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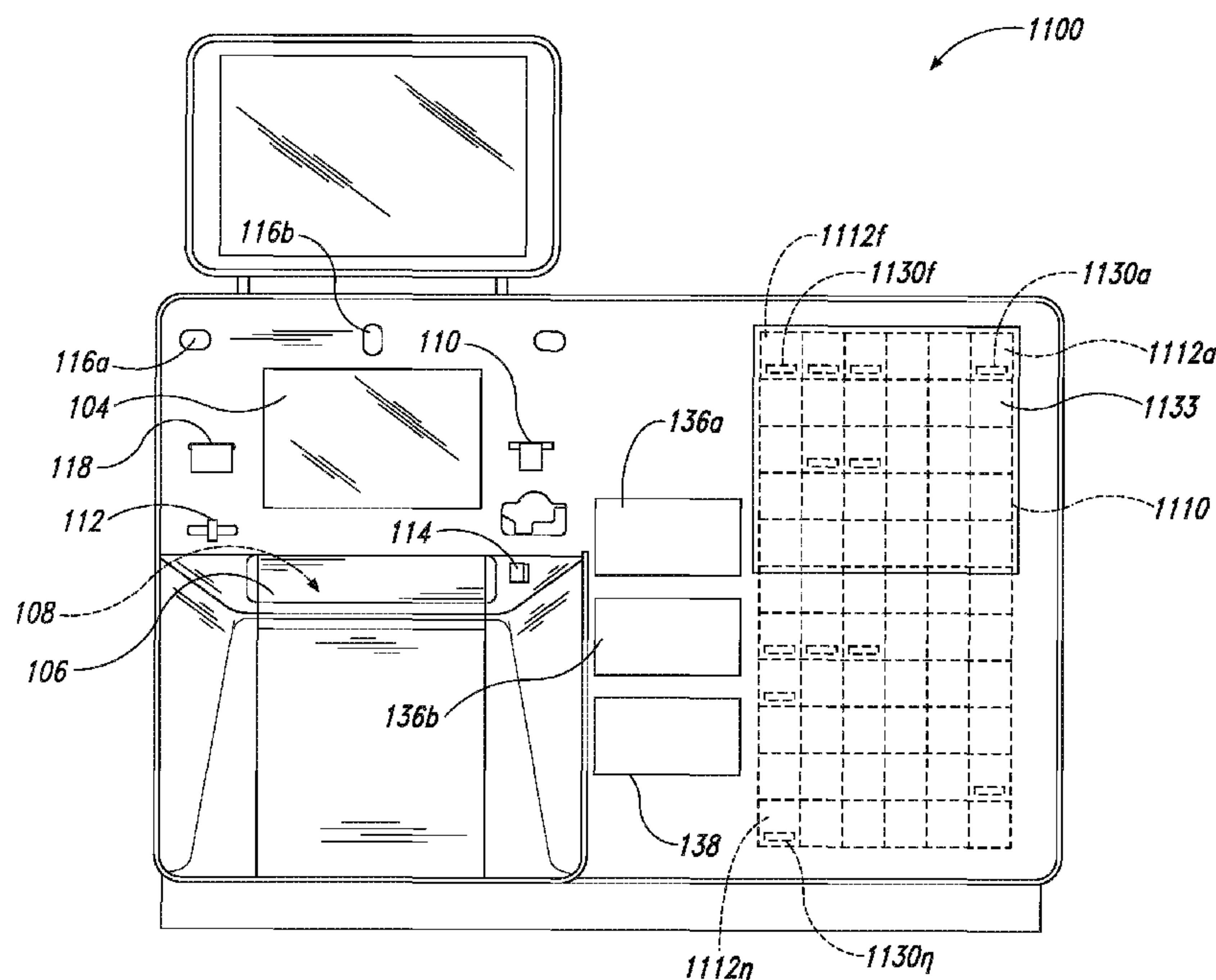


Fig. 11A

(57) Abstract: Kiosk systems and methods for vending mobile phones and other electronic devices to, and/or for purchasing mobile phones and other electronic devices from, consumers are disclosed herein. In some embodiments, such systems can include subsystems for preparing purchased mobile phones for resale, moving mobile phones between different processing stations, transferring data from, e.g., an old phone to a newly purchased phone, etc. In some embodiments, the kiosk systems disclosed herein can purchase a mobile phone from one consumer, process the mobile phone for resale (e.g., by removing personal data, etc.), and then sell the mobile phone to another consumer.

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SYSTEMS AND METHODS FOR VENDING AND/OR PURCHASING
MOBILE PHONES AND OTHER ELECTRONIC DEVICES

CROSS-REFERENCE TO RELATED APPLICATIONS INCORPORATED BY
REFERENCE

[0001] The present application claims priority to and the benefit of U.S. Provisional Application No. 62/950,075, titled SYSTEMS AND METHODS FOR VENDING AND/OR PURCHASING MOBILE PHONES AND OTHER ELECTRONIC DEVICES, and filed on December 18, 2019, which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

[0002] The present disclosure is generally directed to systems and methods for vending, purchasing, transferring data to or from, recycling, and/or performing other processes associated with mobile phones and/or other electronic devices.

BACKGROUND

[0003] Consumer electronic devices, such as mobile phones, laptop computers, notebooks, tablets, MP3 players, etc., are ubiquitous. Currently there are over 6 billion mobile devices in use in the world; and the number of these devices is growing rapidly with more than 1.5 billion mobile phones being sold in 2018 alone. There are now more mobile devices in use than there are people on the planet. Part of the reason for the rapid growth in the number of mobile phones and other electronic devices is the rapid pace at which these devices evolve, and the increased usage of such devices in third world countries.

[0004] As a result of the rapid pace of development, a relatively high percentage of electronic devices are replaced every year as consumers continually upgrade their mobile phones and other electronic devices to obtain the latest features or a better operating plan. According to the U.S. Environmental Protection Agency, the U.S. alone disposes of over 370 million mobile phones, PDAs, tablets, and other electronic devices every year. Millions of other outdated or broken mobile phones and

other electronic devices are simply tossed into junk drawers or otherwise kept until a suitable disposal solution arises.

[0005] Although many electronic device retailers and cell carrier stores now offer mobile phone trade-in or buyback programs, many old mobile phones still end up in landfills or are improperly disassembled and disposed of in developing countries. Unfortunately, however, mobile phones and similar devices typically contain substances that can be harmful to the environment, such as arsenic, lithium, cadmium, copper, lead, mercury and zinc. If not properly disposed of, these toxic substances can seep into groundwater from decomposing landfills and contaminate the soil with potentiality harmful consequences for humans and the environment.

[0006] As an alternative to retailer trade-in or buyback programs, consumers can now recycle and/or sell their used mobile phones using self-service kiosks located in malls, retail stores, or other publicly accessible areas. Such kiosks are operated by ecoATM, LLC, the assignee of the present application, and embodiments of such kiosks are disclosed in, for example, U.S. Patent Nos.: 10,475,002; 10,445,708; 10,438,174; 10,417,615; 10,269,110; 10,127,647; 9,911,102; 9,885,672; 8,463,646; 8,423,404; 8,239,262; 8,200,533; 8,195,511; and 7,881,965; each of which is incorporated herein by reference in its entirety.

[0007] There is a need for systems that enable consumers to easily sell their old mobile phones and purchase new ones. Additionally, there is a need for systems that enable consumers to conveniently transfer the data from their old mobile phone to a newly purchased phone. Simplifying the selling and purchasing processes, enhancing the consumer experience, and discouraging fraud can incentivize consumers to dispose of their old phones and other electronic devices in an efficient and environmentally conscientious way.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] Figure 1A is a partially schematic front view of a kiosk for purchasing and/or vending mobile phones and/or other electronic devices, configured in accordance with embodiments of the present technology.

[0009] Figures 1B-1E are a series of isometric views of a portion of the kiosk of Figure 1A with a number of exterior panels removed to illustrate operation in accordance with embodiments of the present technology.

[0010] Figure 2 is a partially schematic front view of a kiosk for purchasing and/or vending mobile phones and/or other electronic devices, configured in accordance with other embodiments of the present technology.

[0011] Figure 3 is an enlarged, partially schematic side view of an electronic device vending apparatus configured in accordance with embodiments of the present technology.

[0012] Figure 4 is an enlarged, partially schematic isometric view of an electronic device data transfer apparatus configured in accordance with embodiments of the present technology.

[0013] Figure 5 is an enlarged, partially schematic isometric view of an electronic device cleaning apparatus configured in accordance with embodiments of the present technology.

[0014] Figure 6 is an enlarged, partially schematic isometric view of an electronic device in a vending package configured in accordance with embodiments of the present technology.

[0015] Figure 7 is a schematic diagram illustrating various components associated with the kiosk systems of Figures 1A and 2.

[0016] Figures 8A and 8B illustrate a flow routine for purchasing an electronic device from a user and selling another electronic device to the user in accordance with embodiments of the present technology.

[0017] Figure 9 is a schematic diagram of a suitable distributed computing environment for implementing various aspects of the present technology.

[0018] Figures 10A and 10B are partially schematic side views of an electronic device data transfer compartment configured in accordance with other embodiments of the present technology, and Figure 10C is a partially schematic top view of an electrical connector disengagement device configured in accordance with a further embodiment of the present technology.

[0019] Figure 11A is a partially schematic front view of a kiosk for purchasing and/or vending mobile phones and/or other electronic devices, configured in accordance with embodiments in the present technology; and Figures 11B and 11C are partially schematic rear and top views, respectively, of the kiosk of Figure 11A with one or more exterior panels removed for purposes of illustration.

[0020] Figure 12 is a schematic diagram illustrating various components associated with the kiosk of Figure 11A-C configured in accordance with embodiments of the present technology.

[0021] Figure 13 illustrates a flow routine for operating the kiosk of Figure 11A-C to purchase an electronic device from a user and prepare the electronic device for resale to another user, in accordance with embodiments of the present technology.

[0022] Figure 14 illustrates a flow routine for operating the kiosk of Figures 11A-C to sell an electronic device to a user, in accordance with embodiments of the present technology.

DETAILED DESCRIPTION

[0023] The following disclosure describes various embodiments of systems and methods that can enable consumers to purchase "new" mobile phones and, if the consumer desires, sell their "old" mobile phone. For example, in some embodiments a kiosk or system of kiosks configured in accordance with the present technology can enable users to sell a damaged or broken phone, purchase a new phone, and then transfer data from the old phone to the new phone. In other similar embodiments, users can purchase a new phone, transfer data from an old phone to the new phone, and then sell the old phone. In some embodiments, the user may also have the option of applying the proceeds from the sale of the old phone toward the cost of the new phone. Such systems can also enable users to sell their old mobile phones without having to buy a new phone, and/or to purchase new phones without selling an old phone. In general, as used herein the term "old" does not necessarily mean that a phone is chronologically old, outdated, damaged, etc., but only that the phone is one that the owner wishes to sell and/or replace with a new phone. Similarly, the term "new" phone is not limited to phones that are brand new, but can also include phones that have been recycled and refurbished for resale and/or are otherwise "new" to the purchaser.

[0024] The following disclosure also describes various embodiments of kiosk systems and methods that can be used to purchase a mobile phone from one user, prepare the mobile phone for resale (e.g., by removing personal data from the phone, cleaning the phone, etc.), and then sell the phone to another user. Accordingly, in these embodiments phones that have been purchased by the kiosk do not have to be retrieved from the kiosk, manually prepared for resale by service personnel, and the restocked in a vending kiosk or offered for sale through other channels. Instead, embodiments of the kiosk systems described herein can purchase phones, automatically process them for resale, and then resell them without the phones ever having to be removed from the kiosk.

[0025] Certain details are set forth in the following description and in Figures 1A–14 to provide a thorough understanding of various embodiments of the present technology. In other instances, well-known structures, materials, operations and/or systems often associated with smartphones and other handheld devices, consumer electronic devices, computer hardware, software, and network systems, etc. are not shown or described in detail in the following disclosure to avoid unnecessarily obscuring the description of the various embodiments of the present technology. Those of ordinary skill in the art will recognize, however, that the present technology can be practiced without one or more of the details set forth herein, or with other structures, methods, components, and so forth.

[0026] The accompanying Figures depict embodiments of the present technology and are not intended to be limiting of its scope. The sizes of various depicted elements are not necessarily drawn to scale, and these various elements may be arbitrarily enlarged to improve legibility. Component details may be abstracted in the Figures to exclude details such as position of components and certain precise connections between such components when such details are unnecessary for a complete understanding of how to make and use the invention. In the Figures, identical reference numbers identify identical, or at least generally similar, elements. To facilitate the discussion of any particular element, the most significant digit or digits of any reference number refers to the Figure in which that element is first introduced. For example, element 110 is first introduced and discussed with reference to Figure 1A.

[0027] Figure 1A is a front view of a kiosk 100 for purchasing or recycling mobile phones and other electronic devices from consumers, selling (e.g., vending) mobile phones and other electronic devices to consumers, and/or performing other processes and transactions associated with such devices, in accordance with embodiments of the present technology. The term "recycling" is used herein for ease of reference to generally refer to purchasing, reselling, exchanging, donating, etc. mobile phones and other electronic devices. For example, owners may elect to sell their used electronic devices at the kiosk 100, and the electronic devices can be recycled for resale, reconditioning, repair, recovery of salvageable components, environmentally conscious disposal, etc. Unless otherwise specified the term "processing" is used herein for ease of reference to generally refer to all manner of services and operations that may be performed or facilitated by the kiosk 100 on, with, or otherwise in relation to an electronic device. Such services and operations can include, for example, identifying, evaluating, pricing, auctioning, decommissioning, transferring data from or to, cleaning, reconfiguring, refurbishing, changing carriers, facilitating insurance transactions, etc.

[0028] Although many embodiments of the present technology are described herein in the context of mobile phones, aspects of the present technology are not limited to mobile phones and generally apply to other consumer electronic devices. Such devices include, as non-limiting examples, all manner of mobile phones; smartphones; handheld devices; personal digital assistants (PDAs); MP3 or other digital music players; tablet, notebook, ultrabook and laptop computers; e-readers all types of cameras GPS devices; set-top boxes; universal remote controls; wearable computers; etc. In some embodiments, it is contemplated that the kiosk 100 can facilitate selling and/or otherwise processing larger consumer electronic devices, such as desktop computers, TVs, game consoles, etc., as well smaller electronic devices such as Google® Glass™, smartwatches (e.g., the Apple Watch™, Android Wear™ devices such as the Moto 360®, or the Pebble Steel™ watch), etc. Embodiments of the kiosk 100 and various features thereof can be at least generally similar in structure and function to the systems, methods and corresponding features described in the following patents and patent applications, which are incorporated herein by reference in their entireties: U.S. Patent Nos.: 10,860,990, 10,853,873, 10,572,946, 10,475,002; 10,445,708; 10,438,174; 10,417,615; 10,401,411; 10,269,110; 10,127,647;

10,055,798; 9,885,672; 9,881,284; 8,200,533; 8,195,511; and 7,881,965; U.S. Patent Application Nos.: 16/794,009; 16/788,169; 16/788,153; 16/719,699; 16/794,009; 16/534,741; 15/057,707; 14/967,183; 14/966,346; 14/964,963; 14/663,331; 14/660,768; 14/598,469; 14/568,051; 14/498,763; 13/794,816; 13/794,814; 13/753,539; 13/733,984; 13/705,252; 13/693,032; 13/658,828; 13/658,825; 13/492,835; 13/113,497; and U.S. Provisional Application No. 62/169,072, titled "METHODS AND SYSTEMS FOR VISUALLY EVALUATING ELECTRONIC DEVICES," filed by the applicant on June 1, 2015; U.S. Provisional Application No. 62/202,330, titled "METHODS AND SYSTEMS FOR INSPECTING MOBILE DEVICES AND OTHER CONSUMER ELECTRONIC DEVICES WITH ROBOTIC ACTUATION," filed by the applicant on August 7, 2015; U.S. Provisional Application No. 62/332,736, titled "METHODS AND SYSTEMS FOR DETECTING DAMAGE IN EDGE REGIONS OF MOBILE ELECTRONIC DEVICES," filed by the applicant on May 6, 2016; U.S. Provisional Application No. 62/807,153, titled "KIOSK FOR EVALUATING AND PURCHASING USED ELECTRONIC DEVICES," filed by the applicant on February 18, 2019; U.S. Provisional Application No. 62/804,714, titled "CONNECTOR CARRIER FOR ELECTRONIC DEVICE KIOSK," filed by the applicant on February 12, 2019; U.S. Provisional Application No. 62/807,165, titled "NEURAL NETWORK BASED PHYSICAL CONDITION EVALUATION OF ELECTRONIC DEVICES, AND ASSOCIATED SYSTEMS AND METHODS," filed by the applicant on February 18, 2019; U.S. Provisional Application No. 63/066,794, titled "KIOSK FOR EVALUATING AND PURCHASING USED ELECTRONIC DEVICES," filed by the applicant on August 17, 2020; U.S. Provisional Application No. 63/070,207, titled "EVALUATING AND RECYCLING ELECTRONIC DEVICES," filed by the applicant on August 25, 2020; U.S. Provisional Application No. 63/088,377, titled "KIOSK FOR EVALUATING AND PURCHASING USED ELECTRONIC DEVICES," filed by the applicant on October 6, 2020; U.S. Provisional Application No. 63/116,007, titled "EVALUATING AN ELECTRONIC DEVICE USING A WIRELESS CHARGER," filed by the applicant on November 19, 2020; and U.S. Provisional Application No. 63/116,020, titled "EVALUATING AN ELECTRONIC DEVICE USING OPTICAL CHARACTER RECOGNITION," filed by the applicant on November 19, 2020. All the patents and patent applications listed in the preceding sentence and any other patents or patent applications identified herein are incorporated herein by reference in their entireties.

[0029] In the illustrated embodiment, the kiosk 100 includes a first kiosk portion 101 for purchasing and/or recycling mobile phones and/or other electronic devices received from users, and a second kiosk portion 102 for selling (e.g., vending) such devices to users. In some embodiments, the first kiosk portion 101 and the second kiosk portion 102 can have separate housings placed in close proximity to each other and/or physically attached to each other (as shown in Figure 1A), or they can be spaced apart from each other as separate kiosks that can either be used separately or in conjunction with each other. In other embodiments, the first kiosk portion 101 and the second kiosk portion 102 can be integrated into a single unit or housing (as described below with reference to Figure 2).

[0030] The first kiosk portion 101 can be at least generally similar in structure and function to one or more of the kiosks described in detail in the patents and applications incorporated herein by reference in their entirety. For example, in the illustrated embodiment the first kiosk portion 101 is a floor-standing self-service machine configured for use by a user (e.g., a consumer, customer, etc.) to recycle, sell, and/or perform other operations with a mobile phone or other consumer electronic device. In other embodiments, the kiosk portion 101 can be configured for use on a countertop or a similar raised surface. Although the first kiosk portion 101 is configured for use by consumers, in various embodiments the kiosk portion 101 and/or various portions thereof can also be used by other operators, such as a retail clerk or kiosk assistant to facilitate the selling or other processing of mobile phones and other electronic devices.

[0031] In the illustrated embodiment, the first kiosk portion 101 includes a housing 103 that is approximately the size of a conventional vending machine. The housing 103 can be of conventional manufacture from, for example, sheet metal, plastic panels, etc. A plurality of user interface devices are provided on a front portion of the housing 103 for providing instructions and other information to users, and/or for receiving user inputs and other information from users. For example, the kiosk portion 101 can include a display screen 104 (e.g., a liquid crystal display (LCD) or light emitting diode (LED) display screen, a projected display (such as a heads-up display or a head-mounted device), GUI, and so on) for providing information, prompts, etc. to users. The display screen 104 can include a touch screen for receiving user input and responses to displayed prompts. In addition or alternatively, the kiosk portion 101 can include a

separate keyboard or keypad for this purpose. The kiosk portion 101 can also include an ID reader or scanner 112 (e.g., a driver's license scanner), a fingerprint reader 114, and one or more cameras 116 (e.g., digital still and/or video cameras, identified individually as cameras 116a–b). The kiosk portion 101 can additionally include output devices such as a label printer having an outlet 110, and a cash dispenser having an outlet 118. Although not identified in Figure 1A, the kiosk portion 101 can further include a speaker and/or a headphone jack for audibly communicating information to users, one or more lights for visually communicating signals or other information to users, a handset or microphone for receiving verbal input from the user, a card reader (e.g., a credit/debit card reader, loyalty card reader, etc.), a receipt or voucher printer and dispenser, as well as other user input and output devices. The input devices may include a touchpad, a pointing device such as a mouse, a joystick, pen, game pad, motion sensor, scanner, eye direction monitoring system, etc. Additionally, the first kiosk portion 101 can also include a bar code reader (for reading, e.g., a bar code displayed on a mobile device), QR code reader (for reading, e.g., a bar code displayed on a mobile device), bag/package dispenser, a digital signature pad, etc.

[0032] In the illustrated embodiment, the kiosk portion 101 additionally includes a header 120 having a display screen 122 for displaying marketing advertisements and/or other video or graphical information to attract users to the kiosk 100. In addition to the user interface devices described above, the front portion of the housing 103 also includes an access panel or door 106 located directly beneath the display screen 104. As described in greater detail below, the access door 106 is configured to automatically retract so that the user can place an electronic device (e.g., a mobile phone) in an inspection area 108 for automatic inspection by the first kiosk portion 101.

[0033] A sidewall portion of the housing 103 (e.g., the sidewall opposite the second kiosk portion 102) can include a number of conveniences to help users recycle or otherwise process their mobile phones. For example, in the illustrated embodiment the sidewall can carry an accessory bin that is configured to receive mobile device accessories that the user wishes to recycle or otherwise dispose of. Additionally, the sidewall can provide a free charging station with a plurality of electrical connectors for charging a wide variety of mobile phones and other consumer electronic devices.

[0034] Figures 1B–1E are a series of isometric views of the first kiosk portion 101 with the housing 103 removed to illustrate selected internal components of the first kiosk portion 101 configured in accordance with an embodiment of the present technology. Referring first to Figure 1B, in the illustrated embodiment the first kiosk portion 101 includes a connector carrier 140 and an inspection plate 144 operably disposed behind the access door 106 (Figure 1A). In the illustrated embodiment, the connector carrier 140 is a rotatable carrousel that is configured to rotate about a generally horizontal, center axis and carries a plurality of electrical connectors 142 (e.g., approximately 25 connectors) distributed around an outer periphery thereof. In other embodiments, other types of connector carrying devices (including both fixed and linearly movable arrangements) can be used. In some embodiments, the connectors 142 can include a plurality of interchangeable USB connectors configured to provide power and/or exchange data with a variety of different mobile phones and/or other electronic devices. In operation, the carrousel 140 is configured to automatically rotate about its central axis to position an appropriate one of the connectors 142 adjacent to an electronic device, such as a mobile phone 150, that has been placed on the inspection plate 144 for recycling. The connector 142 can then be manually and/or automatically withdrawn from the carrousel 140 and connected to a port on the mobile phone 150 for electrical analysis. Such analysis can include, e.g., an evaluation of make, model, configuration, condition, etc. using one or more of the methods and/or systems described in detail in the commonly owned patents and patent applications identified herein and incorporated by reference in their entireties.

[0035] In the illustrated embodiment, the inspection plate 144 is configured to translate back and forth (on, e.g., parallel mounting tracks) to move an electronic device, such as the mobile phone 150, between a first position directly behind the access door 106 and a second position between an upper chamber 160 and an opposing lower chamber 162. Moreover, in this embodiment the inspection plate 144 is transparent, or at least partially transparent (e.g., formed of glass, Plexiglas, etc.) to enable the mobile phone 150 to be photographed and/or otherwise optically evaluated from all, or at least most viewing angles (e.g., top, bottom, sides, etc.) using, e.g., one or more cameras, mirrors, etc. mounted to or otherwise associated with the upper and lower chambers 160 and 162, respectively. When the mobile phone 150 is in the second position, the upper chamber 160 can translate downwardly to generally enclose

the mobile phone 150 between the upper chamber 160 and the lower chamber 162. The upper chamber 160 is operably coupled to a gate 168 that moves up and down in unison with the upper chamber 160. As noted above, in the illustrated embodiment the upper chamber 160 and/or the lower chamber 162 can include one or more cameras, magnification tools, scanners (e.g., bar code scanners, infrared scanners, etc.) or other imaging components (not shown) and an arrangement of mirrors (also not shown) to view, photograph and/or otherwise visually evaluate the mobile phone 150 from multiple perspectives. In some embodiments, one or more of the cameras and/or other imaging components discussed above can be movable to facilitate device evaluation. The inspection area 108 (Figure 1A) can also include weight scales, heat detectors, UV readers/detectors, and the like for further evaluation of electronic devices placed therein. The first kiosk portion 101 can further include an angled binning plate 166 for directing electronic devices from the transparent plate 144 into a collection bin 164 positioned in a lower portion of the kiosk portion 101.

[0036] The first kiosk portion 101 can be used in a number of different ways to efficiently facilitate the recycling, selling and/or other processing of mobile phones and other consumer electronic devices. Referring to Figures 1A–1E together, in some embodiments a user wishing to sell a used mobile phone, such as the mobile phone 150, approaches the first kiosk portion 101 and identifies the type of device the user wishes to sell by, for example, responding to textual and/or visual prompts displayed on the screen 104. Next, the user may be prompted to remove any cases, stickers, or other accessories from the device 150 so that it can be accurately evaluated. Additionally, the kiosk portion 101 may print and dispense a unique identification label (e.g., a small adhesive-backed sticker with a QR code, barcode, etc.) from the label outlet 110 for the user to adhere to the back of the mobile phone 150. After this is done, the door 106 retracts allowing the user to place the mobile phone 150 onto the transparent plate 144 in the inspection area 108 (Figure 1B). The door 106 then closes and the transparent plate 144 moves rearwardly to move the mobile phone 150 under the upper chamber 160 as shown in Figure 1C. The upper chamber 160 then moves downwardly to generally enclose the mobile phone 150 between the upper and lower chambers 160 and 162, and the cameras and/or other imaging components in the upper and/or lower chambers 160 and 162 perform a visual inspection of the mobile phone 150.

[0037] In some embodiments, the visual inspection can include a 3D visual analysis (of, e.g., the shape and/or size of the phone 150) to confirm the identification of the mobile phone 150 (e.g. make and model) and/or to evaluate or assess the condition and/or function of the mobile phone 150 and/or its various components and systems. For example, in some embodiments, the cameras and/or other imaging components in the upper and/or lower chambers 160 and 162 obtain images of the mobile phone 150 under, e.g., various lighting conditions, and the first kiosk portion 101 can use visual inspection and recognition software to analyze the images of the mobile phone 150. The visual inspection and recognition software can analyze the images to, e.g., determine the borders of the phone 150 and the corresponding external dimensions of the phone 150. The external dimensions can be utilized to determine a subset of possible mobile phones from a master database of mobile phones stored in memory of the kiosk 100 or stored in a remote database accessible to the kiosk 100 via a network connection. In some embodiments, the visual inspection and recognition software can then use a set of secondary and/or tertiary features of the phone 150 as shown on the images to further distinguish the device. These secondary and tertiary features can include placement and size of the display screen, placements and size of the keyboard, unique buttons, placement of ports, and other distinguishing features. The visual analysis can also include an inspection of a display screen on the mobile phone 150 for cracks or other damage. For example, the visual inspection and recognition software can subtract an image of the display screen and/or other portions of the mobile phone 150 obtained by the one or more kiosk cameras from an image of an undamaged phone of the same make and model. The result of the subtraction can identify, e.g., damaged pixels, cracks in the screen, broken or missing parts, and/or low, medium or high wear. In some embodiments, the display screen of the phone 150 can be illuminated for the images, and in other embodiments the display screen may be "off" or otherwise not illuminated. In some embodiments, the visual inspection can also include performing optical character recognition (OCR) to identify printed or displayed patterns, codes, and/or text, and comparing characteristics of the patterns, codes, and/or text (e.g., layout, size, font, color, etc.) to templates to determine the presence of device identifiers such as a model number, serial number, IMEI number, etc. In some embodiments, the first kiosk portion 101 can perform the visual analysis using one or more of the methods and/or systems described in detail in the commonly owned patents

and patent applications identified herein and incorporated by reference in their entireties.

[0038] Referring next to Figure 1D, after the visual analysis is performed and the device 150 has been identified, the upper chamber 160 returns to its upper position and the transparent plate 144 returns the mobile phone 150 to its initial position next to the door 106 (Figure 1A). The display screen 104 can also provide an estimated price or an estimated range of prices that the kiosk portion 101 may offer the user for the mobile phone 150 based on the visual analysis and/or based on user input (e.g., input regarding the type, condition, etc. of the mobile phone 150). If the user indicates (via, e.g., input via the touch screen) that he or she wishes to proceed with the transaction, the carousel 140 automatically rotates an appropriate one of the connectors 142 into an upper position adjacent the transparent plate 144, and the door 106 is again opened. The user can then be instructed (via, e.g., the display screen 104) to withdraw the appropriate connector 142 (and its associated wire) from the carousel 140, plug the connector 142 into the corresponding port (e.g., a USB port) on the mobile phone 150, and reposition the mobile phone 150 in the inspection area on the transparent plate 144. After doing so, the door 106 once again closes and the kiosk portion 101 (or, more specifically, a kiosk processor) performs an electrical inspection of the mobile phone 150 via the connector 142 to identify the phone and further evaluate the condition of the phone as well as specific component and operating parameters such as memory, carrier, etc.

[0039] For example, in some embodiments, the kiosk portion 101 (e.g., a kiosk CPU or other processing device) can query the mobile phone 150 (by using, e.g., an operating system API) to obtain characteristic information about the mobile phone 150, which can include device identification, make, model, and/or configuration. In other embodiments, the characteristic information can further include device functionality including hardware/software configuration, charging capability, memory capacity, etc. Information necessary to identify and/or evaluate a mobile device can include, for example, a unique identifier (e.g., an IMEI number or an MEID or equivalent number of a mobile phone, a hardware media access control address (MAC address) of a networkable device, or a model number and serial number of the electronic device); information describing the device manufacturer (e.g., a manufacturer name or ID code), model, characteristics and capabilities (e.g., CPU type and speed, storage capacity

(SRAM, DRAM, disk, etc.), wireless carrier, radio bands (frequency ranges and encodings such as CDMA, GSM, LTE, etc.), color, and/or condition; and so on. In some embodiments, the electrical analysis can include evaluating the condition and/or functionality of the charging circuit of the electronic device. In particular, the testing electronics can measure the amount of charge current that the charging circuit draws on the power lines, and the testing electronics can use the corresponding current measurement signal to determine whether the charging circuit is functional or damaged. In some embodiments, the kiosk portion 101 can perform the electrical analysis using one or more of the methods and/or systems described in detail in the commonly owned patents and patent applications identified herein and incorporated by reference in their entireties.

[0040] In some embodiments, the user can attach the electrical connector to the mobile phone 150 and/or perform an electrical analysis of the device before the kiosk portion 101 performs a visual analysis of the phone. For example, in such an embodiment the user can approach the kiosk portion 101 and identify the type of device (e.g., the make and model) he or she wishes to recycle, and/or the appropriate electrical connector for connecting to the device. The kiosk portion 101 can then use this information to stage the appropriate electrical connector at the inspection area. Alternatively, the kiosk portion 101 can present the user with a selection of standard electrical connectors from which the user can determine an appropriate electrical connector for connecting to the device. Either way, the door 106 retracts and the user is instructed to withdraw the selected connector 142 from the carrier 140, plug it into the corresponding port (e.g., a USB port) on the mobile phone 150, and position the mobile phone 150 on the transparent plate 144 in the inspection area. The user may also be prompted to remove any cases, stickers, or other accessories from the mobile phone 150, and adhere a unique identification label to the back of the mobile phone 150 as described above. The door 106 then closes and the kiosk portion 101 can perform an electrical inspection of the mobile phone 150 as described above, and after the electrical inspection, a visual inspection as described above. The electrical inspection can include gathering device identification information and/or other information, which the kiosk portion 101 can then use to customize further interaction with the user, such as to add or omit user inquiries depending on the type of device the user connects. Thus, in

some embodiments, electrical inspection of the mobile phone 150 can occur before the user provides information about the mobile phone 150 to the kiosk portion 101.

[0041] After the visual and electronic analysis of the mobile phone 150, the kiosk portion 101 (e.g., the kiosk processor) determines whether the evaluation is sufficient for pricing the mobile phone 150. The determination can include, for example, whether the evaluation of the phone's type and condition is sufficient to determine a price to offer for the phone or whether the price for the phone could be in a range of possible prices. For example, to determine a price for the mobile phone 150, the kiosk portion 101 may use information about the make, model and/or condition of the phone or one or more unique identifiers of the phone to look up a current price for the device based on its make, model, and/or condition in a database or pricing model. The database or pricing model can be, for example, a local lookup table of common devices and/or a remotely hosted database or web service to which the kiosk portion 101 can transmit information about the electronic device and receive a current market value or offer price for the electronic device. After a phone purchase price has been determined, the user may be presented with the price via the display screen 104. If the user declines the price (via, e.g., the touch screen), a retraction mechanism 143 automatically disconnects the connector 142 from the mobile phone 150, the door 106 opens, and the user can reach in and retrieve the mobile phone 150. If the user accepts the price, the door 106 remains closed and the purchase transaction proceeds. For example, the user may be prompted to place his or her identification (e.g., a driver's license) in the ID scanner 112 and provide a thumbprint via the fingerprint reader 114 (Figure 1A). As a fraud prevention measure, the kiosk portion 101 can be configured to transmit an image of the driver's license to a remote computer screen, and an operator at the remote computer can visually compare the picture (and/or other information) on the driver's license to the person standing in front of the kiosk portion 101 as viewed by one or more of the cameras 116a–b (Figure 1A) to confirm that the person attempting to sell the mobile phone 150 is in fact the person identified by the driver's license. In some embodiments, one or more of the cameras 116a–b can be movable to facilitate viewing of kiosk users, as well as other individuals in the proximity of the kiosk portion 101. Additionally, the person's fingerprint can be checked against records of known fraud perpetrators. If either of these checks indicate that the person selling the phone

presents a fraud risk, the transaction can be declined and the mobile phone 150 returned to the user.

[0042] Returning to Figure 1D, after the user's identity has been verified the retraction mechanism 143 automatically disconnects the connector 142 from the mobile phone 150 and the transparent plate 144 moves back toward the upper and lower chambers 160 and 162. As shown in Figure 1E, however, when the upper chamber 160 is in the lower position the gate 168 permits the transparent plate 144 to slide underneath but not electronic devices carried thereon. As a result, the gate 168 knocks the phone 150 off of the transparent plate 144, onto the binning plate 166 and into the bin 164. The first kiosk portion 101 can then provide payment of the purchase price to the user. In some embodiments, payment can be made in the form of cash dispensed from the cash outlet 118. In other embodiments, the user can receive remuneration for the mobile phone 150 in various other useful ways. For example, the user can be paid via a redeemable cash voucher, a coupon, an e-certificate, a prepaid card, a wired or wireless monetary deposit to an electronic account (e.g., a bank account, credit account, loyalty account, online commerce account, mobile wallet, etc.), Bitcoin, etc.

[0043] As those of ordinary skill in the art will appreciate, the foregoing routines are but some examples of ways in which the first kiosk portion 101 can be used to purchase, recycle or otherwise process consumer electronic devices such as mobile phones. Additionally, it should be understood that the configuration of the first kiosk portion 101 described above is but one example of a suitable mobile device evaluation, purchasing, and/or recycling system that can be used with embodiments of the present technology. Accordingly, other embodiments of the present technology can use other mobile device evaluation, purchasing, and/or recycling systems without departing from the present disclosure. Such systems specifically include, for example, the kiosk configurations described in detail in U.S. Provisional Application No. 62/807,153, titled KIOSK FOR EVALUATING AND PURCHASING USED ELECTRONIC DEVICES, which was filed February 18, 2018 and is incorporated herein by reference in its entirety. Although the foregoing examples are described in the context of mobile phones, it should be understood that kiosk portion 101 and various embodiments thereof can also be used in a similar manner for recycling virtually any consumer electronic device, such as MP3 players, tablet computers, laptop computers, e-readers, PDAs, Google® Glass™, smartwatches, and other portable or wearable devices, as well as other

relatively non-portable electronic devices such as desktop computers, printers, televisions, DVRs, devices for playing games, entertainment or other digital media on CDs, DVDs, Blu-ray, etc. Moreover, although the foregoing examples are described in the context of use by a consumer, the kiosk portion 101 in various embodiments thereof can similarly be used by others, such as store clerk, to assist consumers in recycling, selling, exchanging, etc. their electronic devices.

[0044] Although embodiments of the first kiosk portion 101 described above include establishing an electrical connection between the mobile phone 150 and the first kiosk portion 101 (and, more specifically, a central processing unit (CPU) of the kiosk portion 101) via an electrical connector for electrical inspection of the phone 150, in other embodiments the first kiosk portion 101 can establish a wireless connection with the mobile phone 150 to facilitate performing all or a portion of the phone evaluation and purchase steps described above. For example, in some embodiments the first kiosk portion 101 can include a wireless radio transceiver that is accessible by user devices. The first kiosk portion 101 can establish a wireless connection with the mobile phone 150 by providing connection instructions and/or authentication information (via, e.g., the display screen 104) for the user to enter on the mobile phone 150 and/or the first kiosk portion 101. For example, the first kiosk portion 101 can direct the user to make the mobile phone's Bluetooth connection discoverable, and/or can provide a Bluetooth pairing code that the user can type on the screen of the phone 150 or on the touchscreen of the first kiosk portion 101. As another example, the kiosk portion 101 can provide a Wi-Fi network name and/or password that when selected and/or entered on the user's phone 150 enables the user to wirelessly connect the device to the indicated Wi-Fi network. In other embodiments, establishing the connection can include providing a visual code or image (e.g., a QR code) for the user to scan using the mobile phone 150, such that scanning the code or image prompts the phone to connect to the kiosk's wireless network (e.g., upon user confirmation). In some embodiments, establishing the connection can include allowing a particular wireless device to join or use the wireless network or make a wireless connection. For example, when the first kiosk portion 101 detects the mobile phone 150 and determines that the device is registered for access or otherwise recognized, the kiosk portion 101 automatically wirelessly connects to the mobile phone 150 without requiring further user authentication. Once connected, the first kiosk portion 101 can perform all or a portion

of the electrical inspection and/or other steps described above via the wireless connection. In other embodiments, the user can load a mobile app onto the mobile phone 150, and the app can evaluate the electronic device and facilitate wireless communication between the mobile phone 150 and the first kiosk portion 101 to facilitate phone evaluation and purchase by the kiosk portion 101. Various systems and methods for establishing a wireless connection between the kiosk 100 and a mobile phone or other electronic device of a user are described in at least some of the patents and/or patent applications incorporated herein by reference in their entireties. In other embodiments, wireless connections between the kiosk 100 and mobile phones and other electronic devices can be established using other suitable means known in the art.

[0045] As noted above, in some embodiments, the user can load a mobile app onto the mobile phone 150, and the app can evaluate the electronic device and/or facilitate wireless communication between the mobile phone 150 and the first kiosk portion 101 to facilitate phone evaluation and/or purchase by the first kiosk portion 101. For example, in some embodiments the user can download the app to the electronic device from an app store or other software repository (e.g., the Apple® App StoreSM, Google PlayTM store, Amazon® AppstoreTM, and so on), from a website, from the kiosk 100 (e.g., sideloading an app over a wired or wireless data connection), etc. In some embodiments, the app and/or a remote server operatively connectable to the app can perform some or all of the device electrical inspection described herein. For example, the user can use the app to price the mobile phone 150 even when the electronic device is remote from the kiosk 100. In some embodiments, the app can obtain information from the mobile phone 150 automatically. For example, the app can access mobile device information under the iOS® operating system via the Settings/General/About screen, or by using Application Programming Interfaces (APIs) available via iOS®; other operating systems provide similar access to device information. The app can obtain information necessary to identify and/or evaluate the electronic device, such as a unique identifier (e.g., an IMEI number or an MEID or equivalent number of a mobile phone, a hardware media access control address (MAC address) of a networkable device, or a model number and serial number of the electronic device); information describing the device's manufacturer (e.g., a manufacturer name or ID code), model, characteristics (e.g., storage capacity, color, carrier, and/or radio bands), capabilities, and/or condition;

and so on. Characteristic information about an electronic device can include the device make, model, and configuration. The app can store the information about the electronic device in a data structure on the electronic device (e.g., in a table maintained by the app) and/or remotely from the electronic device (e.g., in a data structure maintained at one or more of the kiosk 100, a server computer, a Cloud storage facility, etc.).

