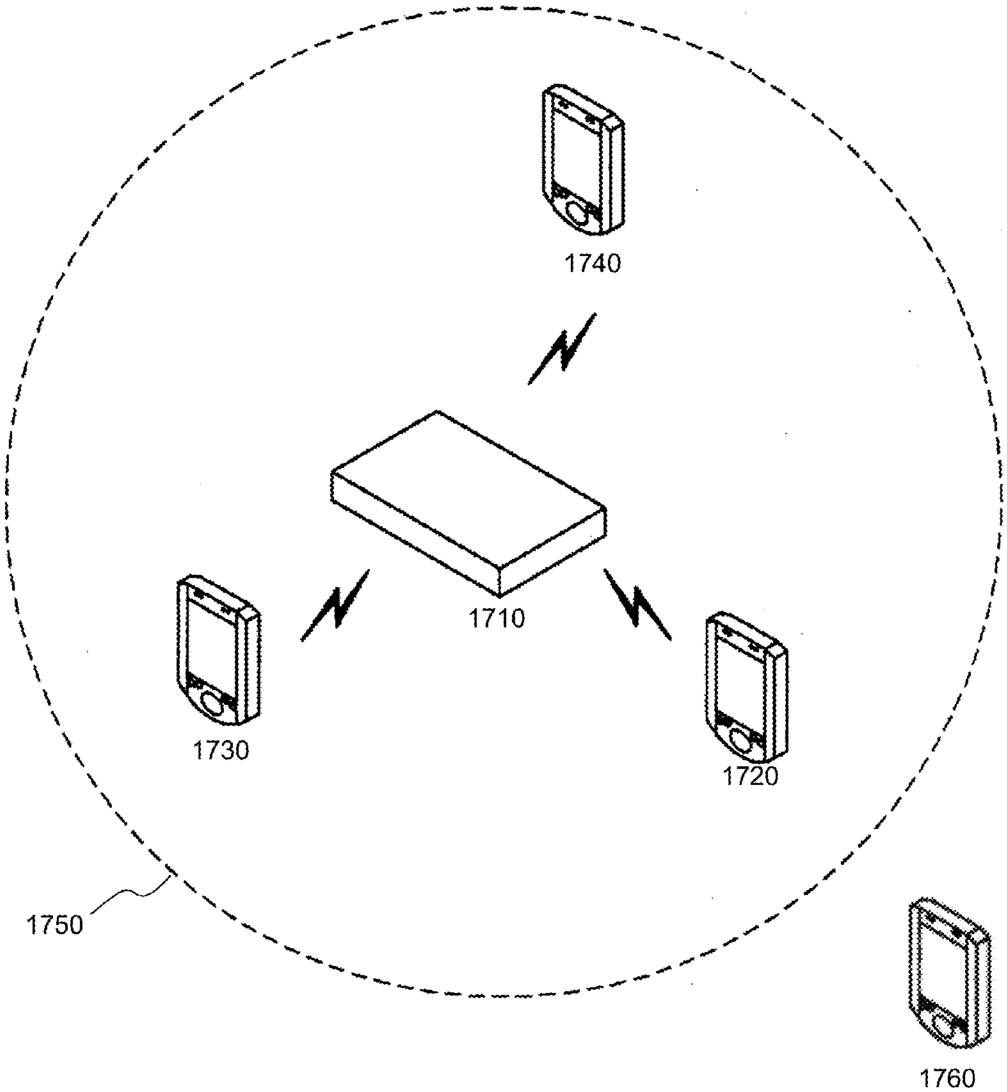


FIG. 17

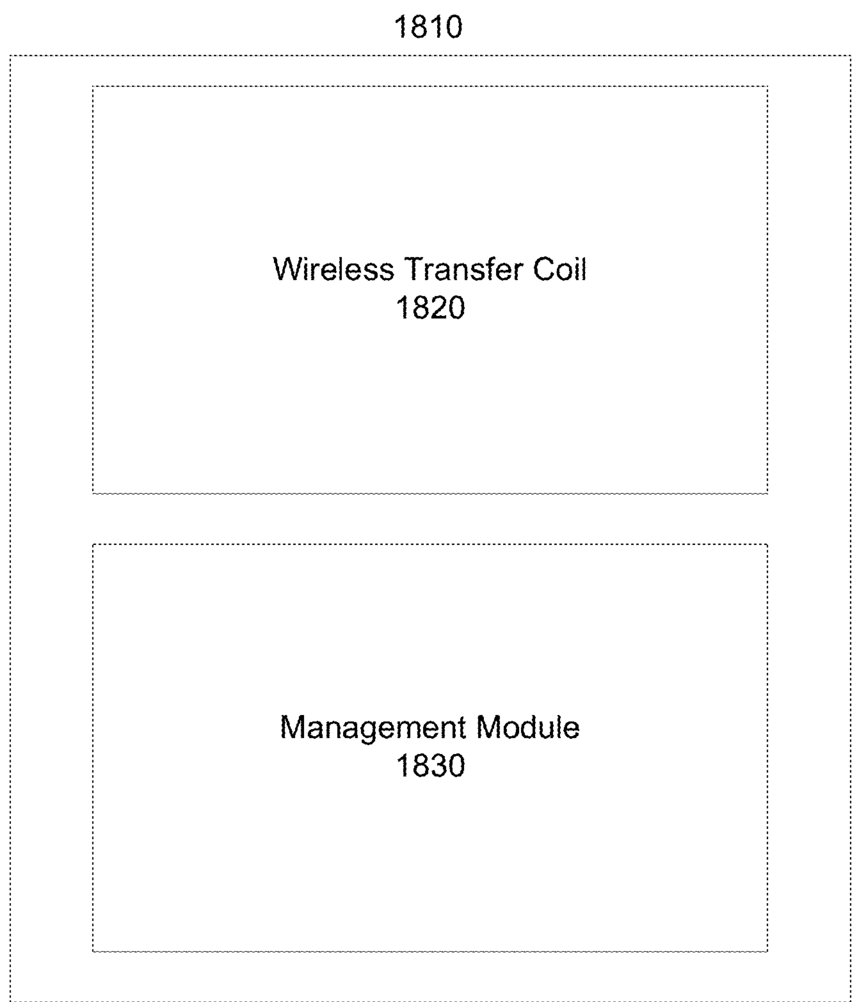


FIG.18

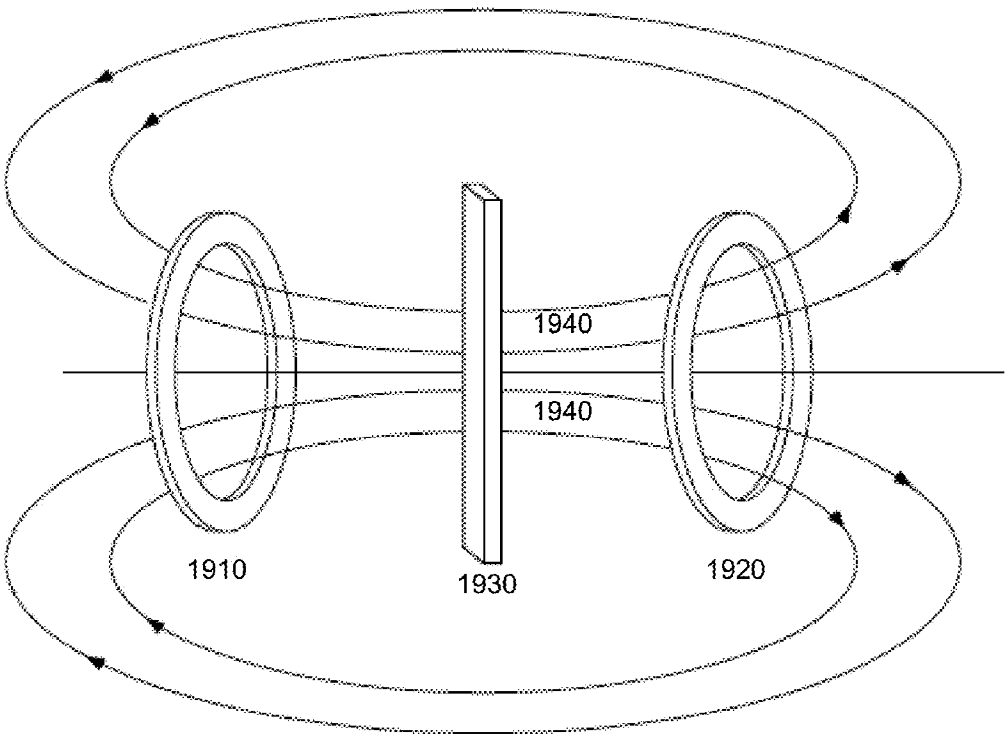


FIG.19

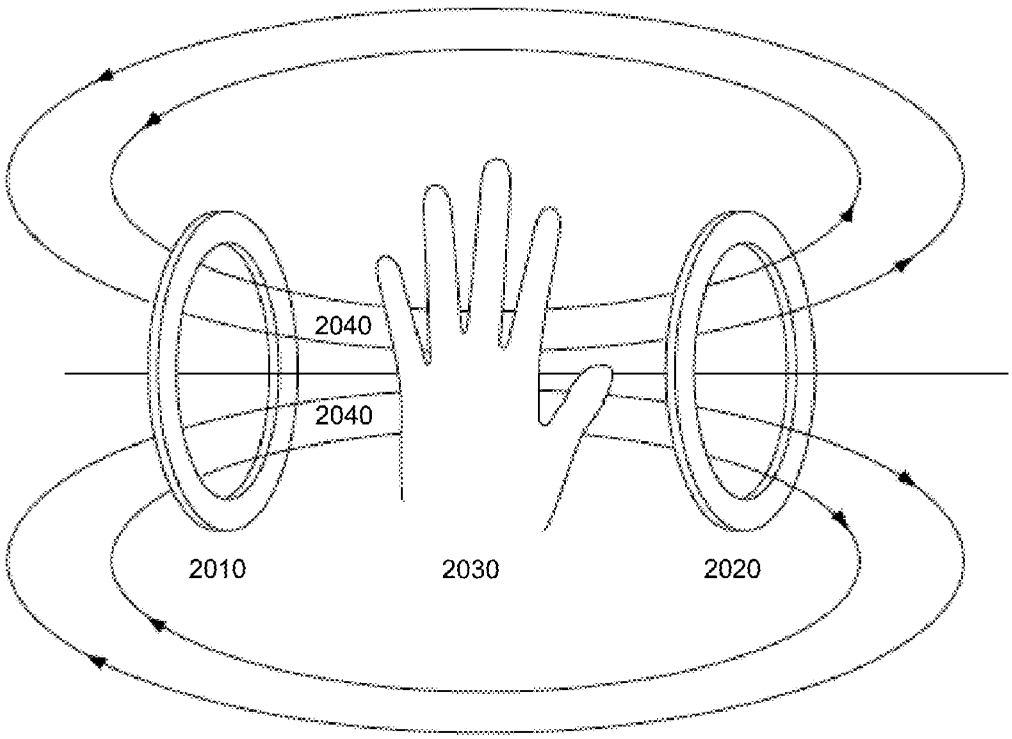


FIG.20

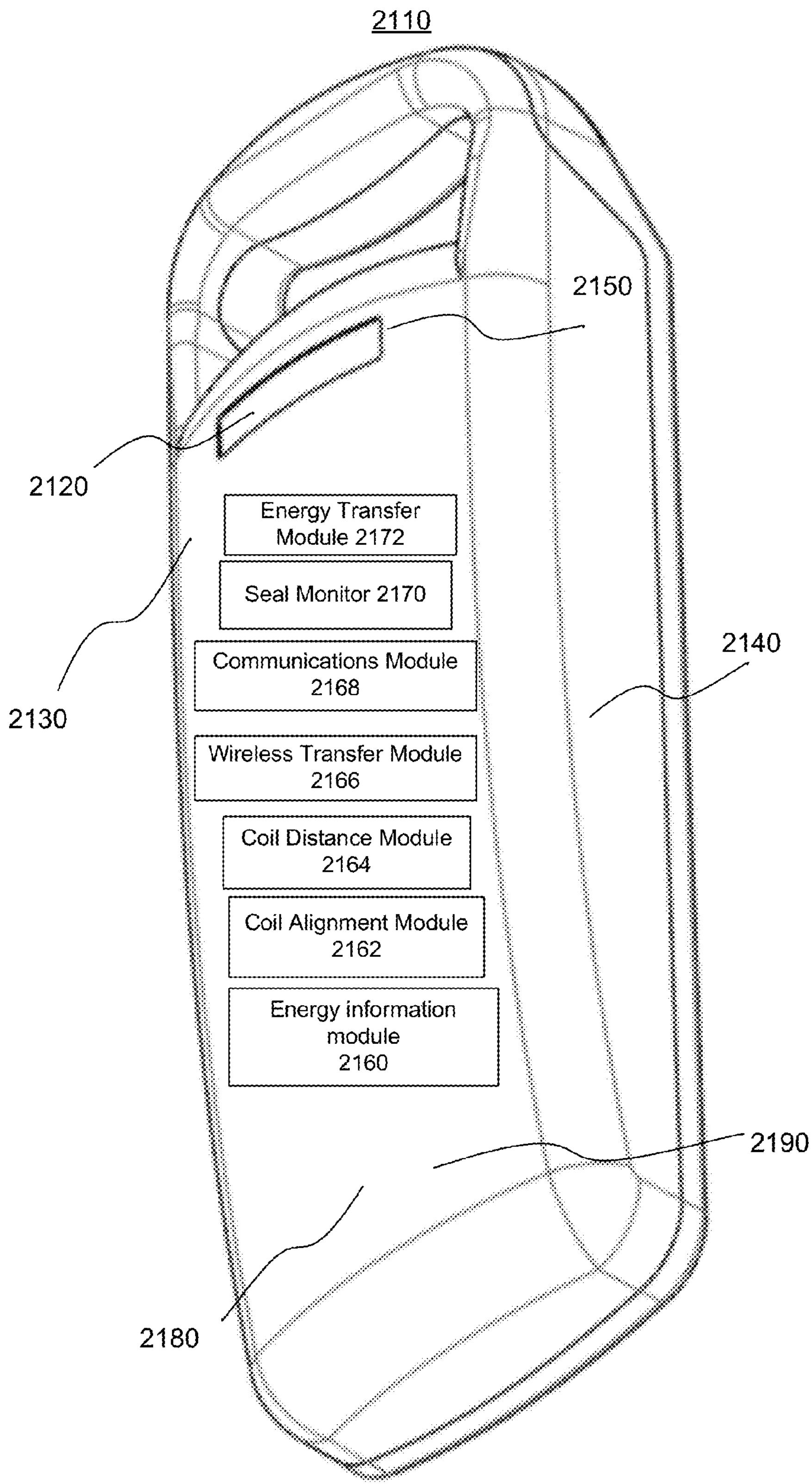

2110
2150
2120
Energy Transfer Module 2172
Seal Monitor 2170
Communications Module 2168
Wireless Transfer Module 2166
Coil Distance Module 2164
Coil Alignment Module 2162
Energy information module 2160
2130
2140
2190
2180