[0046] The app can also perform tests to reveal the condition of the electronic device, such as tests of processor performance, battery charging and/or capacity, memory tests for quality of the memory, test calls to confirm sufficient operation of device's radios, and so forth). The app can perform interactive tests that incorporate user feedback, such as screen tests (e.g., asking the user whether there are any cracks in the glass and/or displaying a solid color or pattern on an LCD or LED display and prompting the user to identify dead or stuck pixels in the display), and/or interactive tests that include user action such as directing the user to activate a function on the electronic device (e.g., turning on a Bluetooth radio so that the app can test the radio's function).

[0047] In some embodiments, the app can determine whether the evaluation of the mobile phone 150 is sufficient to determine a price to offer for the device, or whether the device could be in a range of possible prices. If the app determines that the evaluation is sufficient to price the mobile phone 150, then the app can present the price to the user via, e.g., the phone's screen, and/or a remote server can send the user a text message or email containing the price that the user can obtain by selling the mobile phone 150 at the kiosk 100. In some embodiments, the app can also associate a unique identifier with the electronic device 150 or the user. The identifier can be a globally unique identifier (GUID) and/or a visual identifier, such as a QR code, a bar code, or other unique code, etc. After the user is presented with the offer price for the mobile phone 150, the user may elect to bring the phone 150 to the kiosk 100 for recycling. At the kiosk 100, the user can input the unique identifier of the electronic device and/or user identification. For example, when the user electrically connects the electronic device to the kiosk 100 (via, e.g., one of the wired connectors 142, or by a wireless connection), the kiosk 100 can detect the electronic device via the connection. Based on the type of the electronic device and/or the type of connection, the kiosk 100 can electrically query the electronic device to receive the unique identifier of the device. As another example, the kiosk 100 can prompt the user to enter the

unique identifier at the touch screen 104 of the first kiosk portion 101. The kiosk 100 can then use the unique identifier to retrieve stored information about the mobile phone 150 obtained by the app. In some embodiments, the kiosk 100 automatically retrieves information previously submitted about the mobile phone 150, such as information that the user submitted via the app, from the memory of the phone 150, and/or from a remote database. In some embodiments, the information can be retrieved from a remote stored location, and in other embodiments the information can be retrieved directly from the mobile phone 150 via, e.g., a wireless connection. After retrieving the information about the mobile phone 150 that was obtained via, e.g., the app, the first kiosk portion 101 can evaluate the phone 150 based at least in part on the information, and/or the first kiosk portion 101 can compare the information with information about the phone 150 obtained directly at the kiosk 100. For example, in some embodiments the first kiosk portion 101 can electrically query the mobile phone 150 (via a wired or wireless connection) as described above to confirm that the information received directly from the mobile phone 150 in response to the query corresponds to the information received via the app. After confirming the information about the mobile phone 150, the first kiosk portion 101 can proceed as described above to confirm a purchase price for the phone 150 and/or perform other portions of the phone purchase processes described herein. Various systems and methods for evaluating the mobile phone 150 with a mobile app and utilizing an app to facilitate device evaluation and purchase are described in at least some of the patents and/or patent applications incorporated herein by reference in their entireties.

[0048] Returning to Figure 1A, in another aspect of this embodiment the second kiosk portion 102 includes a plurality of vending units 132a-f, a display 134, a plurality of data transfer units or compartments 136a,b, a cleaning compartment 138, and a supply compartment 139. As described in greater detail below, each of the vending units 132 can be configured to hold and vend one or more mobile phones. In some embodiments, the vending units 132a-f can be positioned behind a transparent front cover or panel 133 that is positioned above an access door 135 through which users can access purchased phones. To accommodate urban areas where retail space is at a premium, the second kiosk portion 102 can be relatively tall and narrow, and each of the vending units 132 can similarly be relatively narrow. For example, in some

embodiments the individual vending units 132 can be about 3 inches wide and can carry up to six mobile phones each.

[0049] In another aspect of the illustrated embodiment, the display 134 can be positioned below the vending units 132 to comply with ADA requirements, and can include, for example, a display screen for displaying graphical and textual prompts to users to facilitate use of the second kiosk portion 102. Additionally, the display 134 can also include, for example, a touch screen for receiving user input and responses to display prompts. The second kiosk portion 102 can further include a key pad and/or other user input devices (e.g., fingerprint reader(s), optical scanners, etc.) for receiving user input.

[0050] As described in further detail below, each of the data transfer compartments 136 includes means for transferring data from one mobile phone (e.g., an old mobile phone that a user wishes to sell via the first kiosk portion 101) to another mobile phone (e.g., a new mobile phone). The second kiosk portion 102 can include two or more data transfer compartments 136 so that multiple users can use the second kiosk portion 102 to transfer data at the same time. In some embodiments, the cleaning compartment 138 can include an ultraviolet light source and/or other devices for cleaning mobile phones. In some embodiments, the supply compartment 139 can carry supplies that a user may access to facilitate a purchase or sale of a mobile phone. For example, in some embodiments the supply compartment 139 can include a plurality of pre-addressed shipping pouches that users can use to securely send their phone (e.g., an old mobile phone) to an operator of the system 100 for evaluation and sale.

[0051] Figure 2 is a front view of a kiosk 200 for purchasing or recycling "old" mobile phones and other electronic devices from consumers, selling (e.g., vending) "new" devices to consumers, and/or performing other processes associated with such devices and transactions, in accordance with other embodiments of the present technology. In some embodiments, the kiosk 200 is essentially the same in structure and function as the kiosk 100 described above with reference to Figure 1A, except that the first kiosk portion 101 and the second kiosk portion 102 are integrated into a single housing 203. Accordingly, in some embodiments the kiosk 200 can include a first kiosk portion 201 having all, or at least substantially all, of the functionality provided by the first kiosk portion 101 of the kiosk 100, and a second kiosk portion 202

having all, or at least substantially all, of the functionality provided by the second kiosk portion 102 of the kiosk 100.

[0052] For example, a plurality of user interface devices can be provided on a front portion of the housing 203 for providing instructions and other information to users, and/or for receiving user inputs and other information from users. For example, the first kiosk portion 201 can include a display screen 104 (e.g., a liquid crystal display (LCD), etc.) for providing information, prompts, etc. to users to facilitate use of the first kiosk portion 201. The display screen 204 can include a touch screen for receiving user input and responses to displayed prompts. The first kiosk portion 201 can further include an ID reader or scanner (e.g., a driver's license scanner), a fingerprint reader, and one or more cameras (e.g., digital still and/or video cameras), that are at least generally similar in structure and function to the scanner 112, fingerprint reader 114, and cameras 116 described in detail above with reference to Figure 1A. Similarly, the first kiosk portion 201 can also include output devices such as a label printer, a cash dispenser, and/or other functionality described above with reference to Figure 1A to facilitate purchasing a mobile phone from a user. In addition to the user interface devices described above, the first kiosk portion 201 also includes an access panel or door 106 located directly beneath the display screen 104. As described in detail above with reference to Figures 1A-1E, the access door 106 is configured to automatically retract (open) so that the user can place electronic device in an inspection area 108 for automatic inspection by the kiosk 200. As will be clear from the foregoing discussion, the first kiosk portion 201 can include all, or at least substantially all, of the apparatus, structures, and functions the first kiosk portion 101 includes for purchasing a phone from a user as described above with reference to Figures 1A-1E.

[0053] Turning next to the second kiosk portion 202, in some embodiments this portion of the kiosk 200 can include all, or at least substantially all, of the structures and functions provided by the second kiosk portion 102 described above with reference to Figure 1A. For example, this portion of the kiosk 200 can include a plurality of vending units 132a-f and a display 134 (e.g., a GUI), that are at least generally similar in structure and function, or the same in structure and function, as the vending units 132a-f and the display 134, respectively, described in detail above with reference to Figure 1A. Additionally, the second kiosk portion 202 can further include one or more data transfer compartments 136a, b and a cleaning compartment 138 that are at least generally

similar in structure and function, or identical, to the data transfer compartment 136 and the cleaning compartment 138, respectively, described in detail above with reference to Figure 1A.

[0054] Figure 3 is an enlarged, partially schematic side view of a plurality of the vending units 132 configured in accordance with embodiments of the present technology. Each of the vending units 132 can be at least generally similar in structure and function, and each can include a dispensing apparatus 348. In the illustrated embodiment, the dispensing apparatus 348 includes a rotatable dispenser 349 operably coupled to a drive mechanism (e.g., an electric motor; not shown). The dispenser 349 is in the shape of a horizontally oriented coil or helix that is rotatably supported on a proximal end and supports a plurality of product packages 340. Each of the product packages 340a-f carries a corresponding mobile phone 330a-f and, in some embodiments, ancillary equipment such as a recharging cable, SIM card tool, etc. In some embodiments, the phones 330 can be used phones that have been purchased from prior owners and processed for resale (e.g., personal data erased from memory) and/or brand-new phones. In some embodiments, the front cover 133 of the vending units 132 can be formed from plexiglass or some other transparent material that enables users to view the product packages 340 and see which mobile phones are available from the kiosk at any given time. In operation, the drive mechanism rotates the dispenser 349 about the longitudinal axis to advance the product packages 340 forward in response to user selections. When a selected product package 340 (e.g., the package 340a) gets to the end of the corresponding vending unit slot, it falls into an outlet tray 342. The user can then push the access door 135 inwardly as shown by the dashed lines in Figure 3 to retrieve the product package 340a. In other embodiments, other types of suitable conveyor devices known in the art can be used to selectively vend the product packages 340. Such devices can include, for example, conveyor belts, robot arms, etc. Additionally, in some embodiments the last product package 340 in each vending unit can be an empty package that never gets vended. This way customers will always see what appear to be "products" in the kiosk, instead of empty spaces.

[0055] The vending units 132 described above are but one example of suitable vending systems and structures that the second kiosk portion 102, 202 can include for displaying, dispensing, and/or vending phones and/or other consumer

electronic devices. In other embodiments, for example, the second kiosk portion 102, 202 can include a plurality of individual vending compartments or units having product support surfaces that are angled downwardly toward an outlet. Each of the units can hold one or more phones or other devices in, e.g., individual packages that are viewable to users. Each compartment can include a mechanism (e.g., a solenoid-driven release pin) configured to release a selected package when the corresponding product has been purchased by a user, thereby enabling the package to slide down the angled surface to the outlet for retrieval by the user.

[0056] As described in greater detail below with reference to Figure 6, in some embodiments each of the vending units 132 can include one or more cable carriers 358 carrying one or more electrical cables 356. Each of the cables 356 can include a corresponding connector 354 that connects to one of the mobile phones 330 in its respective product package 340. As described in greater detail below, providing an electrical connection to each of the mobile phones 330 in the dispensing units 132 can enable the kiosk 100, 200 described above to effect a data transfer between a user's old phone and a newly selected phone 330 (e.g., the phone 330f) while the newly selected phone 330 is still held within the corresponding dispensing unit 132 and the old phone is contained in, for example, the inspection area 108 of the first kiosk portion 101, 201 and connected to the electrical connector 142. In some embodiments, the cable carriers 358 can include, e.g., spring-loaded and/or electromechanically driven spools and/or other devices configured to retract the cables 356 and/or otherwise unplug the connectors 354 from the respective phones 330 just prior to the phones being dispensed, and/or during the dispensing process.

[0057] Figure 4 is an enlarged, partially schematic isometric view of one of the data transfer compartments 136 configured in accordance with embodiments of the present technology. In the illustrated embodiment, the data transfer compartment 136 can include a lockable door 450 that, when opened (with, e.g., an appropriate code), enables a user to place two or more mobile phones in the interior of the compartment. For example, in the illustrated embodiment the data transfer compartment 136 contains a new mobile phone 330 that the user purchased via one of the vending units 132, and an old mobile phone 150 (e.g., a mobile phone the user wishes to sell via the first kiosk portion 101, 201). The interior of the data transfer compartment 136 can include a first connector head 452a and a second connector head 452b. Each of the connector heads

452 can carry a plurality of electrical cables having corresponding connectors 454a-c. For example, in some embodiments each of the connector heads 452 can carry connectors suitable for connecting to each of the commercially available types of mobile phones, such as iPhones, Android phones, etc.

[0058] To transfer data from the old phone 150 to the new phone 330, the user opens the door 450 and positions the old phone 150 inside the data transfer compartment 136 and connects it to the appropriate cable connector 454. The user then does the same with the new phone 330 (and, if needed, turning the new phone on) and closes the door 450. As described in greater detail below, the user then initiates the data transfer process by inputting (via, e.g., the display 134) appropriate selections (e.g., selections of data the user wishes to transfer to the new phone 330, such as contacts, photos, apps, etc.) via the display 134 of the second kiosk portion 102, 202, and the door 450 is automatically locked with a suitable mechanism (not shown). The user can then define or be given (via, e.g., the display 134) a unique code that must be entered (via, e.g., the display 134) before the user can reopen the door 450 and remove the devices. After locking the door, the second kiosk portion processor transfers selected data (e.g., contacts, photos, settings, applications, etc.) from the old phone 150 to the new phone 330 (and/or deletes/erases selected data from the old phone 150) using data transfer methods known in the art and/or described in one or more of the patents and/or applications incorporated herein by reference in their entirety. For example, in some embodiments the kiosk processor can be configured to transfer the data directly from the old phone 150 to the new phone 330, or to a temporary storage device, to Cloud storage, etc., and then to the new phone 330. In some embodiments, the kiosk processor can transfer the data from the mobile phone 150 over a network to a server for storage in a database and eventual retrieval by the user for download to the new phone 330. In other embodiments, the new phone 330 (and/or the mobile phone 150) can include a preloaded software application (a preloaded app) that can facilitate the data transfer from the mobile phone 150 to the new phone 330. In some embodiments, the user may also manually transfer their SIM card from the old phone 150 to the new phone 330 to, e.g., activate the new phone 330 prior to the data transfer. In other embodiments, wireless connectivity devices can be used to facilitate data transfer between the old phone 150 and/or the new phone 330.

[0059] In some embodiments, data can also be erased from the mobile phone 150. For example, a kiosk processor can be configured to instruct the mobile phone 150 to erase all personal data (e.g., photos, contacts, etc.) from the phone. Other data, such as operating software for the phone, is not erased. If the data is to be transferred to a remote database for storage, a kiosk processor can be configured to transfer the data from the mobile phone 150, through the kiosk 100, 200, and over a network to a server for storage in a database for eventual retrieval by the owner of the device for, e.g., downloading to a new device. Once the data transfer is complete, the user can input the unique code to open the door 450 and retrieve the phones.

[0060] Figure 5 is an enlarged, partially schematic isometric view of the cleaning compartment 138 of the second kiosk portion 102, 202 described above. In the illustrated embodiment, the cleaning compartment 138 includes an interior portion having one or more ultraviolet (UV) light sources 556. To clean an old phone 150, the user can open the door 550 and place the old phone inside the cleaning compartment 138. The user can then start the cleaning process by pressing an appropriate button or similar manual control adjacent the cleaning compartment 138, or an icon on the display 134, which turns the UV light source 556 on to clean the phone 150. After a sufficient period of time and the phone is clean, the UV light source 556 turns off and an audible or visual signal can let the user know that they can retrieve the phone 150 from the cleaning compartment 138.

[0061] Figure 6 is an enlarged, partially schematic isometric view of the product package 340 configured as it would be when contained within one of the vending units 132 described above with reference to Figure 3. In the illustrated embodiment, the product package 340 can be a paper (e.g., cardboard) box configured to enclose a mobile phone 330 and having an opening 642 through which the cable 356 can be connected to the mobile phone 330. As described above, providing an electrical connection between the second kiosk portion 102, 202 and the mobile phone 330 while the mobile phone 330 is in the vending unit 132 enables the kiosk to transfer data from, for example, an old phone to the mobile device 330 after it has been selected and paid for by the user, but before it has been dispensed to the user. In other embodiments, the cable connection can also enable the kiosk to keep the phone 330 charged, and/or to load other data, applications, etc. onto the phone 330 before it is dispensed to a customer. In another aspect of this embodiment, the product package 340 can include

a compartment that contains ancillary equipment for use with the mobile phone 330. Such equipment can include, for example, a recharging cable 660 and/or a SIM card removal tool 662, etc.

[0062] Figure 7 provides a schematic representation of an architecture of the kiosk 100, 200 in accordance with embodiments of the present technology. In the illustrated embodiment, the first kiosk portion 101, 201 includes a suitable processor or central processing unit (CPU) 700 that controls operation of the first kiosk portion 101, 201 as described above in accordance with computer-readable instructions (e.g., non-transitory computer-readable instructions) stored on system memory 706. The CPU 700 may be any logic processing unit, such as one or more CPUs, digital signal processors (DSPs), application-specific integrated circuits (ASICs), etc. The CPU 700 may be a single processing unit or multiple processing units in an electronic device or distributed across multiple devices. The CPU 700 is connected to the memory 706 and may be coupled to other hardware devices, for example, with the use of a bus (e.g., a PCI Express or Serial ATA bus). The CPU 700 can include, by way of example, a standard personal computer (PC) (e.g., a DELL® OptiPlex® 7010 PC) or other type of embedded computer running any suitable operating system, such as Windows®, Linux®, Android™, iOS®, or an embedded real-time operating system. In some embodiments, the CPU 700 can be a small form factor PC with integrated hard disk drive (HDD) or solid-state drive (SSD) and universal serial bus (USB) or other ports to communicate with the other components of the kiosk portion 101. In other embodiments, the CPU 700 can include a microprocessor with a standalone motherboard that interfaces with a separate HDD. The memory 706 can include read-only memory (ROM) and random access memory (RAM) or other storage devices, such as disk drives or SSDs, that store the executable applications, test software, databases and other software required to, for example, control kiosk components, process electronic device information and data (to, e.g., evaluate device make, model, condition, pricing, etc.), communicate and exchange data and information with remote computers and other devices, etc.

[0063] The CPU 700 can provide information and instructions to kiosk users via the display screen 104 and/or an audio system (e.g., a speaker) 704. The CPU 700 can also receive user inputs via, e.g., a touch screen 708 associated with the display screen 104, a keypad with physical keys, and/or a microphone 710. Additionally, the CPU 700 can receive personal identification and/or biometric information associated

with users via the ID reader 112, one or more of the external cameras 116, and/or the fingerprint reader 114. In some embodiments, the CPU 700 can also receive information (such as user identification and/or account information) via a card reader 712 (e.g., a debit, credit, or loyalty card reader having, e.g., a suitable magnetic stripe reader, optical reader, etc.). The CPU 700 can also control operation of the label dispenser 110 and systems for providing remuneration to users, such as the cash dispenser 118 and/or a receipt or voucher printer and an associated dispenser 720.

[0064] As noted above, the first kiosk portion 101, 201 additionally includes a number of electronic, optical and electromechanical devices for electrically, visually and/or physically analyzing electronic devices placed therein for recycling. Such systems can include one more internal cameras 714 for visually inspecting electronic devices for, e.g., determining external dimensions and condition, and one or more of the electrical connectors 142 (e.g., USB connectors) for, e.g., powering up electronic devices and performing electronic analyses. As noted above, the cameras 714 can be operably coupled to the upper and lower chambers 160 and 162, and the connectors 142 can be movably and interchangeably carried by the carrousel 140 (Figures 1B–1E). The first kiosk portion 101, 201 further includes a plurality of mechanical components that are electronically actuated for carrying out the various functions of the kiosk portion 101, 201 during operation. The mechanical components 718 can include, for example, the inspection area access door 106 and one or more of the movable components (e.g. the inspection plate 144, the upper and lower chambers 160 and 162, etc.) operably disposed within the inspection area 108 (Figure 1A). The kiosk portion 101 further includes power 702, which can include battery power and/or facility power for operation of the various electrical components associated with kiosk operation.

[0065] In the illustrated embodiment, the first kiosk portion 101, 201 further includes a network connection 722 (e.g., a wired connection, such as an Ethernet port, cable modem, FireWire cable, Lightning connector, USB port, etc.) suitable for communication with, e.g., all manner of processing devices (including remote processing devices) via a communication link 750, and a wireless transceiver 724 (e.g., including a Wi-Fi access point; Bluetooth transceiver; near-field communication (NFC) device; wireless modem or cellular radio utilizing GSM, CDMA, 3G and/or 4G technologies; etc.) suitable for communication with, e.g., all manner of processing devices (including remote processing devices) via the communication link 750 and/or

directly via, e.g., a wireless peer-to-peer connection. For example, the wireless transceiver 724 can facilitate wireless communication with electronic devices, such as an electronic device 730 (and/or the mobile devices 150 and 330) either in the proximity of the kiosk portion 101, 201 or remote therefrom. In the illustrated embodiment, the electronic device 730 is depicted as a handheld device, e.g., a mobile phone. In other embodiments, however, the electronic device 730 can be other types of electronic devices including, for example, other handheld devices; PDAs; MP3 players; tablet, notebook and laptop computers; e-readers; cameras; desktop computers; TVs; DVRs; game consoles; Google® Glass™; smartwatches; etc. By way of example only, in the illustrated embodiment the electronic device 730 can include one or more features, applications and/or other elements commonly found in smartphones and other known mobile devices. For example, the electronic device 730 can include a CPU and/or a graphics processing unit (GPU) 734 for executing computer readable instructions stored on memory 736. In addition, the electronic device 730 can include an internal power source or battery 732, a dock connector 746, a USB port 748, a camera 740, and/or well-known input devices, including, for example, a touch screen 742, a keypad, etc. In many embodiments, the electronic device 730 can also include a speaker 744 for two-way communication and audio playback. In addition to the foregoing features, the electronic device 730 can include an operating system (OS) 731 and/or a device wireless transceiver that may include one or more antennas 738 for wirelessly communicating with, for example, other electronic devices, websites, and the first kiosk portion 101, 201. Such communication can be performed via, e.g., the communication link 750 (which can include the Internet, a public or private intranet, a local or extended Wi-Fi network, cell towers, the plain old telephone system (POTS), etc.), direct wireless communication, etc.

[0066] In the illustrated embodiment, the second kiosk portion 102, 202 can include a suitable processor or CPU 701 that controls operation of the second kiosk portion 102, 202 as described above in accordance with computer readable instructions (e.g., non-transitory computer readable instructions) stored on system memory 768. The CPU 701 may be a single processing unit or multiple processing units in an electronic device or distributed across multiple devices. In some embodiments, the CPU 701 and the CPU 700 can be operably connected to each other to perform the various methods described herein, exchange data and information, share processing

tasks, etc. In other embodiments, the processors 701 and 700 can be combined into a single processing device. The CPU 701 can provide information and instructions to kiosk users via the display 134. The processor 701 can also be operably connected to and control operation of the dispense mechanism 348 (e.g., the dispenser drive mechanism), the cable carriers 358, and the device connectors 354 in the vending units 132; the data transfer system, device connectors 454, and the access door 450 of the data transfer compartments 136; and the UV light source 556 in the cleaning compartment 138. In some embodiments, the second kiosk portion 102, 202 can further include a network connection 762 (e.g., a wired connection, such as an Ethernet port, cable modem, etc.) suitable for communication with e.g., the first kiosk portion 101, 201, and all manner of other processing devices via, e.g., the communication link 750. Additionally, the second kiosk portion 102, 202 can further include a wireless transceiver 764 (e.g., a Wi-Fi access point; Bluetooth transceiver; near-field communication (NFC) device, etc.) suitable for communication with, e.g., all manner of processing devices (including remote processing devices) via the communication link 750 and/or directly via e.g., a wireless peer-to-peer connection.

[0067] Unless described otherwise, the construction and operation of the various components shown in Figure 7 are of conventional design. As a result, such components need not be described in further detail herein, as they will be readily understood by those skilled in the relevant art. In other embodiments, the first kiosk portion 101, 201 and/or the electronic device 730 (150, 330) can include other features that may be different from those described above. In still further embodiments, the first kiosk portion 101, 201 and/or the electronic device 730 (150, 330) can include more or fewer features similar to those described above.

[0068] Figures 8A and 8B are flow diagrams of a routine 800 for operating the kiosk 100, 200 in accordance with embodiments of the present technology. In some embodiments, all or portions of the routine 800 can be performed by the processor 700 and/or the processor 701 described above with reference to Figure 7, in accordance with computer-readable instructions stored on the memory 706 and/or the memory 768. Referring first to Figure 8A, the routine begins when a user approaches the kiosk and selects a desired transaction. For example, the user may approach the kiosk 100, 200 and indicate (via, e.g., interactions with the display 104) that the user wishes to sell an

electronic device that the user currently owns (e.g., a mobile phone), and/or the user may indicate that they wish to purchase a new device.

[0069] In decision block 802, the routine determines if the user wishes to sell their old device. If so, then the first kiosk portion 101, 201 proceeds to receive, evaluate and purchase the old device from the user as described in detail above with reference to, e.g., Figures 1A-1E. If the user does not wish to just sell their old device, the routine proceeds to decision block 804 and determines if the user wishes to just buy a new device. If so, the second kiosk portion 102, 202 can vend a selected mobile phone to the user as described in more detail below. If the user does not wish to only buy a new device, the routine proceeds to decision block 806 to determine if the user instead wishes to upgrade an old device by selling the old device and purchasing a new device via the kiosk.

[0070] If the user does not select one of the available options, the routine returns to decision block 802 and repeats. Conversely, if the user wishes to sell their current phone and purchase a new one, the routine proceeds to block 810 and receives the old device from the user in the inspection area 108 of the first kiosk portion 101, 201. In block 812, the kiosk establishes a digital connection to the old device via, e.g., a wireless connection or a cable connection, and then evaluates the old device in block 814. After the device has been evaluated for make, model, functionality, and/or condition, etc., the routine proceeds to block 816 and the kiosk displays an offer for the old device via, e.g., the display screen 104. If the user rejects the offer or otherwise indicates that they do not wish to continue with the transaction, the routine returns the old device to the user and the routine ends. In some embodiments, the kiosk functions associated with blocks 810, 812, 814 and 816 can be substantially equivalent to the corresponding kiosk functions described in detail above with reference to Figures 1A-1E.

[0071] In some embodiments, after the kiosk portion 101, 201 makes the user an offer for their old phone, the kiosk portion 101, 201 can also make a recommendation to the user as to which new phone the user should purchase. For example, if the first kiosk portion 101, 201 determines (e.g., using one or more of the internal cameras, a cable, and/or a wireless connection) that the old phone is a 32 GB black iPhone 7, the first kiosk portion 101, 201 might suggest that the use purchase a

32GB black and gray iPhone 8 and/or an iPhone 8 plus (or iPhone 10, 11, etc.) from the second kiosk portion 102, 202. Additionally, if the first kiosk portion 101, 201 determines that the user has, for example, 45GB of photos and videos stored on their old device, the first kiosk portion 101, 201 could suggest to the user to purchase a new phone with 64GB storage space, versus a phone with 512GB. In some embodiments, after presenting a purchase offer to the user for the old device and receiving an indication of acceptance or a desire to otherwise proceed with the transaction, the routine can proceed to block 818 and return the old device to the user for further operations as described below. In other embodiments as described below, the first kiosk portion 101, 201 can retain the user's old device and proceed to block 820.

[0072] In block 820, the routine receives a selection from the user of a new device the user wishes to purchase from the second kiosk portion 102, 202. For example, the kiosk may present a list of available mobile phones and associated prices, specifications, etc. on the display 134, and the user can select a desired phone via the associated touch screen. Alternatively, the user may simply view the contents of the dispensing units 132 to determine if a desired make and model of phone is available, and if so, make an appropriate selection via the touch screen. Alternatively, in other embodiments the user can use their mobile phone or other web-enabled device to check the inventory of mobile phones available at the different kiosks in the network of kiosks. That way, the user can confirm that a particular kiosk 100, 200 has the phone they want before making a trip to the kiosk. In further embodiments, if a particular kiosk does not have a desired phone in inventory, it can refer the user to the closest kiosk in the network that does have the desired phone.

[0073] In decision block 822, the routine determines if the selected device is available in one of the dispensing units 132 (Figures 1A, 2 and 3). If not, the routine proceeds to block 824 and offers (e.g., via the display 104 or 134) to mail the user the selected phone. If the user declines the offer to receive the new phone by mail, the routine ends. If not, the routine continues to block 826 and displays the price of the new phone to the user via, e.g., the display 134 of the second kiosk portion 102, 202.

[0074] Turning next to Figure 8B, in decision block 828 the routine determines if the kiosk has received payment from the user for the new mobile phone. In some embodiments, for example, the user can pay for the new mobile phone via a

cash acceptor and/or a credit/debit card acceptor on the first kiosk portion 101, 201 and/or the second kiosk portion 102, 202. If the kiosk is unable to confirm that payment for the new device has been received, the routine ends. Alternatively, if payment is confirmed the routine proceeds to block 830 and the second kiosk portion 102, 202 dispenses the new mobile phone to the user via the corresponding vending unit 132.

[0075] After receiving the new device, the user can remove it from its product package 340 (Figures 3 and 6) and inspect the device. By "new" device it should be understood that, in some embodiments the new device may be a brand-new device, and in other embodiments the new device may actually be a used device that was purchased from a previous owner or other source and refurbished or repaired for resale. Accordingly, the user may wish to inspect the new device to make sure that they find it acceptable. In decision block 832, the routine determines if the user accepts the new device via, e.g., an appropriate user input via the touch screen on the display 134. If not, the routine proceeds to block 834 and receives the new device back from the user. For example, if the user decides not to accept the new device, the user can place the new device in the inspection area 108 of the first kiosk portion 101, 201 and connect it to the first kiosk portion 101, 201 via a cable connector or suitable wireless connection, as shown in block 836. In block 838, once the returned device has been suitably connected, the routine verifies that the new returned device is in fact the same device that was previously dispensed to the user. If so, the routine proceeds to block 840 and dispenses a refund to the user. It should be understood that "dispensing" a refund includes initiating a credit or other form of electronic payment and does not necessarily require that a tangible form of payment (e.g., cash or a redeemable voucher) be dispensed from the kiosk. After block 840, the routine ends.

[0076] Returning to decision block 832, if the user accepts the new device the routine proceeds to block 842 and receives a unique code from the user. The unique code can be, for example, a unique four-digit code that the user provides the kiosk for subsequent use by the user to identify themselves to the kiosk to, for example, access the data transfer compartment 136 and retrieve their new phone. After block 842, the routine can proceed in one of two ways. In a first embodiment, if the old phone was returned to the user in block 818 after it was evaluated and priced by the first kiosk portion 101, 201, then the routine can proceed to block 844 and receive the old phone from the user in one of the data transfer compartments 136 of the second kiosk portion

102, 202. In block 846, after placing the old mobile phone in the transfer compartment 136, the user connects the old phone to the appropriate cable connector 454, as shown in Figure 4. In block 848, the user also places the new phone in the data transfer compartment 136, and in block 850 the user connects the new phone to an appropriate connector 454. In a second embodiment, if the user's old phone was retained in the inspection area 108 of the first kiosk portion 101, 201 (and connected to the appropriate connector 142) after block 816, the routine proceeds directly from block 842 to block 848 and receives only the new device in the data transfer compartment 136. In block 850, the user connects the new device to the appropriate cable connector 454 as shown in Figure 4. After block 850, the routine proceeds to block 852 and closes and locks the door 450 on the data transfer compartment 136.

[0077] In block 854, the routine determines the amount of data stored on the old device. The amount of data can be determined by the first kiosk portion 101, 201 when the old device is in the inspection area 108, or by the second kiosk portion 102, 202 if the old device has been positioned in the data transfer compartment 136. The type and size of this data can be communicated to the user via the display 134, and in block 856 the user can select which of this data (e.g., contacts, photos, mobile apps, settings, etc.) the user wishes to have transferred from their old device to their new device. Once the kiosk 100, 200 receives this information, the kiosk can determine or estimate the amount of time it will take to transfer the data and display the time estimate to the user in block 858. For example, if it will take approximately two hours for the kiosk to complete the data transfer, the kiosk can inform the user of this and suggest that the user instead backup the desired files from their old phone at home, and then return to the kiosk when their old phone is clean to avoid having to wait. If instead the user elects to wait while the data is transferred, the routine proceeds to block 860 and transfers the selected data from the old device to the new device via the respective kiosk connections. Once the data transfer is complete, the kiosk can notify the user by either displaying a message on the display 134, and/or by sending the user a text, email, and/or other electronic message via, e-mail, text, etc. to the mobile device of a friend or another processing device of the user to inform them that the data transfer is complete.

[0078] As described above, the kiosk 100, 200 can transfer data from an old device to a new device in at least two different ways. In one method the user retrieves

their old device from the first kiosk portion 101, 102 after it has been evaluated and priced, and then places the old device in the data transfer compartment 136 along with the new device and connects the two devices as described above. The data transfer between the two devices then occurs via the data transfer compartment 136 as described above. In the other method described above, the first kiosk portion 101, 201 retains the old device and the data transfer occurs between the old device in the inspection area 108 of the first kiosk portion 101, 201 and the new device positioned in the data transfer compartment 136 of the second kiosk portion 102, 202. In yet other embodiments, the data transfer from the old device to the new device can occur while the new device is still held within the corresponding dispensing unit 132 and connected to the cable 356 (Figures 3 and 6) and the old phone is contained in, for example, the inspection area 108 of the first kiosk portion 101, 201 and connected to the appropriate electrical connector 142. Of course, in this embodiment the new device would not be dispensed to the user as shown in block 830 until after the data transfer has been completed.

[0079] In other embodiments, the first kiosk portion 101, 201 can inform the user how long it will take to transfer their data from the old phone to a new phone before the user purchases a new phone from the second kiosk portion 102, 202. For example, returning to block 814, when the old phone is in the inspection area 108 and connected to the first kiosk portion 101, 201 (via, e.g. a wireless connection or a wired connector), the first kiosk portion 101, 201 can query the old phone for the types and sizes of data stored thereon, and display the required backup times to the user via the display 104. By way of example only, in one embodiment the kiosk can display this information as follows:

- a. Backup Contacts: 3 min
- b. Backup Photos: 1:15 hours
- c. Backup Videos: 1:21 hours
- d. Total Backup Time: 2:39 hours

[0080] By informing the user of backup times in this manner before they buy a new phone, the user can decide what data to transfer and whether they have the time to wait at the kiosk 100, 200 for the backup to be performed. If not, the user can go

home, to their office, etc. and backup the data themselves, and then return to the kiosk and purchase a new phone without having to wait to have their data backed up. This can prevent the user from being caught off guard if they were expecting to purchase a new phone and then be on their way, only to learn that they have to wait around for their data to transfer after they purchased the new phone.

[0081] In another embodiment, to save time the user may opt to do a partial backup of the data on their old phone (e.g., one or more of the smaller files, such as contacts) while at the kiosk 100, 200, and then backup larger files (e.g., photos, videos, etc.) at home or at another location later. Alternatively, if the user is selling their old phone at the kiosk 100, 200, the user may opt to backup larger files at home or at another location prior to visiting the kiosk, and then backup other data (e.g., one or more of the smaller files) while at the kiosk 100, 200. In these embodiments, the smaller files or file (e.g., contacts) from the old phone are pushed to a database (e.g., a remote database, such as Cloud storage, hard disk, etc.) by, e.g., the first kiosk portion 101, 201 when the old phone is being evaluated, or by the second kiosk portion 102, 202 via one of the data transfer compartments 136. The user then purchases a new phone via the second kiosk portion 102, 202, and runs a pre-loaded application program ("app") installed on the new phone to automatically retrieve the contacts or other "small" data from the database and load it onto the new phone.

[0082] Turning momentarily to Figures 10A and 10B, these figures are partially schematic side views of a data transfer compartment (or "locker") 1036 configured in accordance with another embodiment of the present technology, and Figure 10C is a partially schematic top view of an electrical connector disengagement device 1056 configured in accordance with a further embodiment of the present technology. In some embodiments, the kiosk 100, 200 can include the data transfer compartment 1036 for transferring large data files from an old phone to a new phone in an efficient manner. The data transfer compartment 1036 can include a plurality of cables 1052 with corresponding connectors 1054 (e.g., at least one connector for each type of phone connector receptacle) and/or wireless connection devices for connecting the old phone (e.g., the mobile phone 150) to the second kiosk portion 102, 202. (In other embodiments, there can be multiple such data transfer compartments 1036, each having a connector or connectors 1054 configured for one type of phone/connector receptacle.) The user connects the appropriate cable connector 1054 to the old phone

150, places the old phone 150 in the corresponding data transfer compartment 1036, and closes a door 1050 which is on the front side of the second kiosk portion 102, 202 and accessible to the user. The user can then leave the kiosk 100, 200, and the second kiosk portion 102, 202 will push the larger data files (e.g., the files other than contacts) to the database. When the backup to the database is complete, the old phone 150 can be left in the transfer compartment 1036 until it is retrieved by kiosk service personnel or, in some embodiments, by the user.

[0083] Alternatively, in other embodiments the data transfer compartment 1036 can be configured to automatically transfer old phones into an associated storage bin after the data transfer, so that the compartment can be used by another customer as soon as the data transfer is complete. For example, as shown in Figures 10B and 10C, in some embodiments a floor portion 1040 of each data transfer compartment 1036 can be sloped to form a chute, and an end portion of the cable 1052 can include a disengagement device 1056 that includes two pivotable pushing elements. After the data transfer is complete, the device 1056 can be commanded to pivot the pushing elements inwardly, thereby pushing the phone 150 away from the connector 1054 and disconnecting the connector 1054 therefrom. This action also pushes the old phone 150 toward the rear of the compartment so that it can slide down the chute as shown in Figure 10B and into a storage bin (not shown). After the larger data files have been backed up in the database, the user can then be sent a text, email, or other message informing them that they can now run the preloaded app again to download the larger files to their new phone.

[0084] Returning to Figure 8B, regardless of the particular way that data is transferred from the old device to the new device, after the data transfer in block 860 the routine proceeds to block 862 and receives a unique code from the user. The unique code can be the unique code that the user defined earlier to provide them with secure access to their new phone in the data transfer compartment 136. In decision block 864, the routine determines if the code is correct. If not, the routine keeps the data transfer compartment 136 locked and returns to block 862 until it receives the correct code. If the routine never receives the correct code after a preset number of tries, the kiosk can display an appropriate message to the user providing, for example, a number the user can call to resolve the issue, and the routine ends. Alternatively, if the code is correct the routine proceeds to block 866 and opens the door 450 to the data transfer

compartment 136. The user can then retrieve the new device and, in those embodiments in which the old device was also placed in the data transfer compartment 136, the old device from the data transfer compartment 136.

[0085] If the old device was positioned in the data transfer compartment 136 for the data transfer described above, then the kiosk instructs the user to return the old device to the inspection area 108 of the first kiosk portion 101, 201. In block 868, the routine receives the old device from the user in the inspection area 108. Conversely, if the user left the old device in the inspection area 108 of the first kiosk portion 101, 201 for the data transfer, then the routine bypasses block 868. Either way, in block 870 the first kiosk portion 101, 201 completes the purchase of the old device in the manner described above and provides payment to the user. In some embodiments, it should be noted that the kiosk 100, 200 can apply all or a portion of the proceeds from the sale of the user's old device as a credit toward the purchase price of the new device. After block 870, the routine ends.

[0086] In some embodiments, the kiosk 100, 200 can activate new phones for wireless carrier service before or immediately after the second kiosk portion 102, 202 dispenses the phone to a user (e.g., a purchaser). For example, the user can optionally select a carrier and/or data plan (via, e.g., interactions with the display 134) when user selects a new phone for purchase from the second kiosk portion 102, 202 (see, e.g., block 820 in Figure 8A discussed above). The kiosk 100, 200 can then communicate with the selected carrier as needed (or, the kiosk operator may be the carrier) to activate the selected phone service.

[0087] Figure 9 is a schematic diagram of a suitable network environment for implementing various aspects of an electronic device recycling system 900 configured in accordance with embodiments of the present technology. In the illustrated embodiment, a plurality of the kiosks 100, 200 (identified individually as kiosks 100a, 200a–100n, 200n) can exchange information with one or more remote computers (e.g., one or more server computers 904) via the communication link 750. Although the communication link 750 can include a publicly available network (e.g., the Internet with a web interface), a private communication link, such as an intranet or other network can also be used. Moreover, in various embodiments the individual kiosks 100, 200 can be

connected to a host computer (not shown) that facilitates the exchange of information between the kiosks 100, 200 and remote computers, other kiosks, mobile devices, etc.

[0088] The server computer 904 can perform many or all of the functions for receiving, routing and storing of electronic messages, such as webpages, audio signals and electronic images necessary to implement the various electronic transactions described herein. For example, the server computer 904 can retrieve and exchange web pages and other content with an associated database or databases 906. In some embodiments, the database 906 can include information related to mobile phones and/or other consumer electronic devices. Such information can include, for example, make, model, serial number, International Mobile Equipment Identity (IMEI) number, carrier plan information, pricing information, owner information, etc. In various embodiments the server computer 904 can also include a server engine 908, a web page management component 910, a content management component 912, and a database management component 914. The server engine 908 can perform the basic processing and operating system level tasks associated with the various technologies described herein. The webpage management component 910 can handle creation and/or display and/or routing of web or other display pages. The content management component 912 can handle many of the functions associated with the routines described herein. The database management component 914 can perform various storage, retrieval and query tasks associated with the database 906, and can store various information and data such as animation, graphics, visual and audio signals, etc.

[0089] In the illustrated embodiment, the kiosks 100, 200 can also be operably connected to a plurality of other remote devices and systems via the communication link 750. For example, the kiosks 100, 200 can be operably connected to a plurality of user devices 918 (e.g., personal computers, laptops, handheld devices, etc.) having associated browsers 920. Similarly, as described above the kiosks 100, 200 can each include wireless communication facilities for exchanging digital information with wireless-enabled electronic devices, such as the electronic device 730. The kiosks 100, 200 and/or the server computer 904 are also operably connectable to a series of remote computers for obtaining data and/or exchanging information with necessary service providers, financial institutions, device manufactures, authorities, government agencies, etc. For example, the kiosks 100, 200 and the server computer 904 can be operably connected to one or more cell carriers 922, one or more device

manufacturers 924 (e.g., mobile phone manufacturers), one or more electronic payment or financial institutions 928, one or more databases (e.g., the GSMA IMEI Database, etc.), and one or more computers and/or other remotely located or shared resources associated with cloud computing 926. The financial institutions 928 can include all manner of entity associated with conducting financial transactions, including banks, credit/debit card facilities, online commerce facilities, online payment systems, virtual cash systems, money transfer systems, etc.

[0090] In addition to the foregoing, the kiosks 100, 200 and the server computer 904 can also be operably connected to a resale marketplace 930 and a kiosk operator 932. The resale marketplace 930 represents a system of remote computers and/or services providers associated with the reselling of consumer electronic devices through both electronic and brick and mortar channels. Such entities and facilities can be associated with, for example, online auctions for reselling used electronic devices as well as for establishing market prices for such devices. The kiosk operator 932 can be a central computer or system of computers for controlling all manner of operation of the network of kiosks 100, 200. Such operations can include, for example, remote monitoring and facilitating of kiosk maintenance (e.g., remote testing of kiosk functionality, downloading operational software and updates, etc.), servicing (e.g., periodic replenishing of cash and other consumables), performance, etc. In addition, the kiosk operator 932 can further include one or more computer systems with display screens operably connected to receive images from one or more cameras located at each of the kiosks 100, 200 (e.g., one or more of the cameras 116, and/or one or more of the cameras associated with the upper and lower chambers 160 and 162, as described above with reference to Figures 1A-1E). This remote viewing capability enables operator personnel to verify user identification and/or make other visual observations at the systems 100 in real-time during transactions, as described above with reference to Figure 1A. This remote viewing capability can also enable a remote evaluator to evaluate images of a mobile phone (e.g., images of the device display screen) obtained by the one or more cameras within the kiosk inspection area to grade the physical condition of the device and/or confirm that the results of the kiosk's visual inspection of the device condition as described above were accurate.

[0091] The foregoing description of the electronic device recycling system 900 illustrates but one possible network system suitable for implementing the various

technologies described herein. Accordingly, those of ordinary skill in the art with appreciate that other systems consistent with the present technology can omit one or more of the facilities described in reference to Figure 9, or can include one or more additional facilities not described in detail in Figure 9.

[0092] Figure 11A is a front view of a kiosk 1100 for purchasing electronic devices (e.g., mobile phones) from users and then selling the electronic devices to other users, in accordance with embodiments with the present technology. In some embodiments, portions of the kiosk 1100 can be at least generally similar in structure and function to the corresponding portions of the kiosks 100 and 200 described in detail above with reference to Figures 1A-10 and, accordingly, the kiosk 1100 can include many of the same, or at least generally similar, systems and components as the kiosks 100 and 200 described in detail above. For example, in the illustrated embodiment the kiosk 1100 includes a plurality of user interface devices for providing instructions and/or information to users, and/or for receiving user inputs and other information. Such user interface devices can include a display screen 104 (e.g., an LCD or LED display screen) for providing information, prompts, etc. to users. The display screen 104 can include a touchscreen for receiving user inputs and responses to displayed prompts. In addition or alternatively, the kiosk 1100 can include a separate keyboard or keypad for this purpose. The kiosk 1100 can also include an ID reader or scanner 112 (e.g., a driver's license scanner), a fingerprint reader 114, and one or more cameras 116a, b. The kiosk 1100 can additionally include output devices such as a label printer having an outlet 110, and a cash dispenser having an outlet 118. Although not identified in Figure 11A, the kiosk 1100 can further include speakers, a headphone jack, and/or other features for audibly communicating information to users, a card reader (e.g., a credit/debit card reader, loyalty card reader, etc.), a receipt/voucher printer and dispenser, a bar code reader (for reading, e.g., a bar code displayed on a mobile device), a QR code reader (for reading, e.g., QR code displayed on a mobile device), etc. In addition to the user interface devices described above, the front portion of the kiosk 1100 also includes an access panel or door 106 located directly beneath the display screen 104. As described in detail above with reference to, e.g., Figures 1A-1D, the access door 106 is configured automatically to retract so that a user can place an electronic device (e.g., a mobile phone) in an inspection area 108 for inspection and evaluation by the kiosk 1100.

[0093] In one aspect of this embodiment, the kiosk 1100 further includes an electronic device storage area 1110 in an interior portion thereof. The electronic device storage area 1110 can include a plurality of individual storage compartments 1112 (identified individually as storage compartments 1112a-1112n). The storage compartments 1112 are configured to contain electronic devices (e.g., mobile phones 1130; identified individually as mobile phones 1130a-1130n). As described in further detail below, at least a portion of the electronic devices 1130 contained in the storage area 1110 may be ready for immediate sale by the kiosk 1100. For example, in some embodiments the kiosk 1100 can include a transparent cover or panel 1133 (e.g., a plexiglass panel) that extends over a front portion of the storage compartments 1112 to enable kiosk users to view the electronic devices 1130 that are currently offered for sale by the kiosk 1100. In another aspect of this embodiment, the kiosk 1100 can also include one or more data transfer compartments 136a, b and/or a cleaning compartment 138. The data transfer compartments 136a, b and the cleaning compartment 138 can be the same, or at least generally similar, in structure and function to the corresponding compartments 136a, b and 138, respectively, described in detail above with reference to, e.g., Figures 4 and 5.

[0094] Figures 11B and 11C are partially schematic rear and top views, respectively, of the kiosk 1100 with one or more exterior panels removed for purposes of illustrating the internal components and systems of the kiosk 1100 for purchasing, processing, and/or selling mobile phones and/or other electronic devices in accordance with embodiments of the present technology. Referring first to Figure 11B, in the illustrated embodiment the inspection area 108 of the kiosk 1100 includes a transparent inspection plate 144 (e.g., a glass plate), an upper chamber 160, and a lower chamber 162. The inspection plate 144, the upper chamber 160, and the lower chamber 162 can be at least generally similar in structure and function to the corresponding components described in detail above with reference to Figures 1B-1D. Although not shown in Figure 11B, the inspection area 108 can also include the other components and systems (e.g., the connector carousel 140, wireless transceiver 724, etc.) associated with the inspection area 108 as described in detail above with reference to, e.g., Figures 1B-1D. Accordingly, the inspection area 108 is configured to receive an electronic device, e.g. a mobile phone 150, from a user via the access door 106, and perform an electrical and/or a visual inspection of the mobile phone 150 to evaluate the device for

purchase from the user. In other embodiments, other types of mobile device receiving and evaluation systems can be used with the kiosk 1100, such as the systems described in detail in U.S. Provisional Application No. 62/807,153, titled "KIOSK FOR EVALUATING AND PURCHASING USED ELECTRONIC DEVICES," filed by the applicant on February 18, 2019; U.S. Provisional Application No. 62/804,714, titled "CONNECTOR CARRIER FOR ELECTRONIC DEVICE KIOSK," filed by the applicant on February 12, 2019; U.S. Provisional Application No. 63/066,794, titled "KIOSK FOR EVALUATING AND PURCHASING USED ELECTRONIC DEVICES," filed by the applicant on August 17, 2020; U.S. Provisional Application No. 63/116,007, titled "EVALUATING AN ELECTRONIC DEVICE USING A WIRELESS CHARGER," filed by the applicant on November 19, 2020; and U.S. Provisional Application No. 63/116,020, titled "EVALUATING AN ELECTRONIC DEVICE USING OPTICAL CHARACTER RECOGNITION," filed by the applicant on November 19, 2020; each of which is incorporated herein by reference in its entirety.

[0095] In addition to the inspection area 108 and the electronic device storage area 1110, the kiosk 1100 further includes an electronic device processing system 1140, and, in some embodiments, an electronic device packaging system 160. As described above with reference to Figure 11A, the electronic device storage area 1110 includes a plurality of device storage compartments 1112a-*n* which are configured to contain mobile phones 1130 for resale to consumers via the kiosk 1100. In the illustrated embodiment, the storage area 1110 is divided into a holding portion 1114a and a display portion 1114b. The holding portion 1114a can include a plurality of individual storage compartments 1112 that are configured to hold mobile phones 1130 after they have been purchased from consumers and prior to being prepared for resale by the processing system 1140. More specifically, as described in greater detail below, in some embodiments the kiosk 1100 may be required to hold purchased mobile phones for a preset period of time (e.g., thirty days, sixty days, etc.) to comply with local second-hand dealer laws. For example, some jurisdictions may require that purchased mobile phones be held for a period of thirty days in case the mobile phone is reported as having been stolen, in which case the kiosk 1100 can retrieve the specific device from the holding portion 1114a and return it to authorities as necessary to comply with the second-hand dealer laws. On the other hand, the device compartments 1112 in the display portion 1114b can contain mobile devices 1130 that have been prepared by the

processing system 1140 and are ready for resale to consumers. For this reason, the phones 1130 in the display portion 1114b are placed behind the transparent panel 1133 (Figure 11A) so they can be viewed by prospective buyers.

[0096] In the illustrated embodiment, the processing system 1140 is configured to prepare mobile phones for resale after they have been purchased from consumers via the kiosk 1100 (and, if required, held for the requisite number of days to comply with second-hand dealer laws or other laws). For example, in the illustrated embodiment, the processing system 1140 includes a robotic finger 1144 that is operably coupled to a robotic palm 1142. As described in greater detail below, the robotic finger 1144 is configured to touch the display of a mobile phone (e.g., the mobile phone 150) to test operation of the phone, obtain device information, load apps onto the phone, and/or otherwise interact with the phone while the phone is positioned on a support surface 1145. In addition to touching the display of the mobile phone 150, the robotic finger 1144 can also press physical buttons on the phone. As shown in Figure 11C, in some embodiments the processing system 1140 can also include a cradle 1147 configured to support and/or move the mobile phone 150 on the support surface 1145. In some embodiments, the cradle 1147 can facilitate lateral, fore and aft, and/or rotational movement of the mobile phone 150 on the support surface 1145. Additionally, the processing system 1140 can also include one or more electrical connectors 1148a, b and/or one or more projecting members 1149 positioned adjacent a periphery of the support surface 1145. In some embodiments, the cradle 1147 is configured to (1) move the mobile phone 150 toward one of the connectors 1148a, b to insert the connector into a corresponding receptacle on the phone for downloading data from the phone, loading an app onto the phone, providing power to the phone, etc., via the connector 1148a, b, and/or to (2) move the mobile phone 150 toward one of the projecting members 1149 so that the projecting member 1149 can depress or otherwise actuate a corresponding button located on a side of the phone 150. In some embodiments, the cradle 1147 can be operably coupled to a suitable drive system (e.g., an electric motor, such as a stepper motor or linear motor, operably coupled to one or more gears, drive belts, linear drive screws, etc.; not shown) configured to move the cradle 1147 as described herein in response to commands from a kiosk processor.

[0097] Returning to Figure 11B, in some embodiments the robotic palm 1142 is an articulatable member or linkage rotatably mounted to or adjacent the support

surface 1145 so that the palm 1142 can rotate upwardly away from the surface for placement of the mobile phone 150 thereon. Additionally, in some embodiments the processing system 1140 can include one or more cameras 1146 positioned, e.g., above the support surface 1145, and movement of the robotic palm 1142 away from the support surface 1145 can enable the one or more cameras 1146 to obtain images of the mobile phone 150 for analysis and/or guidance and positioning of the robotic finger 1144 relative to, e.g., the mobile phone 150. Additionally, in some embodiments the processing system 1140 can further include one or more ultraviolet (UV) light sources 1151 positioned, e.g., generally above the support surface 1145. In operation, the UV light sources 1151 can project UV light onto the mobile phone 150 for cleaning as described above with reference to, for example, Figure 5. In some embodiments, the robotic palm 1142 and/or the robotic finger 1144 can be operably coupled to a suitable drive system (e.g., an electric motor, such as stepper motor or linear motor, operably coupled to one or more gears, drive belts, linear drive screws, etc.; not shown) configured to move the robotic finger 1144 and/or the robotic palm 1142 as described herein in response to commands from a kiosk processor. In other embodiments, the kiosk 1100 can include other types of operating systems to move the robotic palm 1142 and/or the robotic finger 1144 as described herein, and/or the kiosk 1100 can use other types of robotic fingers, robotic arms, and similar apparatuses. In some embodiments, for example, the robotic finger 1144 and/or the robotic palm 1142 can be at least generally similar in structure and function to one or more of the robotic devices described in the article titled "HOW WE BUILT A ROBOT FOR AUTOMATED MANUAL MOBILE TESTING", published by TestDevLab on July 24, 2017, which is incorporated herein by reference in its entirety, and is also bodily incorporated in the attached Appendix which forms part of the present disclosure. In other embodiments, the present technology can include other types of robotic fingers, robotic arms, and similar apparatuses, such as those described in U.S. Patent Application No. 13/658,828, titled "METHOD AND APPARATUS FOR RECYCLING ELECTRONIC DEVICES," which was filed on October 24, 2012; and/or those described in U.S. Provisional Application No. 62/202,330, titled "METHODS AND SYSTEMS FOR INSPECTING MOBILE DEVICES AND OTHER CONSUMER ELECTRONIC DEVICES WITH ROBOTIC ACTUATION," which was filed on August 7, 2015; both of which are incorporated herein by reference in their entireties, and are also bodily incorporated in the attached

Appendix which forms part of the present disclosure. In further embodiments, the present technology can include other types of robotic fingers, robotic arms, and similar apparatuses, including those described in one or more of the other applications and/or references bodily incorporated in the attached Appendix, which in addition to being bodily incorporated in the attached Appendix are also incorporated herein by reference in their entireties.

[0098] In some embodiments, the kiosk 1100 can further include a suitable packaging system 1160 known in the art. In some embodiments, the packaging system 1160 can receive a mobile device via an opening 1162 and place a package around the device (e.g., a cardboard package) that is suitably marked and configured for resale of the device.

[0099] In addition to the kiosk systems described above, the kiosk 1100 can further include a device transport system 1150 for moving mobile phones between the various inspection, storage, processing, packaging, and/or dispensing systems of the kiosk 1100. In the illustrated embodiment, the device transport system 1150 includes a robotic arm 1156 that is moveably coupled to a vertically-extending bridge 1152. The upper and lower end portions of the bridge 1152 are moveably coupled (e.g., via rollers, bearings, a belt, etc.) to an upper track 1154a and a lower track 1154b, respectively. In the illustrated embodiment, the robotic arm 1156 includes a gripper 1158 operably coupled to a distal end portion of an extendable member 1157. The gripper 1158 can include opposing fingers or jaws 1159a, b that can (e.g., pivotally) open and close as necessary to grip a mobile phone for movement within the kiosk 1100. The gripper 1158 can also be rotatably coupled to the extendable member 1157 at a pivot point 1155, enabling the gripper 1158 to pivot thereabout.

[0100] In operation, the bridge 1152 is configured to move horizontally back and forth (e.g., left and right) along the tracks 1154a, b. In some embodiments, one or both end portions of the bridge 1152 can be operably coupled to a suitable drive system to move the bridge 1152 back and forth along the tracks 1154a, b. The drive system can include, for example a suitable driver, such as an electric motor (e.g., a stepper motor, linear drive motor, etc.; not shown) operably coupled to the bridge 1152 via, e.g., a drive belt, drive chain, linear drive screw, rack-and-pinion, etc. The robot arm 1156 is configured to move vertically up and down along the bridge 1152, and to rotate in a

horizontal plane about the bridge 1152 as shown in Figure 11C. The extendable member 1157 is configured to extend and retract from the base of the arm 1156, and the gripper 1158 is configured to rotate about the longitudinal axis of the extendable member 1157 as well as rotate about the pivot point 1155. The ability to move the robotic arm 1156, and more particularly, the gripper 1158 in any combination of the foregoing movements enables the transport system 1150 to move mobile phones between the various processing and storage locations within the kiosk 1100, as described in greater detail below with reference to Figures 13 and 14. The robotic arm 1156, the gripper 1158, and/or the extendable member 1157 can each be operably coupled to a suitable drive system (not shown) for operation as described herein. In some embodiments, the drive systems can include one or more suitable drivers (e.g., one or more electric motors, hydraulic systems, etc.) operably coupled to the robotic arm 1156, the gripper 1158, and/or the extendable member 1157 via a suitable mechanism (e.g., a linkage, a gear system, a drive belt/chain, and/or a linear drive screw, etc.) to effect movement of the robotic arm 1156, the gripper 1158, and/or the extendable member 1157 as described herein. In other embodiments, the bridge 1152 and/or the robotic arm 1156 can be movably supported by a suitable gantry system. As those of ordinary skill in the art will appreciate, the drive systems described above for operation of the various components of the kiosk 1100 are provided by way of examples of such systems that can be used with some embodiments of the present technology. Accordingly, in other embodiments, other suitable drive/operating systems can be used without departing from the present disclosure.

[0101] Figure 12 provides a schematic representation of an architecture of the kiosk 1100 configured in accordance with embodiments of the present technology. The component architecture of the kiosk 1100 is at least generally similar in structure and function to the kiosk architecture of the kiosks 100 and 200 described in detail above with reference to, e.g., Figure 7. For example, the kiosk 1100 includes one or more processors 700 that are operably connected to the components associated with the inspection area 108, the device transport system 1150, the device processing system 1140, and the device packaging system 1160. Accordingly, the processor 700 can execute computer-readable instructions stored on system memory 706 to perform the operations of the kiosk 1100 described herein. The other components illustrated in

Figure 12 can be the same as, or at least generally similar to, the components of like reference number described in detail above with reference to, e.g., Figure 7.

[0102] Figure 13 is a flow diagram of a routine 1300 for operating the kiosk 1100 to purchase an electronic device (e.g., the mobile phone 150) from a user in accordance with embodiments of the present technology. In some embodiments, all or portions of the routine 1300 can be performed by the respective components of the kiosk 1100 in response to commands from the processor 700 of Figure 12 in accordance with computer-readable instructions stored on the memory 706. The description of the routine 1300 which follows refers to the kiosk components described above with reference to Figures 11A-C. In block 1302, the routine begins when the kiosk 1100 receives a user input (via, e.g., the display 104) indicating that the user wishes to sell an electronic device (e.g., the mobile phone 150). In block 1304, the kiosk 1100 receives the mobile phone 150 from the user in the inspection area 108, and in block 1306 the kiosk performs visual and/or electrical inspections of the mobile phone 150 as described in detail above with reference to Figures 1B-1D to identify and/or evaluate the operability and/or condition of the mobile phone 150. In block 1308, after evaluating the mobile phone 150, the kiosk presents (via e.g., the display 104) an offer price to the user for the mobile phone 150. In decision block 1310, the routine determines if the user has accepted the offer. If not, the routine proceeds to block 1312 and the kiosk returns the mobile phone 150 to the user by moving the inspection plate 144 toward the front of the kiosk 1100 and opening the access door 106. Returning to decision block 1310, if the user accepts the offer price for the mobile phone 150 (via e.g., the display 104), the routine proceeds to block 1314 and provides compensation to the user for the device. As noted above, the compensation can be in the form of cash or a voucher dispensed to the user, or financial or digital remuneration for the device that is electronically transferred to an account of the user.

[0103] After the user has been compensated for the mobile phone 150, the routine proceeds to block 1316 to move the device from the inspection area 108 to the storage area 1110. More specifically, with reference to Figures 11B and 11C, the bridge 1152 moves the robotic arm 1156 to position A which is adjacent to the inspection area 108 (Figure 11C). After adjusting the elevation of the robotic arm 1156 on the bridge 1152 so that the arm 1156 is at, or near, the elevation of the inspection plate 144, the extendable member 1157 can be retracted and the robotic arm 1156 rotated about the

bridge 1152 as necessary to align the gripper 1158 with the mobile phone 150. The extendable member 1157 can then be extended as necessary to position the gripper jaws 1159a, b about the mobile phone 150 so that they can grasp the device. The robotic arm 1156 then moves the device from the inspection area 108 to position B adjacent the storage area 1110 (Figure 11C). Once at the storage area 1110, the robotic arm 1156 positions the mobile phone 150 in one of the empty storage compartments 1112 in the phone holding portion 1114a of the storage area 1110 (e.g., the storage compartment 1112x; Figure 11B). Each of the storage compartments 1112 is associated with a particular compartment identification number or code stored in memory 706 (Figure 12). For example, each storage compartment 112 can be identified by the corresponding column and row number. In block 1318, the routine records the pertinent intake information associated with the mobile phone 150. For example, the recorded information can include the make, model and identification number associated with the mobile phone 150, the condition of the phone, as well as other characteristic information. Additionally, the recorded information can include which of the storage compartments 1112 the phone is stored in, as well as the date and time the phone was purchased by the kiosk 1100. After this information has been recorded, the routine proceeds to decision block 1320.

[0104] In decision block 1320, the routine determines if a required number of days has elapsed since the mobile phone 150 was purchased from the user. For example, as explained above, in some jurisdictions it may be required that the mobile phone 150 be retained by the kiosk operator for a preset period of time in case the phone is later found to have been, e.g., stolen. In this way, phones that are identified as stolen within the preset period of time can be recovered and returned to their rightful owners. If the required number of days has not elapsed since the phone was purchased, the routine repeats until the required number of days has passed. Once the required number of days has elapsed, the routine proceeds to block 1322 and the robotic arm 1156 returns to the storage compartment 1112x (Figure 11B) to retrieve the mobile phone 150 and move it to position C adjacent to the processing system 1140 (Figure 11C) to prepare the mobile phone 150 for resale. More specifically, at position C the robotic palm 1142 is rotated away from the support surface 1145 to provide room for the robotic arm 1156 to place the mobile phone 150 on the support surface 1145. As noted above, in some embodiments the mobile phone 150 can be positioned in the

cradle 1147, which can move the mobile phone 150 about the support surface 145 to connect the phone to one or more connectors 1148a, b, and/or to press one of the buttons on the side of phone against the projecting member 1149 to actuate the one or more buttons. After the mobile phone 150 has been suitably positioned on the support surface 1145, the robotic palm 1142 can rotate downwardly so that the robotic finger 1144 can touch and interact with the user interface of the phone.

[0105] At block 1324, the routine prepares the mobile phone 150 for resale via the kiosk 1100. In some embodiments, the robotic finger 1144 can test the mobile phone 150 by pressing both physical buttons on the phone and touching the phone display. Additionally, in some embodiments the robotic finger 1144 can include a camera at or proximate the tip of the finger so that the camera can obtain an image of the phone user interface and transmit the image to, for example, a remote human operator so that the operator can view the image of the phone display and facilitate positioning of the robotic finger 1144 on a desired button or other feature that needs to be pressed, swiped, etc. In other embodiments, the camera on the tip of the robotic finger 1144 can enable the kiosk to use machine learning to determine which button needs to be pressed and the location of the button relative to the robotic finger 1144. Additionally, in some embodiments, the kiosk 1100 (or the user) can load an app onto the mobile phone 150 (via, e.g., a wired or wireless connection) which the robotic finger 1144 then interacts with to test the functionality of the mobile phone 150. For example, in some embodiments the app can be similar to the mobile app described above and can cause the mobile phone 150 to display graphics, icons, patterns, control features, etc. that the robotic finger 1144 interacts with to, e.g., test device functionality and/or condition. Such interactions can include, for example, activating a function on the mobile phone 150 (e.g., scrolling a screen view, selecting displayed icons, pressing device buttons, turning on a Bluetooth radio so that the app can test the radio's function, etc.). After running such tests, the mobile app can then report the results to the kiosk processor 700 to confirm phone condition, determine a sale price, etc. In addition to testing the functionality of the phone at the processing system 140, the kiosk can also prepare the mobile phone 150 for resale by using the robotic finger 1144 and/or an app or electronic commands via one of the connectors 1148, to remove any personal data of the prior owner of the phone 150 from the mobile phone 150. For example, the robotic finger 1144 and/or electronic commands from the processor 700 can erase the

former owner's contacts, photos, etc. from the mobile phone 150. Additionally, in some embodiments the mobile phone 150 can be cleaned at the processing system 1140 by means of the UV light source 1147.

[0106] After preparing the mobile phone 150 for resale at block 1324, the routine proceeds to block 1326 and the robotic arm 1156 moves the mobile phone 150 from the processing system 1140 to position D adjacent the packaging system 1160 (Figure 11C). At block 1328, the robotic arm 1156 inserts the mobile phone 150 into the opening 1162 of the packaging system 1160 or otherwise positions the phone so that the packaging system 1160 can package the phone. After the mobile phone 150 has been packaged, the routine proceeds to block 1330 and the robotic arm 1156 retrieves the packaged mobile phone from the packaging system 1160 and moves to position B adjacent the phone storage area 1110 (Figure 11C). At position B, the robotic arm 1156 places the mobile phone 150 in one of the compartments 1112 in the display portion 1114b of the kiosk 1100 (e.g., compartment 1112i; Figure 11B). As noted above, the phones in the display portion 1114 are viewable by potential customers approaching the kiosk 1100 by virtue of the transparent panel 1133 on the face of the kiosk 1100 (Figure 11A). After placing the packaged mobile phone 150 in one of the display compartments, the routine ends.

[0107] As noted above, in some embodiments the kiosk 1100 can purchase an electronic device (e.g., a mobile phone) from one user, prepare it for resale, and then sell it to another user. By way of example, Figure 14 is a flow diagram of a routine 1400 for operating the kiosk 1100 to sell such an electronic device (e.g., the mobile phone 150) to a user in accordance with embodiments of the present technology. Referring to Figure 14 together with Figures 11A-C, the routine begins in block 1402 when the kiosk receives (via e.g., display 104) a user input indicating that a user wishes to buy an electronic device from the kiosk. In block 1404, the kiosk receives a device selection from the user. By way of example, the user may approach the kiosk 1100 and view the available mobile phones for sale in the phone display portion 1114b, and then input a selection of a particular phone (e.g., the phone 150 previously purchased by the kiosk 1100) via the display 104. For example, in some embodiments the user may input the number of the display compartment 1112 that holds the desired phone, the name/type of phone, etc. In block 1406, after receiving the device selection from the user, the kiosk displays a price for the selected device via the display 104. In decision block

1408, the routine determines if the user accepts the price. If not, the routine ends. Conversely, if the user accepts the price, the routine proceeds to block 1410 to receive payment from the user for the selected device. Such payment can include, for example, payment via a credit card, debit card, etc. In some embodiments, the user can pay for the new mobile phone via a cash acceptor and/or a credit/debit card acceptor on the kiosk 1100.

[0108] After confirming payment for the mobile phone 150, the routine proceeds to block 1412 and the robotic arm 1156 retrieves the mobile phone 150 from the recorded storage compartment 1112 (e.g., the compartment 1112i), and moves the mobile phone 150 to position A adjacent the inspection area 108 (Figure 11C). In block 1414, the routine dispenses the mobile phone 150 to the user. For example, the robotic arm 1156 can place the mobile phone 150 onto the inspection plate 144, and the inspection plate 144 can move forward to position the phone beneath the access panel 106, which can then retract so that the user can retrieve their newly-purchased phone. In other embodiments, the kiosk 1100 can include other dispensing systems and/or areas (e.g., one or more dispensing slots, drawers, etc.) for dispensing mobile phones to users. For example, in some embodiments, the kiosk 1100 can include one or more dispensing units that are at least generally similar in structure and function to the dispensing units 132 described above with reference to, e.g., Figures 1A, 2 and 3. In some embodiments, the dispensing units can be associated with individual storage compartments 1112 in the display portion 1114b of the kiosk 1100. Accordingly, it will be understood that various aspects, components, features, etc. of the kiosks 100 and 200 described above can be combined with aspects, components, features, etc. of the kiosk 1100, and vice versa, to form various embodiments of kiosks configured in accordance with the present technology.

[0109] As described in detail above, it may be advantageous to provide users with ways to easily transfer data from an "old" mobile phone to a newly purchased device. Accordingly, in block 1416 the routine transfers data to the newly purchased device of the user. This can happen in a number of different ways. For example, if the user wishes to transfer data from an old device to a newly-purchased device and the user is in possession of the old device, the user can position both devices in the data transfer compartment 136a (Figure 11A) and perform the data transfer process as described in detail above with reference to, e.g., Figure 4. In other embodiments, a

user may sell an old phone to the kiosk and wish to have the data transferred from the old phone to a new phone that the user purchases from the kiosk 1100. To accommodate this, the kiosk 1100 can save the user's personal data from their old phone as part of the intake process of purchasing the old phone. Then, when the user purchases a new phone via the kiosk 1100, the user can instruct the kiosk 1100 (via, e.g., suitable responses to prompts displayed on the kiosk display 104) to retrieve the stored data from the old phone and download the data onto the newly purchased phone before the newly-purchased phone is dispensed from the kiosk. In some embodiments, this data transfer can be affected by having the robotic arm 1156 reposition a newly-purchased phone at the processing system 1140 and connecting the phone to one of the connectors 1148a, b to electronically transfer the data from the old phone (which may be temporarily stored on a local or remote database) to the newly purchased phone. After the data has been transferred to the newly purchased phone in block 1416, the routine 1400 ends.

[0110] The kiosks 100, 200, 1100, mobile devices 150, 330 and 730, server computers 904, user computers or devices 918, etc. can include one or more central processing units or other logic-processing circuitry, memory, input devices (e.g., keyboards and pointing devices), output devices (e.g., display devices and printers), and storage devices (e.g., magnetic, solid state, fixed and floppy disk drives, optical disk drives, etc.). Such computers can include other program modules such as an operating system, one or more application programs (e.g., word processing or spreadsheet applications), and the like. The computers can include wireless computers, such as mobile phones, personal digital assistants (PDAs), palm-top computers, tablet computers, notebook and laptop computers desktop computers, e-readers, music players, GPS devices, wearable computers such as smartwatches and Google® Glass™, etc., that communicate with the Internet via a wireless link. The computers may be general-purpose devices that can be programmed to run various types of applications, or they may be single-purpose devices optimized or limited to a particular function or class of functions. Aspects of the invention may be practiced in a variety of other computing environments.

[0111] While the Internet is shown in some embodiments, a private network, such as an intranet can likewise be used herein. The network can have a client-server architecture, in which a computer is dedicated to serving other client computers, or it

can have other architectures such as peer-to-peer, in which one or more computers serve simultaneously as servers and clients. A database or databases, coupled to the server computer(s), stores much of the web pages and content exchanged between the user computers. The server computer(s), including the database(s), can employ security measures to inhibit malicious attacks on the system, and to preserve integrity of the messages and data stored therein (e.g., firewall systems, message encryption and/or authentication (e.g., using transport layer security (TLS) or secure sockets layer (SSL)), password protection schemes, encryption of stored data (e.g., using trusted computing hardware), and the like).

[0112] One skilled in the relevant art will appreciate that the concepts of the invention can be used in various environments other than location based or the Internet. In general, a display description can be in HTML, XML or WAP format, email format or any other format suitable for displaying information (including character/code-based formats, algorithm-based formats (e.g., vector generated), and bitmapped formats). Also, various communication channels, such as local area networks, wide area networks, or point-to-point dial-up connections, can be used instead of the Internet. The system can be conducted within a single computer environment, rather than a client/server environment. Also, the user computers can comprise any combination of hardware or software that interacts with the server computer, such as television-based systems and various other consumer products through which commercial or noncommercial transactions can be conducted. The various aspects of the invention described herein can be implemented in or for any e-mail environment.

[0113] Although not required, aspects of the invention are described in the general context of computer-executable instructions, such as routines executed by a data processing device, e.g., a server computer, wireless device or personal computer. Those skilled in the relevant art will appreciate that aspects of the invention can be practiced with other communications, data processing, or computer system configurations, including: Internet appliances, hand-held devices (including personal digital assistants (PDAs)), wearable computers, all manner of cellular or mobile phones (including Voice over IP (VoIP) phones), dumb terminals, media players, gaming devices, multi-processor systems, microprocessor-based or programmable consumer electronics, set-top boxes, network PCs, mini-computers, mainframe computers, and the like. Indeed, the terms "computer," "server," "host," "host system," and the like are

generally used interchangeably herein, and refer to any of the above devices and systems, as well as any data processor.

[0114] Aspects of the invention can be embodied in a special purpose computer or data processor that is specifically programmed, configured, or constructed to perform one or more of the computer-executable instructions explained in detail herein. While aspects of the invention, such as certain functions, are described as being performed exclusively on a single device, the invention can also be practiced in distributed environments where functions or modules are shared among disparate processing devices, which are linked through a communications network, such as a Local Area Network (LAN), Wide Area Network (WAN), or the Internet. In a distributed computing environment, program modules can be located in both local and remote memory storage devices.

[0115] Those of ordinary skill in the art will appreciate that the routines and other functions and methods described herein can be implemented as an application specific integrated circuit (ASIC), by a digital signal processing (DSP) integrated circuit, through conventional programmed logic arrays and/or circuit elements. While many of the embodiments are shown and described as being implemented in hardware (e.g., one or more integrated circuits designed specifically for a task), such embodiments could equally be implemented in software and be performed by one or more processors. Such software can be stored on any suitable computer-readable medium, such as microcode stored in a semiconductor chip, on a computer-readable disk, or downloaded from a server and stored locally at a client.

[0116] Aspects of the invention can be stored or distributed on tangible computer-readable media, including magnetically or optically readable computer discs, hard-wired or preprogrammed chips (e.g., EEPROM semiconductor chips), nanotechnology memory, biological memory, or other data storage media. The data storage devices can include any type of computer-readable media that can store data accessible by a computer, such as magnetic hard and floppy disk drives, optical disk drives, magnetic cassettes, tape drives, flash memory cards, DVDs, Bernoulli cartridges, RAM, ROMs, smart cards, etc. Indeed, any medium for storing or transmitting computer-readable instructions and data may be employed, including a connection port to a network such as a LAN, WAN, or the Internet. Alternatively,

computer implemented instructions, data structures, screen displays, and other data under aspects of the invention can be distributed over the Internet or over other networks (including wireless networks), on a propagated signal on a propagation medium (e.g., an electromagnetic wave(s), a sound wave, etc.) over a period of time, or they can be provided on any analog or digital network (packet switched, circuit switched, or other scheme). The terms "memory" and "computer-readable storage medium" include any combination of temporary, persistent, and/or permanent storage, e.g., ROM, writable memory such as RAM, writable non-volatile memory such as flash memory, hard drives, solid state drives, removable media, and so forth, but do not include a transitory propagating signal *per se*.

[0117] The present technology allows devices of various types that can run or be evaluated by a software application, such as mobile phones (smartphones and feature phones, for example), tablet computers, wearable computers, game devices, media players, laptop and desktop computers, etc. (e.g., the device 150) to be evaluated to facilitate purchasing by an automated kiosk portion 101. The present technology enables the user to submit information about the electronic device and/or the user, obtain a price quote for the electronic device, prepare the electronic device for recycling, assist the user with bringing the electronic device to the kiosk portion 101, and facilitate the transaction so that the user can sell the electronic device at the kiosk portion 101 with greater certainty and speed.

[0118] The present technology includes various other types and embodiments of recycling machines. For example, the present technology includes embodiments such as a countertop recycling station and/or a retail store-based interface operated by or with the assistance of a retail employee (such as a partially automated system). As another example, the present technology includes embodiments such as a recycling machine configured to accept all kinds of devices, including larger items (e.g., desktop and laptop computers, televisions, gaming consoles, DVRs, etc.).

APPENDIX

[0119] The patents, patent applications, publications, and/or other materials included in the attached Appendix are bodily incorporated herein and form part of the present disclosure.

[0120] The above Detailed Description of examples and embodiments of the invention is not intended to be exhaustive or to limit the invention to the precise form disclosed above. Although specific examples for the invention are described above for illustrative purposes, various equivalent modifications are possible within the scope of the invention, as those skilled in the relevant art will recognize.

[0121] References throughout the foregoing description to features, advantages, or similar language do not imply that all of the features and advantages that may be realized with the present technology should be or are in any single embodiment of the invention. Rather, language referring to the features and advantages is understood to mean that a specific feature, advantage, or characteristic described in connection with an embodiment is included in at least one embodiment of the present technology. Thus, discussion of the features and advantages, and similar language, throughout this specification may, but do not necessarily, refer to the same embodiment.

[0122] Furthermore, the described features, advantages, and characteristics of the present technology may be combined in any suitable manner in one or more embodiments. One skilled in the relevant art will recognize that the present technology can be practiced without one or more of the specific features or advantages of a particular embodiment. In other instances, additional features and advantages may be recognized in certain embodiments that may not be present in all embodiments of the present technology.

[0123] Any patents and applications and other references noted above, including any that may be listed in accompanying filing papers, are incorporated herein by reference. Aspects of the invention can be modified, if necessary, to employ the systems, functions, and concepts of the various references described above to provide yet further implementations of the invention.

[0124] Unless the context clearly requires otherwise, throughout the description and the claims, the words "comprise," "comprising," and the like are to be construed in an inclusive sense, as opposed to an exclusive or exhaustive sense; that is to say, in the sense of "including, but not limited to." As used herein, the terms "connected," "coupled," or any variant thereof means any connection or coupling, either direct or indirect, between two or more elements; the coupling or connection between

the elements can be physical, logical, or a combination thereof. Additionally, the words "herein," "above," "below," and words of similar import, when used in this application, refer to this application as a whole and not to any particular portions of this application. Where the context permits, words in the above Detailed Description using the singular or plural number may also include the plural or singular number respectively. The word "or," in reference to a list of two or more items, covers all of the following interpretations of the word: any of the items in the list, all of the items in the list, and any combination of the items in the list.

[0125] The teachings of the invention provided herein can be applied to other systems, not necessarily the system described above. The elements and acts of the various examples described above can be combined to provide further implementations of the invention. Some alternative implementations of the invention may include not only additional elements to those implementations noted above, but also may include fewer elements. Further any specific numbers noted herein are only examples: alternative implementations may employ differing values or ranges.