FIG.21

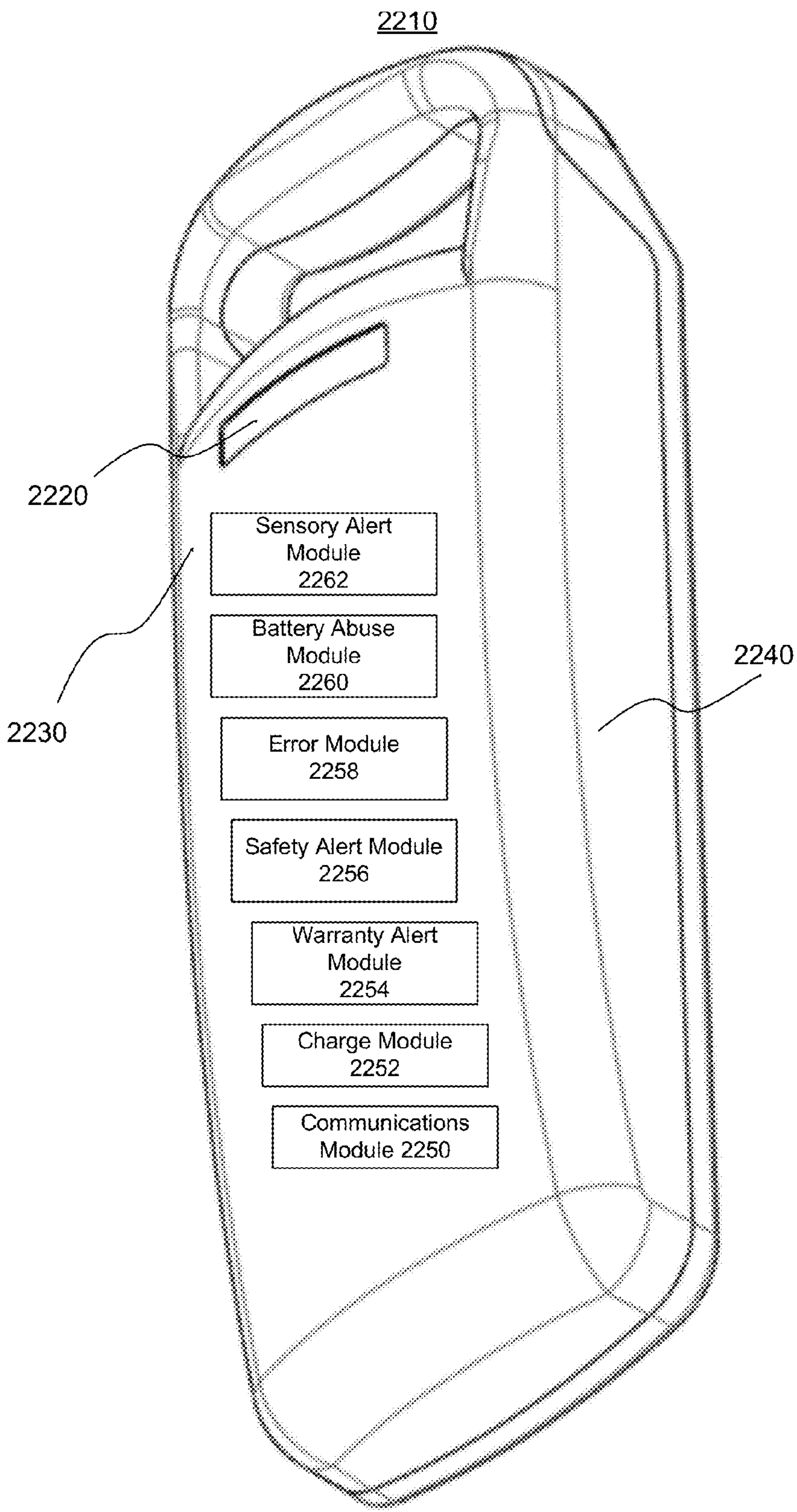

2210
2220
2230
2240
Sensory Alert Module 2262
Battery Abuse Module 2260
Error Module 2258
Safety Alert Module 2256
Warranty Alert Module 2254
Charge Module 2252
Communications Module 2250

FIG.22

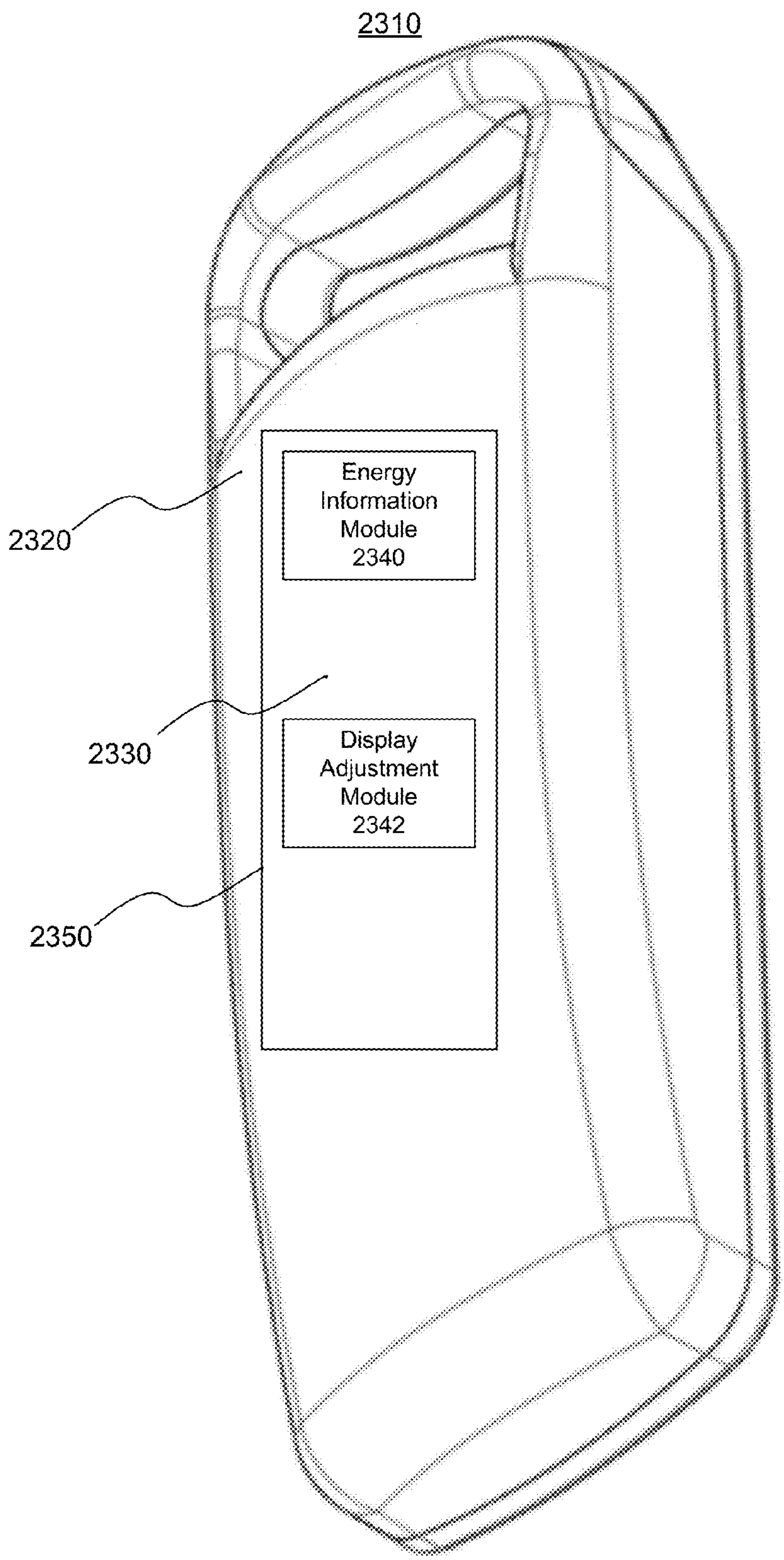

2310
2320
2330
2350
Energy Information Module 2340
Display Adjustment Module 2342

FIG.23

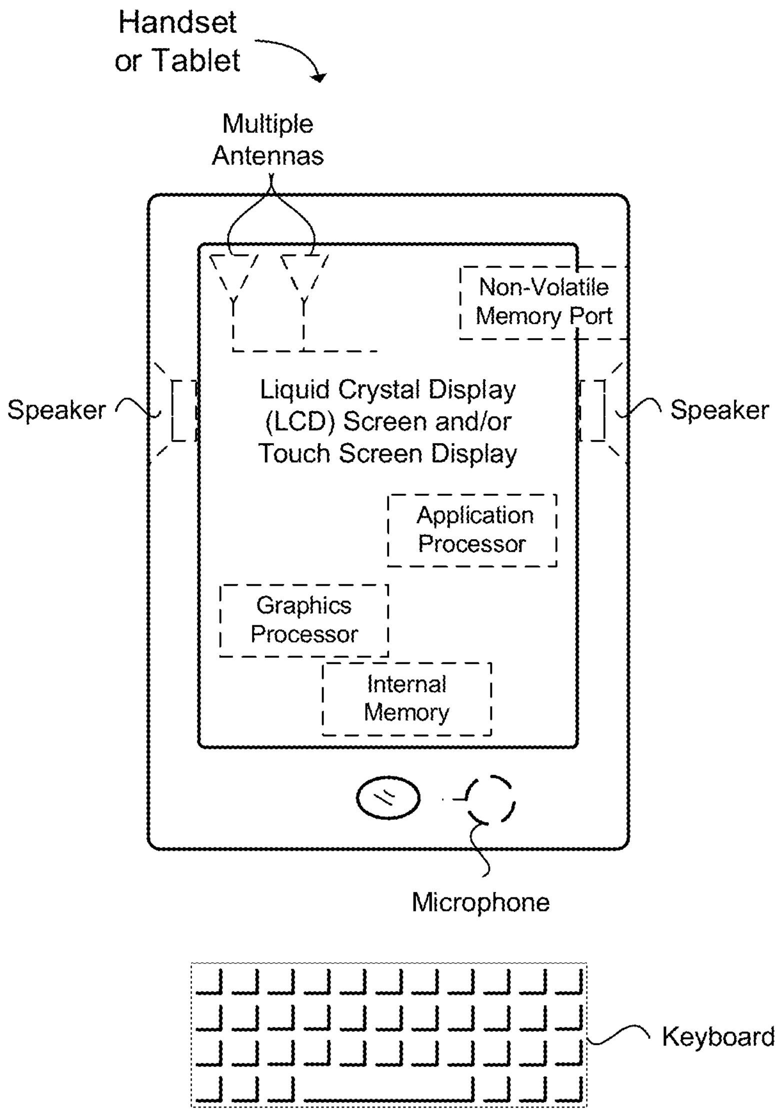

Handset or Tablet
Multiple Antennas
Non-Volatile Memory Port
Speaker
Liquid Crystal Display (LCD) Screen and/or Touch Screen Display
Speaker
Application Processor
Graphics Processor
Internal Memory
Microphone
Keyboard

FIG. 24

WIRELESS TRANSFER STATION WITH DISPLAY

[0001] This application claims the benefit of and hereby incorporates by reference U.S. Provisional Patent Application Ser. No. 62/010,921, filed Jun. 11, 2014, with an attorney docket number 3712-049.PROV.

BACKGROUND

[0002] With an increase of portable equipment, transportation, and communication markets, the battery industry is continually expanding to meet the increasing energy need. Typically, batteries can be broadly classified into two categories: primary batteries and secondary batteries. A primary battery, also known as a disposable battery, can be used once until the battery is depleted, after which the disposable battery can be replaced with a new battery. A secondary battery, also known as a rechargeable battery, can be capable of repeated recharging and reuse. One advantage of rechargeable batteries can be a cost advantage, an environmentally friendly alternative, and an ease-of-use compared to disposable batteries.