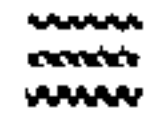
[0126] Although the above description describes various embodiments of the invention and the best mode contemplated, regardless how detailed the above text, the invention can be practiced in many ways. Details of the system may vary considerably in its specific implementation, while still being encompassed by the present technology. As noted above, particular terminology used when describing certain features or aspects of the invention should not be taken to imply that the terminology is being redefined herein to be restricted to any specific characteristics, features, or aspects of the invention with which that terminology is associated. In general, the terms used in the following claims should not be construed to limit the invention to the specific examples disclosed in the specification, unless the above Detailed Description section explicitly defines such terms. Accordingly, the actual scope of the invention encompasses not only the disclosed examples, but also all equivalent ways of practicing or implementing the invention under the claims.

[0127] From the foregoing, it will be appreciated that specific embodiments of the invention have been described herein for purposes of illustration, but that various modifications may be made without deviating from the spirit and scope of the various embodiments of the invention. Further, while various advantages associated with

certain embodiments of the invention have been described above in the context of those embodiments, other embodiments may also exhibit such advantages, and not all embodiments need necessarily exhibit such advantages to fall within the scope of the invention. Accordingly, the invention is not limited, except as by the appended claims.

[0128] Although certain aspects of the invention are presented below in certain claim forms, the applicant contemplates the various aspects of the invention in any number of claim forms. Accordingly, the applicant reserves the right to pursue additional claims after filing this application to pursue such additional claim forms, in either this application or in a continuing application.

APPENDIX



TestDevLab

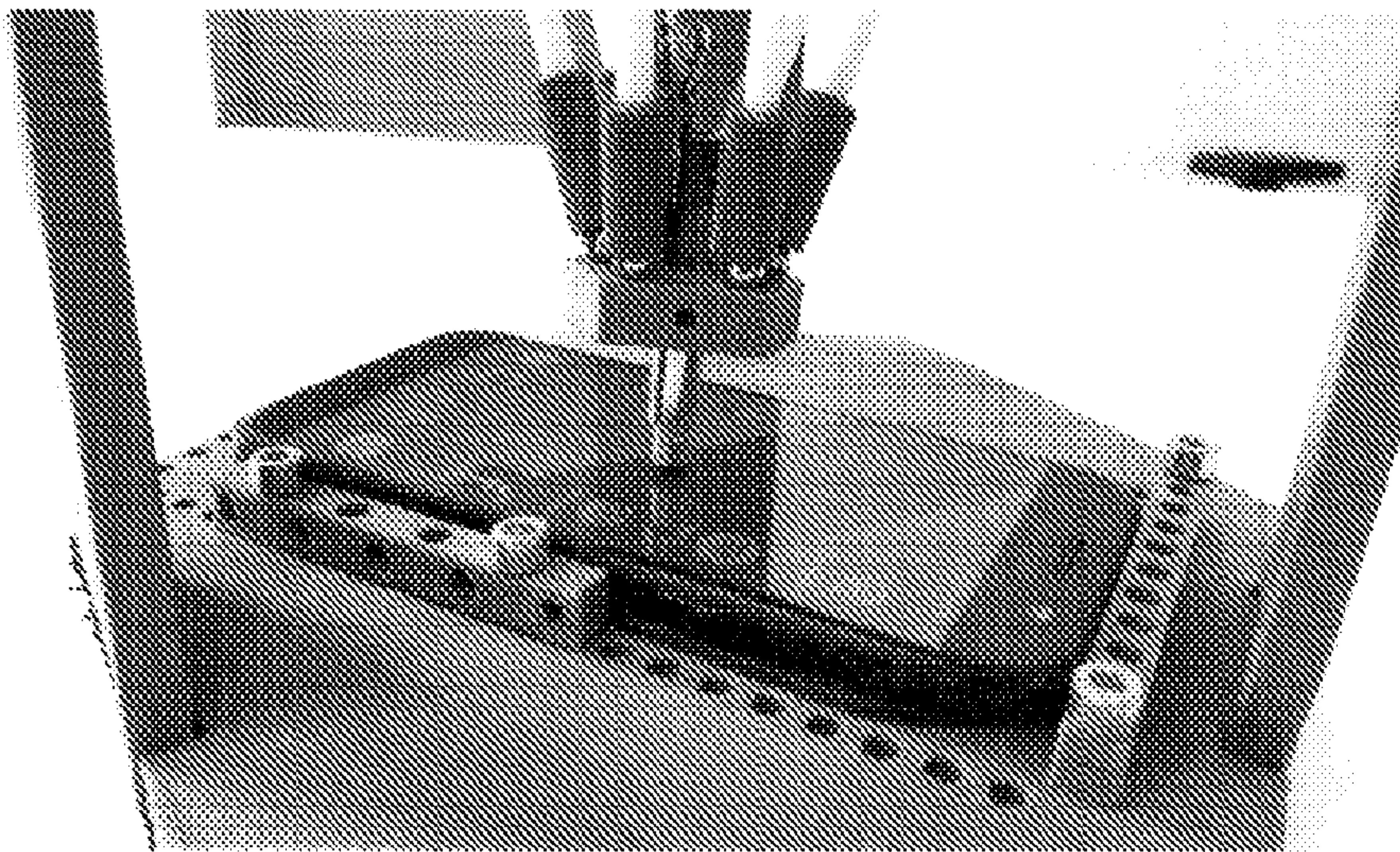
Blog

HI THERE!

HARDWARE

HOW WE BUILT A ROBOT FOR AUTOMATED MANUAL MOBILE TESTING

JULY 24, 2017 · 5 MINUTE READ



Modern technology advances fast not only in the software, but also the hardware industry. To provide quality services and satisfy clients, software testing plays an increasingly important role in the software industry. Given that the number of applications and devices steadily grows new tools for testing are needed as well.

Automation is very important in software development and testing. However, there are cases when test steps need to be done by a human. Such manual work often causes problems, because the test engineer can make mistakes. Furthermore, computerised and robotic automation is more suitable for performing repetitive actions. Additionally, software cannot fully cover full scope of testing. Therefore, we had an idea to build our own robot that could simulate finger taps on a smartphone screen or press physical buttons, something that cannot be simulated with software.

Choosing the Right Robot

Information about robots relevant to us can be found online in an abundance and we chose one that is very simple and cost-effective, because we wanted to build it ourselves. We looked at robot manipulators, CNC machines and delta robots. The following are examples that we examined.

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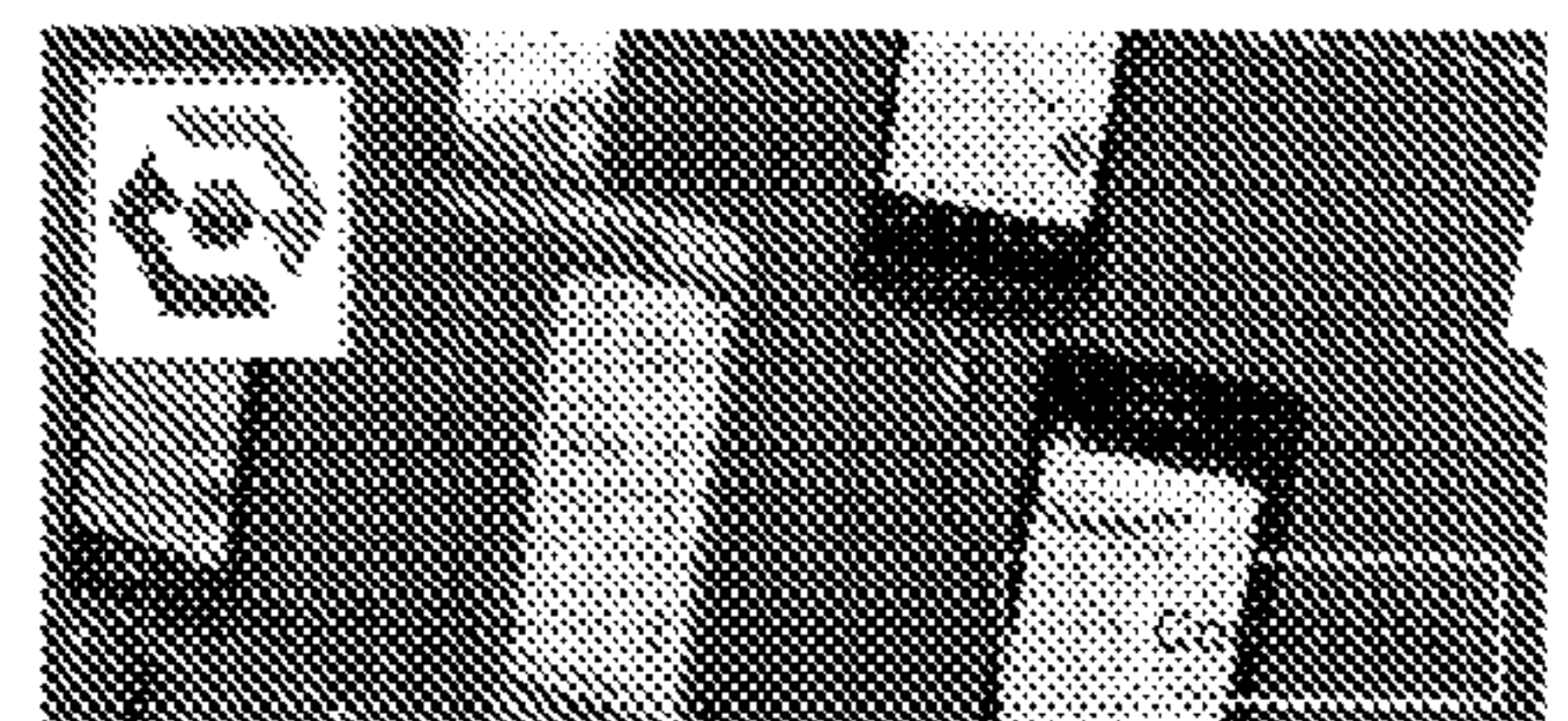
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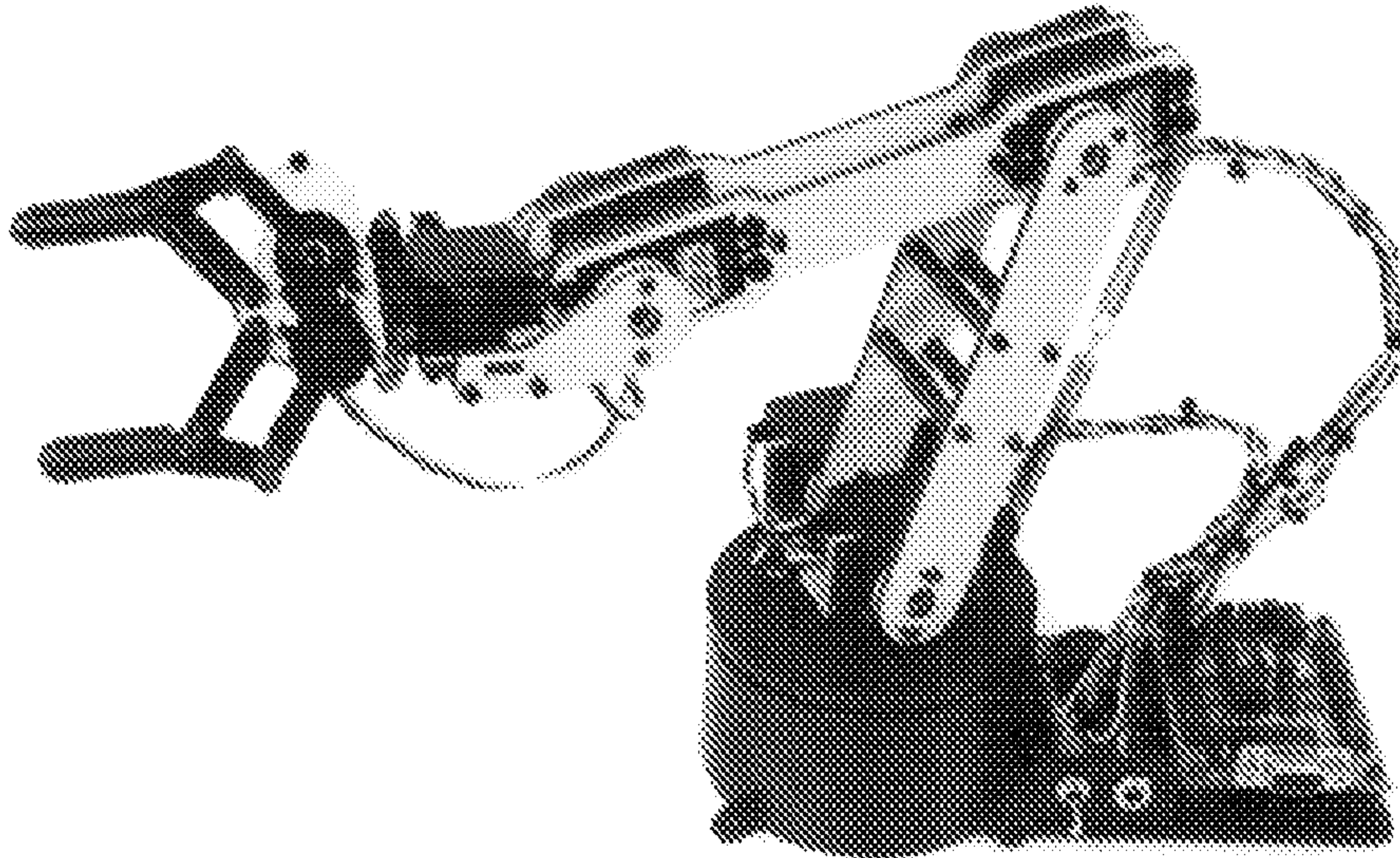
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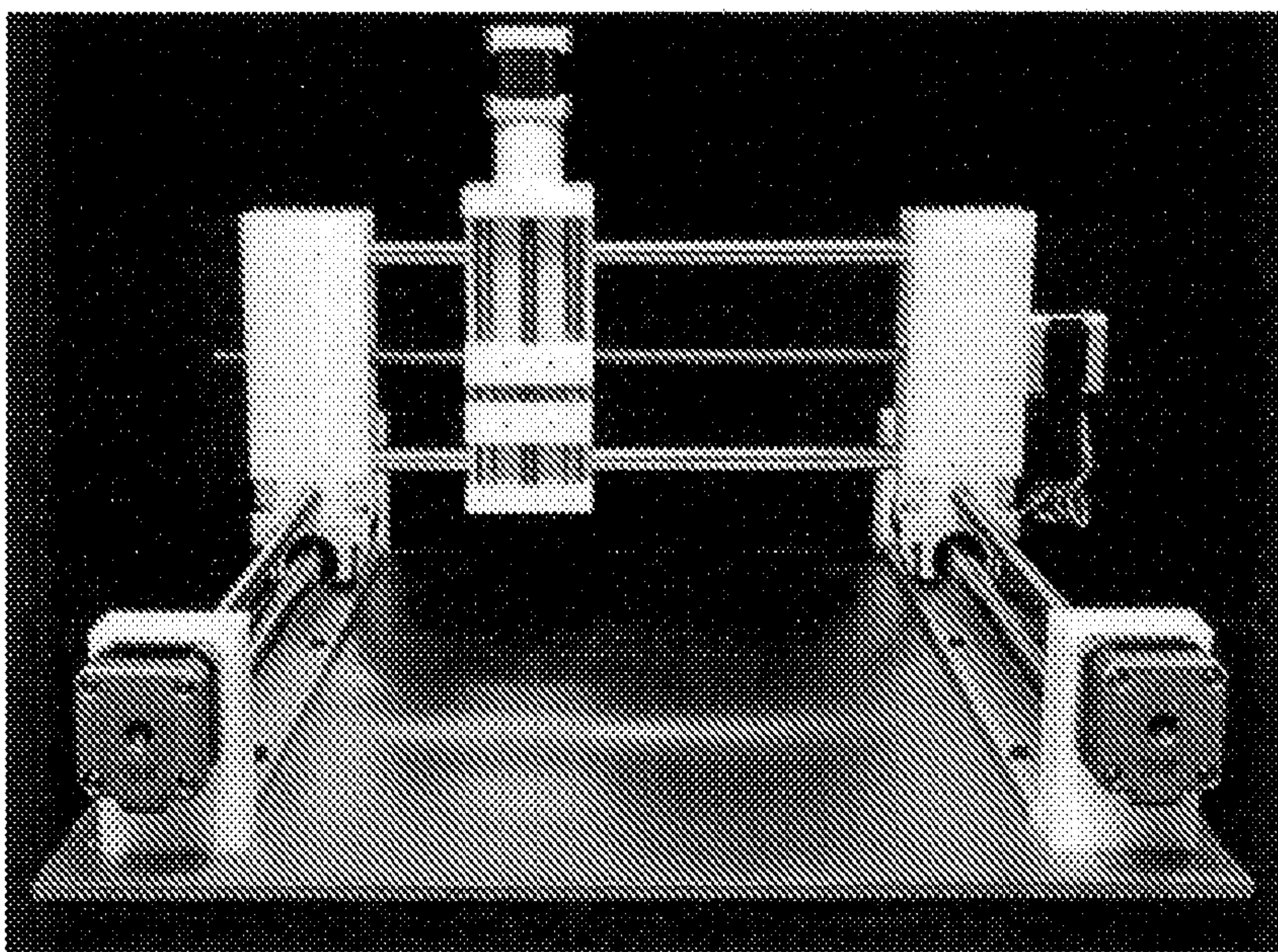
Types of robots:

Manipulator robot is one of the robots we considered. However, we determined that it would not work for us, because of its multiple axes and motor load which would cause it to not press precisely (which in our case is very important) on the contact point at the x,y coordinates.



An example of manipulator robot.

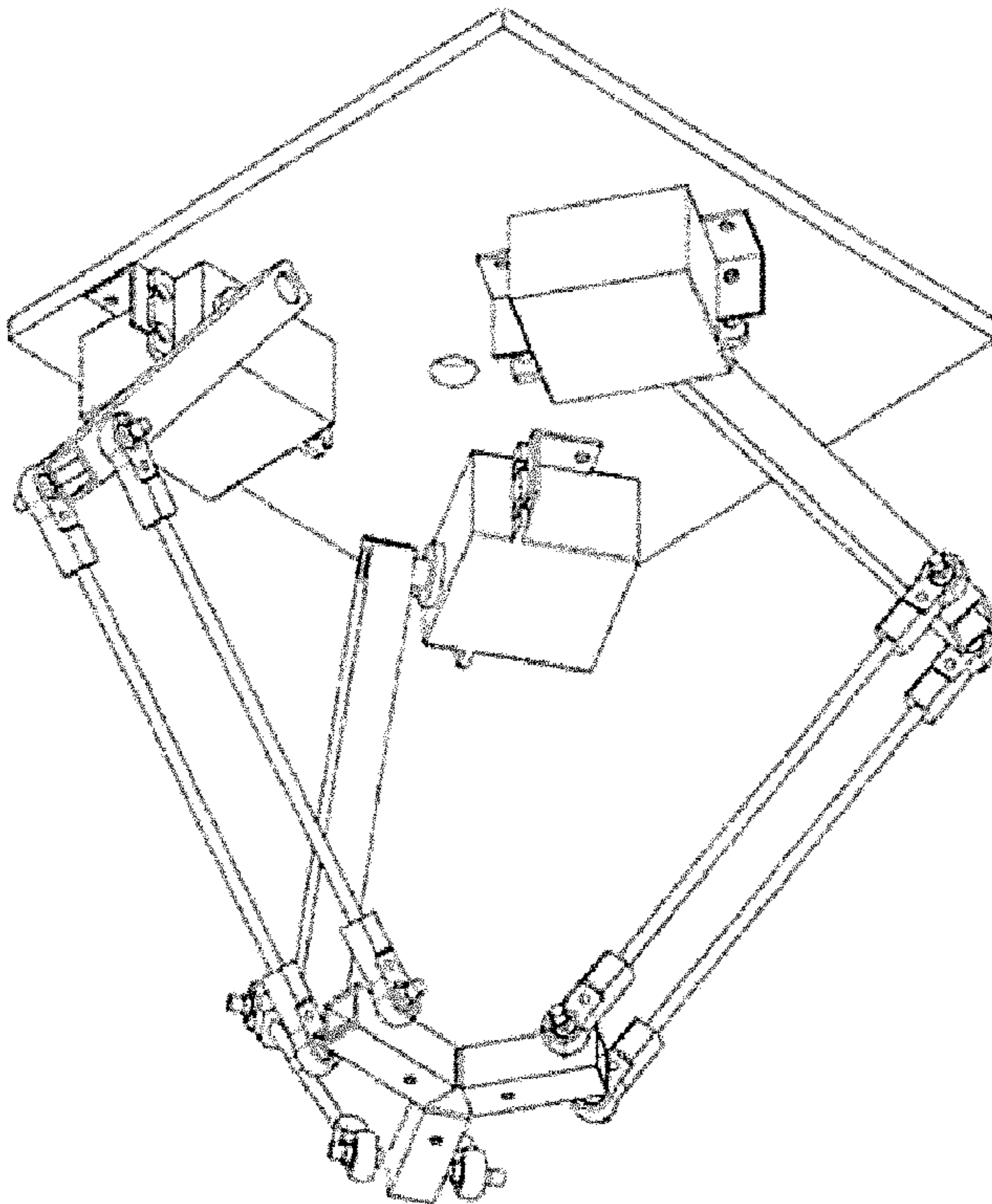
CNC is a robotic device that moves on two planes and adds pressure at the x,y coordinates. We started but did not finish building this robot, because it was difficult to adapt CNC's configuration and calibration to a specific phone. The robot has a complex structure which takes up a lot of space and we would have to add additional switches for calibration.



An example of CNC robot.

Even though creating a CNC robot seemed possible we eventually found a robot that met our needs and was easy to build, which was the determining factor, because we wanted to make it ourselves.

The **delta robot** is a type of parallel robot. It consists of several kinematic chains as well as three effectors called arms that are connected to a universal joint. To maintain the straight orientation of the end-effector against the surface manipulators are constructed of parallel mechanisms.



An example of delta robot

TapsterBot is a well-known, open source (BSD licensed) Delta Robot designed by Jason Huggins (brains behind Selenium) for mobile device testing. It's based on a previous design of his called BitBeam Bot, which was a traditional belt-driven, Cartesian device. Switching to a delta design allowed him to improve the speed, accuracy, and simplicity of the design. TapsterBot 1 is great design to start with if you own a 3D printer. Most of the parts are 3D printable, and all that remains is to purchase a slew of nuts and bolts and a few servo motors. TapsterBot 2 uses magnetic joints and has a few more exotic parts to track down.

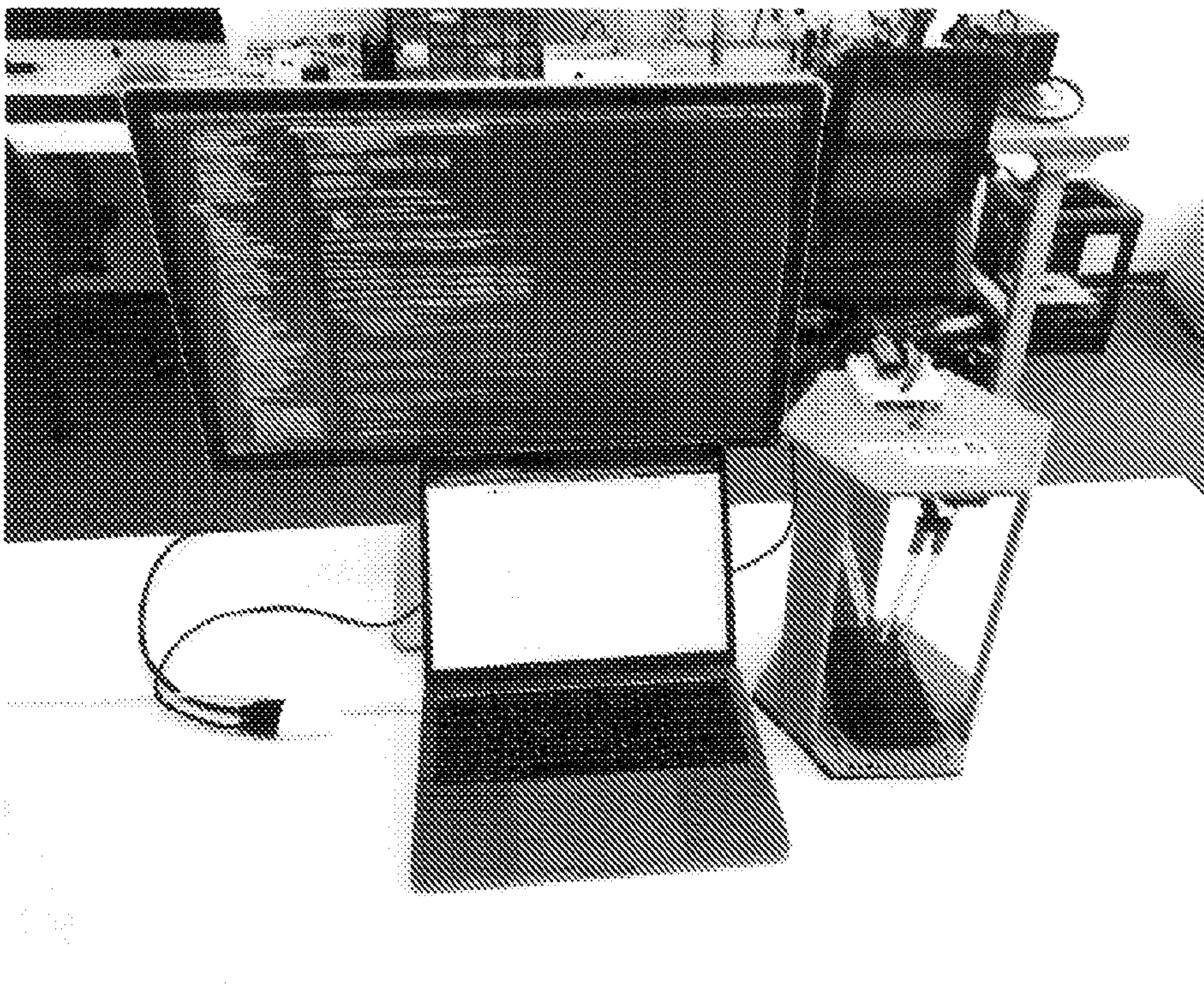
The biggest advantage of a delta robot is its relatively simple three arm electric motors. Another important aspect is the robot's high speed. The three arm frame as the only mobile part can be very light and with low inertia. Unlike regular robots that have all motors built in in the manipulator, delta robot's weight is its own.

However, one of the robot's drawbacks is the non-linearity of the actuating element. For the end effector to translate and rotate the necessary input command depends on the end-effectors position relative to the surface. Because of this delta robots are difficult to use for high precision work.

To successfully control the delta robot the software should continuously solve forward and inverse kinematics tasks. For linear movements it's necessary to solve inverse task which then is recalculated from the Descartes coordinate system in the angular system as well as the forward task to know the end-effector's current position.

Tapsterbot is not the only delta robot that can be used for testing. Examining other options we found ABB IRB 360 FlexPicker and Kawasaki YF003N. However, these robots are used for industrial work. Tapster robot is made specifically for mobile application testing.

How We Built Tappy



Meet Tappy – robot based on TapsterBot built by us

When we found out about TapsterBot project we decided to give it a try. Since we had Zortrax M200 printer we 3D-printed all the parts. Larger parts took some effort, because we didn't have much experience with 3D printing then, so it took us several attempts until we succeeded. Problem with ABS plastic is that once it has cooled down its edges bend upwards. We managed to solve this issue by using various methods such as adding more raft and applying ABS juice to the platform. We also needed to get some nuts and bolts. Assembling first prototype wasn't very difficult, because there were some instructions available online. In total we spent about 70 euros (around USD 80) on all the parts and materials, which is approximately 10 times cheaper than ordering an assembled version.

When the first prototype was done we started working on improvements, because we noticed that the moving platform was very heavy and often detached itself from other parts. Replacing metal bearing balls with neodymium magnets solved problem

with detaching. However, the platform still was too heavy, so we printed out plastic rods and replaced the metal ones. This finally solved issues with unstable moving platform. Now Tappy can Tap and swipe more precisely.

Next issue was determining correct z-index value for contact point. Since calibration usually gave different values for each corner we had to choose which one to use. Lowest value would assure that Tap always succeeds, but sometimes might penetrate the screen too much. Highest value would be safer for screen, but might not succeed with the tap. As a solution we used lowest value so that the tap always succeeds and implemented stylus a pen with a spring so that even if it goes too low, it won't damage the device's screen.

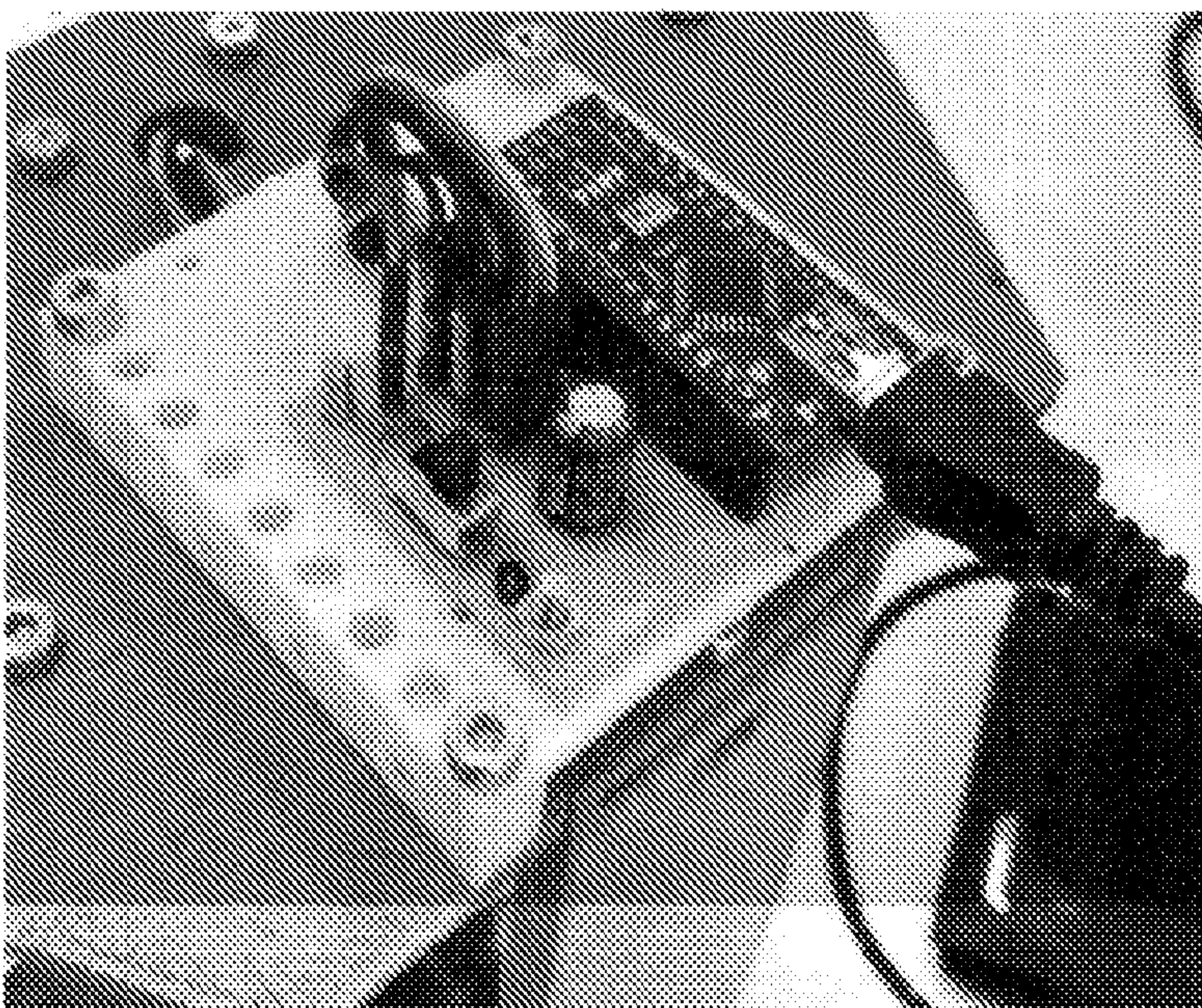
To make sure that device stays in place we placed a simple car antislip mat on the base platform.

These are just a few of the improvements. There are a lot of things that we plan to improve in future. The platform needs to be redesigned to make it more stable and we plan to add some LED's as well. You know, to make this robot much cooler ☺

Electronics

For servo motors we chose to stick with proposed Hitec HS-311, because they have good price/performance ratio and do their job pretty good.

But for microcontroller we decided to replace Arduino Uno with a more compact alternative -- Arduino Nano, which is more than enough for our needs. Setting up Arduino Nano is straightforward -- just upload "Firmata Standard" sketch using Arduino IDE and you are ready to go. We soldered custom board with a on/off switch for servo motors and connections to Arduino board.



Our custom made electronic board

For the sake of convenience we added capacitor as well, so we only need one cable to power both Arduino and servo motors. Finally we added a ground cable running from Arduino to stylus pen so that the mobile device screen registers touches properly.

Backend

Robot's backend server runs on Nodejs. To make it more scalable we divided all the libraries in separate files. For communication with the Arduino board we are using johnny-five library. We tried to setup Nodejs server on Raspberry Pi to make the Robot completely standalone, but faced several issues with some libraries that are not well supported on ARM processor. We plan to dig deeper on this issue.

For communication with external resources we implemented both REST API and Socket.io Websocket libraries. REST API is more useful when there are just some actions that need to be executed by test framework but Websocket is more handy to synchronize data with the frontend app and exchange calibration data.

The source code is available here – <https://github.com/guntiss/tappy>

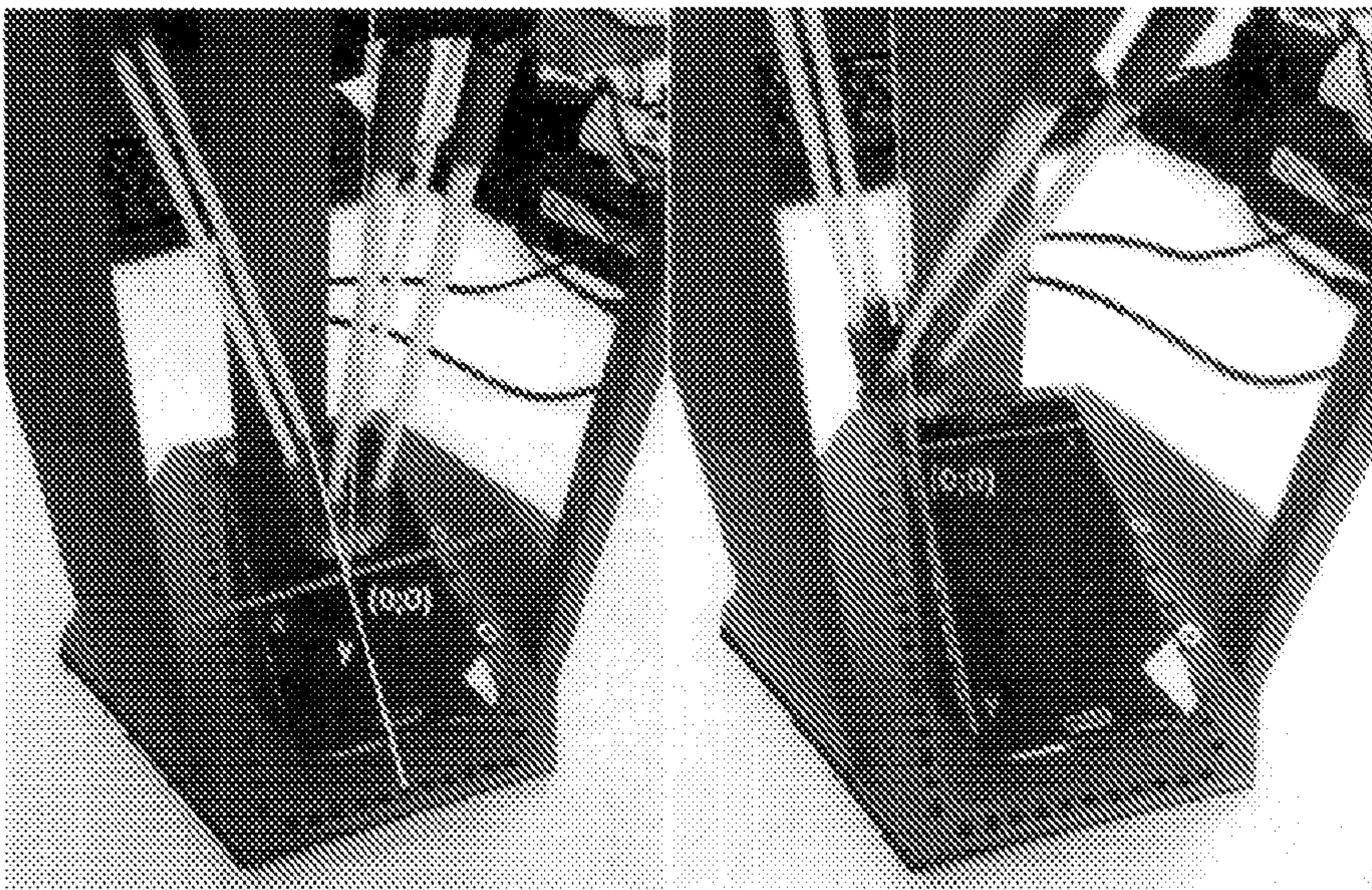
Calibration process

Correct robot and device calibration is very important to achieve maximum precision performance. Calibration consists of two parts:

- Robot arm calibration;
- Testing device calibration.

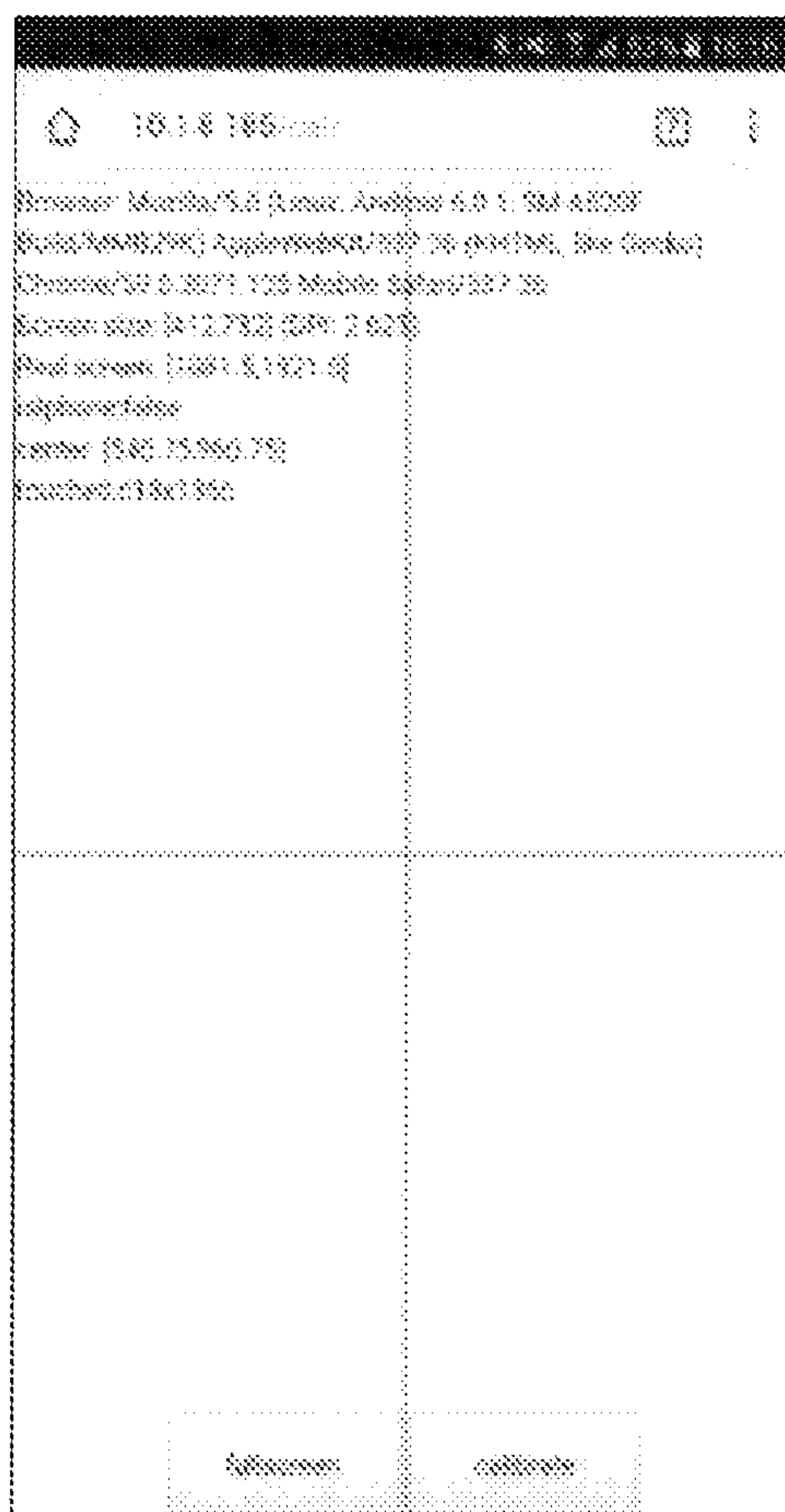
To be able to calculate end effector's position in 3D space we need to use kinematic transformations. Therefore we need to calibrate robot arms so that we can set them precisely anywhere from 0° to 90° angle. Arm calibration is done manually by detaching rods from arms and setting all 3 arms to horizontal state (0°) and then to vertical state (90°). This way we can map servo motor angles with the base. Values are stored manually at calibration file, since this process needs to be done only once unless arms are detached from servo motors.

Next step is device calibration which is necessary to be able to work with testing device screen coordinates. Thus we need to map two different coordinate systems – robots working plane with the device screen.



Coordinate system before and after device calibration

The problem we faced with device calibration was that we needed to install a custom application on the test device to calibrate it. It was really inconvenient, which is why we developed a browser based calibration solution, because every device has a web browser already installed. The process is pretty simple – there is a running Nodejs web server on backend with socket.io listener and on the mobile device we just navigate to the calibration page.



Calibration page opened on mobile device

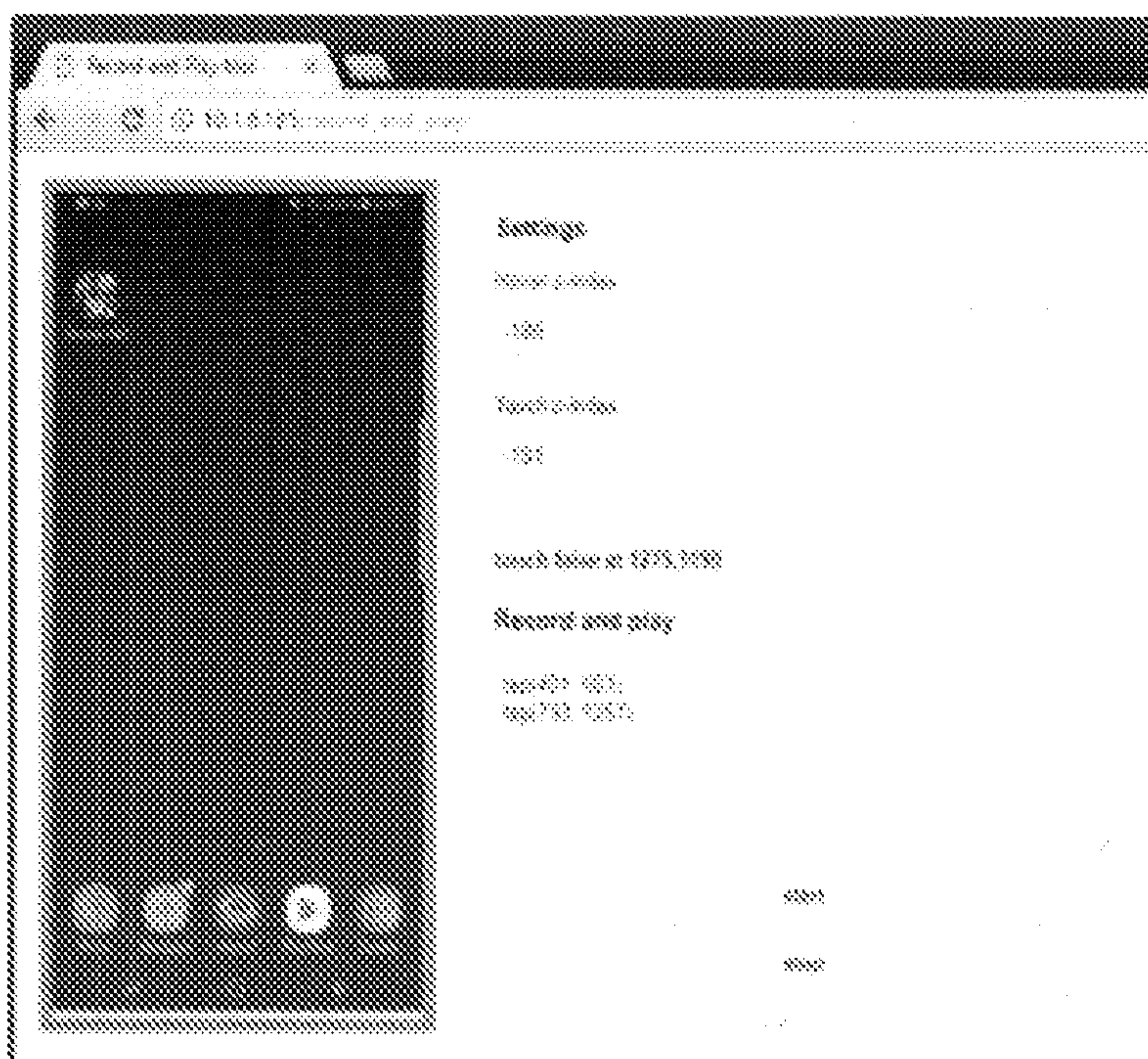
Calibration page contains simple javascript code that registers any tap on screen and sends tapped coordinates to server through websocket connection. Some information about device, such as browser version, screen resolution is sent as well. This way we don't have to install anything on the testing device and calibration can be done in seconds by just pressing "Calibrate" button on screen. Additionally, it supports both Android and iOS and probably even other OS devices. Calibration is done completely automatically -- the algorithm taps three points on the screen and stores received coordinates in the calibration file. This is really convenient because calibration must be repeated every time we change the device or its position on the base platform.

Test Automation With Tappy

We came up with two use cases for this robot:

- Record and play automation for battery usage testing;
- Appium test executor.

Since we do a lot of battery usage testing for mobile applications, there are some prerequisites for test results to be reliable. Firstly, there must not be additional software installed on the device that could impact test results. Secondly, test actions must be performed at perfect timing so that the test results are comparable. That's why manual human testing wasn't satisfying for such tasks. Main requirement for developing the "Record and play" tool was that it had to be easy to use and simple yet powerful.



Record and play tool

It consists of a real time screenshot from the device which is synchronized through ADB. Actions can be recorded by clicking on the image - they are immediately added to the script editor. Scripts run on JavaScript, thus actions can be looped or executed at specific time intervals easily.

The problem with the "record and play" tool is that we don't have much feedback from the device regarding test results or what is happening on the screen other than the screenshot. That's why we implemented Tappy as a test executor for our Appium tests. All we had to do was rewrite Tap and Swipe methods to send REST API call to Tappy's backend.

Rewritten function that uses REST API to invoke Tap action on robot:

```

1.  def tapster.tap
2.    loc = calc_element_position
3.    p loc
4.    post_data = Net::HTTP.post_form(URI.parse('http://'+ Tapster::IP + '/tap'),
5.      {'x' => loc[0], 'y' => loc[1]})
6.    puts post_data.body
7.  end

```

Huge advantage of using robot instead of pure software automation is that we can access all system functions. For example, we can put an application in the background, switch to another application, change system settings and even type on the screen keyboard, which sometimes can't be done or is very difficult with just software automation.

What did we learn?

While building this robot we gained a lot of experience -- how to 3D print, customize 3D models, assemble the robot, implement kinematics, etc.

This is a great project with which to improve technical knowledge. We got to work with hardware and software and we are happy to have built this robot ourselves!

There still are a lot of things we plan to improve for this project, so stay tuned!

Unexpected Use of the Robot

Some time later, when we had built another robot our colleagues from the marketing team noticed our creations. They thought it was very interesting and took it to various conferences where the company participated. The robot was an absolute star and brought a lot of attention. People came over and wondered what it can do and what technology was used to build it and run it. That is how Tappy became famous! ☺

METHODS AND SYSTEMS FOR INSPECTING MOBILE DEVICES AND OTHER CONSUMER ELECTRONIC DEVICES WITH ROBOTIC ACTUATION

TECHNICAL FIELD

[0001] The present disclosure is directed generally to methods and systems for recycling mobile phones and other consumer electronic devices and, more particularly, to methods and systems for inspecting such devices using robotic actuation.

BACKGROUND

[0002] Consumer electronic devices, such as mobile phones, laptop computers, notebooks, tablets, MP3 players, etc., are ubiquitous. Currently there are over 6 billion mobile devices in use in the world; and this number is growing rapidly as more than 1.8 billion mobile phones were sold in 2013 alone. By 2017 it is expected that there will be more mobile devices in use than people on the planet. In addition to mobile phones, over 300 million desk-based and notebook computers shipped in 2013, and for the first time the number of tablet computers shipped exceeded laptops. Part of the reason for the rapid growth in the number of mobile phones and other electronic devices is the rapid pace at which these devices evolve, and the increased usage of such devices in developing countries.

[0003] As a result of the rapid pace of development, a relatively high percentage of electronic devices are replaced every year as consumers continually upgrade their mobile phones and other electronic devices to obtain the latest features or a better operating plan. According to the U.S. Environmental Protection Agency, consumers in the United States alone dispose of over 370 million mobile phones, PDAs, tablets, and other electronic devices every year. Millions of other outdated or

broken mobile phones and other electronic devices are simply tossed into junk drawers or otherwise kept until a suitable disposal solution arises.

[0004] Although many electronic device retailers and cell carrier stores now offer mobile phone trade-in or buyback programs, many old mobile phones still end up in landfills or are improperly disassembled and disposed of in developing countries. Mobile phones and similar electronic devices, however, typically contain substances that can be harmful to the environment, such as arsenic, lithium, cadmium, copper, lead, mercury and zinc. If not properly disposed of, these toxic substances can seep into groundwater from decomposing landfills and contaminate the soil with potentiality harmful consequences for humans and the environment.

[0005] As an alternative to retailer trade-in or buyback programs, consumers can now recycle and/or sell their used mobile phones using self-service kiosks located in malls, retail stores or other publically accessible areas. Such kiosks are operated by ecoATM, Inc., the assignee of the present application, and are disclosed in, for example, U.S. Patent Nos.: 8,463,646, 8,423,404, 8,239,262, 8,200,533, 8,195,511, and 7,881,965, which are commonly owned by ecoATM, Inc. and are incorporated herein by reference in their entireties.

[0006] When offering to purchase used mobiles phones and/or other electronic devices from consumers, it can be important to accurately determine the make and model of the phone, as well as the physical condition so that the device can be accurately priced. Accordingly, improving the process of automated evaluation of electronic devices can lead to more accurate pricing. Establishing suitable prices for mobile phones and other electronic devices can be mutually advantageous to both buyer and seller, and doing so may incentivize consumers to dispose of their old electronic devices in an efficient, environmentally conscientious way.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] Figure 1 is an isometric view of a machine configured in accordance with an embodiment of the present technology for recycling mobile phones and/or other electronic devices.

[0008] Figures 2A–2D are a series of isometric views of the machine of Figure 1 with a number of exterior panels removed to illustrate operation of the machine in accordance with an embodiment of the present technology.

[0009] Figures 3A–3H illustrate various embodiments of device actuation systems within an inspection area of the machine of Figures 1–2D.

[0010] Figure 4 is a flow diagram of a routine for recycling mobile phones and/or other electronic devices in accordance with an embodiment of the present technology.

[0011] Figure 5 is a flow diagram of a subroutine for visually evaluating mobile phones and/or other electronic devices in accordance with an embodiment of the present technology.

[0012] Figure 6 is a schematic diagram illustrating various components associated with the machine of Figure 1.

[0013] Figure 7 is a schematic diagram of a suitable distributed computing environment for implementing various aspects of the present technology.

DETAILED DESCRIPTION

[0014] The following disclosure describes various embodiments of systems and methods for automatically actuating mobile phones and other consumer electronic devices for automated inspection, and for performing other operations associated with electronic device recycling. Embodiments of the methods described herein can be performed by or with consumer-operated kiosks, networked processing devices, retailer-assisted machines, and/or the like. Some embodiments of the present

technology, for example, are directed to consumer-operated kiosks that can perform automatic visual and/or electrical inspections of mobile phones and/or other consumer electronic devices that are submitted to the kiosks for sale or recycling. As described in greater detail below, the visual evaluation and/or inspection can be performed using device actuation by, for example, a robotic actuation system, in conjunction with one or more cameras or other imaging devices, and the electrical analysis can be performed using a suitable processing device connected to the subject electronic device via, e.g., a suitable electrical connector.

[0015] When purchasing and/or recycling a used electronic device (e.g., a used mobile phone), it can be important for a purchaser to inspect the device to identify any issues that may affect the value. For example, when purchasing a mobile phone, it can be important to properly identify the mobile phone and determine whether it has been damaged, if the phone has significant wear and tear, or if the phone has been reported stolen. In the case of a transaction executed via a consumer-operated kiosk, carrying out this inspection can be significantly more challenging than it would be in the case of a person-to-person transaction. For example, consumer-operated kiosks typically require the user to enter information at a kiosk touchscreen or keypad to help identify the make and model of the mobile device. Additionally, in some kiosks, a camera is used to acquire one or more images of the device so that the kiosk can process the images to determine the identity of the device (e.g., the device make and/or model), as well as the presence of any damage to the device. In some cases, however, the image quality may be poor, and as a result it may be difficult to detect the dimensions and other features of the device. As a result, the kiosk may not be able to recognize or sufficiently identify a device based on the images alone. Additionally, the images may not reveal the functionality or condition of the device in the absence of some interaction with the device such as via a touchscreen or physical buttons. Accordingly, there is a risk that consumer-operated kiosks may not be able to properly identify some mobile devices and/or properly assess the condition of the devices.

[0016] Systems, devices, and methods configured in accordance with embodiments of the present technology can at least partially address one or more of the problems described above and/or other problems associated with conventional technologies whether or not stated herein. For example, self-service kiosks configured in accordance with at least some embodiments of the present technology include a device actuation system which allows for physical interaction with the device before, during, and/or after the visual and/or electrical evaluation of the device. For example, in some embodiments a device actuation system can include one or more styluses which can interact with a touchscreen of an electronic device, allowing for the device to be accurately identified (e.g., by accessing an “about” screen of the device). In some embodiments, a device actuation system can interact with external buttons of an electronic device (e.g., volume buttons, a power button, or other physical buttons) via a stylus, projection, or other such element. As described below, the kiosk can determine one or more attributes of the electronic device based at least in part on physical interaction with the electronic device (e.g., a touchscreen, physical buttons, etc.) via a device actuation system. These attributes can then be used to identify, assess the value of, and/or authenticate the electronic device.

[0017] Certain details are set forth in the following description and in Figures 1–7 to provide a thorough understanding of various embodiments of the present technology. In other instances, well-known structures, materials, operations and/or systems often associated with smartphones and other handheld devices, consumer electronic devices, computer hardware, software, and network systems, etc. are not shown or described in detail in the following disclosure to avoid unnecessarily obscuring the description of the various embodiments of the technology. Those of ordinary skill in the art will recognize, however, that the present technology can be practiced without one or more of the details set forth herein, or with other structures, methods, components, and so forth. The terminology used below should be interpreted in its broadest reasonable manner, even though it is being used in conjunction with a detailed description of certain examples of embodiments of the technology. Indeed, certain terms may even be emphasized below; however, any

terminology intended to be interpreted in any restricted manner will be specifically defined as such in this Detailed Description section.

[0018] The accompanying Figures depict embodiments of the present technology and are not intended to be limiting of its scope. The sizes of various depicted elements are not necessarily drawn to scale, and these various elements may be arbitrarily enlarged to improve legibility. Component details may be abstracted in the Figures to exclude details such as the position of components and certain precise connections between such components when such details are unnecessary for a complete understanding of how to make and use the invention.

[0019] In the Figures, identical reference numbers identify identical, or at least generally similar, elements. To facilitate the discussion of any particular element, the most significant digit or digits of any reference number refers to the Figure in which that element is first introduced. For example, element 110 is first introduced and discussed with reference to Figure 1.

[0020] Figure 1 is an isometric view of a kiosk 100 for recycling and/or other processing of mobile phones and other consumer electronic devices in accordance with the present technology. The term “processing” is used herein for ease of reference to generally refer to all manner of services and operations that may be performed or facilitated by the kiosk 100 on, with, or otherwise in relation to an electronic device. Such services and operations can include, for example, selling, reselling, recycling, donating, exchanging, identifying, evaluating, pricing, auctioning, decommissioning, transferring data from or to, reconfiguring, refurbishing, etc., mobile phones and other electronic devices. Although many embodiments of the present technology are described herein in the context of mobile phones, aspects of the present technology are not limited to mobile phones and generally apply to other consumer electronic devices. Such devices include, as non-limiting examples, all manner of mobile phones, smart phones, handheld devices, PDAs, MP3 players, tablet, notebook and laptop computers, e-readers, cameras, etc. In some embodiments, it is contemplated that the kiosk 100 can facilitate selling and/or

otherwise processing larger consumer electronic devices, such as desktop computers, TVs, game consoles, etc., as well smaller electronic devices such as Google Glass™, smart-watches, etc. The kiosk 100 and various features thereof can be at least generally similar in structure and function to the kiosks and corresponding features described in U.S. patent numbers: 8,463,646, 8,423,404, 8,239,262, 8,200,533, 8,195,511, and 7,881,965; and in U.S. patent application numbers 12/573,089, 12/727,624, 13/113,497, 12/785,465, 13/017,560, 13/438,924, 13/753,539, 13/658,825, 13/733,984, 13/705,252, 13/487,299, 13/492,835, 13/562,292, 13/658,828, 13/693,032, 13/792,030, 13/794,814, 13/794,816, 13/862,395 and 13/913,408, 14/498,763, 14/500,739, 14/506,449, 62/059,129, 62/059,132, 62/073,840, 62/073,847, and 62/076,437, each of which is incorporated herein in its entirety by reference. All of the patents and patent applications listed in the preceding sentence are commonly owned by the applicant of the present application, and they along with any other patents or patent applications identified herein are incorporated herein by reference in their entireties.

[0021] In the illustrated embodiment, the kiosk 100 is a floor-standing self-service kiosk configured for use by a user 101 (e.g., a consumer, customer, etc.) to recycle, sell, and/or perform other operations with a mobile phone or other consumer electronic device. In other embodiments, the kiosk 100 can be configured for use on a countertop or a similar raised surface. Although the kiosk 100 is configured for use by consumers, in various embodiments the kiosk 100 and/or various portions thereof can also be used by other operators, such as a retail clerk or kiosk assistant to facilitate the selling or other processing of mobile phones and other electronic devices.

[0022] In the illustrated embodiment, the kiosk 100 includes a housing 102 that is approximately the size of a conventional vending machine. The housing 102 can be of conventional manufacture from, for example, sheet metal, plastic panels, etc. A plurality of user interface devices are provided on a front portion of the housing 102 for providing instructions and other information to users, and/or for receiving user inputs and other information from users. For example, the kiosk 100 can include a

display screen 104 (e.g., a liquid crystal display (“LCD”) or light emitting diode (“LED”) display screen, a projected display (such as a heads-up display or a head-mounted device), and so on) for providing information, prompts, etc., to users. The display screen 104 can include a touch screen for receiving user input and responses to displayed prompts. In addition or alternatively, the kiosk 100 can include a separate keyboard or keypad for this purpose. The kiosk 100 can also include an ID reader or scanner 112 (e.g., a driver’s license scanner), a fingerprint reader 114, and one or more cameras 116 (e.g., digital still and/or video cameras, identified individually as cameras 116a-c). The kiosk 100 can additionally include output devices such as a label printer having an outlet 110, and a cash dispenser having an outlet 118. Although not identified in Figure 1, the kiosk 100 can further include a speaker and/or a headphone jack for audibly communicating information to users, one or more lights for visually communicating signals or other information to users, a handset or microphone for receiving verbal input from the user, a card reader (e.g., a credit/debit card reader, loyalty card reader, etc.), a receipt or voucher printer and dispenser, as well as other user input and output devices. The input devices can include a touchpad, pointing device such as a mouse, joystick, pen, game pad, motion sensor, scanner, eye direction monitoring system, etc. Additionally the kiosk 100 can also include a bar code reader, QR code reader, bag/package dispenser, a digital signature pad, etc. In the illustrated embodiment, the kiosk 100 additionally includes a header 120 having a display screen 122 for displaying marketing advertisements and/or other video or graphical information to attract users to the kiosk. In addition to the user interface devices described above, the front portion of the housing 102 also includes an access panel or door 106 located directly beneath the display screen 104. The access door 106 is configured to automatically retract so that the user 101 can place an electronic device (e.g., a mobile phone) in an inspection area 108 for automatic inspection by the kiosk 100. As described in greater detail below, such inspection can be at least partially performed by use of a device actuation system 130 (shown schematically) configured in accordance with the present technology.

[0023] A sidewall portion of the housing 102 can include a number of conveniences to help users recycle or otherwise process their mobile phones. For example, in the illustrated embodiment the kiosk 100 includes an accessory bin 128 that is configured to receive mobile device accessories that the user wishes to recycle or otherwise dispose of. Additionally, the kiosk 100 can provide a free charging station 126 with a plurality of electrical connectors 124 for charging a wide variety of mobile phones and other consumer electronic devices.

[0024] Figures 2A-2D are a series of isometric views of the kiosk 100 with the housing 102 removed to illustrate selected internal components configured in accordance with an embodiment of the present technology. Referring first to Figure 2A, in the illustrated embodiment the kiosk 100 includes a connector carrier 240 and an inspection plate 244 operably disposed behind the access door 106 (Figure 1). In the illustrated embodiment, the connector carrier 240 is a rotatable carrousel that is configured to rotate about a generally horizontal axis and carries a plurality of electrical connectors 242 (e.g., approximately 25 connectors) distributed around an outer periphery thereof. In other embodiments, other types of connector carrying devices (including both fixed and movable arrangements) can be used. In some embodiments, the connectors 242 can include a plurality of interchangeable USB connectors configured to provide power and/or exchange data with a variety of different mobile phones and/or other electronic devices. In operation, the connector carrier 240 is configured to automatically rotate about its axis to position an appropriate one of the connectors 242 adjacent to an electronic device, such as a mobile phone 250, that has been placed on the inspection plate 244 for recycling. The connector 242 can then be manually and/or automatically withdrawn from the connector carrier 240 and connected to a port on the mobile phone 250 for electrical analysis. Such analysis can include, e.g., an evaluation of the make, model, configuration, condition, etc., using one or more of the methods and/or systems described in detail in the commonly owned patents and patent applications identified herein and incorporated by reference in their entireties.

[0025] In the illustrated embodiment, the inspection plate 244 is configured to translate back and forth (on, e.g., parallel mounting tracks) to move an electronic device, such as the mobile phone 250, between a first position (Figure 2A) directly behind the access door 106 and a second position (Figure 2B) between an upper enclosure or chamber 230 (e.g., a hood) and an opposing lower enclosure or chamber 232. Moreover, in this embodiment the inspection plate 244 is transparent, or at least partially transparent (e.g., formed of glass, Plexiglas, etc.) to enable the mobile phone 250 to be photographed and/or otherwise optically evaluated from all, or at least most viewing angles (e.g., top, bottom, sides, etc.) using, e.g., one or more cameras, mirrors, etc. mounted to or otherwise associated with the upper and lower chambers 230 and 232. When the mobile phone 250 is in the second position, the upper chamber 230 can translate downwardly to generally enclose the mobile phone 250 between the upper chamber 230 and the lower chamber 232. The upper chamber 230 can be operably coupled to a gate 238 that moves up and down in unison with the upper chamber 230. As described in greater detail below, in some embodiments the device actuation system 130 can be operably coupled to the upper chamber 230 and configured to automatically actuate one or more functions of the device 250 when the upper chamber 230 is lowered down over the device 250. As noted above, in the illustrated embodiment the upper chamber 230 and/or the lower chamber 232 can include one or more cameras, magnification tools, scanners (e.g., bar code scanners, infrared scanners, etc.) or other imaging components (not shown) and an arrangement of mirrors (also not shown) to view, photograph and/or otherwise visually evaluate the mobile phone 250 from multiple perspectives before and/or after the device has been turned on or otherwise activated. In some embodiments, one or more of the cameras and/or other imaging components discussed above can be movable to facilitate device evaluation. The inspection area 108 can also include weight scales, heat detectors, UV readers/detectors, and the like, for further evaluation of electronic devices placed therein. The kiosk 100 can further include an angled binning plate 236 for directing electronic devices from the inspection plate 244 into a collection bin 234 positioned in a lower portion of the kiosk 100.

[0026] The kiosk 100 can be used in a number of different ways to efficiently facilitate the recycling, selling and/or other processing of mobile phones and other consumer electronic devices. Referring to Figures 1-2D together, in one embodiment a user wishing to sell a used mobile phone, such as the mobile phone 250, approaches the kiosk 100 and identifies the type of device the user wishes to sell by selecting options (e.g., touch screen options) in response to prompts on the display screen 104. Next, the user may be prompted to remove any cases, stickers, or other accessories from the device so that it can be accurately evaluated. Additionally, the kiosk 100 may print and dispense a unique identification label (e.g., a small adhesive-backed sticker with a quick response code (“QR code”), barcode, or other machine-readable indicia, etc.) from the label outlet 110 for the user to adhere to the back of the mobile phone 250. After this is done, the door 106 retracts and opens allowing the user to place the mobile phone 250 onto the inspection plate 244 in the inspection area 108 (Figure 2A). The door 106 then closes and the inspection plate 244 moves the mobile phone 250 under the upper chamber 230 as shown in Figure 2B. The upper chamber 230 then moves downwardly to generally enclose the mobile phone 250 between the upper and lower chambers 230 and 232 as shown in Figure 2D.

[0027] In some embodiments, the device actuation system 130 can automatically actuate one or more functions of the mobile phone 250 in order to facilitate the visual inspection when the upper chamber 230 is positioned over the mobile phone 250. For example, the device actuation system 130 can be carried by or otherwise operably coupled to the upper chamber 230, and can interact with the mobile phone 250 either in conjunction with or separately from the visual and/or electrical inspection of the mobile phone 250. For example, an “about” screen on the mobile phone 250 can be brought up via interaction between the device actuation system 130 and the mobile phone 250. The “about” screen can display, for example, make, model, and other information about the mobile phone 250. Similarly, typing test characters, dialing a test phone number, activating a camera mode, or performing other such interactions can indicate functionality of the mobile phone 250.

Embodiments of such device actuation systems are described in more detail below with reference to Figures 3A–3H.

[0028] As noted above, in some embodiments the cameras and/or other imaging components in the upper and lower chambers 230 and 232 can perform a visual inspection of the mobile phone 250, when the upper chamber 230 is lowered over the mobile phone 250. In some embodiments, the visual inspection can include a computer-implemented visual analysis (e.g., a three-dimensional (“3D”) analysis) performed by a processing device within the kiosk (e.g., a CPU) to confirm the identification of the mobile phone 250 (e.g. make, model and/or sub-model) and/or to evaluate or assess the condition and/or function of the mobile phone 250 and/or its various components and systems. For example, the visual analysis can include computer-implemented evaluation (e.g., a digital comparison) of images of the mobile phone 250 taken from top, side and/or end view perspectives to determine length, width, and/or height (thickness) dimensions of the mobile phone 250. The visual analysis can further include a computer-implemented inspection of a display screen on the mobile phone 250 to check for, e.g., cracks in the glass and/or other damage or defects in the LCD (e.g., defective pixels, etc.). In some embodiments, the kiosk 100 can perform the visual analysis using one or more of the methods and/or systems described in detail in the commonly owned patents and patent applications identified herein and incorporated by reference in their entireties.

[0029] Referring next to Figure 2C, after the visual analysis is performed and the device has been identified, the upper chamber 230, which includes a hood or similar structure, returns to its upper position and the inspection plate 244 returns the mobile phone 250 to its initial position near the door 106. The display screen 104 can also provide an estimated price, or an estimated range of prices, that the kiosk 100 may offer the user for the mobile phone 250 based on the visual analysis, and/or based on user input (e.g., input regarding the type, condition, etc. of the mobile phone 250). If the user indicates (via, e.g., input via the touch screen) that they wish to proceed with the transaction, the connector carrier 240 automatically rotates an

appropriate one of the connectors 242 into position adjacent the inspection plate 244, and door 106 is again opened. The user can then be instructed (via, e.g., the display screen 104) to withdraw the selected connector 242 (and its associated wire) from the carousel 240, plug the connector 242 into the corresponding port (e.g., a USB port) on the mobile phone 250, and reposition the mobile phone 250 in the inspection area on the inspection plate 244. After doing so, the door 106 once again closes and the kiosk 100 (e.g. the kiosk CPU) performs an electrical inspection of the device via the connector 242 to further evaluate the condition of the phone as well as specific component and operating parameters such as the memory, carrier, etc. In addition or alternatively, in some embodiments the electrical inspection can include a determination of phone manufacturer information (e.g., a vendor identification number or VID) and product information (e.g., a product identification number or PID). In some embodiments, the kiosk 100 can perform the electrical analysis using one or more of the methods and/or systems described in detail in the commonly owned patents and patent applications identified herein and incorporated by reference in their entireties.

[0030] After the visual and electronic analysis of the mobile phone 250, the user is presented with a phone purchase price via the display screen 104. If the user declines the price (via, e.g., the touch screen), a retraction mechanism (not shown) automatically disconnects the connector 242 from the mobile phone 250, the door 106 opens, and the user can reach in and retrieve the mobile phone 250. If the user accepts the price, the door 106 remains closed and the user may be prompted to place his or her identification (e.g., a driver's license) in the ID scanner 112 and provide a thumbprint via the fingerprint reader 114. As a fraud prevention measure, the kiosk 100 can be configured to transmit an image of the driver's license to a remote computer screen, and an operator at the remote computer can visually compare the picture (and/or other information) on the driver's license to an image of the person standing in front of the kiosk 100 as viewed by one or more of the cameras 116a–c (Figure 1) to confirm that the person attempting to sell the phone 250 is in fact the person identified by the driver's license. In some embodiments, one or more of the cameras 116a-c can be movable to facilitate viewing of kiosk users, as well as other

individuals in the proximity of the kiosk 100. Additionally, the person's fingerprint can be checked against records of known fraud perpetrators. If either of these checks indicate that the person selling the phone presents a fraud risk, the transaction can be declined and the mobile phone 250 returned. After the user's identity has been verified, the inspection plate 244 moves back toward the upper and lower chambers 230 and 232. As shown in Figure 2D, however, when the upper chamber 230 is in the lower position the gate 238 permits the inspection plate 244 to slide underneath but not electronic devices carried thereon. As a result, the gate 238 knocks the mobile phone 150 off of the inspection plate 244, onto the binning plate 236 and into the bin 234. The kiosk can then provide payment of the purchase price to the user. In some embodiments, payment can be made in the form of cash dispensed from the cash outlet 118. In other embodiments, the user can receive remuneration for the mobile phone 150 in various other useful ways. For example, the user can be paid via a redeemable cash voucher, a coupon, an e-certificate, a prepaid card, a wired or wireless monetary deposit to an electronic account (e.g., a bank account, credit account, loyalty account, online commerce account, mobile wallet etc.), Bitcoin, etc.

[0031] Figures 3A–3H illustrate various embodiments of device actuation systems 130a–130f configured in accordance with embodiments of the present technology. As noted above, in various embodiments the device actuation systems 130a–e can be positioned within the inspection area 108 of the kiosk 100 of Figures 1–2D. Although the embodiments of Figures 3A–3H illustrate a mobile phone, in various embodiments similar hardware and routines can be used to interact with tablets, phablets, audio or video players, portable gaming systems, or any other device having a touchscreen and/or physical buttons accessible via an exposed surface with which a device actuation system can physically interact.

[0032] Referring to Figure 3A, the mobile phone 250 rests on the inspection plate 244 within the inspection area 108 beneath the upper chamber 230. The upper chamber 230 is illustrated transparently in order to more clearly show the inspection area 108. In this embodiment, the device actuation system 130a includes a support

302 that is disposed over the inspection plate 244 and is coupled to the upper chamber 230. For example, the support 302 can be securely mounted to interior sidewalls of the upper chamber 230 so that the position of the support 302 is fixed with respect to the upper chamber 230. An actuating member, such as a stylus 304 projects downwardly from the support 302 towards the inspection plate 244. The stylus 304 can be elongated and have a tip portion 306 that is configured to contact the touchscreen of the mobile phone 250 to initiate certain functions, turn the phone on or off, etc.

[0033] The stylus 304 can be configured to interact with a touchscreen of the mobile phone 250, and/or to interact with other input devices such as physical buttons or switches of the mobile phone 250. Mobile phones can employ a number of different touchscreen technologies, such as resistive touchscreens, surface acoustic wave touchscreens, capacitive touchscreens, optical touchscreens (e.g., infrared grid, infrared acrylic projection), acoustic touchscreens (e.g., acoustic pulse recognition), etc. The stylus 304 can be configured to interact with, and be detected by, one or more such touchscreen technologies. For example, in some embodiments, the tip portion 306 can be capacitive which can be detected by a capacitive touchscreen. In some embodiments, the tip portion 306 can be resistive (i.e. configured to be detected by resistive touchscreens). In some embodiments, the tip portion 306 can be configured to be detected by acoustic touchscreens (e.g., by interfering in an acoustic manner with surface acoustic waves on the touchscreen). In some embodiments, the tip portion 306 can be configured to be detected by optical touchscreens (e.g., by interfering with an optical grid layer just above the screen). In some embodiments, the stylus 304 can combine two or more of these technologies.

[0034] Cameras 308a and 308b (collectively identified as cameras 308) can be coupled to the support 302 and positioned to image the mobile phone 250. In some embodiments, there may be fewer or more than two cameras coupled to the support 302. For example, in some embodiments there may be one, three, four, five, six, or more cameras. The cameras 308a and 308b are spaced apart from the stylus

304 and configured to capture images of the mobile phone 250 before, concurrently, and/or after the stylus 304 interacts with the mobile phone 250. In some embodiments, the stylus 304 may have a camera integrated within, for example, an opening at the end of the tip portion 306 can house a camera or optics coupled to a camera (e.g., fiber-optic cable, lens, etc.) in order to obtain images through the stylus 304.

[0035] As noted above with respect to Figures 2A–2D, the inspection plate 244 can be moved inwardly toward the upper chamber 230 and outwardly away from the upper chamber 230 along the y-axis. In the illustrated embodiment, the upper chamber 230 is configured to move horizontally (laterally) along the x-axis and vertically along the z-axis. For example, the kiosk 100 can include an upper chamber support system 340 having a base 342 movably supported on a pair of fixed horizontal rails 313a–b. The base can be movably coupled to the rails 313a, b by means of a roller/track system, gears, other suitable means. A first driver 344a, such as a first stepper motor, can be operably coupled to the base via a lead screw, belt, gear drive, and/or other suitable drive system to move the base 342 back and forth on the rails 313a–b along the x-axis (e.g., perpendicular to movement of the inspection plate 244). Two vertical guide rails 315a–b extend downwardly from the base on opposite sides of the upper chamber 230, and can include guide channels 319a–b that movably receive corresponding guide pins 317a, b which extend outwardly from opposite sides of the upper chamber 230. A second driver 321b, such as a second stepper motor, can be operably coupled to the upper chamber 230 via a lead screw, belt, gear drive, and/or other suitable drive system to move the upper chamber 230 up and down via the guide channels 319a, b along the z-axis. Because the support 302 is fixed with respect to the upper chamber 230, movement of the upper chamber 230 causes the support 302 and stylus 304 to move as well. In other embodiments, any suitable structure or mechanism can be used to move the upper chamber 230 and hence the stylus 304.

[0036] In operation, the cameras 308 can obtain one or more images of the mobile phone 250. These images can be used to determine the position of the mobile

phone 250 with respect to the support 302 and specifically with respect to the stylus 304. For example, images obtained by the cameras 308 can be analyzed to determine that the stylus 304 is positioned, for example, 3 inches to the right of a certain point (e.g., the on/off button) on the mobile phone 250. The upper chamber 230 can then be moved 3 inches to the left so that the stylus 304 is positioned directly over that particular point on the mobile phone 250. Similarly, images obtained by the cameras 308 can be used to determine the elevation of the stylus 304 with respect to the mobile phone 250, which can then be used to move the upper chamber 230 vertically in order to interact with the mobile phone 250. For example, the elevation of the stylus 304 can be determined with the use of angled mirrors positioned adjacent the mobile phone 250 on the inspection plate 244. The angled mirrors can allow overhead cameras 308 to capture of side views of the mobile phone 250. The side view images obtained by the cameras 308 can be analyzed to determine the vertical distance between the stylus 304 and the mobile device 250 by using computer vision and/or machine vision techniques, for example edge matching, feature extraction, pixel counting, segmentation, neural net processing, optical character recognition, etc. In some embodiments, images obtained by the cameras 308 can be compared to images stored in a database that correspond to an assortment of mobile phones and other devices. The kiosk 100 can compare the obtained images from the cameras 308 with the stored images in order to identify the make and model of a particular device, its dimensions, locations of features (e.g., on/off button), etc.

[0037] The upper chamber 230 and/or the inspection plate 244 can be moved to properly position and/or move the stylus 304 relative to the mobile phone 250. For example, the position of the mobile phone 250 may be random on the inspection plate 244, and an initial image of the mobile phone 250 (e.g., an image captured by cameras housed within the upper chamber 230 or the cameras 308) can be used to determine the position of the mobile phone 250 relative to the inspection plate 244 and/or the stylus 304. The position information can then be used to determine vertical and/or lateral movement of the upper chamber 230 and/or the inspection plate 244 necessary to cause the stylus 304 to interact with the mobile phone 250 in a desired

way (e.g., to turn on the phone, bring up an image, etc.). For example, the upper chamber 230 can be lowered until the stylus 304 contacts the mobile phone 250, with movement of the upper chamber 230 laterally along the x-axis and movement of the inspection plate 244 laterally along the y-axis determining the point of contact between the tip portion 306 and the mobile phone 250. The upper chamber 230 can be momentarily lowered and then raised such that the stylus 304 “taps” the touchscreen or a physical button of the mobile phone 250. The upper chamber 230 can also be lowered such that the stylus 304 is in contact with the touchscreen of the mobile phone 250, after which the upper chamber 230 and/or the inspection plate 224 can move laterally so that the stylus 304 sweeps across the touchscreen of the mobile phone 250, for example, to mimic the sweeping gesture to unlock the mobile phone 250. Various other combinations of movement between the upper chamber 230 and the inspection plate 244 can be coordinated so that the stylus 304 interacts with the touchscreen of the mobile phone 250, and/or so that the stylus 304 interacts with physical buttons of the mobile phone 250 to activate desired functions of the mobile phone 250. As described in detail below, in other embodiments, the stylus 304 can remain stationary, and the mobile phone 250 can be coupled to a cradle or other support structure that is moveable with respect to the stylus 304.