[0003] As popularity of rechargeable batteries increases, a range of uses of a rechargeable battery pack also increases. To accommodate an increased number of usages per rechargeable battery and the range of uses of the rechargeable battery, battery packs with sensor circuits within the battery pack (e.g. smart battery packs) can be used to determine selected information. To aid a user in utilizing information from the smart battery pack, the smart battery pack can include a display.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] Features and advantages of the disclosure will be apparent from the detailed description which follows, taken in conjunction with the accompanying drawings, which together illustrate, by way of example, features of the disclosure; and, wherein:

[0005] FIG. **1** depicts a wireless transfer station in accordance with an example;

[0006] FIG. **2** depicts transferring energy or data between a plurality of wireless transfer coils in accordance with an example;

[0007] FIG. **3***a* depicts a wireless transfer station in accordance with an example;

[0008] FIG. **3***b* depicts another wireless transfer station in accordance with an example;

[0009] FIG. **3***c* depicts a cross-sectional view of a battery in accordance with an example;

[0010] FIG. **4** depicts a wireless transfer station in accordance with an example;

[0011] FIG. **5***a* depicts a wireless transfer station that includes one or more resonant wireless transfer coils and/or one or more induction wireless transfer coils in accordance with an example;

[0012] FIG. **5***b* depicts a wireless transfer station in accordance with an example;

[0013] FIG. **5***c* depicts a wireless transfer station integrated into an object in accordance with an example;

[0014] FIG. **5***d* depicts a plurality of wireless transfer stations integrated into an object in accordance with an example;

[0015] FIG. **6** depicts a wireless transfer station that can provide energy to one or more non-wire powered electronic devices and/or one or more recharge batteries coupled to a device in accordance with an example;

[0016] FIG. **7***a* depicts a device with a wireless transfer station coupled to a device or integrated into the device in accordance with an example;

[0017] FIG. **7***b* depicts a wireless transfer station with a plurality of wireless transfer coils configured to transfer energy and/or data to an electronic device in accordance with an example;

[0018] FIG. **8** shows an exploded view of a wireless transfer station in accordance with an example;

[0019] FIG. **9** illustrates one exemplary embodiment of the wireless transfer station case in accordance with an example;

[0020] FIG. **10** shows another exploded view of a wireless transfer station in accordance with an example;

[0021] FIG. **11***a* shows a bottom perspective view of the wireless transfer station with a molded seal in a seam of a wireless transfer station case in accordance with an example;

[0022] FIG. **11***b* shows a seam with a gasket integrated into one of the pieces of a wireless transfer station in accordance with an example;

[0023] FIG. **12***a* shows a top perspective view of a wireless transfer station with a display in accordance with an example;

[0024] FIG. **12***b* shows an exploded view of the wireless transfer station with a display **1220** and an optically viewable portion in accordance with an example;

[0025] FIG. **13** shows a top perspective view of a wireless transfer station with a plurality of displays in accordance with an example;

[0026] FIG. **14***a* shows a perspective view of the wireless transfer station with display in accordance with an example;

[0027] FIG. **14***b* shows a front view of the wireless transfer station with display in accordance with an example;

[0028] FIG. **14***c* shows a side view of the wireless transfer station with display in accordance with an example;

[0029] FIG. **15** shows a top perspective view of the wireless transfer station with display in accordance with an example;

[0030] FIG. **16** shows a wireless transfer station configured to communicate with other wireless transfer stations in accordance with an example;

[0031] FIG. **17** shows a wireless transfer station transferring energy and/or data with one or more wireless transfer stations and/or devices within a selected range in accordance with an example;

[0032] FIG. **18** depicts a wireless transfer station in accordance with an example;

[0033] FIG. **19** depicts a foreign object entering a magnetic field between wireless transfer coils in accordance with an example;

[0034] FIG. **20** depicts another foreign object entering a magnetic field between wireless transfer coils in accordance with an example;

[0035] FIG. **21** depicts another wireless transfer station operable to display information in accordance with an example;

[0036] FIG. **22** depicts a wireless battery pack operable to display information in accordance with an example;

[0037] FIG. **23** depicts a wireless battery display operable to display information in accordance with an example; and

[0038] FIG. **24** illustrates a diagram of a device in accordance with an example.

[0039] Reference will now be made to the exemplary embodiments illustrated, and specific language will be used herein to describe the same. It will nevertheless be understood that no limitation of the scope of the invention is thereby intended.

DETAILED DESCRIPTION

[0040] Before the present invention is disclosed and described, it is to be understood that this invention is not limited to the particular structures, process steps, or materials disclosed herein, but is extended to equivalents thereof as would be recognized by those ordinarily skilled in the relevant arts. It should also be understood that terminology employed herein is used for the purpose of describing particular examples only and is not intended to be limiting. The same reference numerals in different drawings represent the same element. Numbers provided in flow charts and processes are provided for clarity in illustrating steps and operations and do not necessarily indicate a particular order or sequence.

[0041] The terms battery, cell, and/or battery cell as used herein can be used interchangeably and can refer to any of a variety of different cell chemistries and configurations. In one embodiment the cell chemistries and configurations can include, but are not limited to, lithium ion (e.g., lithium iron phosphate, lithium cobalt oxide, other lithium metal oxides, etc.), lithium ion polymer, nickel metal hydride, nickel cadmium, nickel hydrogen, nickel zinc, silver zinc, or other battery type/configurations.

[0042] The term battery pack as used herein can refer to one or more individual batteries contained within a single piece housing, or a multiple piece housing. The one or more individual batteries can be electrically interconnected in parallel and/or in series to achieve a selected energy level (such as a voltage level or a current level) and capacity level.

[0043] An increasing number and variety of electronic devices are powered using non-wired energy sources, such as batteries or wireless energy sources that provide power directly to the device or to energy storage systems. The electronic devices can range from mobile phones, portable music players, laptop computers, and tablet computers to medical devices such as hearing aids, pace makers, wheeled medical carts, medical measurement equipment, medical test equipment, and other types of medical equipment.

[0044] Traditionally, battery chargers operate to charge one or more batteries by either simultaneously charging one or more batteries of the same type using a single charging port or by charging each of the batteries of the same type simultaneously using multiple charging ports. Traditional battery chargers can only recharge one type of battery and do not account for individual characteristics of different types of batteries. The battery chargers are often limited in the type of battery they can recharge. In one example, a traditional battery charger can only provide a fixed voltage output and a fixed current output to a selected battery or type of battery with a selected energy level. Energy levels in batteries are typically measured in watt-hours or amp-hours.

[0045] Often, rechargeable batteries are used as a replenishable energy source for electronic devices. In one embodiment, a battery pack can include one or more rechargeable batteries. In one example, the one or more rechargeable batteries can be a lead-based battery, a lithium-based battery, a nickel based battery, or another type of chemical storage battery. Traditionally, a rechargeable battery pack provides energy to an electronic device using physical electrically conductive connections between the rechargeable battery pack and the electronic device. When the traditional rechargeable batteries of the rechargeable battery pack are depleted, the rechargeable batteries can be replenished by connecting physical electrically conductive contacts between the rechargeable battery pack and a battery charger.

[0046] In one embodiment of the present invention, a wireless transfer station can receive energy and/or send energy to another device, such as another wireless transfer station, using a wireless energy transfer scheme (e.g. transfer energy without wires). A wireless energy transfer scheme can be any form of wireless energy transfer associated with the use of electric fields, magnetic fields, electromagnetic fields, and so forth that allows electrical energy to be transmitted between two or more wireless transfer elements without using physical electrical contacts. In one example, a wireless energy transfer of wireless energy can be a transfer of electrical energy from an energy source to an electrical load without the use of interconnecting wires or physical electrical contacts.

[0047] In one embodiment, the wireless transfer station can include one or more wireless transfer coils to transfer energy and/or data with other wireless transfer stations. The wireless transfer coil can include one or more power management modules to control the energy transfers and/or data transfers with the other wireless transfer stations.

[0048] Examples of a wireless transfer station includes a wireless energy rechargeable battery pack, a wireless energy transfer platform and/or data transceiver integrated into a medical cart, a wireless energy transfer platform and/or data transceiver integrated into an electronic device, a wireless energy transfer platform and/or data transceiver integrated into a piece of furniture, a wireless energy transfer platform and/or data transceiver integrated into a plate mounted to a wall, a wireless energy transfer platform and/or data transceiver integrated into a device (such as a medical device or medical equipment), and so forth.

[0049] In one example, the wireless transfer station can be a wireless energy battery pack that can be attached to a device, such as a medical cart or medical equipment. The wireless transfer station that transfers energy and/or data with the device can also relay the energy and/or data with other devices and/or wireless transfer stations. These examples are not intended to be limiting. The wireless transfer station can be implemented in a variety of electronic devices and mounting locations.

[0050] In one embodiment, the wireless transfer station can receive data from and/or send data or information to another device, such as another wireless transfer station, using a wireless data transfer scheme. In another embodiment, the wireless data transfer scheme can be any form of data transfer associated with a communications network. In another embodiment, the communications network can be a cellular network. The cellular network can be configured to operate based on a cellular standard, such as the third generation partnership projection (3GPP) long term evolution (LTE) Rel. 8, 9, 10, 11, or 12 standard, or the institute of electronic and electrical engineers (IEEE) 802.16p, 802.16n, 802.16m-2011, 802.16h-2010, 802.16j-2009, or 802.16-2009 standard.

[0051] In another embodiment, the communications network can be a wireless local area network (such as a wireless fidelity network (Wi-Fi)) that can be configured to operate using a standard such as the IEEE 802.11-2012, IEEE 802.11ac, or IEEE 802.11ad standard. In another embodiment, the communications network can be configured to operate using a Bluetooth standard such as Bluetooth v1.0, Bluetooth v2.0, Bluetooth v3.0, or Bluetooth v4.0. In another embodiment, the communications network can be configured to operate using a ZigBee standard, such as the IEEE 802.15.4-2003

(ZigBee 2003), IEEE 802.15.4-2006 (ZigBee 2006), or IEEE 802.15.4-2007 (ZigBee Pro) standard. In another embodiment, the wireless data transfer scheme can be any form of data transfer associated with electric fields, magnetic fields, or electromagnetic fields that is transmitted between two or more wireless transfer elements without using physical electrical contacts.

[0052] In one embodiment, the wireless transfer station can include one or more wireless transfer elements. In one example, a wireless transfer element can be a wireless transfer coil. In one embodiment, the wireless transfer coil can be a coil used for transmitting and/or receiving energy and/or data using magnetic inductance and/or magnetic resonance.

[0053] FIG. **1** illustrates a wireless transfer station **110**. FIG. **1** further illustrates that the wireless transfer station **110** can include a wireless transfer coil **120** and a power management module **130**. In one example, the power management module **130** can convert energy received from an energy source, such as another wireless transfer station or an alternating current (AC) energy outlet, a selected current level, a selected voltage level, and/or a selected wattage level. In another embodiment, the wireless transfer station **110** can include one or more batteries, such as rechargeable batteries. In one embodiment, the wireless transfer coil **120** can comprise a transmitting coil and/or a receiving coil.

[0054] FIG. **2** illustrates an example of transferring energy or data between a plurality of wireless transfer coils **210** and **220**. FIG. **2** further illustrates that one of the plurality of wireless transfer coils **210** can be a transmitting coil **210** and another one of the plurality of wireless transfer coils **220** can be a receiving coil **220**. In one embodiment, energy and/or data can be transferred from the transmitting coil **210** to the receiving coil **220** by coupling the transmitting coil **210** with the receiving coil **220** to enable the energy or data to be transferred over a gap or distance. In one example, wireless energy can be transferred by generating a magnetic field **230** (such as an electromagnetic field) at the transmitting coil **210** and positioning the receiving coil **220** within the magnetic field **230** to induce a current at the receiving coil **220**. The process of inducing a current at the receiving coil is referred to as coupling the receiving coil **220** to the transmitting coil **210**. In one embodiment, the wireless transfer coil coupling for wireless energy or data transfer can be a magnetic induction coupling. In another embodiment, the wireless transfer coil coupling for wireless energy transfer can be a magnetic resonant coupling.

[0055] In one embodiment, the transmitting coil **210** can be a transmitting induction coil and the receiving coil **220** can be a receiving induction coil. The wireless transfer station can use a magnetic field to transfer energy between the transmitting coil **210** coupled to a first object (such as a wireless transfer station) and a receiving coil **220** of a second object (such as another wireless transfer station) without any direct contact between the transmitting coil **210** and the receiving coil **220**, e.g. inductive coupling.

[0056] In one embodiment, inductive coupling can occur when the transmitting coil **210** creates a magnetic field **230** (such as an alternating electromagnetic field) using an energy source, such as an alternating current (AC) energy outlet or a direct current (DC) battery. A current can be induced at the receiving coil **220** using the magnetic field when the receiving coil **220** is located within the magnetic field **230**.

[0057] In one example, when the transmitting coil **210** and the receiving coil **220** are within a threshold proximity distance, the transmitting coil **210** and the receiving coil **220** can couple to form an electric transformer. In one embodiment, current from the receiving coil **220** can be transferred to a battery or an electronic device. In another embodiment, the current can be stored in one or more energy sources of the wireless transfer station, such as a battery. In another embodiment, the current can be transferred to a device coupled to the wireless transfer station. In one embodiment, an impedance of one or more transmitting coils **210** can be substantially matched with an impedance of one or more receiving coils **220**.

[0058] In one embodiment, the transmitting coil **210** can be a transmitting resonant coil and the receiving coil **220** can be a receiving resonant coil. A wireless resonant transfer can be a resonant transmission of energy or data between at least one transmitting coil **210** and at least one receiving coil **220**. In another embodiment, at least one transmitting coil **210** and at least one receiving coil **220** can be tuned to resonate at a same frequency or a substantially same frequency.

[0059] In one example, resonant transmission of wireless energy can occur when the transmitting coil and the receiving coil are constructed to resonate at the same frequency or approximately the same frequency. The transmitting coil **210** can be configured to oscillate current at the resonant frequency of the coils to transfer energy and/or data. The oscillating current of the transmitting coil **210** can generate an oscillating magnetic field at the selected resonant frequency of the receiving coil. When the receiving coil **220** is positioned adjacent to the oscillating magnetic field and constructed to operate at the same frequency or substantially the same frequency as the transmitting coil **210**, the receiving coil **220** can receive energy and/or data from the oscillating magnetic field.

[0060] In another embodiment, an impedance of one or more transmitting coils **210** can be substantially matched with an impedance of one or more receiving coils **220** for energy and/or data transfer. In another embodiment, the transmitting coil and the receiving coil can be positioned such that the receiving coil is within the near field of the magnetic field of the transmitting coil. The near field can be based within the Fraunhofer region, which can be approximately within $\frac{1}{2}\pi$ times the wavelength of the electromagnetic field.

[0061] One advantage of placing the receiving coil within the near field for wireless energy transfer is to reduce an amount of energy that may be radiated or leaked from the wireless transfer coils **210** and **220**, e.g. energy not received at the receiving coil **220**. In one embodiment, energy in a magnetic field falls off as the inverse squared of a distance ($1/d^2$) between the transmitting coil **210** and the receiving coil **220** within the near field. In one example, magnetic resonant coupling can be used to transfer energy at relatively high energy levels between the transmitting coil **210** and the receiving coil **220** and to minimize or reduce energy leaking away from the wireless transfer coils **210** and **220**.

[0062] Another advantage of using a near field or a non-radiating field for wireless energy transfer can be that the near field or the non-radiating field can be used in areas adjacent to biological material, such as humans or other biological entities, with minimal or no effects to the biological material from the wireless energy transfer. In another embodiment, a wireless transfer station, such as in FIG. **1**, can use a radio frequency (RF) signal, ultrasound, and/or laser beams to wirelessly transfer energy and/or data between a transmitting device and a receiving device.