[0038] In some embodiments, the cameras 308 can obtain images of the mobile phone 250 before, during, and after the stylus 304 interacts with the mobile phone 250. For example, as described above, in some embodiments the cameras 308 can obtain images of the mobile phone 250 prior to positioning of the stylus 304. These images can be used to determine movement of the upper chamber 230 and/or the inspection plate 244 in order to position the stylus 304 over the mobile phone 250 and/or to interact with the mobile phone 250 (e.g., to press a physical or virtual button on the mobile phone 250, to activate particular features, turn off the screen, etc.). After the stylus 304 interacts with the mobile phone 250, the cameras 308 can again image the mobile phone 250 (or in some embodiments the imaging can be continuous video). These images can be used to determine the next interaction between the stylus 304 and the mobile phone 250. For example, the initial images can be used to

determine the position of the mobile phone 250 and to cause the stylus 304 to press a “home” button on the mobile phone 250. After pressing the “home” button with the stylus 304, images from the cameras 308 may show a “lock screen” indicating that a sweeping gesture is needed to unlock the mobile phone 250. These images can be used to determine position and movement of the stylus 304 (via control of the upper chamber 230 and/or the inspection plate 244) such that the stylus 304 sweeps across the touchscreen and thereby unlocks the mobile phone 250. The cameras 308 can then obtain additional images of the mobile phone 250, which can in turn be used to cause the stylus 304 to interact further with the mobile phone 250. This iterative process can continue with the stylus 304 interacting with the mobile phone 250, guided by images obtained by the cameras 308 to cause the desired actions, e.g., to open an “app,” to navigate a menu, to type test letters, to dial a test phone number, to initiate a camera mode, or other such interaction. In one embodiment, the stylus 304 can be used to turn off the screen and/or to power off the mobile phone 250 before visual evaluation of the mobile phone 250. Doing so can improve crack detection and other visual evaluation of the mobile phone 250. Additionally, it can be advantageous to power off the mobile phone 250 before binning it.

[0039] The various interactions with the mobile phone 250 described above and the resulting images obtained via cameras 308 can be used as part of the visual evaluation of the mobile phone 250 carried out by the kiosk 100. For example, an “about” screen on the mobile phone 250 can be brought up via interaction between the stylus 304 and the mobile phone 250. The “about” screen can display, for example, make, model, and other information about the mobile phone 250. Similarly, typing test characters, dialing a test phone number, activating a camera mode, or performing other such interactions can indicate functionality of the mobile phone 250. As indicated above, following visual analysis and identification of the device, the upper chamber 230 can be raised and the inspection plate 244 can return the mobile phone 250 to its initial position near the door 106 (Figure 2C) for electrical evaluation. Note that visual inspection can include inspection for damage to the screen, body, buttons, etc.. In some embodiments, the visual inspection can include one or more of the

methods and/or systems described in detail in the commonly owned patents and patent applications identified herein and incorporated by reference in their entireties.

[0040] Figure 3B illustrates the device actuation system 130b within the inspection area 108. Various components are at least generally similar in structure and function to those of the device actuation system 130a described above with reference to Figure 3A. However, in the illustrated embodiment of Figure 3B, a support 303 carries an array of styluses 305 (individually identified as styluses 305a–305n) projecting downwardly toward the inspection plate 244. Each individual stylus 305n can be configured to move vertically downward to project beyond adjacent styluses 305n and then retract upwardly back into place. As illustrated in Figure 3B, for example, the stylus 305a is extended and projects beyond the adjacent styluses 305n. In some embodiments, the dimensions of the array of styluses 305 can be larger than the dimensions of the mobile phone 250 or other electronic device. For example, in some embodiments, the array of styluses 305 can be sufficiently large so that it covers any location of the inspection plate 244 where the electronic device 250 may be placed. This features makes it unnecessary to move the upper chamber 230 laterally along the x-axis to position the array of styluses 305 over the electronic device 250.

[0041] In the illustrated embodiment, each of the styluses 305a-305n are movably received in a corresponding socket 307. Each of the sockets 307 is operably associated with a corresponding driver such as a solenoid 311 or other electromechanical device, which in turn is operably connected to a controller 309. The solenoids 311 can individually move the styluses 305n up and down in the sockets 307 in response to signals from the controller 309. For example, the controller 309 can include an integrated circuit chip configured to control the current passing through individual solenoids 311. Alternatively or in addition, each stylus can include a row of teeth configured to operably engage a corresponding drive gear 310. The gear 310 can be driven by a small electric motor or other suitable drive system, and configured to receive operating instructions from the controller 309. Rotation of the gear 310 in a

first direction lowers the stylus 305a, and rotation of the gear 310 in the opposite direction raises the stylus 305a. In other embodiments, a small stepper motor, pneumatic drive, or other such actuator can be used to individually move the styluses 305a–305n up and down as needed relative to the support 303. The individual styluses 305a–305n can be controlled to interact with the mobile phone 250, e.g. to press virtual and/or physical buttons on the mobile phone 250, to perform gestures via a touchscreen of the mobile phone 250, etc.

[0042] The array of styluses 305 can be configured to accommodate a mobile phone 250 in various orientations. For example, the actuation system 130b can be particularly useful for analyzing mobile phones 250 which are oriented in random or irregular orientations, for example, at an angle with respect to the inspection plate 244. Additionally, in this embodiment, the upper chamber 230 can be fixed in the lateral direction (e.g., the upper chamber 230 may only move vertically), eliminating the need for a drive and translation system to move the upper chamber 230 laterally with respect to the inspection plate 244.

[0043] In operation, the upper chamber 230 can be lowered over the mobile phone 250 until the array of styluses 305a–305n are disposed over the mobile phone 250 but not in contact with the mobile phone 250. Cameras 308a and 308b can be used to obtain images of the mobile phone 250 similar to that described above with respect to Figure 3A to determine the position of the mobile phone 250 with respect to the array of styluses 305. An individual stylus or styluses 305n can then be controlled by, e.g., the controller 309, to extend downwardly and contact the mobile phone 250 in one or more desired locations. In other embodiments the cameras 308 can be disposed within the array of styluses 305, while in other embodiments the cameras 308 can be disposed adjacent to the array and pointing towards the mobile phone 250. In some embodiments, one or more of the individual styluses 305a–305n can have a camera integrated therein, e.g. via an opening at the end of the stylus for a camera or for associated optics (e.g., lens, optical fiber, etc.) to reside. In some embodiments, cameras disposed within the upper chamber 230 (e.g., coupled to an inner surface of

the hood or other enclosure) can image the electronic device 250. For example, such cameras can be positioned about the upper chamber 230 so as to have a clear line-of-sight with the electronic device 250 on the inspection plate 244. In some embodiments, mirrors, lenses, or other optical elements can be used to allow the cameras coupled to the upper chamber to image the electronic device 250 without the array of styluses 305 interfering.

[0044] The images obtained by the cameras 308 can be used to determine movement of the inspection plate 244 and/or the individual styluses 305a–305n necessary to interact with the mobile phone 250 in a desired way, e.g., to press a physical or virtual button on the mobile phone 250. As described above, the cameras 308 can be used to obtain images of the mobile phone 250 before, during, and after interaction between any individual stylus 305n and the mobile phone 250. After interacting with the phone 250, the cameras 308 can again image the phone 250 (or in some embodiments the imaging can be continuous video). These images can be used to determine the next interaction between the stylus 305 and the mobile phone 250. For example, the initial images can be used to determine the position of the mobile phone 250 and to cause the appropriate stylus 305n to press a “home” button on the mobile phone 250. After pressing the “home” button with the stylus 305n, images from the cameras 308 can show a “lock screen” indicating that a sweeping gesture is needed to unlock the mobile phone 250. These images can be used to determine which individual styluses 305n to actuate in order to effect a sweeping gesture across the touchscreen to thereby unlock the mobile phone 250. For example, adjacent individual styluses 305n can be sequentially actuated to simulate a sweeping gesture across a portion of the touchscreen. The cameras 308 can then obtain additional images of the mobile phone 250, which can in turn be used to cause the appropriate stylus 305n to interact once more with the mobile phone 250. This iterative process can continue with the appropriate individual styluses 305n interacting with the mobile phone 250, guided by images obtained by the cameras 308 to cause the desired actions as described above.

[0045] Figures 3C–3E illustrate the device actuation system 130c in various operational states within the inspection area 108. Various components of the device actuation system 130c are at least generally similar in structure and function to those of the actuation systems 130a and 130b described above with reference to Figures 3A and 3B, respectively. In the embodiment of Figures 3C–3E, however, an array of styluses 314 projects upwardly from a support 303 which is disposed on the inspection plate 244. In this embodiment, a cradle 316 is moveably mounted to the inspection plate 244 and configured to receive the mobile phone 250 in a fixed, face-down orientation such that the face of the mobile phone 250 faces toward the array of styluses 314 (as shown in Figure 3D). The cradle 316 includes adjustable sidewalls 318 configured to grasp or clamp the mobile phone 250 in order to hold it in place over the array of styluses 314. The distance between the sidewalls 318 can be expanded or contracted to accommodate and grasp a range of devices having various widths W. For example, in some embodiments the sidewalls 318 can be biased inwardly and can be manually expanded by a user in order to accommodate the mobile phone 250 between them. Upon releasing the sidewalls 318, the inward bias can cause the distance between the sidewalls 318 to contract until the sidewalls 318 abut and grasp the sides of the mobile phone 250. In other embodiments, the distance between the sidewalls 318 can be electronically controlled. In other embodiments, the cradle can assume other shapes and configurations, for example a suction cup or adhesive device coupled to an arm can hold the mobile phone 250 over the array of styluses 305. In some embodiments, a similar cradle can be used in the embodiments described above with reference to Figures 3A and 3B.

[0046] The sidewalls 318 extend upwardly from and are moveably mounted to parallel rails 321 positioned on opposite sides of the array of styluses 314. The cradle 316 can moveably engage the rails 321 by, for example, having protrusions or rollers received in slots or receptacles within the rails 321. The protrusions can be slidably moved along the slots or receptacles via a lead screw or belt drive coupled to a stepper motor (not shown), or other suitable mechanism for effecting translation of the cradle 316 with respect to the rails 321. The cradle 316 can be moved along the

rails 321 in the y-direction to position the mobile phone 250 at a desired position with respect to the inspection plate 244. For example, in a first position (shown in Figure 3D) the cradle 316 can be positioned so that the mobile phone 250 is suspended face-down over the array of styluses 314. In a second position (shown in Figure 3E), the cradle 316 moves away from the array of styluses 314 to position the mobile phone 250 over cameras 325 disposed beneath the inspection plate 244.

[0047] In operation, the mobile phone 250 can be positioned between the sidewalls 318 of the cradle 316 by the user 101 when the inspection plate 244 is positioned directly behind or near to the door 106 as shown in Figure 2A, so that the mobile phone 250 faces downward over the array of styluses 314 without contacting the styluses 314. The inspection plate 244 can then move back into position under the upper chamber 230 as shown in Figure 3C. The cradle 316 (now carrying the mobile phone 250 with its screen facing down) moves along the rails 321 in the y-direction and position the mobile phone 250 over the cameras 325 (as shown in Figure 3E), which can be used to obtain images of the mobile phone 250 similar to that described above with respect to Figure 3B. For example, a stepper motor coupled to a belt drive or other such mechanism can be engaged to automatically translate the cradle 316 along the rails 321 into position over the cameras 325. Images obtained by the cameras 325 can be analyzed to determine which of the individual styluses 314_n should contact the phone in order to perform the desired operations (e.g., open an application, type test characters, access an “about” screen, etc.). The cradle 316 then moves back on the rails 321 in the y-direction to position the mobile phone 250 over the array of styluses 314 (as shown in Figure 3D). Individual styluses 314_n can then be operated to extend upwardly and contact the mobile phone 250. For example, a solenoid or similar electrical and/or mechanical device can be used to extend an individual stylus 314_n from its socket or receptacle (not shown), similar to that described above with respect to Figure 3B. Alternatively or in addition a toothed gear can mesh with teeth on the stylus 314_n. Rotation of the gear can be controlled via a controller, thereby causing the stylus 314_n to be raised or lowered. In other embodiments, a small stepper motor, pneumatic drive, or other such actuator can be

used to individually move the styluses 314 n up and down as needed relative to the support 303.

[0048] After the styluses 314 have interacted with the mobile phone 250, the cradle 316 moves back again along the rails 321 in the y-direction to position the mobile phone 250 over the cameras 308a and 308b for subsequent imaging. Subsequent images obtained by cameras 308a and 308b can then be analyzed to obtain additional information (e.g., to read the text of an “about” screen) and/or to determine which individual styluses 314 n of the array should be moved in order to interact further with the device. In some embodiments the cameras 308 can be disposed within the array of styluses 314, while in other embodiments the cameras 308 can be disposed adjacent to the array and pointing towards the mobile phone 250. In some embodiments, one or more of the individual styluses 314a–314 n can have a camera integrated therein, e.g. via an opening at the end of the stylus for a camera or for associated optics (e.g., lens, optical fiber, etc.) to reside.

[0049] Figure 3F illustrates the device actuation system 130d configured in accordance with another embodiment of the present technology. In this embodiment, the device actuation system 130d includes a stylus 323 operably coupled to a translation system 322. In some embodiments, the translation system 322 can be coupled to and carried by the upper chamber 230. The translation system 322 can be a 3-dimensional translation system comprising a cross-member such as a cross-beam 324 which extends between opposing side-members such as side-beams 326a–b. In some embodiments, the cross-beam 324 and the side-beams 326a–b can be threaded lead screws, and the cross-beam 324 can be mounted to the side-beams 326a–b via threaded nuts 327 which engage the lead screws. The side-beams 326a–b can be rotated in tandem (e.g., via stepper motors 329), thereby causing the cross-beam 324 to translate back and forth on the side-beams 326a–b along the y-axis. The stepper motors 329 can be controlled via an electronic controller 331 which cause the side-beams 326a–b to rotate in unison. In other embodiments, various other linear actuators can be used to effect movement of the cross-beam 324 with respect to the

side-beams 326. In some embodiments, the controller 331 can include an integrated circuit chip, for example a processor or CPU configured to execute computer-readable instructions to control the stepper motors 329 as well as stepper motor 336, as described in more detail below.

[0050] The stylus 323 is coupled to a carrier 328 that includes a threaded portion that engages the threaded cross-beam 324. The carrier 328 is configured to move back and forth along the longitudinal axis of the cross-beam 324 as the cross-beam 324 is rotated (e.g., via stepper motor 336 which is carried by one of the nuts 327). The stepper motor 336 can be controlled via the electronic controller 331 to cause the cross-beam 324 to rotate and translate the carrier 328 to a desired position along the length of the cross-beam 324. The combination of moving the cross-beam 324 along side-beams 326, and moving the carrier 328 along the longitudinal axis of the cross-beam 324 provides two degrees of freedom for controlling the lateral position of the stylus 323 with respect to the mobile phone 250. Between control of these two positions, the stylus 323 can be oriented over a desired position of the mobile phone 250. In some embodiments, movement of the cross-beam 324 with respect to the side-beams 326, and movement of the carrier 328 with respect to the cross-beam 324, can be controlled via stepper motors, belt drives, or any other suitable mechanism for effecting controlled movement of these components. The stylus 323 can itself be actuated to extend further downwardly to provide for vertical movement. For example, in some embodiments a solenoid can be used to move the stylus 323 downward and upward relative to the carrier 328 as described above. In other embodiments, a gear mechanism, rotary motor, pneumatic drive, or other such actuator can be used to cause the stylus 323 to extend or retract with respect to the carrier 328.

[0051] In operation, the camera 308 can be used to obtain images of the mobile phone 250 similar to that described above with respect to Figures 3A–3E. The images can then be analyzed to determine the initial position of the mobile phone 250 with respect to the stylus 323. The controller 331 transmits signals to the stepper

motors 329 and 336 to position the cross-beam 324 and the carrier 328 to position the stylus 323 over a desired point on the mobile phone 250 (e.g., over the “home” button). The stylus 323 can then be actuated to extend downward and to contact the mobile phone 250. In some embodiments one or more cameras 308 can be disposed on the cross-beam 324, while in other embodiments one or more cameras 308 can be coupled to the side-beams 326. In still other embodiments, the stylus 323 can have a camera integrated therein, e.g. via an opening at the end of the stylus for a camera or for associated optics (e.g., lens, optical fiber, etc.) to reside.

[0052] The images obtained by the camera 308 can be used to determine movement of the cross-beam 324, the driver 328, and the stylus 323 in order to interact with the mobile phone 250, e.g., to press a physical or virtual button on the mobile phone 250. As described above with respect to Figure 3A, use of the cameras 308 in conjunction with control of the position of the stylus 323 can facilitate visual evaluation of the mobile phone 250, for example testing functionality, accessing “about” screens, etc.

[0053] Figure 3G illustrates the device actuation system 130e within the inspection area 108. In this embodiment, a plurality of protrusions 330a–330d (e.g., cylindrical pins, nubs, etc.) project outwardly from the surface of sidewalls 332 which are disposed directly above the inspection plate 244. The protrusions 330a–330d are disposed at various heights along the sidewalls, and are configured such that one or more external buttons on side surfaces of the mobile phone 250 can be depressed by lateral movement of one or more buttons of the mobile phone 250 against one of the protrusions 330a–330d. For example, movement of the mobile phone 250 against the protrusion 330c may cause a power button on the mobile phone to be depressed.

[0054] The mobile phone 250 can be moved with respect to the protrusions 330a–330d via a translation system 333. The translation system 333 comprises a cradle 334 configured to receive the mobile phone 250 therein. The cradle 334 can be adjustable (e.g., expandable/contractible) to accommodate a variety of different

devices, and can be configured to grip corners of the mobile phone 250 to leave the side surfaces of the mobile phone 250 largely exposed and accessible.

[0055] In the illustrated embodiments, the cradle 334 includes a threaded through-hole (not shown) that is coupled to a cross-member such as a threaded cross-beam 335 (e.g., a lead screw) which allows the cradle 334 to translate back and forth along the length of the cross-beam 335 when the cross-beam 335 is rotated (e.g., via stepper motor 336 mounted at one end of the cross-beam 335). Control of the stepper motor 336 can effect movement of the cradle 334 along the y-axis. The cross-beam 335 extends between parallel side-members such as side-beams 337a–b, which are likewise threaded. More specifically, the opposite ends of the cross-beam 335 can be attached to threaded support nuts 338 which receive the threaded side-beams 337a–b extending therethrough. The support nuts 338 translate along the lengths of the respective side-beams 337a–b in response to axial rotation of the side-beams 337a–b (e.g., via stepper motors 339 activated in unison). Translation of the support nuts 338 causes the cross-beam 335 to move in the x-direction. Controlling the stepper motor 336 for y-axis translation and controlling the stepper motors 339 for x-axis translation moves the cradle 334 and therefore the mobile phone 250 to be positioned relative to the inspection plate 244 and controls the position of the mobile phone 250 with respect to the protrusions 330a–330d. The stepper motors 336 and 339 can be controlled via an electronic controller 331. In other embodiments, various other linear actuators can be used to effect movement of the cradle 334 with respect to the inspection plate 244. In some embodiments, the controller 331 can include an integrated circuit chip, for example a processor or CPU.

[0056] In operation, a camera mounted to the upper chamber 230 can be used to obtain images of the mobile phone 250 similar to that described above with respect to Figures 3A–3E. The images can then be analyzed to determine the initial position of the mobile phone 250 with respect to the protrusions 330a–d. The controller 331 transmits signals to the stepper motors 336 and 339 to position the mobile phone 250 to contact one or more of the protrusions 330a–330d to depress

one or more buttons on a side surface of the mobile phone 250 (e.g., volume buttons, a power button, etc.). The camera mounted to the upper chamber 230 can image the mobile phone 250 before, during, or after such interaction between the mobile phone 250 and the protrusion(s) 330a–330d. The images obtained by the camera can also be used by the controller 331 to determine movement of the stepper motors 336 and 339 to cause the mobile phone 250 to interact with one or more of the protrusions 330a–330d.

[0057] In some embodiments, there may be fewer or more protrusions, for example, one, five, six, seven, eight or more protrusions. In some embodiments, the protrusions can take other forms, for example elongated projections from a side surface, a ridged edge, etc. Similar to that described above with respect to Figures 3A–3F, images obtained of the mobile phone 250 before, during, and/or after interaction with one or more of the protrusions 330a–330d can be used to facilitate visual evaluation of the mobile phone 250. For example, powering the mobile phone 250 on and off via interaction with one of the protrusions 330a–330d, toggling volume levels via the protrusions 330a–330d, and other such interactions can aid in assessing functionality and value of the mobile phone 250.

[0058] In some embodiments, a translation system and/or the protrusions as shown in Figure 3G can be combined with one or more of the stylus or array of styluses as shown in Figures 3A–3F and 3H. Such a combination allows for the protrusions to be used in depressing buttons on a side surface of the mobile phone 250, while using the stylus or styluses to interact with buttons or a touchscreen on the face of the mobile phone 250.

[0059] Figure 3H illustrates the device actuation system 130f configured in accordance with another embodiment of the present technology. In this embodiment, the device actuation system 130f includes a stylus 348 operably coupled to a translation system 350 mounted to a front side of the upper chamber 230. For example, the translation system 350 can be mounted to a gate 238 (Figures 2A–2D) or other structure coupled to the upper chamber 230. The translation system 350 can

be a one-dimensional translation system configured to move the stylus 348 back and forth along the x-axis. In the illustrated embodiment, the translation system 350 includes a beam 352, such as a threaded lead screw. The stylus 348 can be mounted to the beam 352 a nut 354, such as a threaded nut which engages the lead screw. The nut 354 and stylus 348 can translate back and forth along the length of the beam 350 when the beam 350 is rotated (e.g., via stepper motor 356 mounted at one end of the beam 350). Control of the stepper motor 356 can effect movement of the nut 354 and stylus 348 along the x-axis. The stepper motor 356 can be controlled via an electronic controller 358. In other embodiments, various other linear actuators can be used to effect x-axis movement of the stylus 348 with respect to the upper chamber 230, for example a belt drive system, pneumatic actuator, a rack and pinion system, etc. Furthermore, the controller 358 can include an integrated circuit chip, for example a processor or CPU.

[0060] The inspection plate 144 on which the mobile phone 250 rests can move inwardly toward the upper chamber 230 and outwardly away from the upper chamber 230 along the y-axis. In the illustrated embodiment, the upper chamber 230 is configured to move vertically along the z-axis. For example, the upper chamber 230 can be raised and lowered along the z-axis in the manner described above with reference to Figure 3A. Because the translation system 350 is fixed with respect to the upper chamber 230, movement of the upper chamber 230 causes the translation system 350 and the stylus 348 to move along the z-axis as well. In other embodiments, any suitable structure or mechanism can be used to raise and lower the upper chamber 230 and hence the stylus 348.

[0061] In operation, a camera (not shown) mounted to the interior of the upper chamber 230 can be used to obtain images of the mobile phone 250 when the mobile phone 250 is positioned beneath the upper chamber 230. The images can then be analyzed to determine the initial position of the mobile phone 250 with respect to the stylus 348. The controller 358 transmits signals to the stepper motor 356 to position the nut 354 and the stylus 348 over a desired point on the mobile phone 250

(e.g., over the “home” button). The stylus 348 can then be actuated to extend downwardly and to contact the mobile phone 250. In some embodiments one or more cameras can be disposed on the beam 352, rather than being mounted on the upper chamber. In still other embodiments, the stylus 348 can have a camera integrated therein, e.g. via an opening at the end of the stylus for a camera or for associated optics (e.g., lens, optical fiber, etc.) to reside.

[0062] The images obtained by the camera can be used to determine movement of the stepper motor 356 and the stylus 348 in order to interact with the mobile phone 250, e.g., to press a physical or virtual button on the mobile phone 250. As described above with respect to Figures 3A–3F, use of cameras in conjunction with control of the position of the stylus 348 can facilitate visual evaluation of the mobile phone 250, for example testing functionality, accessing “about” screens, etc.

[0063] The upper chamber 230 and/or the inspection plate 244 can be moved to properly position and/or move the stylus 348 relative to the mobile phone 250. For example, the position of the mobile phone 250 on the inspection plate 244 may initially be random. An initial image of the mobile phone 250 (e.g., an image captured by cameras housed within the upper chamber 230) can be used to determine the initial position of the mobile phone 250 relative to the inspection plate 244 and/or the stylus 348. The position information can then be used to determine vertical movement of the upper chamber 230, lateral movement of the stylus 348 along the beam 352, and/or lateral movement of the inspection plate 244 necessary to cause the stylus 348 to interact with the mobile phone 250 in a desired way (e.g., to turn on the phone, bring up an image, etc.). For example, when the upper chamber 230 is lowered to contact the stylus 348 to the mobile phone 250, movement of the stylus 348 along beam 352 on the x-axis and movement of the inspection plate 244 laterally along the y-axis can determine the point at which contact between the stylus 348 and the mobile phone 250 will occur.

[0064] Several different types of contact between the stylus 304 and the mobile phone 250 are possible. For example, the upper chamber 230 can be

momentarily lowered and then raised such that the stylus 304 “taps” the touchscreen or a physical button of the mobile phone 250. As another example, the upper chamber 230 can first be lowered such that the stylus 348 moves into contact with the touchscreen of the mobile phone 250, after which the stylus 348 (via the beam 352) and/or the inspection plate 244 can move laterally so that the stylus 348 sweeps across the touchscreen of the mobile phone 250. This can be useful, for example, to mimic a sweeping gesture to unlock the mobile phone 250. Various other combinations of movement between the upper chamber 230, the stylus 348 along the beam 352, and the inspection plate 244 can be coordinated so that the stylus 348 interacts with the touchscreen of the mobile phone 250, and/or so that the stylus 348 interacts with physical buttons of the mobile phone 250 to activate desired functions of the mobile phone 250.

[0065] Utilizing one or more of the features illustrated in Figures 3A–3H, the mobile phone 250 can be visually evaluated in order to assess condition and functionality, as well as to identify make and model of the mobile phone 250. Following such visual evaluation, the process may continue as outlined above with respects to Figures 2A–2D. For example, following visual analysis and identification of the device, the upper chamber 230 can be raised and the inspection plate 244 can return the mobile phone 250 to its initial position near the door 106 (Figure 2C) for electrical evaluation.

[0066] As those of ordinary skill in the art will appreciate, the foregoing routines are but some examples of ways in which the kiosk 100 can be used to recycle or otherwise process consumer electronic devices such as mobile phones. Although the foregoing example is described in the context of mobile phones, it should be understood that the kiosk 100 and various embodiments thereof can also be used in a similar manner for recycling virtually any consumer electronic device, such as MP3 players, tablet computers, PDAs, and other portable devices, as well as other relatively non-portable electronic devices such as desktop computers, printers, devices for implementing games, entertainment or other digital media on CDs, DVDs,

Blu-ray, etc. Moreover, although the foregoing example is described in the context of use by a consumer, the kiosk 100 in various embodiments thereof can similarly be used by others, such as a store clerk, to assist consumers in recycling, selling, exchanging, etc. their electronic devices.

[0067] The Figures described herein and below include representative flow diagrams and other information that depict processes used in some embodiments of the present technology. These flow diagrams may not show all functions or exchanges of data, but instead they provide an understanding of commands and data exchanged under the systems described herein. Those skilled in the relevant art will recognize that some functions or exchange of commands and data may be repeated, varied, omitted, or supplemented, and other (less important) aspects not shown may be readily implemented. Those skilled in the art will appreciate that the blocks shown in the flow diagrams discussed below may be altered in a variety of ways. For example, while processes or blocks are presented in a given order, alternative implementations may perform routines in a different order, and some processes or blocks may be rearranged, deleted, moved, added, subdivided, combined, and/or modified to provide alternative or sub-combinations. Each of these processes or blocks may be implemented in a variety of different ways. Also, although processes or blocks are at times shown as being performed in series, these processes or blocks may instead be performed or implemented in parallel, or may be performed at different times. The steps depicted in the flow diagrams and/or represented by other tables, formulas, etc. can themselves include a sequence of operations that need not be described herein. Those of ordinary skill in the art can create source code, microcode, program logic arrays and/or or computer-readable instructions to implement the depicted steps and routines based on the flowcharts and the detailed description provided herein. The routines and portions thereof can be stored in non-volatile memory that forms part of a processor contained in the kiosk 100 or otherwise associated with the kiosk 100 (e.g., a remote processor operably connected to the kiosk 100 via a wired/wireless communication link, etc.), or they can be stored in

removable media, such as disks, or hardwired or preprogrammed in chips, such as EEPROM semiconductor chips.

[0068] Figure 4 is a flow diagram of a routine 400 that can be performed by the kiosk 100 for purchasing devices, e.g., mobile phones and/or other electronic devices, from users in accordance with an embodiment of the present technology. The routine can be executed by a processing device in accordance with computer-executable instructions stored on memory. In step or block 402, the routine receives the device from the user (e.g., in the inspection area 108 of the kiosk 100 (Figure 1)). In block 404, the routine performs an evaluation, e.g., a visual and/or electrical inspection of the device, to determine various information about the device that can affect the device value. The visual and/or electrical inspection can include interaction with the electronic device via one of the device actuation systems 130a–130f as described in detail above with reference to Figures 3A–3H. Information determined based on the evaluation can include, for example, the make, model, sub-model of the device, the device features (e.g., memory size, cell service carrier, etc.), device operability, device charge and/or rechargeability, physical condition, display function and condition, etc. After the device has been evaluated, the routine proceeds to block 406 to determine a price to offer the user for the device. In block 408, the routine presents the offer to the user (via, e.g., a textual message on the display screen 104, an audio speaker, etc.). In decision block 410, the routine determines if the user has accepted the offer price (by, e.g., providing input via a touch screen, key pad, microphone, etc. operably coupled to the kiosk 100). If the user declines the offer, the routine proceeds to block 412 and returns the device to the user. Conversely, if the user accepts the offer, the routine proceeds to block 414 and provides remuneration to the user in the amount of the purchase price. Such remuneration or payment can be in the form of, e.g., cash, a voucher redeemable for cash, merchandise, services, etc., electronic value (e.g., bitcoin, e-certificates, credit to electronic payment account, etc.), credit (e.g., a prepaid credit card, debit card, gift card, etc.), coupons, loyalty points, and/or other forms of value. In block 416, the routine retains the device (e.g., in the collection bin 234 of the kiosk 100) and the routine ends.

[0069] Figure 5 is a flow diagram of a subroutine 500 for the visual inspection of an electronic device, such as a mobile phone, including interaction with the device via one of the device actuation systems 130a–130f described in detail above. The subroutine can be executed by a processing device in accordance with computer-executable instructions stored on memory. The subroutine 500 can take place as a portion of block 404 in the flow diagram of Figure 4. Referring to Figure 5, in block 502 the routine obtains a first image of the device. The image can be obtained via an overhead camera disposed within the upper chamber 230 (Figure 2A) or via a lower camera positioned underneath the inspection plate 244. In some embodiments, the image can be obtained via one or more of the cameras 308 associated with the device actuation systems 130a–130f, for example one or more of the cameras 308 coupled to the support for the stylus or array of styluses (Figures 3A–3E), or coupled to the cross-beam of a translation system (Figure 3F).

[0070] In block 504, a first image is analyzed. The first image can be used to determine the location of the mobile phone 250 with respect to the inspection plate 244. For example, an associated processing device (e.g., a controller associated with the device actuation system, a separate processor associated with the kiosk 100, or other suitable processing device) can include programmed logic to process images of the device 250 and to determine motion of components of a device actuation system 130a–e in order to cause a stylus to interact with the mobile phone 250. In block 506, the subroutine moves the stylus to interact with the mobile phone 250 based on the device position as determined in block 504. The stylus and device actuation system can have a number of forms. For example a single stylus 304 can be coupled to a support which is fixed in relation to the upper chamber 230 as described above with reference to Figure 3A. In this embodiment, the upper chamber 230 can move in relation to the inspection plate 244 to position the stylus 304 with respect to the mobile phone 250 so that the stylus 304 can, for example, press a virtual button on a touch screen of the mobile phone 250. In other embodiments, an array of styluses 305 can be coupled to a support which is disposed over the mobile phone 250 as described above with respect to Figure 3B, with each of the styluses 305 individually moveable

to interact with the touch screen of the mobile phone 250 (e.g., press virtual buttons, navigate menus, etc.). In some embodiments, an array of styluses 305 can be positioned beneath the mobile phone 250 as described above with respect to Figure 3C, with the mobile phone 250 facing downward in a cradle 316 so that upward movement of the styluses 305 enables interaction with the mobile phone 250 via a touch screen or other input. In some embodiments, a stylus 323 can be coupled to a translation system as described above with respect to Figure 3F, which moves the stylus 323 in three degrees of freedom with respect to the mobile phone 250 such that the stylus 323 can interact with the touchscreen or other input of the mobile phone 250.

[0071] In each of these configurations, the stylus or styluses can be used to interact with the electronic device. The interaction can be based at least in part on the first image, for example the first image can provide orientation for the stylus or styluses to interact with the electronic device. Interaction with the electronic device can include, for example, navigating a menu to display an “about” screen which provides information about the make and model of the device. Interaction with the electronic device can also include typing in test characters, dialing a test phone number, navigating menus, initiating a camera mode, or other such interaction in order to assess the functionality of the electronic device and/or to determine the make and model of the device.

[0072] In block 508, the routine obtains another image of the device following the interaction between the stylus and the device. For example, the stylus can press a “home” button of a mobile phone, after which a camera can obtain an image of the display screen. In some embodiments, the stylus can be robotically moved again based on the second image to further interact with the device. For example, after pressing the “home” button with the stylus, images from the cameras can show a “lock screen” indicating that a sweeping gesture is needed to unlock the device. These images can be used to determine how to move the stylus in order to effect a sweeping gesture across the touchscreen to thereby unlock the device. The camera can then

obtain additional images of the device, which can in turn be used to determine the next movement of the stylus for interaction with the device. This iterative process can continue with the stylus or styluses interacting with the device, guided by images obtained by the camera(s) and processed by a related processing device to cause the desired actions, e.g., to open an “app”, to navigate a menu, to type test letters, to dial a test phone number, or other such interaction.

[0073] In block 510, the additional image (and/or any subsequent image) is inspected and a visual analysis of the device is performed to determine various information about the device that can affect the device value. For example, the visual analysis can include computer-implemented evaluation (e.g., a digital comparison) of images of the mobile phone 250 taken by the cameras 308 to determine length, width, and/or height (thickness) dimensions of the mobile phone 250. In some embodiments, the visual analysis can include an inspection of a display screen on the mobile phone 250 for cracks or other damage. In some embodiments, the routine can perform the visual analysis using one or more of the methods and/or systems described in detail in the commonly owned patents and patent applications identified herein and incorporated by reference in their entireties. In decision block 512, if additional images are desired then the routine returns to block 506 to obtain another image. If additional images are not desired, then the subroutine 500 concludes. As indicated above with respect to Figure 4, visual and/or electrical evaluation of the device (block 404) can be followed by determining a price (block 406) and presenting an offer to the customer (block 408).

[0074] The flow diagrams described herein (e.g., those described with reference to Figures 4 and 5) are representative flow diagrams that depict routines and processes used in some embodiments. These processes and routines can be executed by a processing device, such as a processor or CPU associated with the kiosk 100 (as described below with reference to, e.g., Figure 6), an associated server computer, wireless device, personal computer, etc. in accordance with computer-executable instructions stored on a computer-readable medium. In some

embodiments, the routines disclosed herein can be performed by computing devices that are separate from a kiosk, for example a user's home computer, a mobile electronic device (e.g., smartphone or tablet), etc. Those skilled in the relevant art will appreciate that aspects of the invention can be practiced with other communications, data processing, or computer system configurations, including: Internet appliances, hand-held devices (including personal digital assistants (PDAs)), wearable computers, all manner of cellular or mobile phones (including Voice over IP (VoIP) phones), dumb terminals, media players, gaming devices, multi-processor systems, microprocessor-based or programmable consumer electronics, set-top boxes, network PCs, mini-computers, mainframe computers, and the like. Indeed, the terms "computer," "server," "host," "host system," and the like, are generally used interchangeably herein and refer to any of the above devices and systems, as well as any data processor. These flow diagrams may not show all functions or exchanges of data, but instead they provide an understanding of commands and data exchanged under the system. Those skilled in the relevant art will recognize that some functions or exchange of commands and data may be repeated, varied, omitted, or supplemented, and other (less important) aspects not shown may be readily implemented. For example, while processes or blocks are presented in a given order, alternative implementations may perform routines having steps, or employ systems having blocks in a different order, and some processes or blocks may be deleted, moved, added, subdivided, combined, and/or modified to provide alternative or sub-combinations. Each of these processes or blocks may be implemented in a variety of different ways. Also, while processes or blocks are at times shown as being performed in series, these processes or blocks may instead be performed or implemented in parallel, or may be performed at different times. Various steps depicted in the flow diagrams can be of a type well known in the art and can itself include a sequence of operations that need not be described herein. Those of ordinary skill in the art can create source code, microcode, program logic arrays or otherwise implement the inventions described herein based on the Figures and the detailed description provided herein. The routines described above can be

stored in non-volatile memory, or in removable media, such as disks, or hardwired or preprogrammed in chips, such as EEPROM semiconductor chips.

[0075] Figure 6 provides a schematic representation of an architecture of the kiosk 100 in accordance with an embodiment of the present technology. In the illustrated embodiment, the kiosk 100 includes a suitable processor or central processing unit ("CPU") 600 that controls operation of the kiosk 100 in accordance with computer-readable instructions stored on system memory 606. The CPU 600, for example, can control performance of the various routines described herein with reference to, for example, Figures 4 and 5. The CPU 600 may be any logic processing unit, such as one or more CPUs, digital signal processors (DSPs), application-specific integrated circuits (ASICs), etc. The CPU 600 may be a single processing unit or multiple processing units in a device or distributed across multiple devices. The CPU 600 is connected to the memory 606 and may be coupled to other hardware devices, for example, with the use of a bus (e.g., a PCI Express or Serial ATA bus). The CPU 600 can include, by way of example, a standard personal computer ("PC") (e.g., a DELL OPTIPLEX 780 or 7010 PC) or other type of embedded computer running any suitable operating system, such as Linux, Windows, Android, iOS, MAC OS, or an embedded real-time operating system. In some embodiments, the CPU 600 can be a small form factor PC with integrated hard disk drive ("HDD") or solid-state drive ("SSD") and universal serial bus ("USB") or other ports to communicate with the other components of the kiosk 100. In other embodiments, the CPU 600 can include a microprocessor with a standalone motherboard that interfaces with a separate HDD. The memory 606 can include read-only memory (ROM) and random access memory (RAM) or other storage devices, such as disk drives or SSDs, that store the executable applications, test software, databases and other software required to, for example, implement the various routines described herein (e.g., those described with reference to Figures 4 and 5), control kiosk components, process electronic device information and data (to, e.g., evaluate device make, model, condition, pricing, etc.), communicate and exchange data and information with remote computers and other devices, etc.

[0076] The CPU 600 can provide information and instructions to kiosk users via the display screen 104 and/or an audio system (e.g., a speaker) 604. The CPU 600 can also receive user inputs via, e.g., a touch screen 608 associated with the display screen 104, a keypad with physical keys, and/or a microphone 610. Additionally, the CPU 600 can receive personal identification and/or biometric information associated with users via the ID reader 112, one or more of the external cameras 116, and/or the fingerprint reader 114. In some embodiments, the CPU 600 can also receive information (such as user identification and/or account information) via a card reader 612 (e.g., a debit, credit, or loyalty card reader having, e.g., a suitable magnetic stripe reader, optical reader, etc.). The CPU 600 can also control operation of the label dispenser 110 and systems for providing remuneration to users, such as the cash dispenser 118 and/or a receipt or voucher printer and an associated dispenser 620.

[0077] As noted above, the kiosk 100 additionally includes a number of electronic, optical and electromechanical devices for electrically, visually and/or physically analyzing electronic devices placed therein for recycling. Such systems can include one more internal cameras 614 for visually inspecting electronic devices to, e.g., determine the external dimensions and condition, and one or more of the electrical connectors 242 (e.g., USB connectors) for, e.g., powering up electronic devices and performing electronic analyses. As noted above, the cameras 614 can be operably coupled to the upper and lower chambers 230 and 232, and the connectors 242 can be movably and interchangeably carried by the carousel 240 (Figures 2A-2D). The kiosk 100 further includes a plurality of mechanical components that are electronically actuated for carrying out the various functions of the kiosk 100 during operation. The mechanical components 618 can include, for example, the inspection area access door 106 and one or more of the movable components (e.g. the inspection plate 244, the upper and lower chambers 230 and 232, the support 302, the stylus(es) 304, the cradle 316, a translation system 322, and/or a translation system 333, etc.) operably disposed within the inspection area 108 (Figure 1). The kiosk 100

further includes power 602, which can include battery power and/or facility power for operation of the various electrical components associated with kiosk operation.

[0078] In the illustrated embodiment, the kiosk 100 further includes a network connection 622 (e.g., a wired connection, such as an Ethernet port, cable modem, FireWire cable, Lightning connector, USB port, etc.) suitable for communication with, e.g., all manner of remote processing devices via a communication link 650, and a wireless transceiver 624 (e.g., including a Wi-Fi access point, Bluetooth transceiver, near-field communication (NFC) device, and/or wireless modem or cellular radio utilizing GSM, CDMA, 3G and/or 4G technologies) for data communications suitable for communication with, e.g., all manner of remote processing devices via the communication link 650 and/or directly via, e.g., a wireless peer-to-peer connection. For example, the wireless transceiver 624 can facilitate wireless communication with handheld devices, such as a mobile device 630 (e.g., a smartphone) either in the proximity of the kiosk 100 or remote therefrom. By way of example only, in the illustrated embodiment the mobile device 630 can include one or more features, applications and/or other elements commonly found in smartphones and other known mobile devices. For example, the mobile device 630 can include a CPU and/or a graphics processing unit ("GPU") 634 for executing computer readable instructions stored on memory 636. In addition, the mobile device 630 can include an internal power source or battery 632, a dock connector 646, a USB port 648, a camera 640, and/or well-known input devices, including, for example, a touch screen 642, a keypad, etc. In many embodiments, the mobile device 630 can also include a speaker 644 for two-way communication and audio playback. In addition to the foregoing features, the mobile device 630 can include a mobile operating system (OS) 631 and/or a device wireless transceiver that may include one or more antennas 638 for wirelessly communicating with, for example, other mobile devices, websites, and the kiosk 100. Such communication can be performed via, e.g., the communication link 650 (which can include the Internet, public and private intranet, a local or extended Wi-Fi network, cell towers, the plain old telephone system (POTS), etc.), direct wireless communication, etc.

[0079] Unless described otherwise, the construction and operation of the various components shown in Figure 6 are of conventional design. As a result, such components need not be described in further detail herein, as they will be readily understood by those skilled in the relevant art. In other embodiments, the kiosk 100 and/or the mobile device 630 can include other features that may be different from those described above. In still further embodiments, the kiosk 100 and/or the mobile device 630 can include more or fewer features similar to those described above.

[0080] Figure 7 is a schematic diagram of a suitable network environment for implementing various aspects of an electronic device recycling system 700 configured in accordance with embodiments of the present technology. In the illustrated embodiment, a plurality of the kiosks 100 (identified individually as kiosks 100a-100n) can exchange information with one or more remote computers (e.g., one or more server computers 704) via the communication link 650. Although the communication link 650 can include a publically available network (e.g., the Internet with a web interface), a private communication link, such as an intranet or other network may also be used. Moreover, in various embodiments the individual kiosk 100 can be connected to a host computer (not shown) that facilitates the exchange of information between the kiosks 100 and remote computers, other kiosks, mobile devices, etc.

[0081] The server computer 704 can perform many or all of the functions for receiving, routing and storing electronic messages, such as webpages, audio signals and electronic images necessary to implement the various electronic transactions described herein. For example, the server computer 704 can retrieve and exchange web pages and other content with an associated database or databases 706. In some embodiments, the database 706 can include information related to mobile phones and/or other consumer electronic devices. Such information can include, for example, make, model, serial number, IMEI, MEID, carrier plan information, pricing information, owner information, etc., as well as dimensional information (size, shape, location of displays, ports, etc.) and other visual information (e.g., logo shapes, sizes, locations, etc.) associated with known devices, such as particular device models, sub-models,

etc. In various embodiments the server computer 704 can also include a server engine 708, a web page management component 710, a content management component 712, and a database management component 714. The server engine 708 can perform the basic processing and operating system level tasks associated with the various technologies described herein. The web page management component 710 can handle creation and/or display and/or routing of web or other display pages. The content management component 712 can handle many of the functions associated with the routines described herein. The database management component 714 can perform various storage, retrieval and query tasks associated with the database 706, and can store various information and data such as animation, graphics, visual and audio signals, etc. Those of ordinary skill in the art will appreciate that many of the routines and/or portions thereof and other functions and methods described above can be performed by the kiosk 100 (e.g., the processor 600), the server computer 704, or both.

[0082] In the illustrated embodiment, the kiosks 100 can also be operably connected to a plurality of other remote devices and systems via the communication link 650. For example, the kiosks 100 can be operably connected to a plurality of user devices 718 (e.g., personal computers, laptops, handheld devices, etc.) having associated browsers 720. Similarly, as described above the kiosks 100 can each include wireless communication facilities for exchanging digital information with mobile devices, such as the mobile device 630. The kiosks 100 and/or the server computer 704 are also operably connectable to a series of remote computers for obtaining data and/or exchanging information with necessary service providers, financial institutions, device manufactures, authorities, government agencies, etc. For example, the kiosks 100 and the server computer 704 can be operably connected to one or more cell carriers 722, one or more device manufacturers 724 (e.g., mobile phone manufacturers), one or more electronic payment or financial institutions 728, one or more databases (e.g., the GSMA International Mobile Equipment Identity Database, etc.), and one or more computers and/or other remotely located or shared resources associated with cloud computing 726. The financial institutions 728 can include all

manner of entity associated with conducting financial transactions, including banks, credit/debit card facilities, online commerce facilities, online payment systems, virtual cash systems, money transfer systems, etc.

[0083] In addition to the foregoing, the kiosks 100 and the server computer 704 can also be operably connected to a resale marketplace 730 and a kiosk operator 732. The resale marketplace 730 represents a system of remote computers and/or services providers associated with the reselling of consumer electronic devices through both electronic and brick-and-mortar channels. Such entities and facilities can be associated with, for example, online auctions for reselling used electronic devices as well as for establishing market prices for such devices. The kiosk operator 732 can be a central computer or system of computers for controlling all manner of operation of the network of kiosks 100. Such operations can include, for example, remote monitoring and facilitating of kiosk maintenance (e.g., remote testing of kiosk functionality, downloading operational software and updates, etc.), servicing (e.g., periodic replenishing of cash and other consumables), performance, etc. In addition, the kiosk operator 732 can further include one or more display screens operably connected to cameras located at each of the kiosks 100 (e.g., one or more of the cameras 116 described above with reference to Figure 1). This remote viewing capability enables operator personnel to verify user identification and/or make other visual observations at the kiosks 100 in real-time during transactions, as described above with reference to Figure 1.

[0084] The foregoing description of the electronic device recycling system 700 illustrates but one possible network system suitable for implementing the various technologies described herein. Accordingly, those of ordinary skill in the art will appreciate that other systems consistent with the present technology can omit one or more of the facilities described in reference to Figure 7 or may include one or more additional facilities not described in detail in Figure 7.

[0085] Those of ordinary skill in the art will appreciate that the routines and other functions and methods described above can be performed by various processing

devices, such as the kiosk processor 600 (Figure 6), the server computer 704 (Figure 7), or both. The processes can be implemented as an application specific integrated circuit (ASIC), by a digital signal processing (DSP) integrated circuit, through conventional programmed logic arrays or circuit elements. While many of the embodiments are shown and described as being implemented in hardware (e.g., one or more integrated circuits designed specifically for a task), such embodiments could equally be implemented in software and be performed by one or more processors. Such software can be stored on any suitable computer-readable medium, such as microcode stored in a semiconductor chip, on a computer-readable disk, or downloaded from a server and stored locally at a client.

[0086] The kiosks 100, mobile devices 630, server computers 704, user computers and/or other user devices 718, etc. may include one or more central processing units or other logic-processing circuitry, memory, input devices (e.g., keyboards and pointing devices), output devices (e.g., display devices and printers), and storage devices (e.g., magnetic, solid state, fixed and floppy disk drives, optical disk drives, etc.). Such computer devices may include other program modules such as an operating system, one or more application programs (e.g., word processing or spread sheet applications), and the like. The user computers may include wireless computers, such as mobile phones, personal digital assistants (PDAs), palm-top computers, etc., which communicate with the Internet via a wireless link. The computers may be general-purpose devices that can be programmed to run various types of applications, or they may be single-purpose devices optimized or limited to a particular function or class of functions. Aspects of the invention may be practiced in a variety of other computing environments.

[0087] While the Internet is shown, a private network, such as an intranet may likewise be used herein. The network may have a client-server architecture, in which a computer is dedicated to serving other client computers, or it may have other architectures such as peer-to-peer, in which one or more computers serve simultaneously as servers and clients. A database or databases, coupled to the

server computer(s), stores much of the web pages and content exchanged between the user computers. The server computer(s), including the database(s), may employ security measures to inhibit malicious attacks on the system and preserve the integrity of the messages and data stored therein (e.g., firewall systems, message encryption and/or authentication (e.g., using transport layer security (TLS) or secure socket layers (SSL)), password protection schemes, encryption of stored data (e.g., using trusted computing hardware), and the like).

[0088] One skilled in the relevant art will appreciate that the concepts of the invention can be used in various environments other than location based or the Internet. In general, a display description may be in HTML, XML or WAP format, email format or any other format suitable for displaying information (including character/code-based formats, algorithm-based formats (e.g., vector generated), and bitmapped formats). Also, various communication channels, such as local area networks, wide area networks, or point-to-point dial-up connections, may be used instead of the Internet. The system may be conducted within a single computer environment, rather than a client/server environment. Also, the user computers may comprise any combination of hardware or software that interacts with the server computer, such as television-based systems and various other consumer products through which commercial or noncommercial transactions can be conducted. The various aspects of the invention described herein can be implemented in or for any e-mail environment.

[0089] Although not required, aspects of the invention are described in the general context of computer-executable instructions, such as routines executed by a general-purpose data processing device, e.g., a server computer, wireless device or personal computer. Those skilled in the relevant art will appreciate that aspects of the invention can be practiced with other communications, data processing, or computer system configurations, including Internet appliances, hand-held devices (including personal digital assistants (PDAs)), wearable computers, all manner of cellular or mobile phones (including Voice over IP (VoIP) phones), dumb terminals, media

players, gaming devices, multi-processor systems, microprocessor-based or programmable consumer electronics, set-top boxes, network PCs, mini-computers, mainframe computers, and the like. Indeed, the terms "computer," "server," "host," "host system," and the like, are generally used interchangeably herein, and refer to any of the above devices and systems, as well as any data processor. Input devices may include a touchpad, keyboard and/or a pointing device such as a mouse. Other input devices are possible such as a microphone, joystick, pen, game pad, scanner, digital camera, video camera, and the like. The data storage devices may include any type of computer-readable media that can store data accessible by a computer, such as magnetic hard and floppy disk drives, optical disk drives, magnetic cassettes, tape drives, flash memory cards, digital video disks (DVDs), Bernoulli cartridges, RAMs, ROMs, smart cards, etc. Indeed, any medium for storing or transmitting computer-readable instructions and data may be employed, including a connection port to a network such as a local area network (LAN), wide area network (WAN) or the Internet.

[0090] Aspects of the invention can be embodied in a special purpose computer or data processor that is specifically programmed, configured, or constructed to perform one or more of the computer-executable instructions explained in detail herein. While aspects of the invention, such as certain functions, are described as being performed exclusively on a single device, the invention can also be practiced in distributed environments where functions or modules are shared among disparate processing devices, which are linked through a communications network, such as a Local Area Network (LAN), Wide Area Network (WAN), or the Internet. In a distributed computing environment, program modules may be located in both local and remote memory storage devices.

[0091] Aspects of the invention may be stored or distributed on tangible computer-readable media, including magnetically or optically readable computer discs, hard-wired or preprogrammed chips (e.g., EEPROM semiconductor chips), nanotechnology memory, biological memory, or other data storage media. The data storage devices may include any type of computer-readable media that can store data

accessible by a computer, such as magnetic hard and floppy disk drives, optical disk drives, magnetic cassettes, tape drives, flash memory cards, DVDs, Bernoulli cartridges, RAM, ROMs, smart cards, etc. Indeed, any medium for storing or transmitting computer-readable instructions and data may be employed, including a connection port to a network such as a LAN, WAN, or the Internet. Alternatively, computer implemented instructions, data structures, screen displays, and other data under aspects of the invention may be distributed over the Internet or over other networks (including wireless networks), on a propagated signal on a propagation medium (e.g., an electromagnetic wave(s), a sound wave, etc.) over a period of time, or they may be provided on any analog or digital network (packet switched, circuit switched, or other scheme). The terms “memory” and “computer-readable storage medium” include any combination of temporary, persistent, and/or permanent storage, e.g., ROM, writable memory such as RAM, writable non-volatile memory such as flash memory, hard drives, solid state drives, removable media, and so forth, but do not include a propagating signal per se.

[0092] The above Detailed Description of examples and embodiments of the invention is not intended to be exhaustive or to limit the invention to the precise form disclosed above. While specific examples for the invention are described above for illustrative purposes, various equivalent modifications are possible within the scope of the invention, as those skilled in the relevant art will recognize. References throughout the foregoing description to features, advantages, or similar language do not imply that all of the features and advantages that may be realized with the present technology should be or are in any single embodiment of the invention. Rather, language referring to the features and advantages is understood to mean that a specific feature, advantage, or characteristic described in connection with an embodiment is included in at least one embodiment of the present technology. Thus, discussion of the features and advantages, and similar language, throughout this specification may, but do not necessarily, refer to the same embodiment. Furthermore, the described features, advantages, and characteristics of the present technology may be combined in any suitable manner in one or more embodiments.

One skilled in the relevant art will recognize that the present technology can be practiced without one or more of the specific features or advantages of a particular embodiment. In other instances, additional features and advantages may be recognized in certain embodiments that may not be present in all embodiments of the present technology.

[0093] Any patents and applications and other references noted above, including any that may be listed in accompanying filing papers, are incorporated herein by reference. Aspects of the invention can be modified, if necessary, to employ the systems, functions, and concepts of the various references described above to provide yet further implementations of the invention.

[0094] Unless the context clearly requires otherwise, throughout the description and the claims, the words "comprise," "comprising," and the like, are to be construed in an inclusive sense, as opposed to an exclusive or exhaustive sense; that is to say, in the sense of "including, but not limited to." As used herein, the terms "connected," "coupled," or any variant thereof, means any connection or coupling, either direct or indirect, between two or more elements; the coupling or connection between the elements can be physical, logical, or a combination thereof. Additionally, the words "herein," "above," "below," and words of similar import, when used in this application, refer to this application as a whole and not to any particular portions of this application. Where the context permits, words in the above Detailed Description using the singular or plural number may also include the plural or singular number respectively. The word "or," in reference to a list of two or more items, covers all of the following interpretations of the word: any of the items in the list, all of the items in the list, and any combination of the items in the list.

[0095] The teachings of the invention provided herein can be applied to other systems, not necessarily the system described above. The elements and acts of the various examples described above can be combined to provide further implementations of the invention. Some alternative implementations of the invention may include not only additional elements to those implementations noted above, but

also may include fewer elements. Further any specific numbers noted herein are only examples—alternative implementations may employ differing values or ranges.

[0096] While the above description describes various embodiments of the invention and the best mode contemplated, regardless how detailed the above text, the invention can be practiced in many ways. Details of the system may vary considerably in its specific implementation, while still being encompassed by the present disclosure. As noted above, particular terminology used when describing certain features or aspects of the invention should not be taken to imply that the terminology is being redefined herein to be restricted to any specific characteristics, features, or aspects of the invention with which that terminology is associated. In general, the terms used in the following claims should not be construed to limit the invention to the specific examples disclosed in the specification, unless the above Detailed Description section explicitly defines such terms. Accordingly, the actual scope of the invention encompasses not only the disclosed examples, but also all equivalent ways of practicing or implementing the invention under the claims.

[0097] From the foregoing, it will be appreciated that specific embodiments of the invention have been described herein for purposes of illustration, but that various modifications may be made without deviating from the spirit and scope of the various embodiments of the invention. Further, while various advantages associated with certain embodiments of the invention have been described above in the context of those embodiments, other embodiments may also exhibit such advantages, and not all embodiments need necessarily exhibit such advantages to fall within the scope of the invention. Accordingly, the invention is not limited, except as by the appended claims. Although certain aspects of the invention are presented below in certain claim forms, the applicant contemplates the various aspects of the invention in any number of claim forms. Accordingly, the applicant reserves the right to pursue additional claims after filing this application to pursue such additional claim forms, in either this application or in a continuing application.

CLAIMS

I/We claim:

1. A kiosk for recycling consumer electronic devices, the kiosk comprising:
an inspection area configured to receive an electronic device therein;
a movable structure positioned relative to the inspection area;
a camera operably coupled to the movable structure and configured to obtain an image of the electronic device when the movable structure is at least generally positioned over the electronic device; and
an actuating member operably coupled to the movable structure, wherein the movable structure is configured to move toward the electronic device to at least partially bring the actuating member into contact with the electronic device and activate at least one function of the electronic device.
2. The kiosk of claim 1 wherein the movable structure includes an enclosure configured to at least partially enclose the electronic device when the enclosure is lowered over the electronic device.
3. The kiosk of claim 2, further comprising:
a processor operably coupled to the enclosure and the camera; and
a non-transitory computer readable medium having instructions that, when executed by the processor, cause the processor to execute a method that includes:
operating the camera to obtain the image of the electronic device in the inspection area;
determining the position of the electronic device relative to the actuating member based on the image; and
based on the determined position, moving the enclosure relative to the electronic device to bring the actuating member into contact the

electronic device and activate at least one function of the electronic device.

4. The kiosk of claim 1 wherein the movable structure is configured to move both vertically and horizontally relative to the electronic device.

5. The kiosk of claim 1, further comprising a translation system operably coupled to the movable structure, wherein the actuating member is operably coupled to the translation system, and wherein the translation system is configured to move the actuating member horizontally relative to the electronic device.

6. The kiosk of claim 1, further comprising a translation system operably coupled to the movable structure, wherein the actuating member is operably coupled to the translation system, and wherein the translation system is configured to move the actuating member both horizontally and vertically relative to the electronic device.

7. The kiosk of claim 6 wherein the translation system comprises a lateral cross-beam coupled to the actuating member,
wherein the actuating member is movable along a first axis parallel to the cross-beam, and
wherein the cross-beam is movable along a second axis substantially perpendicular to the cross-beam.

8. The kiosk of claim 7 wherein the actuating member is additionally moveable along a vertical axis substantially perpendicular to the first and second axes.

9. The kiosk of claim 6 wherein the camera is a first camera, and wherein the kiosk further comprises a second camera coupled to the translation system and configured to image the electronic device within the inspection area.

10. The kiosk of claim 6, wherein the camera is coupled to the translation system and configured to image the electronic device within the inspection area.

11. The kiosk of claim 1 wherein the actuating member is configured to control operation of the electronic device via contact with a touchscreen of the electronic device.

12. The kiosk of claim 11 wherein the actuating member includes a tip portion, and wherein the tip includes an optical lens for imaging the electronic device.

13. The kiosk of claim 11 wherein the actuating member includes a tip portion, and wherein the tip portion includes at least one of a: resistive, acoustic, capacitive, or optical device.

14. A system for processing consumer electronic devices, the system comprising:

- an inspection area configured to receive an electronic device therein;
- an array of actuating members disposed within the inspection area;
- a processor operably coupled to the array of actuating members; and
- a non-transitory computer readable medium having instructions stored therein that are executable by the processor to cause individual actuating members of the array to move with respect to the electronic device and contact the electronic device within the inspection area to activate at least one function of the electronic device.

15. The system of claim 14 wherein the kiosk further comprises an array of drivers operably coupled to individual actuating members to move each of the actuating members with respect to the electronic device.

16. The system of claim 14 wherein each actuating member is vertically moveable relative to the electronic device.

17. The system of claim 14, further comprising an inspection plate within the inspection area configured to receive the electronic device thereon, wherein the array of actuating members is disposed over the inspection plate.

18. The system of claim 14 wherein the array of actuating members face upwardly relative to the inspection area, and wherein the kiosk further comprises a cradle disposed above the array of actuating members, wherein the cradle is configured to retain the electronic device in a face-down orientation over the array of actuating members.

19. The system of claim 14, further comprising a camera configured to obtain an image the electronic device within the inspection area, wherein execution by the processor of the instructions stored on the non-transitory computer readable medium causes the processor to:

determine a location on the electronic device based at least in part on the image,
and
move at least one of the actuating members to contact the location.

20. A kiosk comprising:

an inspection area configured to receive an electronic device therein;
a stylus operably disposed within the inspection area;
a translation system disposed within the inspection area, the translation system comprising:
opposing side-members; and
a cross-member extending between the opposing side-members;
wherein the stylus is operably coupled to the cross-member and moveable relative to the cross-member,
wherein the cross-member is moveable along a length of the side-members,
and
wherein the stylus is moveable along a length of the cross-member;

a camera configured to obtain an image of the electronic device within the inspection area;

a processor operably coupled to the translation system and to the camera; and

a non-transitory computer readable medium having instructions stored therein that are executable by the processor to determine a location of the electronic device based on the image and, based on the determined location, cause the translation system to move the stylus into contact with the electronic device to activate at least one function of the electronic device.

21. The kiosk of claim 20 wherein the cross-member extends along a first longitudinal axis,

wherein the side-members extend along a second longitudinal axis substantially perpendicular to the first, and

wherein the stylus is vertically moveable along a third longitudinal axis substantially perpendicular to the first and second longitudinal axes.

22. The kiosk of claim 20 wherein the cross-member comprises a cross-beam, and wherein the side-members comprise side-beams.

23. The kiosk of claim 20 wherein the camera is carried by the translation system.

24. A kiosk comprising:

an inspection area configured to receive an electronic device therein;

a protrusion within the inspection area;

a translation system configured to move the electronic device relative to the protrusion;

a processor operably coupled to the translation system; and

a non-transitory computer readable medium having instructions stored therein that are executable by the processor to cause the translation system to move the electronic device into contact with the protrusion.

25. The kiosk of claim 24 wherein the translation system is configured to move the electronic device in a first direction and a second direction opposite the first.

26. The kiosk of claim 24, further comprising a plurality of protrusions within the inspection area.

27. The kiosk of claim 24, further comprising an inspection plate within the inspection area,
wherein the protrusion projects from a surface of the inspection plate, and
wherein the translation system is configured to move the electronic device across the surface of the inspection plate.

28. A method for analysis of an electronic device, the method comprising:
receiving an electronic device in an inspection area of a machine;
obtaining a first image of the electronic device;
electrically analyzing the first image to determine a device location;
based at least in part on the determined device location, moving at least one actuating member within the inspection area to contact the electronic device and activate at least one function of the electronic device;
after moving the actuating member within the inspection area to contact the electronic device, obtaining a second image of the electronic device;
visually analyzing the electronic device, based at least in part on the second image, wherein the visual analysis comprises comparing the second image to images stored in a database; and
determining a value for the electronic device based at least in part on the visual analysis.

29. The method of claim 28 wherein contacting the electronic device comprises using the actuating member to dial a phone number into the electronic device.

30. The method of claim 28 wherein contacting the electronic device comprises using the actuating member to activate a camera mode of the electronic device.

31. The method of claim 28 wherein contacting the electronic device comprises navigating a menu of the electronic device to identify a make, model, or about page on the electronic device.

32. The method of claim 28 wherein contacting the electronic device comprises entering characters into the electronic device.