[0063] FIG. 3*a* shows a wireless transfer station **310** that can include: a wireless transfer coil **320**, a power management module **330**, and a conversion module **340**. In one embodiment, the wireless transfer coil **320** can be used for resonance coupling and/or induction coupling. In one example, the conversion module **340** can be coupled to the wireless transfer coil **320** and used to switch the wireless transfer coil **320** from a resonance mode (i.e. transferring wireless energy and/or data using magnetic resonance coupling) to an induction mode (i.e. transferring wireless energy and/or data using magnetic induction coupling), or vice versa.

[0064] In one embodiment, the wireless transfer coil **320** of the wireless transfer station **310** can be used for transmitting wireless energy and/or receiving wireless energy. In one example, the conversion module **340** can be coupled to the wireless transfer coil **320** and used to switch the wireless transfer coil **320** from a receiving mode (i.e. receiving wireless energy and/or data) to a transmitting mode (i.e. transmitting wireless energy and/or data), or vice versa.

[0065] In one embodiment, when the conversion module **340** of the wireless transfer station **310** is in the transmitting mode, the conversion module **340** or the power management module **330** can convert energy received from an energy source (such as a power outlet or a battery) at a selected voltage into a high frequency alternating current and transmit the high frequency alternating current to a wireless transfer coil of another wireless transfer station. The high frequency alternating current can flow through one or more loops of the wireless transfer coil **320** and create a varying magnetic field that can induce a current in the other wireless transfer coil. In another embodiment, when the conversion module **340** is switched to the receiving mode, a varying magnetic field from another wireless transfer station can induce an alternating current flowing through the one or more loops of the wireless transfer coil **320**. The current flowing through the one or more loops can be converted into a direct current (DC) by the conversion module **340** or the power management module **330** and directed to a battery coupled to the wireless transfer station **310** or a device that is electrically coupled to the wireless transfer station **310**.

[0066] In one embodiment, each wireless transfer coil **320** of a wireless transfer station **310** can be coupled to a separate conversion module **340**. In another embodiment, one or more conversion modules **340** can be coupled to one or more selected groups of wireless transfer coils **320**. One advantage of using a conversion module **340** for switching a wireless transfer coil **320** between transmitting mode and receiving mode can be to reduce a complexity of design and/or size of a wireless transfer station **310** by reducing a number of wireless transfer coils **320** used to transmit and/or receive wireless energy. Another advantage of using a conversion module **340** for switching a wireless transfer coil between a transmitting mode and receiving mode is to provide a dual functionality to a wireless transfer station of both transmitting and receiving wireless energy.

[0067] FIG. 3*b* illustrates a wireless transfer station **350**. FIG. 3*b* further illustrates that the wireless transfer station **350** can include: a wireless transfer coil **360**; a power management module **370**; and a battery **380**. The battery **380** can comprise a plurality of batteries, such as rechargeable batteries. In one example, the power management module **370** can convert energy received using the wireless transfer coil **360** from an energy source, such as another wireless transfer station or an alternating current (AC) energy outlet, to a selected current level at a selected voltage level to provide a selected wattage level. In one embodiment, the power management module can transfer the converted energy to the battery **380** to store the energy.

[0068] FIG. 3*c* shows a cross-sectional view of a battery **380**, for example a lithium ion battery utilizing an 18650 battery form-factor. The battery **380** can include: a case **386**, such as a cylindrical case; one or more electrodes **388**, and a cap **384**. In one embodiment, the case **386** can be made of a metal, such as nickel-plated steel, that can be non-reactive with battery materials, such as an electrolyte or the one or more electrodes **388**. In one embodiment, a bottom surface **390** of the case **386** can be seamlessly integrated with the remainder of the case **386**. In one embodiment, a top end **382** of the case **386** can be open ended. In another embodiment, the cap **384** can be located at the top end **382** of the case **386**. In another embodiment, the top end **382** can be a positive electrical terminal of the battery **380** and the bottom end **390** can be a negative electrical terminal. In one example, the positive electrical terminal and the negative electrical terminal of the battery **380** can be connected to a wireless transfer station to provide energy to the wireless transfer station. In another embodiment, a plurality of batteries can be connected in series and/or in parallel. In one embodiment, the battery **380** can be connected to a power management module, such as the power management modules in FIGS. **3***a* and **3***b*.

[0069] FIG. **4** shows a wireless transfer station **410** that can include: a wireless transfer coil **420**, a power management module **430**, a communications module **440**, and/or a coordination module **450**. In one embodiment, the wireless transfer station **410** can communicate with one or more other wireless transfer stations or one or more devices using the communication module **440**.

[0070] In one embodiment, the communication module **440** of the wireless transfer station **410** can use a communications network to communicate the data to a device and/or another wireless transfer station. In another embodiment, the communications network can be a cellular network that may be a 3GPP LTE Rel. 8, 9, 10, 11, or 12 or IEEE 802.16p, 802.16n, 802.16m-2011, 802.16h-2010, 802.16j-2009, 802.16-2009. In another embodiment, communications network can be a wireless network (such as a wireless fidelity network (Wi-Fi)) that may follow a standard such as the Institute of Electronics and Electrical Engineers (IEEE) 802.11-2012, IEEE 802.11ac, or IEEE 802.11ad standard. In another embodiment, the communications network can be a Bluetooth connection such as Bluetooth v1.0, Bluetooth v2.0, Bluetooth v3.0, or Bluetooth v4.0. In another embodiment, the communications network can be a ZigBee connection such as IEEE 802.15.4-2003 (ZigBee 2003), IEEE 802.15.4-2006 (ZigBee 2006), IEEE 802.15.4-2007 (ZigBee Pro).

[0071] In one embodiment, the wireless transfer station **410** can transfer energy to one or more other wireless transfer stations, receive energy from one or more other wireless transfer stations, and/or communicate data or information with one or more other wireless transfer stations. In another embodiment, the coordination module **450** of the wireless transfer station **410** can coordinate when energy is transferred between wireless transfer stations and/or when data is communicated between wireless transfer stations. In another embodiment, the coordination module **450** can use the communications module **440** to communicate with one or more other wireless transfer stations to coordinate energy and/or data transfer between the wireless transfer station **410** and the one or more other wireless transfer stations.

[0072] One advantage of transferring energy and/or data using a wireless transfer station **410** is to provide a single connection point between the wireless transfer station **410** and other wireless transfer stations and/or other devices. Another advantage of transferring energy and/or data using the wireless transfer station **410** can be to enable a single step for both transferring energy between the wireless transfer station **410** and other wireless transfer stations and communicating or synchronizing data communicated between the wireless transfer station **410** and other wireless transfer stations. In one example, when a first wireless transfer station (such as a wireless transfer station integrated into a medical cart) is located adjacent to a second wireless transfer station (such as a wireless transfer station integrated into a plate mounted to a wall or a floor mat), the first wireless transfer station can both receive energy from the second wireless transfer station and synchronize information with the second wireless transfer station.

[0073] In one embodiment, the coordination module **450** can communicate with a conversion module, as in FIG. **3***a*, to coordinate when one or more wireless transfer coils **420** of the wireless transfer station **410** can transmit and/or receive wireless energy and/or data. In one example, the coordination module **450** communicates with a conversion module, as in FIG. **3***a*, to coordinate transmitting and/or receiving wireless energy and/or data by coordinating when one or more wireless transfer coils **420** are in a transmitting mode or a receiving mode, as discussed in the preceding paragraphs.

[0074] FIG. **5***a* shows a wireless transfer station **510** that includes one or more resonant wireless transfer coils **520** and/or one or more induction wireless transfer coils **530**. In one example, the wireless transfer station **510** can have a resonant wireless transfer coil **520** and can transfer energy to a resonant wireless transfer coil of a first wireless transfer station and can have an induction wireless transfer coil **530** and can transfer energy to an induction wireless transfer coil of a second wireless transfer station. One advantage of the wireless transfer station having both resonant wireless transfer coils **520** and induction wireless transfer coils **530** can be to provide energy and/or data to wireless transfer stations and/or devices with only one of the resonant wireless transfer coils or the induction wireless transfer coils, thereby enabling more devices to transfer energy to the wireless transfer station.

[0075] In one embodiment, a device or another wireless transfer station can include one or more resonant wireless transfer coils and/or one or more induction wireless transfer coils. In one embodiment, the device or the other wireless transfer station receiving energy from the wireless transfer station **510** can select whether to receive wireless energy from the one or more resonant wireless transfer coils **520** or the one or more induction wireless transfer coils **530** of the wireless transfer station **510**. In another embodiment, the wireless transfer station **510** can be configured to select whether to transmit wireless energy using the one or more resonant wireless transfer coils **520** or the one or more induction wireless transfer coils **530**. In one example, a resonant transmitting coil and a resonant receiving coil pair can have a higher energy transfer efficiency than an induction transmitting coil and an induction receiving coil pair. In this example, when the device or the other wireless transfer station includes a resonant receiving coil, the other wireless transfer station and/or the device or the wireless transfer station **510** can be configured to use one or more resonant wireless transfer coils to perform an energy transfer.

[0076] In one embodiment, the one or more resonant wireless transfer coils **520** and/or the one or more induction wireless transfer coils **530** can be transmitting coils and/or receiving coils. In another embodiment, the wireless transfer station **510** can include one or more repeater coils **540**. In one example, the repeater coil **540** can enhance wirelessly transmitted energy of a transmitting coil, e.g. providing additional transmission energy. In another example, the repeater coil **540** can receive the wireless energy from a transmitting coil and relay or retransmit the received energy to another repeater coil **540** or to a receiving coil. The repeater coils can be configured as inductive repeater coils or resonant repeater coils, and associated with transmit coils and receive coils of the same kind.

[0077] In one embodiment, the one or more resonant wireless transfer coils **520**, the one or more induction wireless transfer coils **530**, and/or the repeater coil **540** can include a power management module **550** configured to covert energy from an energy source to a varying magnetic field. In another embodiment, the one or more resonant wireless transfer coils **520**, the one or more induction wireless transfer coils **530**, and/or the repeater coil **540** can be coupled to a power management module **550** configured to convert a magnetic field into energy, such as energy at a selected current level, a voltage level, a wattage level, and/or an amperage level, and transfer the energy to a battery of the wireless transfer station **510** or a device coupled to the wireless transfer station **510**.

[0078] FIG. **5***b* illustrates one exemplary embodiment of the wireless transfer station **510**. In one embodiment, the wireless transfer station **510** can be a stand-alone device used to transfer wireless energy to other devices. In another embodiment, the wireless transfer station **510** can include a wireless transfer coil **520** and a power management module **530**. In another embodiment, the wireless transfer station **510** can direct energy received at the wireless transfer coil **520** using the power management module **530** to a device coupled to the wireless transfer station **510**.

[0079] In another embodiment, the wireless transfer station **510** can transfer the energy received at the wireless transfer coil **520** to the coupled device using physical electrical contacts. In another embodiment, the wireless transfer station **510** can transfer the energy to the coupled device using the wireless transfer coil **520**. In one embodiment, the wireless transfer station **510** can store received energy at a battery **540**.

[0080] FIG. **5***c* illustrates one exemplary embodiment of the wireless transfer station **510** integrated into an object **520**. In one embodiment, the object **520** that the wireless transfer station **510** can be integrated into can be an electronic device, such as a medical device or a wireless energy battery pack. In one example, the wireless transfer station **510** can be integrated into a medical infusion pump and provide energy to the medical infusion pump. In another embodiment, the object **520** can be integrated into a medical cart (such as a work surface of the medical cart), a floor mat, a floor surface, a plate mounted to a wall, a wall surface, chair railing, a room railing, a ceiling tile, a ceiling surface, and so forth. FIG. **5***d* illustrates that a plurality of wireless transfer stations **510** can be integrated into an object **520**. FIG. **5***d* is the same as FIG. **5***c* in all other aspects.

[0081] FIG. **6** shows a wireless transfer station **610** that can provide energy to one or more non-wire powered electronic devices **620** and/or one or more rechargeable batteries **640** coupled to a device **630**. In another embodiment, the wireless transfer station **610** can provide energy to different types of non-wire powered electronic devices, such as a monitoring device, a computing device, a medical device, and so forth. In one example, the wireless transfer station **610** can provide a unified energy source for the devices **620** and **630** and/or the one or more rechargeable batteries **640** coupled to the device **630**. In one embodiment, a unified energy source can be a power source that can provide power to a device, a wireless transfer station, and/or a battery without using different power connectors to provide the power to the device, the wireless transfer station, and/or the battery. In one embodiment, the wireless transfer stations can include an integrated wireless energy coil and a physical electrical energy connection terminal. In another embodiment, the wireless transfer station **610** can transfer energy via an electrical energy connection terminal and/or an integrated wireless transfer coil.

[0082] FIG. **7***a* shows a device **710** with a wireless transfer station **720** coupled to the device **710** or integrated into the device **710**. In one embodiment, the wireless transfer station **720** can be configured to provide energy to batteries **730** of the device **710** and the batteries **730** can provide energy to the device **710**. In another embodiment, the wireless transfer station **720** can be configured to provide energy directly to the device **710**, e.g. without using batteries. In one example, a power management module **740** can provide energy directly to the device **710** by receiving energy at a wireless transfer coil **750** of the wireless transfer station **710** from a wireless transfer coil of another wireless transfer station and direct the energy via the power management module **740** to the device **710** and/or the batteries **730**.

[0083] FIG. **7***b* illustrates a wireless transfer station **710** with a plurality of wireless transfer coils **730** configured to transfer energy and/or data to an electronic device **720**, such as a medical device. The medical device can include one or more integrated wireless transfer stations **740**. In one embodiment, the electronic device **720** can be located adjacent to the wireless transfer station **710**. For example, a bottom surface of the electronic device **720** can abut a top surface of the wireless transfer station **710**.

[0084] Electronic devices can receive energy from a wireless transfer station, such as a battery pack, coupled to the electronic device. In one embodiment, the wireless transfer station can comprise a housing. In another embodiment, the housing can comprise an outer surface and an inner cavity. In another embodiment, the inner cavity can be divided into a plurality of sections or compartments.

[0085] FIG. **8** shows an exploded view of a wireless transfer station **810**. The wireless transfer station can comprise a housing **830**. In one embodiment, the housing **830** can comprise an outer surface **840** and an inner cavity **850**. In another embodiment, the wireless transfer station **810** can include: one or more battery cells **860**; a shielding receptacle **820**, such as for shielding the wireless transfer station from a thermal runaway of the one or more battery cells **860**; an energy management module **870**; and one or more wireless transfer coils **880**. In another embodiment, the inner cavity **850** can be divided into a plurality of sections or compartments. In another embodiment, the sections or compartments can include: a battery bay **890**, an energy management compartment **892**, and/or a wireless transfer coil compartment **894**. In one embodiment, the shielding receptacle **820** and one or more battery cells **860** can be located in the battery bay **890**. In one embodiment, one or more of the plurality of sections or compartments can be separated by heat resistant material or heat reflective material to reduce heat transfer between one or more of the sections or compartments. In one embodiment, the energy management module **870** can be located within the energy management compartment **892**. One advantage of separating the wireless transfer station **810** into different sections or compartments can be to disperse heat generated by components located in each compartment. In one example, one or more batteries or battery cells **860** can be baked or prematurely aged when exposed to exterior heat from a wireless transfer station component such as an energy management module **870**.

[0086] In one embodiment, a wireless transfer station can be located in the wireless transfer coil compartment **894** of the wireless transfer station **810**. In one example, the wireless transfer station can include one or more wireless transfer coils **880** (as discussed in the proceeding paragraphs), such as transmitting coils and/or receiving coils, that can be coupled to wireless transfer station **810** or integrated into the wireless transfer station **810** and fully sealed or enclosed. In one embodiment, when the wireless transfer coils **880** are integrated into the wireless transfer station **810**, the wireless transfer coils **880** can be fully sealed or enclosed within the inner cavity **850** of the housing **830**. In one example, the wireless transfer station **810** with the integrated wireless transfer coils **880** can have no physical electrical contact points or physical electrical connection points for: charging the wireless transfer station; communicating information; transferring data; and/or energy management control.

[0087] In one embodiment, a wireless transfer station **810** can be completely sealed or hermetically sealed. In another embodiment, a wireless transfer station **810** can be sealed against water, solvents, cleaning supplies, dust, and other particulates by hermetically sealing the wireless transfer station **810**. In one example, a hermetically sealed wireless transfer station **810** can be airtight, e.g. impervious to air and/or gas.

[0088] FIG. **9** illustrates one exemplary embodiment of the wireless transfer station case **910**. FIG. **9** further illustrates that the wireless transfer station case **910** can include a flat surface **920** along part of an exterior surface of a housing **930** of the wireless transfer station case **910**. In one embodiment, one or more wireless transfer coils **940** can be integrated into the flat surface **920** of the wireless transfer station case **910** beneath the exterior surface. One advantage of a wireless transfer station case **910** with flat surface **920** along part of the exterior surface is that the one or more wireless transfer coils **940** of the wireless transfer station case **910** can abut next to a wireless transfer station with one or more wireless transfer coils to minimize the distance between the one or more wireless transfer coils **940** of the wireless transfer station case **910** and the one or more wireless transfer coils of the wireless transfer station.

[0089] In one embodiment, the wireless transfer station case **910** can include an injection hole **950** extending from the exterior surface of the wireless transfer station case **910** to an inner cavity of the wireless transfer station case **910**. In one embodiment, the wireless transfer station case **910** can be hermetically sealed by placing the battery energy cells, energy management circuitry, and/or the wireless transfer station (as shown in FIG. **1**) in the wireless transfer station case **910** and welding (such as ultrasonic welding) the wireless transfer station case **910** closed. When the wireless transfer station case **910** is welded closed, the wireless transfer station case **910** can be injected with a material, such as a liquid or foam, into the injection hole **950** of the wireless transfer station case **910** to encapsulate the battery energy cells, energy management circuitry, and/or the wireless transfer station in a waterproof material.

[0090] FIG. **10** shows an exploded view of a wireless transfer station **1010**. In one embodiment, the wireless transfer station **1010** can be a waterproof housing enclosure. In another embodiment, the wireless transfer station **1010** can be hermetically sealed. In one example, the wireless transfer station **1010** can be hermetically sealed by placing wireless transfer station components, such as battery energy cells, an energy management module, and/or a wireless transfer coil in the wireless transfer station **1010** and sealing a top piece **1020** and a bottom piece **1030** together. In another embodiment, the wireless transfer station **1010** can include more than two pieces that can be sealed together.

[0091] In one embodiment, the wireless transfer station **1010** can be a waterproof housing enclosure. In another embodiment, the wireless transfer station **1010** can be hermetically sealed by placing the battery energy cells, energy management circuitry, and/or the wireless transfer station in the wireless transfer station **1010** and using an O-ring to seal two or more pieces, such as top piece **1020** and bottom piece **1030**, of the wireless transfer station **1010** together.

[0092] FIG. **11***a* shows a bottom perspective view of the wireless transfer station **1110** with a molded seal in a seam of a wireless transfer station case **1120**. In one embodiment, the wireless transfer station case **1120** can include two or more pieces that can be sealed together, as discussed in the preceding paragraphs and shown in FIGS. **3***a*, **3***b*, and **3***c*. In another embodiment, the wireless transfer station **1110** can be sealed using a gasket, such as a silicon over mold gasket, around one or more seams **1130** of the wireless transfer station **1110**, such as exterior seams of the wireless transfer station **1110**.

[0093] FIG. **11***b* shows a seam **1130** with a gasket **1140** molded or integrated into one of the pieces of a wireless transfer station **1120** (as shown in FIG. **11***a*). In one embodiment, the gasket **1140** can be used to seal the wireless transfer station **1120** when a plurality of pieces of the wireless transfer station **1120** are put together. In one embodiment, the gasket **1140** can run along a channel **1150** of the seam **1130**.

[0094] In one embodiment, the wireless transfer station is non-sealed or non-hermetically sealed. In another embodiment, as discussed in the preceding paragraphs, the wireless transfer station can be sealed to minimize or eliminate the adhesion and/or growth of potential pathogens or hazard materials. In another embodiment, when a wireless transfer coil is incorporated into the wireless transfer station, a need for exposed electrical connectors, exposed wires, or other unsealed portions of the battery pack can be reduced or eliminated.

[0095] One advantage of using a sealed wireless transfer station, such as a sealed battery pack, can be to reduce or eliminate the retransmission or spreading of pathogens, such as bacterium, viruses, prion, or fungus, in a medical environment by minimizing or eliminating crevasses or seams where pathogens can adhere and/or grow. In one example, when a traditional battery pack and/or a device with an attached traditional battery pack is located in an area of a medical facility, such as a patient's room, and the traditional battery pack is moved to another area of the medical facility, such as another patient's room, pathogens adhere to surfaces of the traditional battery packs, such as at the seams or crevices and/or physical electrical contacts of the traditional battery pack. In one embodiment, the sealed wireless transfer station can reduce or eliminate the retransmission of pathogens by reducing or eliminating crevices, seams, and physical electrical contacts of the wireless transfer station. In one embodiment, the wireless transfer station can be sealed with an anti-bacterial material to reduce or eliminate the adherence of pathogens on the surface of the battery pack. In another embodiment, the wireless transfer station can be sealed or encased with waterproof and/or dustproof material.

[0096] Additionally, a traditional battery pack with electrical contacts for receiving and/or transferring energy cannot be fully cleaned because an antibacterial cleaning solution can erode the electrical contacts and/or leak into the unsealed parts of the traditional battery pack. One advantage of a sealed wireless transfer station with wireless transfer coils for transferring energy and/or data can be to enable a user to wash and/or clean the sealed wireless transfer station with antibacterial materials, such as an antibacterial cleaning solution.

[0097] In one embodiment, a case of the wireless transfer station can include, at least in part, of one or more antibacterial materials. In one example, the antibacterial material can be a plastic, such as a polycarbonate plastic, with a silver additive integrated into the plastic material. In another embodiment, the silver additive can kill bacteria that may adhere to the exterior surface of the wireless transfer station case. In another embodiment, the wireless transfer station case can comprise, at least in part, of ultraviolet (UV) light resilient material (such as a polycarbonate plastic or fiberglass) to enable the repeated use of UV light to kill bacteria adhering to the exterior surface of the battery pack case.

[0098] Traditional battery packs also have a risk of electrical short circuiting. In one example, a traditional battery pack has a negative energy terminal and a positive energy terminal. A conductive object that contacts both the negative energy terminal and the positive energy terminal of the traditional battery pack can cause an electrical short. Another advantage of the wireless transfer station with integrated wireless transfer coils for transferring energy is a reduction or an elimination of the risk of electrical shorting by eliminating physical electrical contacts of the wireless transfer station. In one example, the wireless transfer station with integrated wireless transfer coils can transfer energy and/or data without using physical terminal contacts and thereby eliminate traditional physical terminal contacts that cause electrical shorts.

[0099] In one embodiment, a wireless transfer station, such as a battery pack, can include one or more displays to display selected information. FIG. **12***a* shows a top perspective view of a wireless transfer station **1210** with a display **1220**. In another embodiment, the display **1220** can include one or more lighting sources, such as a liquid crystal display (LCD), that can be integrated into an outer surface **1230** of a wireless transfer station housing **1240** to indicate selected information (as discussed in the proceeding paragraphs) of the wireless transfer station **1210**. In another embodiment, the display **1220** can indicate energy level information of the wireless transfer station **1210**. In one example, the display **1220** and/or the display **1260** can indicate a remaining energy level of the wireless transfer station **1210** in selected increments, such as 12 percent energy level increments. In one embodiment, the display **1220** can be substantially flush with the outer surface **1230** and form a hermetic seal with the outer surface **1230**.

[0100] FIG. **12***a* further illustrates that the exterior surface or outer surface **1230** of the case or housing **1240** of the wireless transfer station **1210** can include an optically viewable portion **1250** integrated into the outer surface **1230** of the wireless transfer station housing **1240**. In one embodiment, the optically viewable portion **1250** can be a translucent, transparent, or see-through portion of the wireless transfer station housing **1240**. In one embodiment, the optically viewable portion **1250** and the remaining portion of the wireless transfer station housing **1240** can be comprised of the same material. In one example, the material can be a translucent, transparent, or see-through material, such as polyurethane, glass, acrylic, fiber glass, vinyl, film, and so forth.

[0101] In one embodiment, the display **1220** can be integrated into the wireless transfer station housing **1240** and located beneath the optically viewable portion **1250** of the outer surface **1230** of the wireless transfer station housing **1240**. In another embodiment, the display **1220** can be viewable to a user through the optically viewable portion **1250**. In another embodiment, the optically viewable portion **1250** can be a thinner area of the wireless transfer station housing **1240** relative to the remaining portion of the wireless transfer station housing **1240**. In one example, the thinner area can enable light to pass through the optically viewable portion **1250** of the wireless transfer station housing **1240** to enable the viewing of the display **1220** located beneath the outer surface **1230** of the wireless transfer station housing **1240** while maintaining a sealed wireless transfer station **1210**. In another embodiment, the display **1220** can be flush or level with the outer surface **1230** of the wireless transfer station housing **1240**. In another embodiment, the flush display **1220** and the wireless transfer station housing **1240** can be integrated together to form a waterproof seal, a water-resistant seal, a dust-proof seal, a hermetic seal, and so forth.

[0102] In one embodiment, the optically viewable portion **1250** can be a different type of material from the remaining portion of the wireless transfer station housing **1240**. In one example, the optically viewable portion **1250** can be an acrylic material and the remainder of the wireless transfer station housing **1240** can be polyurethane. In another embodiment, the optically viewable portion **1220** and the remainder of the wireless transfer station housing **1220** can be sealed together or seamlessly integrated to form a waterproof seal, a water-resistant seal, a dust-proof seal, a hermetic seal, and so forth.

[0103] FIG. **12***b* shows an exploded view of the wireless transfer station **1210** with a display **1220** and an optically viewable portion **1250**. In one embodiment, the wireless transfer station housing **1240** can be a waterproof housing enclosure. In another embodiment, the wireless transfer station housing **1240** can be hermetically sealed. In one example, the wireless transfer station **1210** can be hermetically sealed by placing wireless transfer station components, such as battery energy cells, an energy management module, and/or a wireless transfer coil in the wireless transfer station housing **1240** and sealing a top piece **1230** and a bottom piece **1240** together. In another embodiment, the wireless transfer station **1210** can include more than two pieces that can be sealed together.

[0104] In one embodiment, the wireless transfer station **1210** can include an information module **1270** located within the wireless transfer station housing **1240**. In another embodiment, the information module **1270** can be configured to provide selected information for the display **1220**. In another embodiment, the display **1220** can be configured to display the information from the information module **1270**.

[0105] In one embodiment, a wireless transfer station can include a plurality of displays. FIG. **13** shows a top perspective view of a wireless transfer station **1310** with a plurality of displays **1320** and **1360**. In another embodiment, the displays **1320** and **1360** can include one or more lighting sources, such as a liquid crystal display (LCD), that can be integrated into an outer surface **1330** of a wireless transfer station housing **1340** to indicate selected information (as discussed in the proceeding paragraphs) of the wireless transfer station **1310**. In another embodiment, the display **1320** and/or the display **1360** can indicate energy level information of the wireless transfer station **1310**. In one example, the display **1320** and/or the display **1360** can indicate a remaining energy level of the wireless transfer station **1310** in selected increments, such as 5 percent energy level increments. In one embodiment, the display **1320** and/or the display **1360** can be substantially flush with the outer surface **1330** and form a hermetic seal with the outer surface **1330**.

[0106] FIG. **13** further illustrates that the exterior surface or outer surface **1330** of the case or housing **1340** of the wireless transfer station **1310** can include a first optically viewable portion **1350** and a second optically viewable portion **1370** integrated into the outer surface **1330** of the wireless transfer station housing **1340**. In one embodiment, the optically viewable portions **1350** and **1370** can be a translucent, transparent, or see-through portion of the wireless transfer station housing **1340**. In one embodiment, the optically viewable portions **1350** and **1370** and the remaining portion of the wireless transfer station housing **1340** can be comprised of the same material. In one example, the material can be a translucent, transparent, or see-through material, such as polyurethane, glass, acrylic, fiber glass, vinyl, film, and so forth.

[0107] In one embodiment, the displays **1320** and **1360** can be integrated into the wireless transfer station housing **1340** and located beneath the optically viewable portion **1350** and **1370**, respectively, of the outer surface **1330** of the wireless transfer station housing **1340**. In another embodiment, the displays **1320** and **1360** can be viewable to a user through the optically viewable portions **1350** and **1370**, respectively. In another embodiment, the optically viewable portions **1350** and **1370** can be a thinner area of the wireless transfer station housing **1340** relative to the remaining portion of the wireless transfer station housing **1340**. In one example, the thinner area can enable light to pass through the optically viewable portions **1350** and **1370** of the wireless transfer station housing **1340** to enable the viewing of the displays **1320** and **1360** located beneath the outer surface **1330** of the wireless transfer station housing **1340** while maintaining a sealed wireless transfer station **1310**. In another embodiment, the displays **1320** and **1360** can be flush or level with the outer surface **1330** of the wireless transfer station housing **1340**. In another embodiment, the flush displays **1320** and **1360** and the wireless transfer station housing **1340** can be integrated together to form a waterproof seal, a water-resistant seal, a dust-proof seal, a hermetic seal, and so forth.

[0108] In one embodiment, the optically viewable portions **1350** and **1370** can be a different type of material from the remaining portion of the wireless transfer station housing **1340**. In one example, the optically viewable portions **1350** and **1370** can be an acrylic material and the remainder of the wireless transfer station housing **1340** can be polyurethane. In another embodiment, the optically viewable portion **1350** and

1370 and the remainder of the wireless transfer station housing **1340** can be sealed together or seamlessly integrated to form a waterproof seal, a water-resistant seal, a dust-proof seal, a hermetic seal, and so forth.

[0109] In one embodiment, each of the plurality of displays, such as the displays **1320** and **1360**, can display the same information or different information. In one example, when a plurality of wireless transfer stations are available to provide energy to a computing device, one or more of the wireless transfer stations can display which wireless transfer stations for an individual to use with the computing device based on selection criteria. The selection criteria can include: an energy output capability of each of the one or more available wireless transfer stations, a location of each of the one or more available wireless transfer stations, a distance from the computing device to each of the one or more available wireless transfer stations, a number of computing devices requesting energy from one of the plurality of wireless transfer stations, a number of usage cycles of one or more of the wireless transfer stations, a number of uses of one or more of the wireless transfer stations relative to one or more other wireless transfer stations, warranty restrictions of one or more of the wireless transfer stations, and so forth.

[0110] FIGS. **14***a*, **14***b*, and **14***c* show a wireless transfer station **1410** with a display **1420**. FIG. **14***a* shows a perspective view of the wireless transfer station **1410** with display **1420**. FIG. **14***b* shows a front view of the wireless transfer station **1410** with display **1420**. FIG. **14***c* shows a side view of the wireless transfer station **1410** with display **1420**. FIGS. **14***a*, **14***b*, and **14***c* provide different views of the wireless transfer station **1410** with the display **1420** and the wireless transfer station **1410** and the display **1420** shown in FIGS. **14***a*, **14***b*, and **14***c* are the same in all other regards. In one embodiment, FIGS. **14***a*, **14***b*, and **14***c* show a display **1420** that can include one or more lighting sources **1430**, such as light emitting diodes (LEDs), that can be integrated into the battery pack handle **1440** to indicate an energy level of the wireless transfer station **1410**. In one embodiment, the display **1420** can indicate the energy level information of the wireless transfer station **1410** in selected increments, such as 5 percent energy level increments. In one example, the display **1420** can have 20 LEDs **1430** integrated into the wireless transfer station **1410** handle that can provide 5 percent energy level increment indications. In this example, when the wireless transfer station **1410** is at a full energy level, the 20 LEDs **1430** integrated into the handle **1440** of the wireless transfer station **1410** can each be illuminated. As the energy level of the wireless transfer station **1410** decreases, the 20 LEDs **1430** integrated into the handle **1440** can sequentially stop illuminating as the wireless transfer station **1410** decreases in energy at 5 percent increments.

[0111] In one embodiment, a brightness level, an illumination level, and/or the color of the one or more lighting sources integrated into the handle **1440** can be adjusted by the wireless transfer station **1410** based on selected illumination criteria. In one example, the selected illumination criteria can include a time of day, a location of the wireless transfer station **1410**, a type of device that the wireless transfer station **1410** is attached to, a current energy level of the wireless transfer station **1410**, when the wireless transfer station **1410** is receiving a charge, when the wireless transfer station **1410** is transferring energy, and so forth. In another example, the display **1420** can be a night light to indicate the location of the wireless transfer station **1410** during low light conditions and/or provide illuminating light to a surrounding environment during low light conditions.

[0112] In one embodiment, an optically viewable portion (as discussed in the preceding paragraphs) of the wireless transfer station **1410** can be located at a selected location on the handle **1440** with the display **1420** located beneath the optically viewable portion. In another embodiment, the display **1420** can be flush with an exterior surface of the wireless transfer station **1410** and can be located at a selected location on the handle **1440**.

[0113] In one embodiment, one or more of the displays of a wireless transfer station can be a liquid crystal display (LCD), a resistive LCD display, a capacitive LCD display, a light emitting diode (LED) display, a liquid crystal on silicon (LCOS) display, an organic LED (OLED) display, an active-matrix OLED (AMOLED) display, a touch screen display, a haptic display, and/or a tactile display. In another embodiment, the one or more displays can be configured to display one or more colors, such as different colors based on the selected energy information.

[0114] FIG. **15** shows a top perspective view of the wireless transfer station **1510** with display **1520**. In one embodiment, the display **1520** that can include one or more lighting sources, such as a liquid crystal display (LCD), that can be integrated into an outer surface **1530** of the wireless transfer station **1510** to indicate selected information of the wireless transfer station **1510**. In another embodiment, the display **1520** can run along a portion of a vertical axis **1540** of the wireless transfer station **1510**. In another embodiment, the display **1520** can be substantially flush with the outer surface **1530** and form a hermetic seal with the outer surface **1530**.

[0115] In one embodiment, each wireless transfer station can have a unique station ID associated with the wireless transfer station. In another embodiment, each station ID can be used to associate selected information with each wireless transfer station. In another embodiment, each wireless transfer station and/or each type of wireless transfer station can be configured to have a plurality of different characteristics, such as different form factors, different voltage inputs and/or outputs, different current inputs and/or outputs, and so forth.

[0116] In one embodiment, each rechargeable battery or battery cell in a wireless transfer station can have a different battery ID. In another embodiment, one or more types of rechargeable batteries or battery cells in a wireless transfer station can each have different battery IDs. In another embodiment, a wireless transfer station can be coupled to a plurality of different types of devices and/or other wireless transfer stations. In one example, the different types of devices and/or other wireless transfer stations can include: devices and/or other wireless transfer stations used for selected applications, devices and/or other wireless transfer stations with different voltage inputs or outputs, devices and/or other wireless transfer stations with different current inputs or outputs, and so forth. In another embodiment, the different types of devices can use different types of wireless transfer stations. In another embodiment, different station IDs for different wireless transfer stations can be associated with selected types of devices. In one example, each device and/or wireless transfer station can determine when a wireless transfer station coupled to the device is a wireless transfer station that is compatible with the device using the station ID of the wireless transfer station and/or the device ID of the device. In one embodiment, a device ID, a station ID, and/or a battery ID can include: serial number information of the device, the station, or the battery; a manufacturing date of the device, the station, or the battery; a manufacturing location of the device, the station, or the battery; and/or a version number of the device, battery, or wireless transfer station, respectively.

[0117] In one embodiment, a wireless transfer station can operate in different modes, such as a sleep mode, a charging mode, a fully charged mode, a ready for use mode, an error mode, a shut off mode, and so forth. In one example, when the wireless transfer station is fully charged or charged above a selected threshold the wireless transfer station can enter a fully charged mode or a ready for use mode. In another example, when the wireless transfer station has not been in use for a selected period of time, the wireless transfer station can stop transferring energy to one or more devices and enter a sleep mode. One advantage of shutting off or entering a sleep mode after a selected period of time can be to prevent the wireless transfer station from leaking energy when a device has been fully charged by the wireless transfer station and/or the device is no longer in use. In another embodiment, when the wireless transfer station has been coupled with a device or other wireless transfer station, the wireless transfer station can enter an active mode, e.g. a mode to transfer energy to one or more devices or other wireless transfer stations in the coverage area of the battery pack. In another embodiment, a wireless transfer station display can display a mode that the wireless transfer station is operating in.

[0118] In one embodiment, a wireless transfer station can monitor energy information, such as: an amount of energy transferred from the wireless transfer station to a device or other wireless transfer station, an amount of energy received from the other wireless transfer station or the device to the wireless transfer station, voltage level information, current draw level information, internal temperature information, ambient temperature information, a battery capacity level of a device coupled to the wireless transfer station, battery capacity level or a battery pack capacity level of the wireless transfer station, priority level of the device or the wireless transfer station to transfer data and/or energy, an energy consumption rate of a device coupled to the wireless transfer station, an energy consumption rate of the wireless transfer station, a number of times a device coupled to the wireless transfer station has been charged, an estimation of a number of charges remaining for a device coupled to the wireless transfer station or the wireless transfer station, an operational temperature of a device coupled to the wireless transfer station, an internal temperature of a device coupled to the wireless transfer station, a device ID of a device coupled to the wireless transfer station, a battery ID of one or more batteries of the wireless transfer station, a station ID of the wireless transfer station, an estimated total battery life remaining of a device coupled to the wireless transfer, and so forth.

[0119] In another embodiment, the wireless transfer station can display the energy information using the display of the wireless transfer station. In one example, the wireless transfer station can monitor an amount of energy being transferred from a wireless transfer coil of the wireless transfer station to another wireless transfer station or a device and display the amount of energy being transferred. In another example, the wireless transfer station can monitor an amount of energy received by a wireless transfer coil of the wireless transfer station and display the amount of energy being received by another wireless transfer station.

[0120] In one embodiment, the wireless transfer station can include a graphical user interface, such as a touch screen display, to receive input information from a user. In one example, the received input information can be selecting information or data for the graphical user interface to display. In one embodiment, the graphical user interface can receive input information indicating to display selected energy information and the graphical user interface can display the selected energy information.

[0121] FIG. **16** shows a wireless transfer station **1610** configured to communicate with other wireless transfer stations **1620**, **1630**, and/or **1640** and determine which of the one or more other wireless transfer stations **1620**, **1630**, and/or **1640** is capable and/or available to provide energy to a selected device and/or a selected wireless transfer station. In one example, the selected device or the selected wireless transfer station can send a wireless transfer request to the wireless transfer station. When the wireless transfer station **1610** is not compatible with the selected device or the wireless transfer station **1610** is not available to provide energy to the selected device, the wireless transfer station **1610** can communicate with the one or more other wireless transfer stations **1620**, **1630**, and/or **1640** to locate an available wireless transfer station of the one or more other wireless transfer stations **1620**, **1630**, and/or **1640** for the selected device or the selected wireless transfer station to receive wireless energy. When the wireless transfer station **1610** determines that available wireless transfer station can provide energy to the selected device or the selected wireless transfer station, the wireless transfer station **1610** can provide the selected device or the selected wireless transfer station with transfer station information for the available wireless transfer station.

[0122] In one embodiment, the transfer station information can include: directions to one of the other wireless transfer stations **1620**, **1630**, or **1640**; authentication information to receive energy from the other wireless transfer stations **1620**, **1630**, or **1640**; a number of available wireless transfer coils at the other wireless transfer stations **1620**, **1630**, or **1640**; a type of wireless transfer coils available at the other wireless transfer stations **1620**, **1630**, or **1640**; an energy capabilities of the other wireless transfer stations **1620**, **1630**, or **1640**; and so forth. In one embodiment, when more than one of the other wireless transfer stations **1620**, **1630**, or **1640** are available to provide energy to the selected wireless transfer station or the selected device, the selected wireless transfer station or the selected device can select which one of the one or more other wireless transfer stations **1620**, **1630**, or **1640** to receive energy from based on charging criteria. The charging criteria can include: an energy output capability of each of the one or more available other wireless transfer stations **1620**, **1630**, or **1640**; a location of each of the one or more available other wireless transfer stations **1620**, **1630**, or **1640**; a distance from the selected device or the selected wireless transfer station to each of the one or more available other wireless transfer stations **1620**, **1630**, or **1640**; a number of other devices or other wireless transfer stations receiving energy from each of the one or more available other wireless transfer stations **1620**, **1630**, or **1640**, and so forth.

[0123] In one example, the wireless transfer station **1610** is not compatible with the selected device or the selected wireless transfer station when a wireless transfer coil of the selected device or wireless transfer coils of the selected wireless transfer station are a different shape or size than a wireless transfer coil of the wireless transfer station **1610**. In another example, the wireless transfer station **1610** is not compatible with the selected device or the selected wireless transfer station when a wireless transfer coil of the selected device or a wireless transfer coil of the selected wireless transfer station receives data and/or wireless energy at a different resonant frequency range than a resonant frequency range of a wireless transfer coil of the wireless transfer station **1610**.

[0124] FIG. **17** shows a wireless transfer station **1710** transferring energy and/or data with one or more wireless transfer stations and/or devices **1720**, **1730**, and **1740** within a selected range **1750**. In one embodiment, the wireless transfer station **1710** can adjust the selected range **1750** based on selected criteria, such as a number of wireless transfer stations and/or devices within a threshold range of the wireless transfer station **1710**, a number of devices or other wireless transfer stations the wireless transfer station **1710** can support transferring energy and/or data to, and so forth. In one example, the wireless transfer station **1710** can transfer energy and/or data with wireless transfer stations and/or devices **1720**, **1730**, and **1740** that are within the selected range **1750** and not transfer energy and/or data with wireless transfer station and/or device **1760**.

[0125] FIG. **18** illustrates a wireless transfer station **1810** that includes a wireless transfer coil **1820** and a management module **1830**. In one example, the management module **1830** can analyze energy information or state information about the wireless transfer station **1810** to determine a status of the wireless transfer station **1810**, such as when the wireless transfer station **1810** is malfunctioning. In another embodiment, the wireless transfer station **1810** can display the status of the wireless transfer station **1810** using a wireless transfer station display. In one example, when the wireless transfer station **1810** is malfunctioning, the wireless transfer station **1810** can determine a cause of the malfunction and display the cause of the malfunction. In one embodiment, when the wireless transfer station **1810** determines a cause of the malfunction, the wireless transfer station **1810** can determine one or more actions to take because of the malfunction and indicate the one or more actions to a user using the display screen. In one example, the wireless transfer station **1810** can be overheating and the display screen can indicate to a user or third party to shut down the wireless transfer station **1810** or cool down the wireless transfer station **1810**. In another example, the wireless transfer station **1810** may be experiencing a thermal runaway event and can indicate to a user or third party a safety procedure to safely deal with the battery pack.

[0126] In one embodiment, a management module **1830** can store information from one or more devices and/or the wireless transfer station **1810**. In another embodiment, the wireless transfer station **1810** can display selected stored information and/or communicate the stored information to another device using the communication module (as discussed in the preceding paragraphs).

[0127] In one embodiment, the wireless transfer station **1810** can be an information hub device and receive information from other wireless transfer stations and/or devices. In one embodiment, the wireless transfer station **1810** can display information from the other wireless transfer stations **1810** and/or devices. In another embodiment, the wireless transfer station **1810** can use the communications module to communicate the information to a communication hub device, such as a stationary communication hub device. In one example, the stationary communication hub device can be a communication hub device coupled to a computing device or integrated into a computing device, such as a server. In one embodiment, the server can be a third party server, e.g. external to an information technology infrastructure of a facility, such as a medical facility, where the wireless transfer station **1810** is being used.

[0128] In one embodiment, the wireless transfer station **1810** and/or the communication hub device can associate a device ID of a device to information for the device and/or a battery pack coupled to the device. In another embodiment, the wireless transfer station **1810** and/or the communication hub device can associate a battery ID of one or more batteries to the wireless transfer station **1810** to information of one or more batteries. In another embodiment, the wireless transfer station **1810** can display a reminder to the user to recharge the wireless transfer station **1810** when an energy level of the battery pack decreases below a selected threshold.

[0129] In one embodiment, the wireless transfer station **1810** or the management module **1830** can determine state information of the wireless transfer station **1810** and/or a device coupled to the wireless transfer station **1810**. In another embodiment, the state information can include information of a health of the wireless transfer station **1810** or an operational level of the wireless transfer station **1810** (such as when a device and/or wireless transfer station may be malfunctioning or not working properly). In another embodiment, a display of the wireless transfer station **1810** can display the state information of the wireless transfer station **1810** and/or the coupled device.

[0130] In one embodiment, when the wireless transfer station **1810** or the management module **1830** determines that the wireless transfer station **1810** and/or the coupled device may be malfunctioning or not working properly, the wireless transfer station **1810** can use the display to indicate to a user of the wireless transfer station **1810** and/or a third party that the wireless transfer station **1810** may be malfunctioning or not working properly. In another embodiment, the wireless transfer station can monitor an energy usage of a device coupled to the wireless transfer station **1810** and determine state information of the device, such as when the device may be malfunctioning or not working properly. In one example, when the coupled device consumes energy outside of a selected range, e.g. an excessive amount of energy or an insufficient amount of energy, the wireless transfer station **1810** can determine that the state of the device is that the device may be malfunctioning or not working properly and can use the display of the wireless transfer station **1810** to indicate the state information to a user or a third party.

[0131] In wireless energy and/or data transfer, foreign objects (such as metal objects or other electrically conductive objects) that are adjacent to a wireless transfer coil of a wireless transfer station can couple to a portion of a magnetic field, such as an electromagnetic field, of the wireless transfer coil. In one embodiment, a foreign object can be any object that intrudes into a magnetic coupling field between a first wireless transfer coil and a second wireless transfer coil. In one example, the foreign object can be: a cord, such as an electrical cord; keys; a biological object, such as a human hand; a metal plate or disc; and so forth. In another example, a foreign object can include biological and/or non-biological material.

[0132] In one embodiment, when a foreign object with conductive material couples with the magnetic field, the foreign object may heat up. In another embodiment, the foreign object can also interfere with a magnetic field emitted from the wireless transfer coil of the wireless transfer station. In one example, a coupling of the foreign object with the magnetic field of the wireless transfer coil and/or interference caused by the foreign object can result in: an energy wastage; safety issues; an inefficient transfer of energy; an incomplete data transfer; decreased energy and/or data transfer rates; and so forth. In another example, when the foreign object is in the vicinity or adjacent to a coupling link between a transmitting coil and a receiving coil, the transmitting coil and/or the receiving coil can experience a change of frequencies and/or impedances because of the adjacent foreign object.

[0133] In one embodiment, a wireless transfer station can determine a location of a foreign object by comparing an expected amount of energy or data transferred with another wireless transfer station with an actual amount of energy or data transferred with another wireless transfer station. In another embodiment, the wireless transfer station can determine a location of a foreign object by monitoring an increase or decrease in an amount of energy and/or data transferred or an increase or decrease in a rate that the energy and/or data is transferred as a wireless transfer coil of the wireless transfer station is moved to different locations relative to the foreign object.

[0134] In one embodiment, variations in an alignment of a first wireless transfer coil relative to a second wireless transfer coil and/or a distance between the first wireless transfer coil and the second wireless transfer coil can increase or decrease an efficiency of a coupling between the first wireless transfer coil and the second wireless transfer coil. In one example, the increase or decrease in efficiency in coupling can affect an accuracy of a wireless transfer station detecting a foreign object. In one embodiment a first wireless transfer station with a first wireless transfer coil and a second wireless transfer station with a second wireless transfer coil can communicate alignment and/or distance information of the first wireless transfer coil and the second wireless transfer station to determine an alignment of the first wireless transfer coil relative to the second wireless transfer coil and/or the distance between the first wireless transfer coil and the second wireless transfer coil.

[0135] In one embodiment, the first wireless transfer station and/or the second wireless transfer station can filter out an effect of the alignment of the first wireless transfer coil relative to the second wireless transfer station and/or an effect of the distance between the first wireless transfer coil and the second wireless transfer coil when determining the presence of a foreign object in a magnetic field of the transmitting coil. In another embodiment, the first wireless transfer station and/or the second wireless transfer station can monitor an energy draw, e.g. a current draw and/or a voltage draw, between the first wireless transfer coil and the second wireless transfer coil. In one example, the first wireless transfer station and/or the second wireless transfer station can detect variations or imbalances in the energy draw and determine that a foreign object is interfering with a wireless energy and/or data transfer. One advantage of a wireless transfer station detecting the presence of a foreign object in a magnetic field of a wireless transfer coil is to prevent energy wastage and minimize safety issues.

[0136] In one embodiment, an amount of energy and/or data transferred by a wireless transfer station can be adjusted based on a proximity of a biological entity (such as a human) to the wireless transfer station. In one example, an amount of energy transferred by the wireless transfer station can be decreased when a human is within a selected distance of the wireless transfer station.

[0137] In another embodiment, a wireless transfer coil of a wireless transfer station can be shielded from interfering foreign objects. In one embodiment, a Ferrite object (such as a Ferrite plate) can be located adjacent the wireless transfer coil and used to limit a magnetic field within a selected area. In another embodiment, the Ferrite object can be located adjacent to the wireless transfer coil of the wireless transfer station to shield the wireless transfer coil from the foreign object. In one example, a wireless transfer coil can be integrated into a wall or floor of a building or can be located adjacent to a wall or floor. In this example, the wall or floor can contain foreign objects, such as electrically conductive metal support beams. In one embodiment, the Ferrite object can be placed between the wireless transfer coil and the foreign object to shield the magnetic field of the wireless transfer coil from interference caused by the foreign object. In another embodiment, the Ferrite object can be placed between the wireless transfer coil and the foreign objects to redirect the magnetic field of the wireless transfer coil to avoid interference from the foreign objects. In another embodiment, the Ferrite object can be used to direct the magnetic field to radiate away from the foreign object. In another embodiment, a thin conductive plate can be placed behind a Ferrite plate to suppress interference and provide additional shielding to the magnetic field of the wireless transfer coil.

[0138] FIG. **19** illustrates a foreign object **1930** entering a magnetic field **1940** between wireless transfer coil **1910** and wireless transfer coil **1920**. In one embodiment, the foreign object **1930** is an electrically conductive foreign object, such as a metal plate or electrical cord. FIG. **20** illustrates a foreign object **2030** entering a magnetic field **2040** between wireless transfer coil **2010** and wireless transfer coil **2020**. In one embodiment, the foreign object **2030** is a biological object, such as a human hand or human body part. In FIGS. **19** and **20**, foreign objects **1930** and **2030** can interfere with the magnetic field **1940** or **2040**, respectively. In one example foreign objects **1930** and **2030** can absorb the magnetic field **1940** or **2040**, respectively.

[0139] FIG. **21** shows an exemplary embodiment of a wireless transfer station **2110** operable to display information. In another embodiment, the wireless transfer station **2110** can include a wireless transfer station housing **2140** with an outer surface **2130**, wherein the outer surface **2130** includes an optically viewable portion **2150** integrated into the outer surface **2130** of the wireless transfer station housing **2130**. In another embodiment, the wireless transfer station **2110** can include an energy information module **2160** located within the wireless transfer station housing **2130**. In another embodiment, the energy information module **2160** can be configured to provide selected energy information for display. In another embodiment, the wireless transfer station **2110** can include a display **2120**. In another embodiment, the display **2120** can be integrated into the wireless transfer station housing **2140** and located beneath the optically viewable portion **2150** of the outer surface **2130**. In another embodiment, the display **2120** is viewable to a user through the optically viewable portion **2150**. In another embodiment, the display **2120** can be configured to display the energy information from the energy information module **2160**.

[0140] In one embodiment, the optically viewable portion **2150** can be seamlessly integrated into the outer surface **2130** of the wireless transfer station housing **2140**. In another embodiment, the wireless transfer station housing **2140** can further include: an inner cavity; a battery bay located within the inner cavity containing one or more rechargeable batteries; and a wireless transfer module **2166** configured to receive wireless energy from a battery pack and provide at least a portion of the received wireless energy to the one or more rechargeable batteries (as shown in FIG. **8**). In another embodiment, the wireless transfer station **2110** can further comprise a coil alignment module **2162** configured to determine an alignment of a wireless transfer coil of the wireless transfer module **2166** with a wireless transfer coil of the wireless transfer station **2110** or with a wireless transfer coil of a device. In another embodiment, the display **2120** can be configured to display alignment information received from the coil alignment module **2162**. In another embodiment, the wireless transfer station **2110** can further comprise a coil distance module **2164** configured to determine a distance between a wireless transfer coil of the wireless transfer module **2166** with a wireless transfer coil of the wireless transfer station **2110** or with a wireless transfer coil of a device and the display **2120** is configured to display alignment information received from the coil distance module **2164**.

[0141] In one embodiment, the wireless transfer station **2110** can further include a second optically viewable portion **2190** integrated into the outer surface **2130** of the wireless transfer station housing **2140** and a second display **2180**. In another embodiment, the second display **2180** can be integrated into the wireless transfer station housing **2140**. In another embodiment, the second display **2180** can be located beneath the second optically viewable portion **2190** of the outer surface **2130**, wherein the second display **2180** can be viewable to a user through the second optically viewable portion **2190**. In another embodiment, the second display **2180** can be configured to display the energy information from the energy information module **2160**.

[0142] In one embodiment, the second display **2180** can be configured to determine when the display **2120** cannot properly display energy information and display energy information when the display **2120** cannot properly display energy information. In another embodiment, the wireless transfer station **2110** can further comprise a communications module **2168** configured to receive selection information from a device or another wireless transfer station, wherein the selection information is used to select a wireless transfer station and the display **2120** or the second display **2180** can be configured to display an indicator that indicates when the wireless transfer station is next to be used in a wireless transfer station use order based on the received selection information.

[0143] In one embodiment, the wireless transfer station housing **2130** can be hermetically sealed to be liquid proof and dust proof. In another embodiment, the wireless transfer station housing **2130** can be comprised of a plurality of housing pieces that are welded together to form a hermetically sealed wireless transfer station housing **2130**. In another embodiment, the wireless transfer station can further comprise a seal monitor **2170** configured to monitor when the hermetic seal is broken. In one embodiment, the energy information can include error information, safety information, wireless transfer station usage information, charge cycle information, voltage usage, current usage, state of health information, energy remaining information, an operating system (OS) version, a software version, a firmware version, and/or communication information. In another embodiment, the wireless transfer station **2110** can further comprise an energy transfer module **2172** configured to determine an estimated energy transfer level from a device to the wireless transfer station **2110** and the display **2120** can be configured to display energy transfer information received from the energy transfer module **2172**.

[0144] FIG. **22** shows an exemplary embodiment of a wireless battery pack **2210** operable to display information. In another embodiment, the wireless battery pack **2210** can comprise a wireless battery pack housing **2240** with an outer surface **2230** and a display **2220**. In one embodiment, the wireless battery pack housing **2240** can be configured to be sealed. In another embodiment, the display **2220** can be viewable in at least a portion of the outer surface **2230** of the wireless battery pack housing **2240** and configured to display energy information associated with the wireless battery pack **2210**. In another embodiment, the wireless battery pack **2210** can further comprise a communication module **2250** configured to communicate information between the wireless battery pack **2210** and a wireless transfer station or communicate information between the wireless battery pack **2210** and a device. In another embodiment, the wireless battery pack housing **2240** can include a hole configured to receive injection material to seal components within the wireless battery pack housing **2240** or the wireless battery pack **2210**.

[0145] In one embodiment, the wireless battery pack **2210** can further comprise a charge module **2252** configured to estimate a remaining charge time of the wireless battery pack **2210** and the display **2220** configured to display information from the charge module **2252**. In another embodiment, the wireless battery pack **2210** can further comprise a warranty alert module **2254** configured to determine a warranty status of the wireless battery pack **2210** or a state of health of the wireless battery pack **2210** and the display **2220** can be configured to display information from the warranty alert module **2254**. In another embodiment, the wireless battery pack **2210** can further comprise a safety alert module **2256** configured to determine a safety status of the wireless battery pack **2210**, wherein the safety status can be based on one or more of: a temperature of the wireless battery pack; a temperature of one or more rechargeable batteries in the wireless battery pack; a voltage level of one or more of the rechargeable batteries; a current level of one or more of the rechargeable batteries; or an internal pressure level of the wireless battery pack. In another embodiment, the display **2220** can be configured to display information from the safety alert module **2256**.

[0146] In one embodiment, the wireless battery pack **2210** can further comprise an error module **2258** configured to detect an error status of the wireless battery pack **2210**, wherein the error status includes: alignment information between the wireless battery pack and a battery pack or a device; distance information between the wireless battery pack and the battery pack or the device; overvoltage information; under voltage information; overcurrent information; under current information; or communication information. In another embodiment, the display **2220** can be configured to indicate the error status of the wireless battery pack **2210** based on error status information received from the error module **2258**. In another embodiment, the wireless battery pack **2210** can further comprise a battery abuse module **2260** configured to determine when the one or more rechargeable batteries has been used outside of warranted uses and the display **2220** can be configured to display information from the battery abuse module **2260**. In another embodiment, the wireless battery pack **2210** can further comprise a sensory alert module **2262** configured to provide information using a sensory device integrated into the wireless battery pack **2210** or in communication with the wireless battery pack **2210**.

[0147] FIG. **23** shows an exemplary embodiment of a wireless battery display **2330** operable to display information. In one embodiment, the wireless battery display **2330** can further comprise an energy information module **2340**. In another embodiment, the wireless battery display **2330** can be located within a wireless battery pack housing **2320** of a wireless battery pack **2310**. In another embodiment, the wireless battery display **2330** can be configured to provide selected energy information to the wireless battery display **2330** in communication with the energy information module **2340**. In another embodiment, the wireless battery display **2330** can be sized and shaped to be integrated beneath an optically viewable portion **2350** in the wireless battery pack housing **2320**. In another embodiment, the wireless battery display **2330** can be configured to be viewable to a user through the optically viewable portion **2350** of the wireless battery pack housing **2320**. In another embodiment, the wireless battery display **2330** can be configured to display energy information from the energy information module **2340**.

[0148] In one embodiment, the optically viewable portion **2350** can be a substantially transparent material or a translucent material. In another embodiment, the wireless battery pack housing **2320** can comprise of a substantially clear polycarbonate material. In another embodiment, the wireless battery display **2330** can be one or more of a liquid crystal display (LCD), a resistive LCD display, a capacitive LCD display, a light emitting diode (LED) display, a liquid crystal on silicon (LCOS) display, an organic LED (OLED) display, an active-matrix OLED (AMOLED) display, a touch screen display, a haptic display, or a tactile display. In another embodiment, the wireless battery display **2330** can be configured to display one or more colors **2330** can further comprise a display adjustment module **2342** configured to adjust a color of the display or a brightness of the wireless battery display **2330** based on selected criteria. In another embodiment, the selected criteria can include: a time of day, a location of the wireless battery pack; and an ambient light level.

[0149] FIG. **24** provides an example illustration of the device, such as a user equipment (UE), a mobile wireless device, a mobile communication device, a tablet, a handset, or other type of wireless device. The wireless device can include one or more antennas configured to communicate with a battery pack. The device can be configured to communicate using at least one wireless communication standard including 3GPP LTE, WiMAX, High Speed Packet Access (HSPA), Bluetooth, and Wi-Fi. The device can communicate using separate antennas for each wireless communication standard or shared antennas for multiple wireless communication standards. The device can communicate in a wireless local area network (WLAN), a wireless personal area network (WPAN), and/or a wireless wide area network (WWAN).

[0150] FIG. **24** also provides an illustration of a microphone and one or more speakers that can be used for audio input and output from the device. The display screen can be a liquid crystal display (LCD) screen, or other type of display screen such as an organic light emitting diode (OLED) display. The display screen can be configured as a touch screen. The touch screen can use capacitive, resistive, or another type of touch screen technology. An application processor and a graphics processor can be coupled to internal memory to provide processing and display capabilities. A non-volatile memory port can also be used to provide data input/output options to a user. The non-volatile memory port can also be used to expand the memory capabilities of the device. A keyboard can be integrated with the device or wirelessly connected to the wireless device to provide additional user input. A virtual keyboard can also be provided using the touch screen.

[0151] Various techniques, or certain aspects or portions thereof, can take the form of program code (i.e., instructions) embodied in tangible media, such as floppy diskettes, CD-ROMs, hard drives, non-transitory computer readable storage medium, or any other machine-readable storage medium wherein, when the program code is loaded into and executed by a machine, such as a computer, the machine becomes an apparatus for practicing the various techniques. In the case of program code execution on programmable computers, the computing device can include a processor, a storage medium readable by the processor (including volatile and non-volatile memory and/or storage elements), at least one input device, and at least one output device. The volatile and non-volatile memory and/or storage elements can be a RAM, EPROM, flash drive, optical drive, magnetic hard drive, or other medium for storing electronic data. The base station and mobile station can also include a transceiver module, a counter module, a processing module, and/or a clock module or timer module. One or more programs that can implement or utilize the various techniques described herein can use an application programming interface (API), reusable controls, and the like. Such programs can be implemented in a high level procedural or object oriented programming language to communicate with a computer system. However, the program(s) can be implemented in assembly or machine language, if desired. In any case, the language can be a compiled or interpreted language, and combined with hardware implementations.

[0152] It should be understood that many of the functional units described in this specification have been labeled as modules, in order to more particularly emphasize their implementation independence. For example, a module can be implemented as a hardware circuit comprising custom VLSI circuits or gate arrays, off-the-shelf semiconductors such as logic chips, transistors, or other discrete components. A module can also be implemented in programmable hardware devices such as field programmable gate arrays, programmable array logic, programmable logic devices or the like.

[0153] Modules can also be implemented in software for execution by various types of processors. An identified module of executable code can, for instance, comprise one or more physical or logical blocks of computer instructions, which can, for instance, be organized as an object, procedure, or function. Nevertheless, the executables of an identified module need not be physically located together, but can comprise disparate instructions stored in different locations which, when joined logically together, comprise the module and achieve the stated purpose for the module.

[0154] Indeed, a module of executable code can be a single instruction, or many instructions, and can even be distributed over several different code segments, among different programs, and across several memory devices. Similarly, operational data can be identified and illustrated herein within modules, and can be embodied in any suitable form and organized within any suitable type of data structure. The operational data can be collected as a single data set, or can be distributed over different locations including over different storage devices, and can exist, at least partially, merely as electronic signals on a system or network. The modules can be passive or active, including agents operable to perform desired functions.

[0155] Reference throughout this specification to "an example" means that a particular feature, structure, or characteristic described in connection with the example is included in at least one embodiment of the present invention. Thus, appearances of the phrases "in an example" in various places throughout this specification are not necessarily all referring to the same embodiment.

[0156] As used herein, a plurality of items, structural elements, compositional elements, and/or materials can be presented in a common list for convenience. However, these lists should be construed as though each member of the list is individually identified as a separate and unique member. Thus, no individual member of such list should be construed as a de facto equivalent of any other member of the same list solely based on their presentation in a common group without indications to the contrary. In addition, various embodiments and example of the present invention can be referred to herein along with alternatives for the various components thereof. It is understood that such embodiments, examples, and alternatives are not to be construed as defacto equivalents of one another, but are to be considered as separate and autonomous representations of the present invention.

[0157] Furthermore, the described features, structures, or characteristics can be combined in any suitable manner in one or more embodiments. In the following description, numerous specific details are provided, such as examples of layouts, distances, network examples, etc., to provide a thorough understanding of embodiments of the invention. One skilled in the relevant art will recognize, however, that the invention can be practiced without one or more of the specific details, or with other methods, components, layouts, etc. In other instances, well-known structures, materials, or operations are not shown or described in detail to avoid obscuring aspects of the invention.

[0158] While the forgoing examples are illustrative of the principles of the present invention in one or more particular applications, it will be apparent to those of ordinary skill in the art that numerous modifications in form, usage and details of implementation can be made without the exercise of inventive faculty, and without departing from the principles and concepts of the invention. Accordingly, it is not intended that the invention be limited, except as by the claims set forth below.

What is claimed is:

1. A wireless transfer station operable to display information, comprising:

- a wireless transfer station housing with an outer surface, wherein the outer surface includes an optically viewable portion integrated into the outer surface of the wireless transfer station housing;
- an energy information module:
  - located within the wireless transfer station housing; and
  - configured to provide selected energy information for display; and
- a display:
  - integrated into the wireless transfer station housing;
  - located beneath the optically viewable portion of the outer surface, wherein the display is viewable to a user through the optically viewable portion; and
  - configured to display the energy information from the energy information module.

2. The wireless transfer station of claim **1**, wherein the optically viewable portion is seamlessly integrated into the outer surface of the wireless transfer station housing.

3. The wireless transfer station of claim **1**, further comprising:

- the wireless transfer station housing including an inner cavity;
- a battery bay located within the inner cavity containing one or more rechargeable batteries; and
- a wireless transfer module configured to receive wireless energy from a battery pack and provide at least a portion of the received wireless energy to the one or more rechargeable batteries.

4. The wireless transfer station of claim **3**, further comprising:

- a coil alignment module configured to determine an alignment of a wireless transfer coil of the wireless transfer module with a wireless transfer coil of the wireless transfer station or with a wireless transfer coil of a device; and
- the display is configured to display alignment information received from the coil alignment module.

5. The wireless transfer station of claim **3**, further comprising:

- a coil distance module configured to determine a distance between a wireless transfer coil of the wireless transfer module with a wireless transfer coil of the battery pack or with a wireless transfer coil of a device; and
- the display is configured to display alignment information received from the coil distance module.

6. The wireless transfer station of claim **1**, further comprising:

- a second optically viewable portion integrated into the outer surface of the wireless transfer station housing; and
- a second display:
  - integrated into the wireless transfer station housing;
  - located beneath the second optically viewable portion of the outer surface, wherein the second display is viewable to a user through the second optically viewable portion; and
  - configured to display the energy information from the energy information module.

7. The wireless transfer station of claim **6**, wherein the second display is configured to:

- determine when the display cannot properly display energy information; and
- display energy information when the display cannot properly display energy information.

8. The wireless transfer station of claim **6**, further comprising:

- a communications module configured to receive selection information from a device or an other wireless transfer station, wherein the selection information is used to select a wireless transfer station; and
- the display or the second display is configured to display an indicator that indicates when the wireless transfer sta-

tion is next to be used in a wireless transfer station use order based on the received selection information.

9. The wireless transfer station of claim **1**, wherein the wireless transfer station housing is hermetically sealed to be liquid proof and dust proof.

10. The wireless transfer station of claim **9**, wherein the wireless transfer station housing is comprised of a plurality of housing pieces that are welded together to form a hermetically sealed wireless transfer station housing.

11. The wireless transfer station of claim **9**, further comprising a seal monitor configured to monitor when the hermetic seal is broken.

12. The wireless transfer station of claim **1**, wherein the energy information includes error information, safety information, wireless transfer station usage information, charge cycle information, voltage usage, current usage, state of health information, energy remaining information, an operating system (OS) version, a software version, a firmware version, and communication information.

13. The wireless transfer station of claim **1**, further comprising:

an energy transfer module configured to determine an estimated energy transfer level from a battery pack to the wireless energy battery pack; and

the display is configured to display energy transfer information received from the energy transfer module.

14. A wireless battery pack operable to display information, comprising:

a wireless battery pack housing with an outer surface, wherein the wireless battery pack housing is configured to be sealed; and

a display:

viewable in at least a portion of the outer surface of the wireless battery pack housing; and

configured to display information associated with the wireless battery pack.

15. The wireless battery pack of claim **14**, further comprising a communication module configured to:

communicate information between the wireless battery pack and a wireless transfer station; or

communicate information between the wireless battery pack and a device.

16. The wireless battery pack of claim **14**, wherein the wireless battery pack housing includes a hole configured to receive injection material to seal components within the wireless battery pack housing or the wireless battery pack.

17. The wireless battery pack of claim **14**, further comprising:

a charge module configured to estimate a remaining charge time of the wireless battery pack; and

the display configured to display information from the charge module.

18. The wireless battery pack of claim **14**, further comprising:

a warranty alert module configured to determine a warranty status of the wireless battery pack or a state of health of the wireless battery pack; and

the display is configured to display information from the warranty alert module.

19. The wireless battery pack of claim **14**, further comprising:

a safety alert module configured to determine a safety status of the wireless battery pack, wherein the safety status is based on one or more of:

a temperature of the wireless battery pack;

a temperature of one or more rechargeable batteries in the wireless battery pack;

a voltage level of one or more of the rechargeable batteries;

a current level of one or more of the rechargeable batteries; or

an internal pressure level of the wireless battery pack; and

the display is configured to display information from the safety alert module.

20. The wireless battery pack of claim **14**, further comprising:

an error module configured to detect an error status of the wireless battery pack, wherein the error status includes:

alignment information between the wireless battery pack and a battery pack or a device;

distance information between the wireless battery pack and the battery pack or the device;

overvoltage information;

under voltage information;

overcurrent information;

under current information;

communication information; and

the display is configured to indicate the error status of the wireless battery pack based on error status information received from the error module.

21. The wireless battery pack of claim **14**, further comprising:

a battery abuse module configured to determine when the one or more rechargeable batteries has been used outside of warranted uses; and

the display is configured to display information from the battery abuse module.

22. The wireless battery pack of claim **14**, further comprising a sensory alert module configured to provide information using a sensory device integrated into the wireless battery pack or in communication with the wireless battery pack.

23. A wireless battery display operable to display information, comprising:

an energy information module:

located within a wireless battery pack housing of a wireless battery pack; and

configured to provide selected energy information to the wireless battery display in communication with the energy information module; and

the wireless battery display:

sized and shaped to be integrated beneath an optically viewable portion in the wireless battery pack housing;

configured to be viewable to a user through the optically viewable portion of the wireless battery pack housing; and

configured to display energy information from the energy information module.

24. The wireless battery display of claim **23**, wherein the optically viewable portion is a substantially transparent material or a translucent material.

25. The wireless battery display of claim **23**, wherein the wireless battery pack housing is comprised of a substantially clear polycarbonate material.

26. The wireless battery display of claim **23**, wherein:

the display is one or more of a liquid crystal display (LCD), a resistive LCD display, a capacitive LCD display, a light emitting diode (LED) display, a liquid crystal on silicon

(LCOS) display, an organic LED (OLED) display, an active-matrix OLED (AMOLED) display, a touch screen display, a haptic display, or a tactile display; and

the wireless battery display is configured to display one or more colors based on the selected energy information.

27. The wireless battery display of claim **23**, further comprising a display adjustment module configured to adjust a color of the display or a brightness of the wireless battery display based on selected criteria.

28. The wireless battery display of claim **27**, wherein the selected criteria includes:

a time of day,

a location of the wireless battery pack; and

an ambient light level.

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