33. The method of claim 28 wherein the actuating member comprises a stylus.

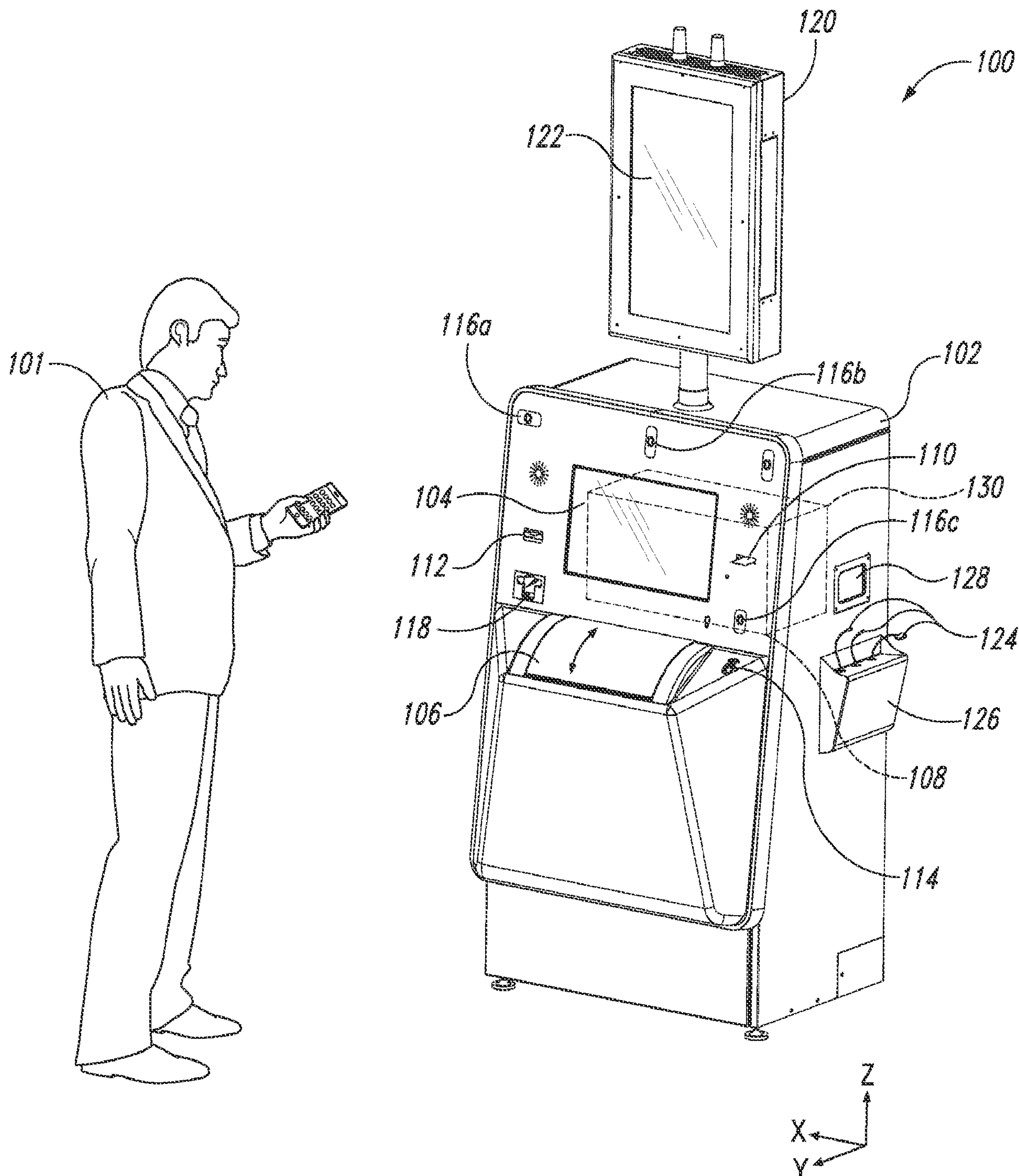


Fig. 1

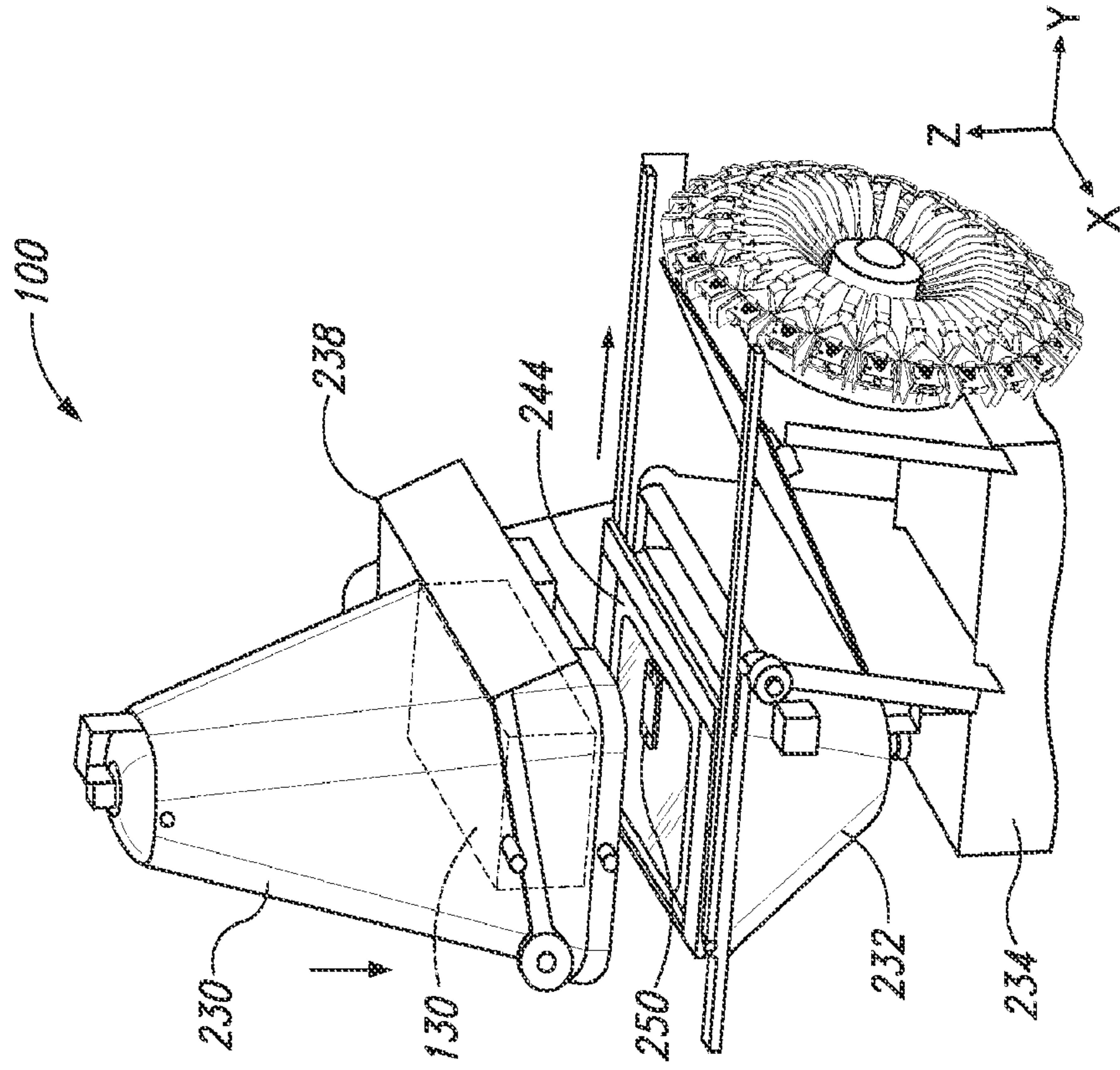


Fig. 2B

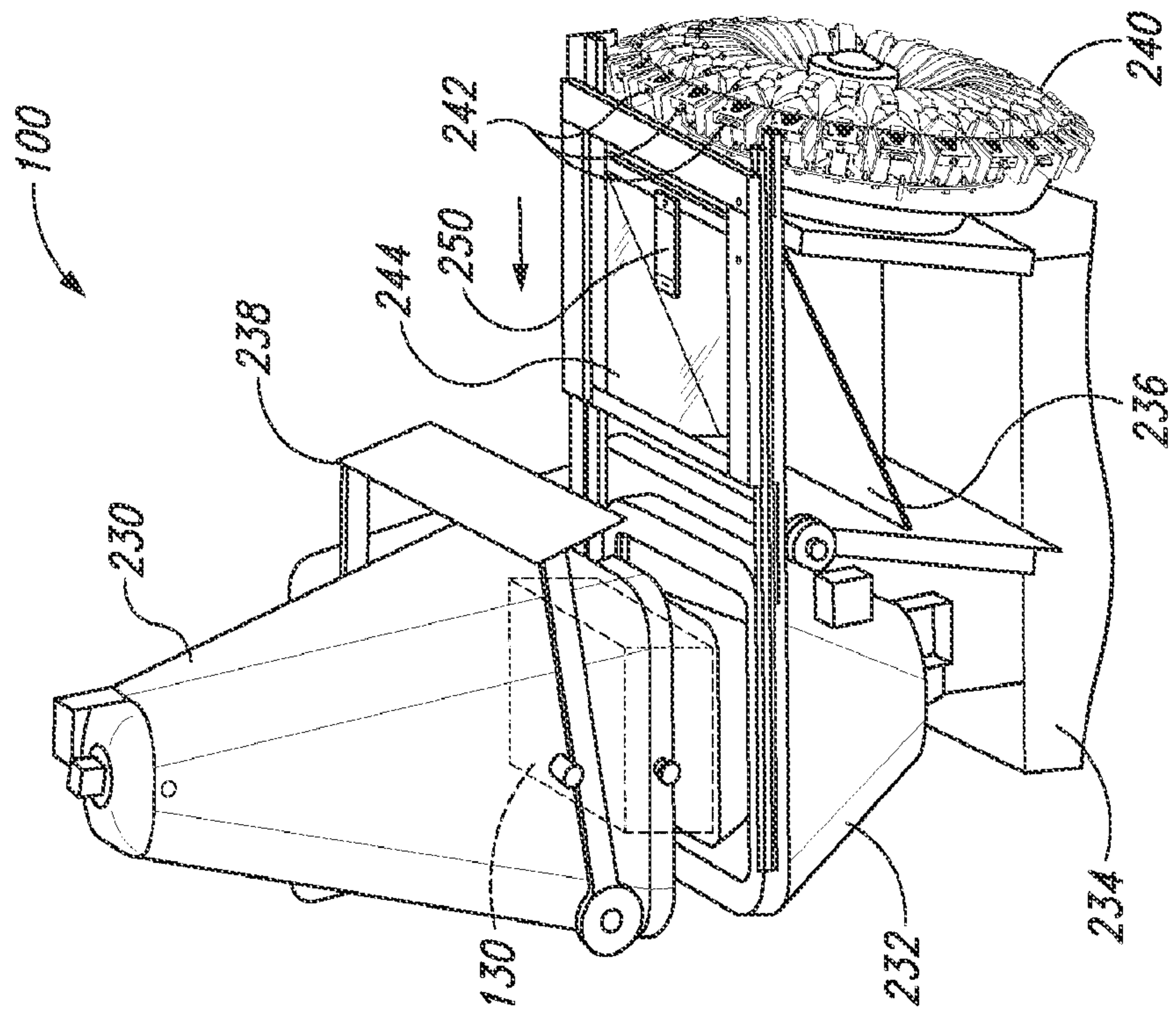


Fig. 2A

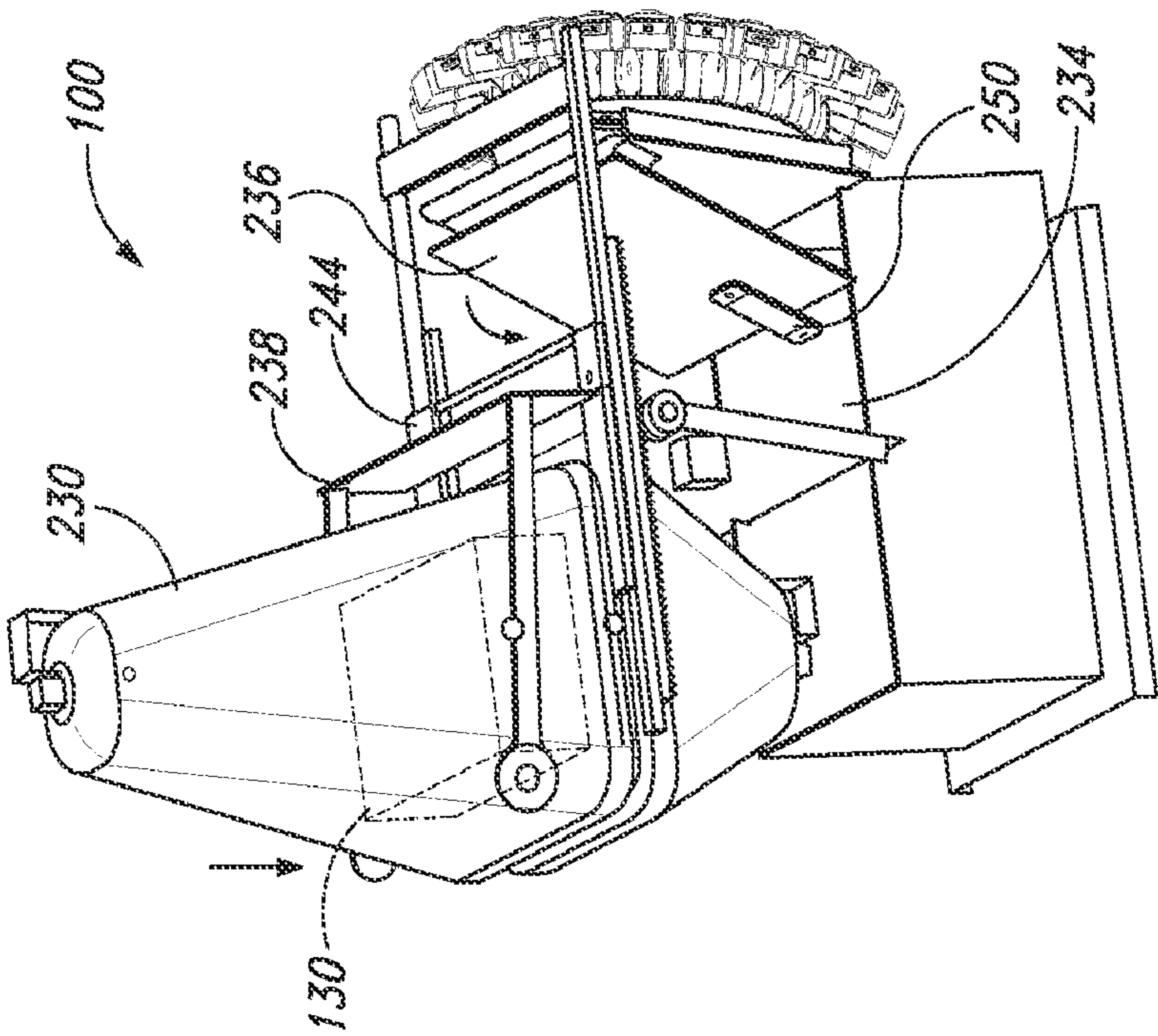


Fig. 2D

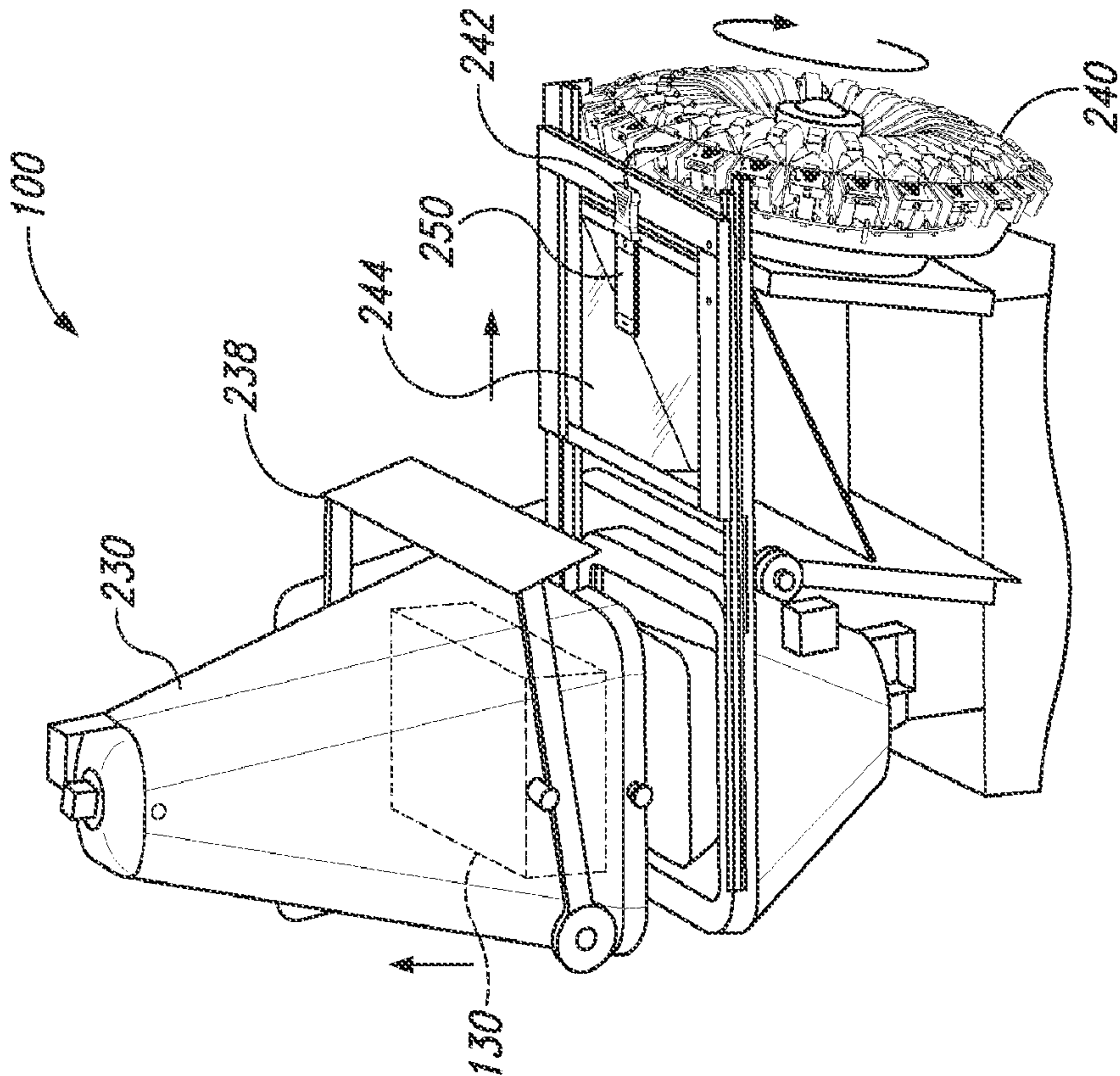


Fig. 2C

4/13

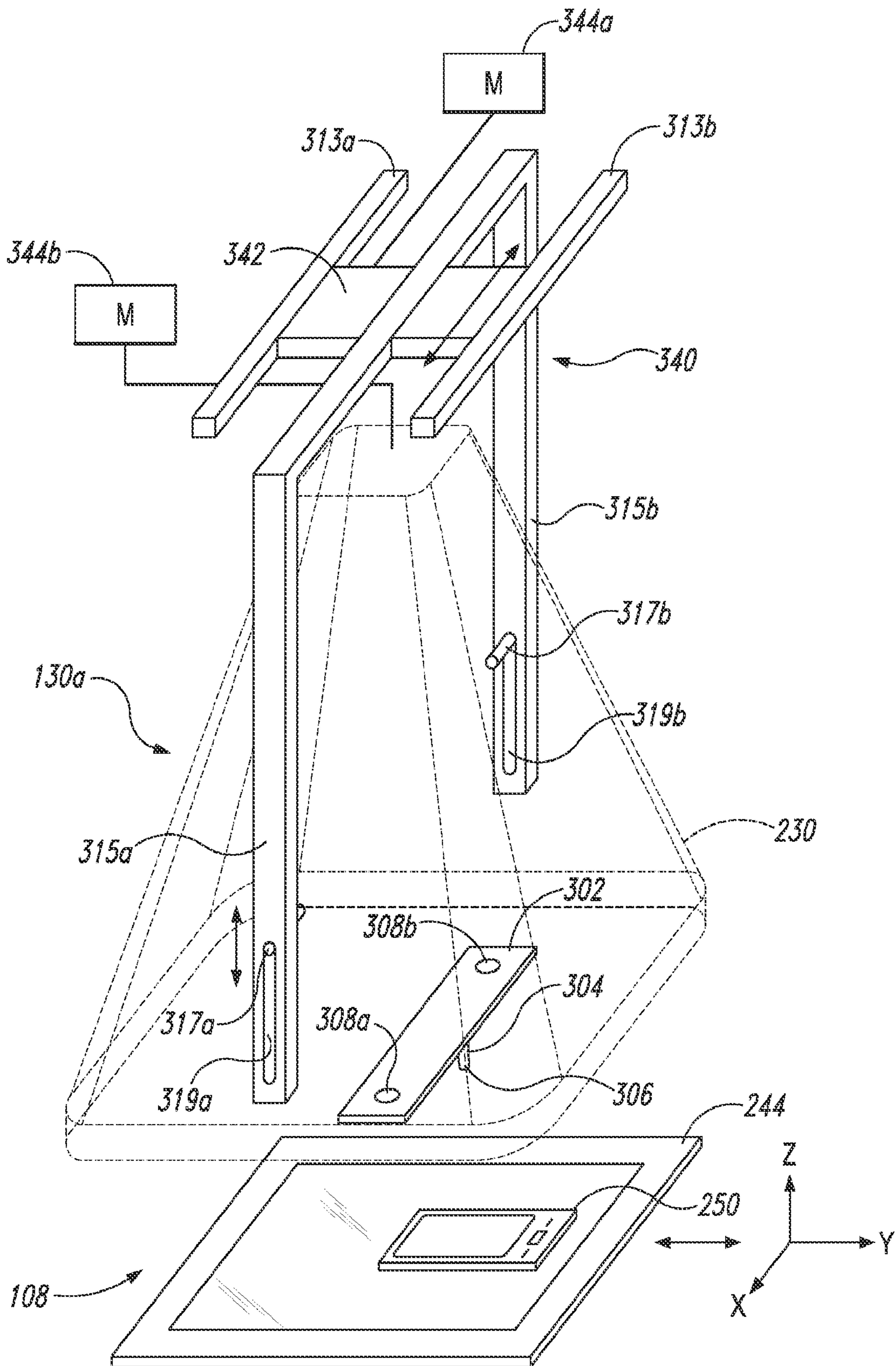


Fig. 3A

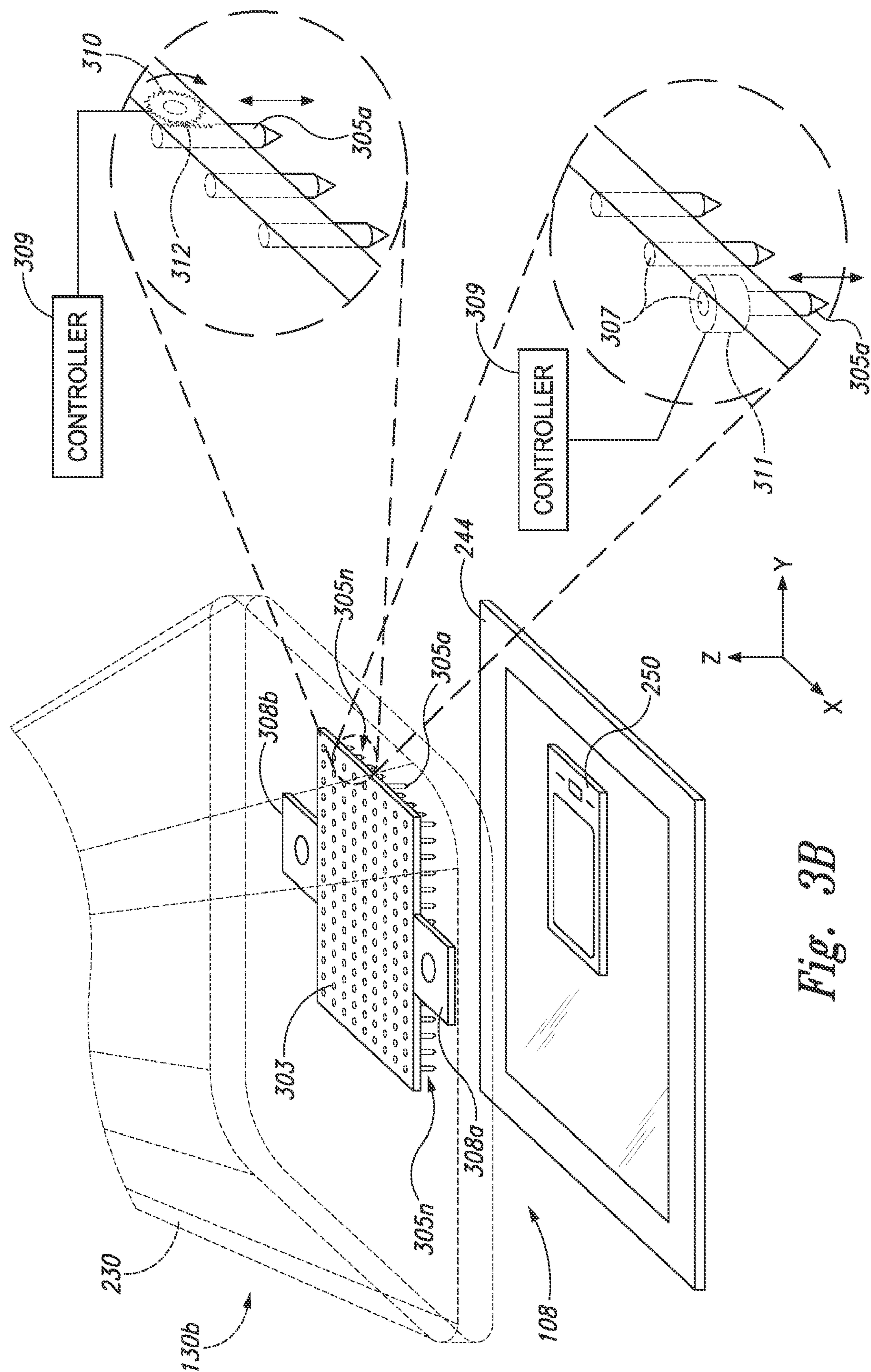


Fig. 3B

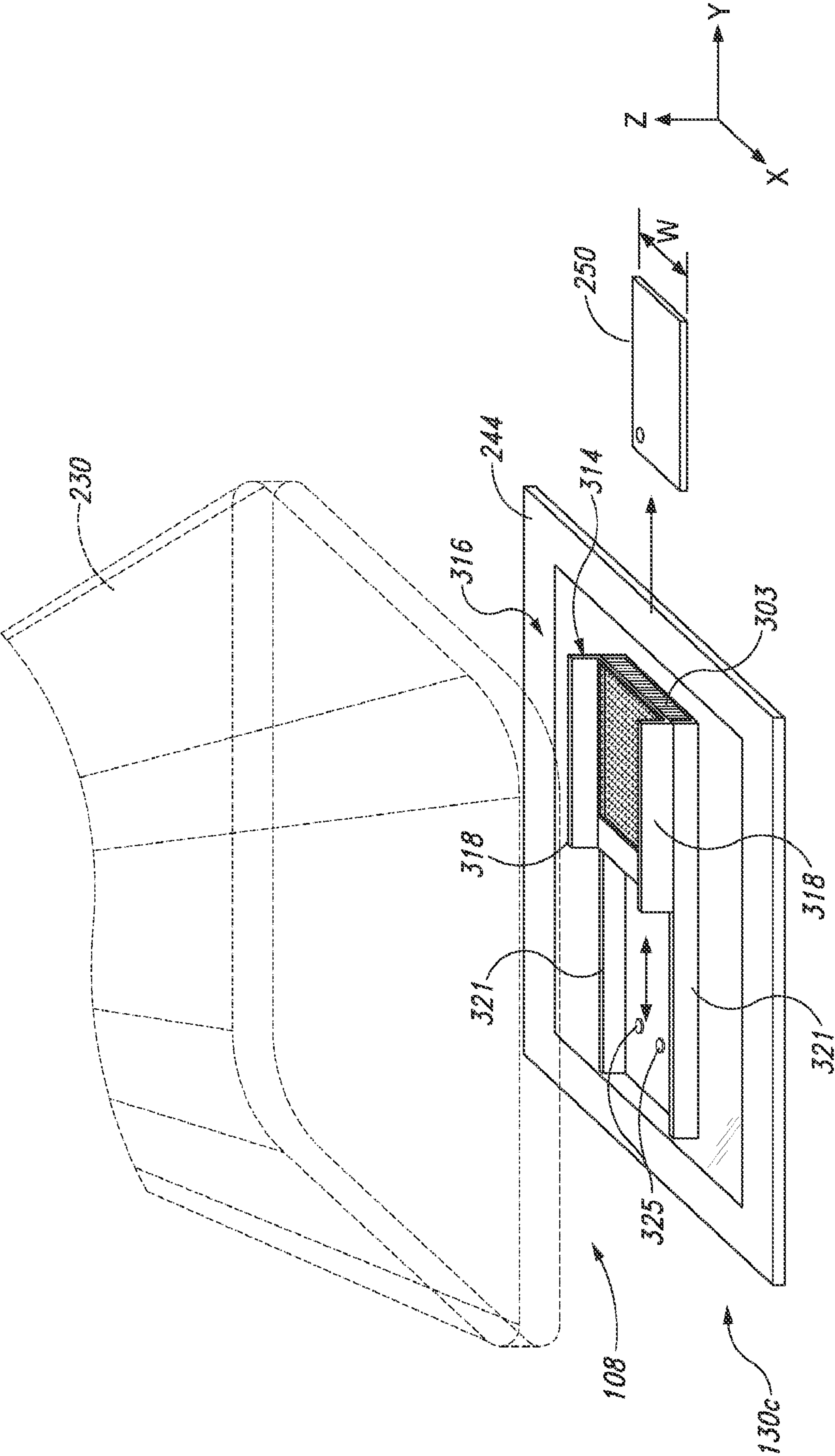


Fig. 3C

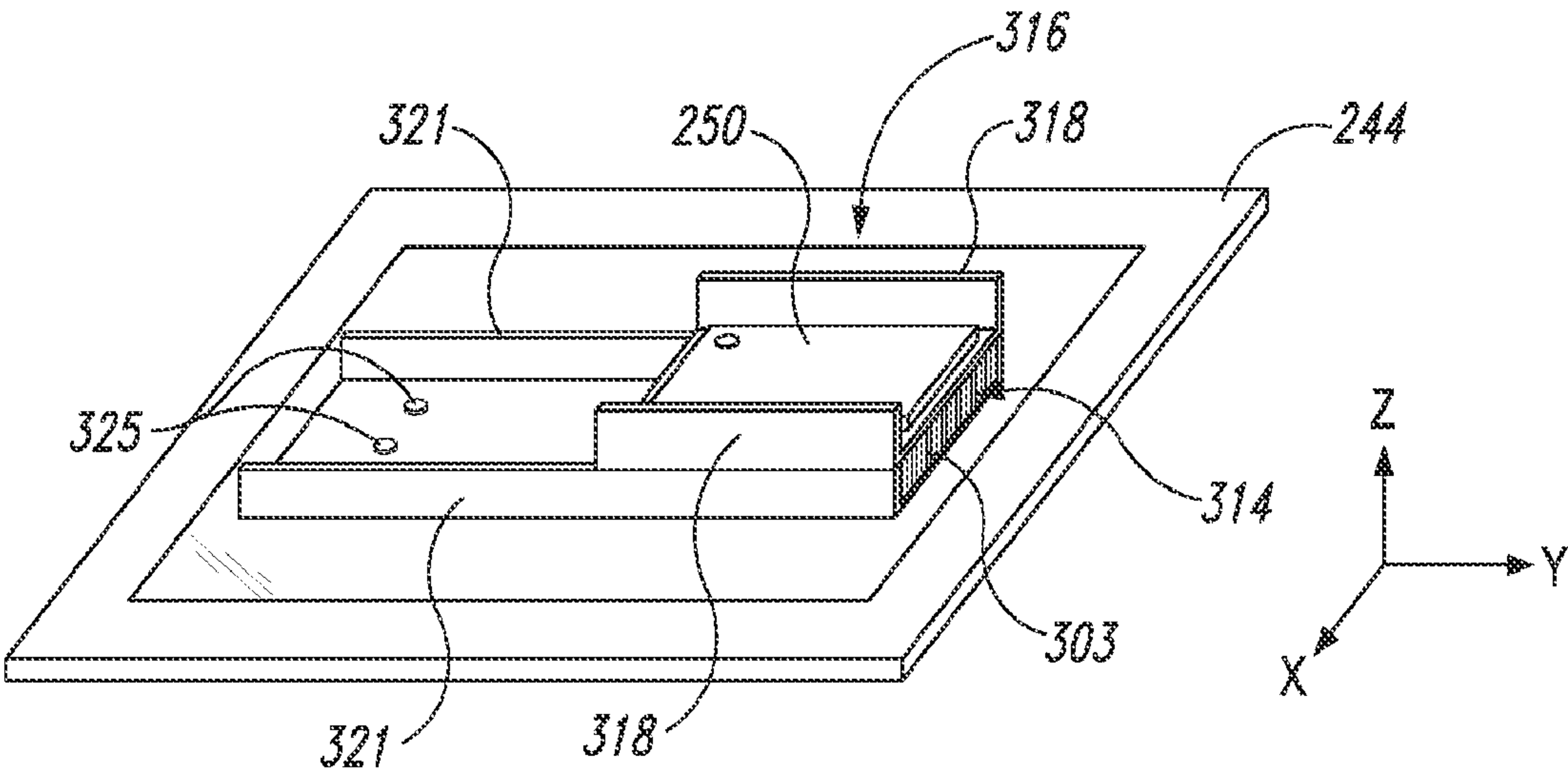


Fig. 3D

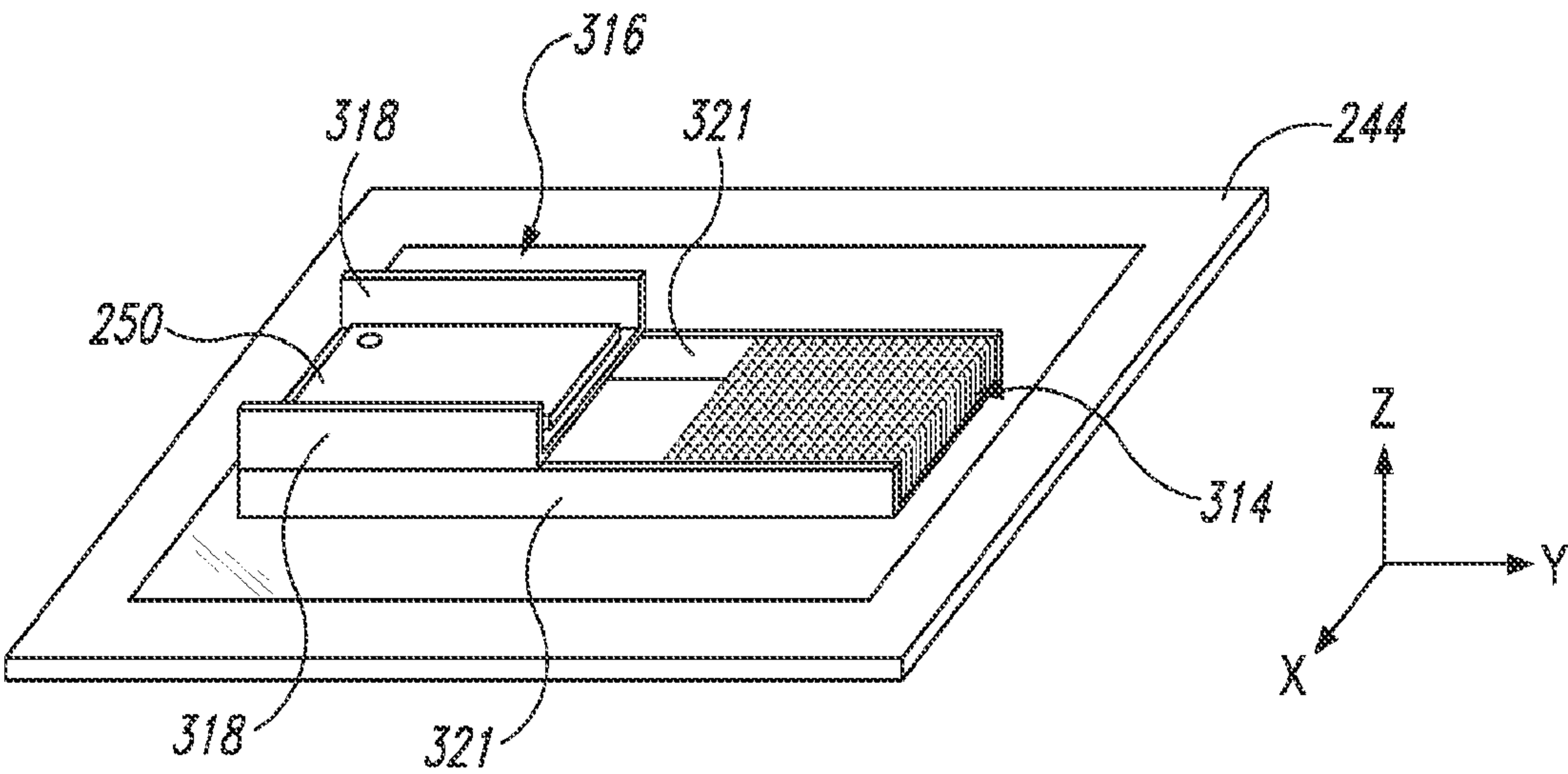


Fig. 3E

8/13

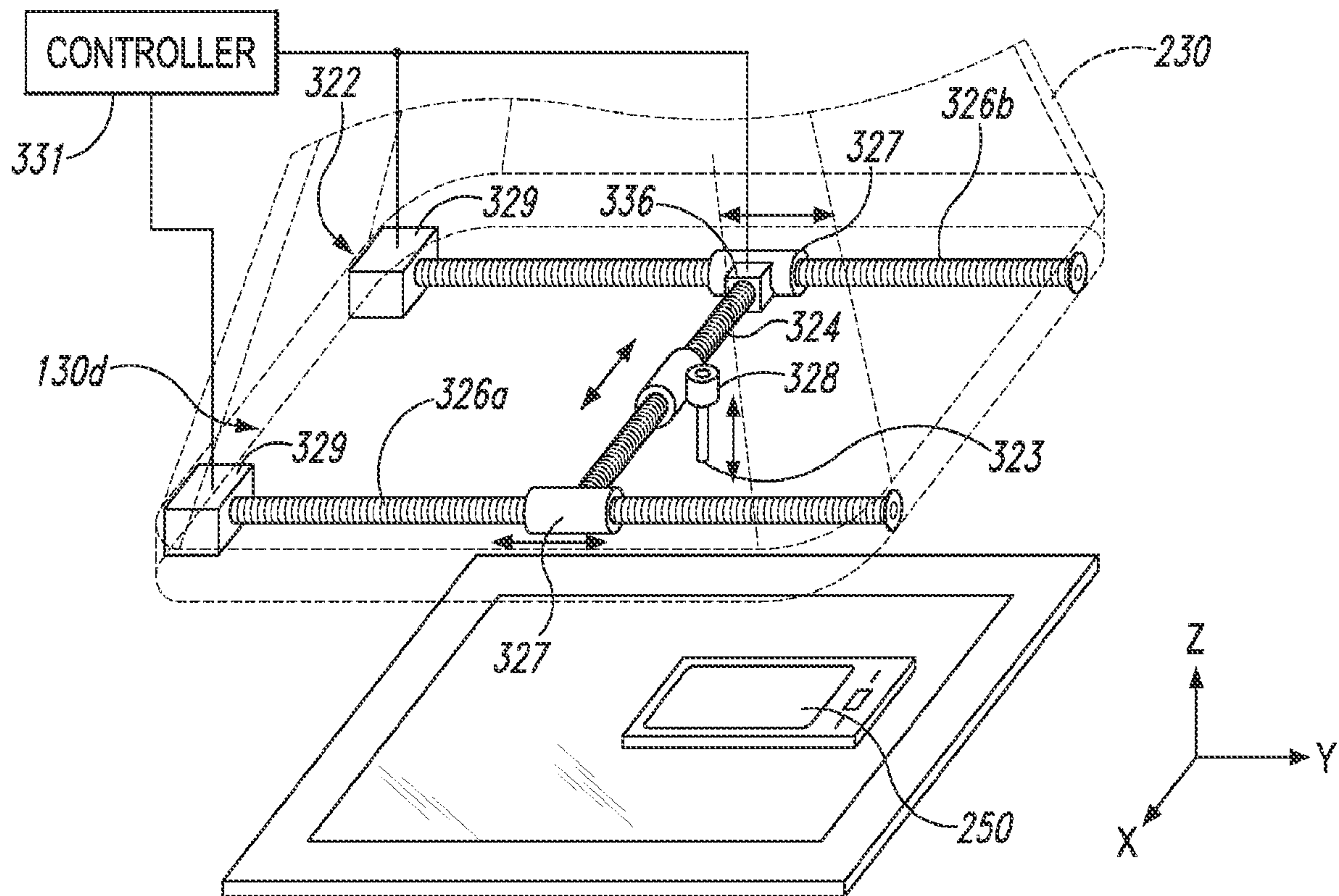


Fig. 3F

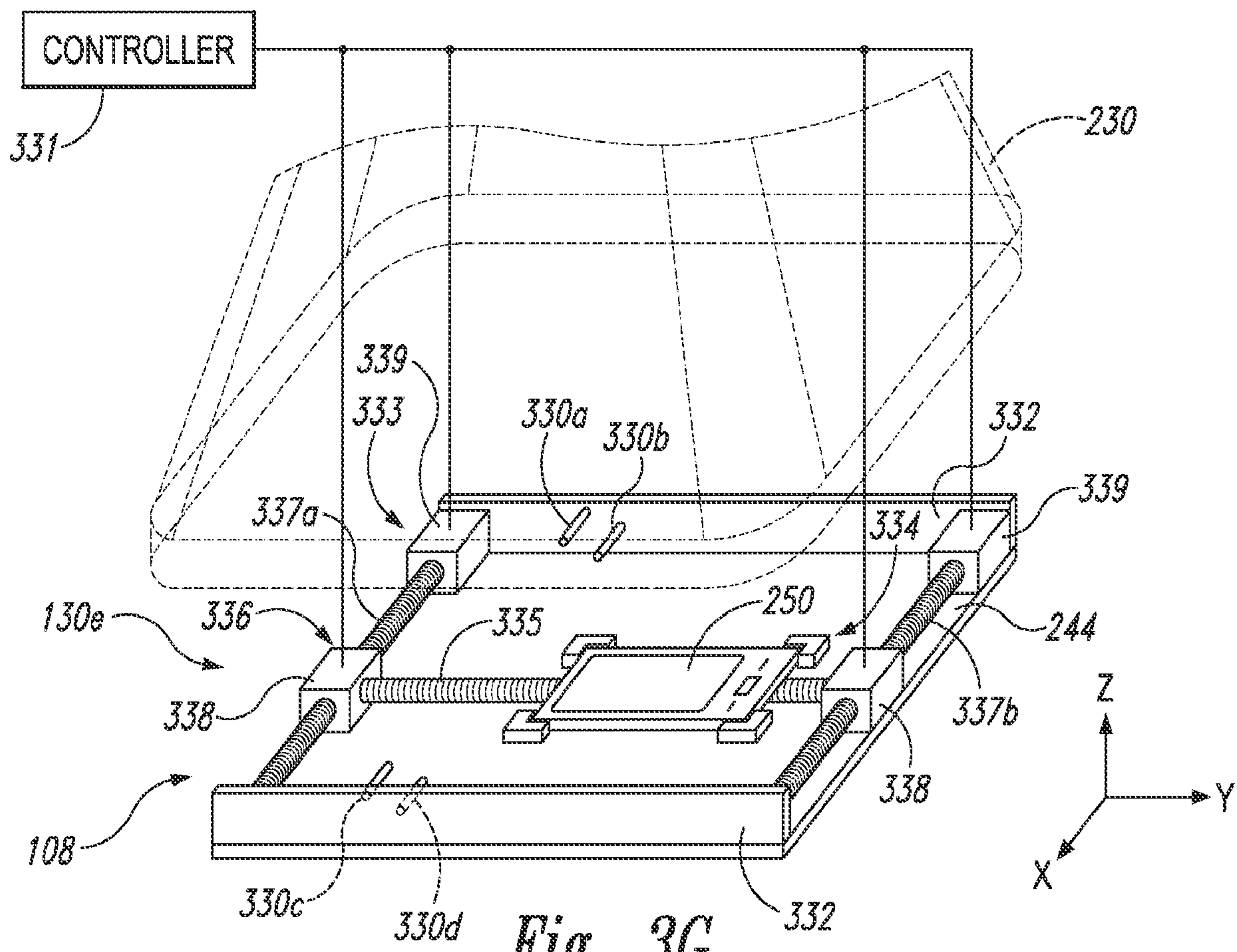


Fig. 3G

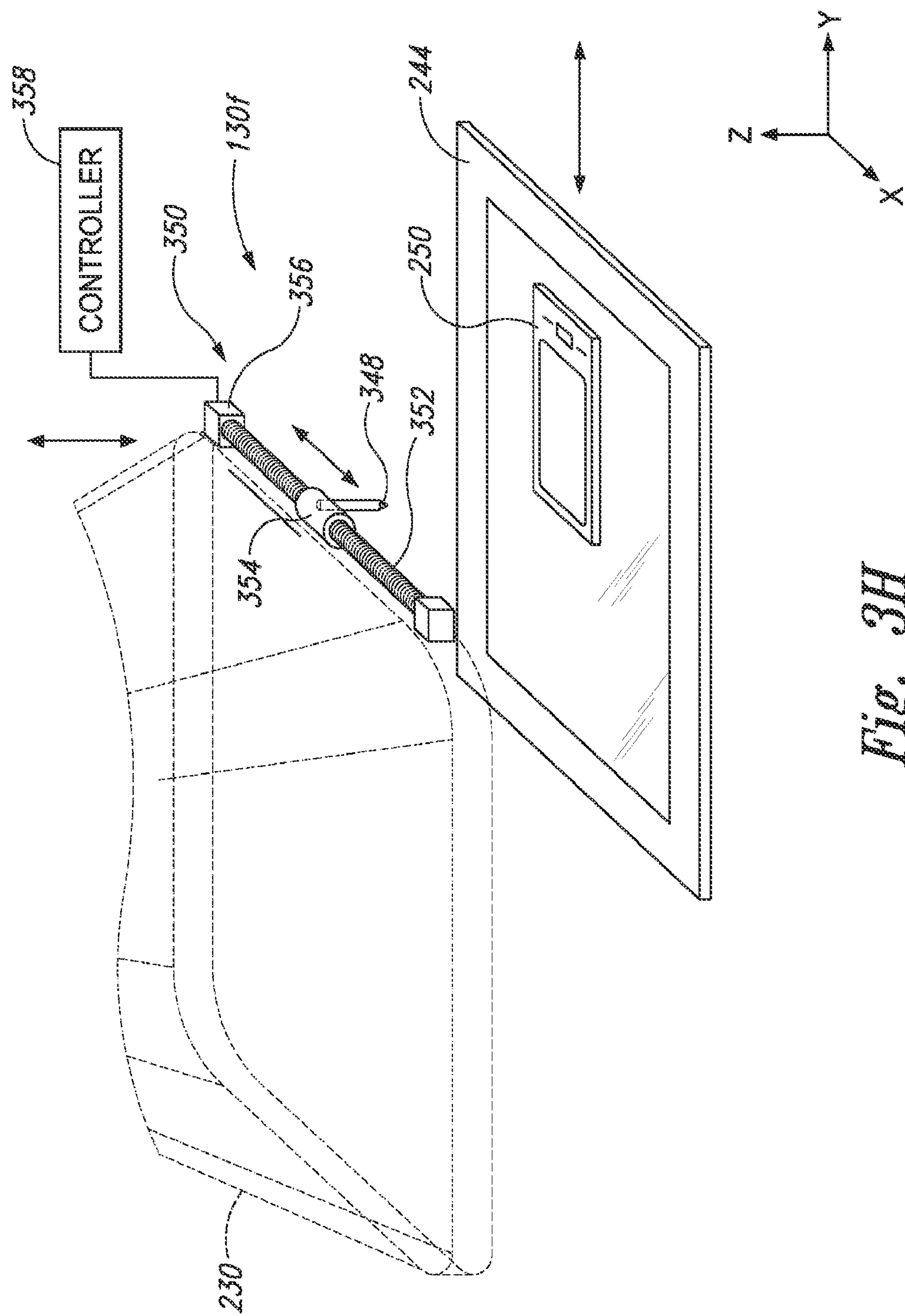
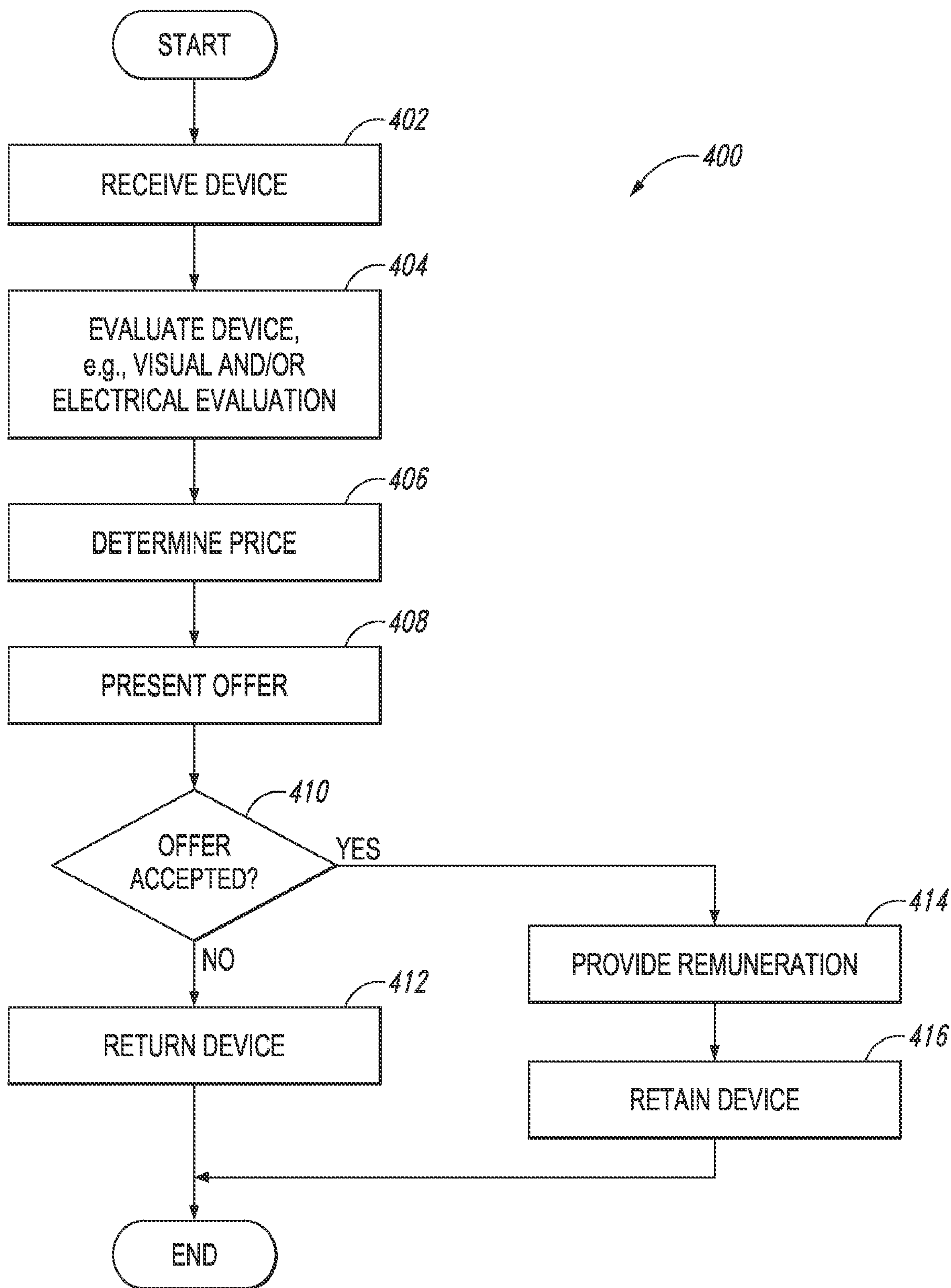
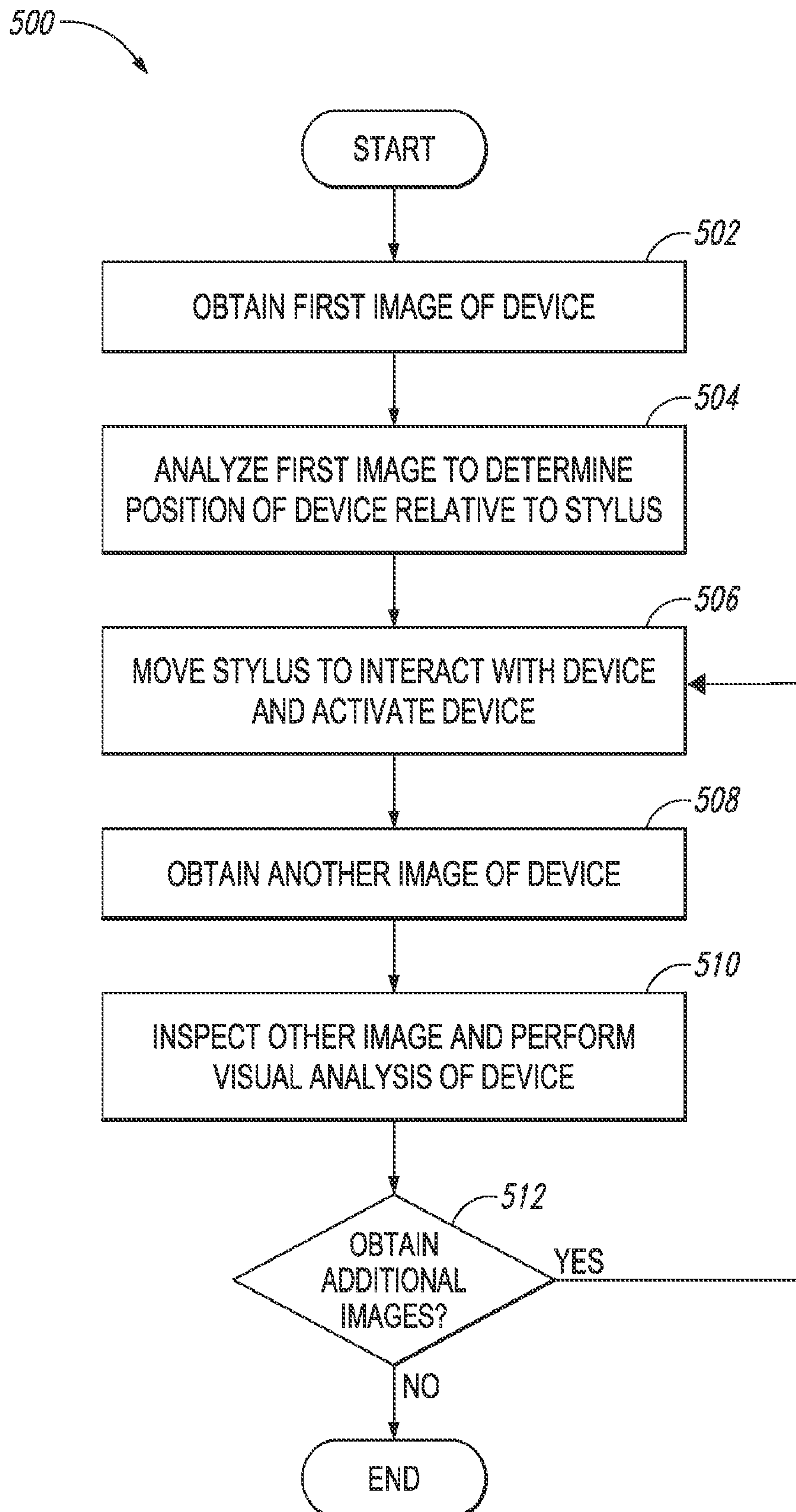


Fig. 3H

10/13

*Fig. 4*

11/13

*Fig. 5*

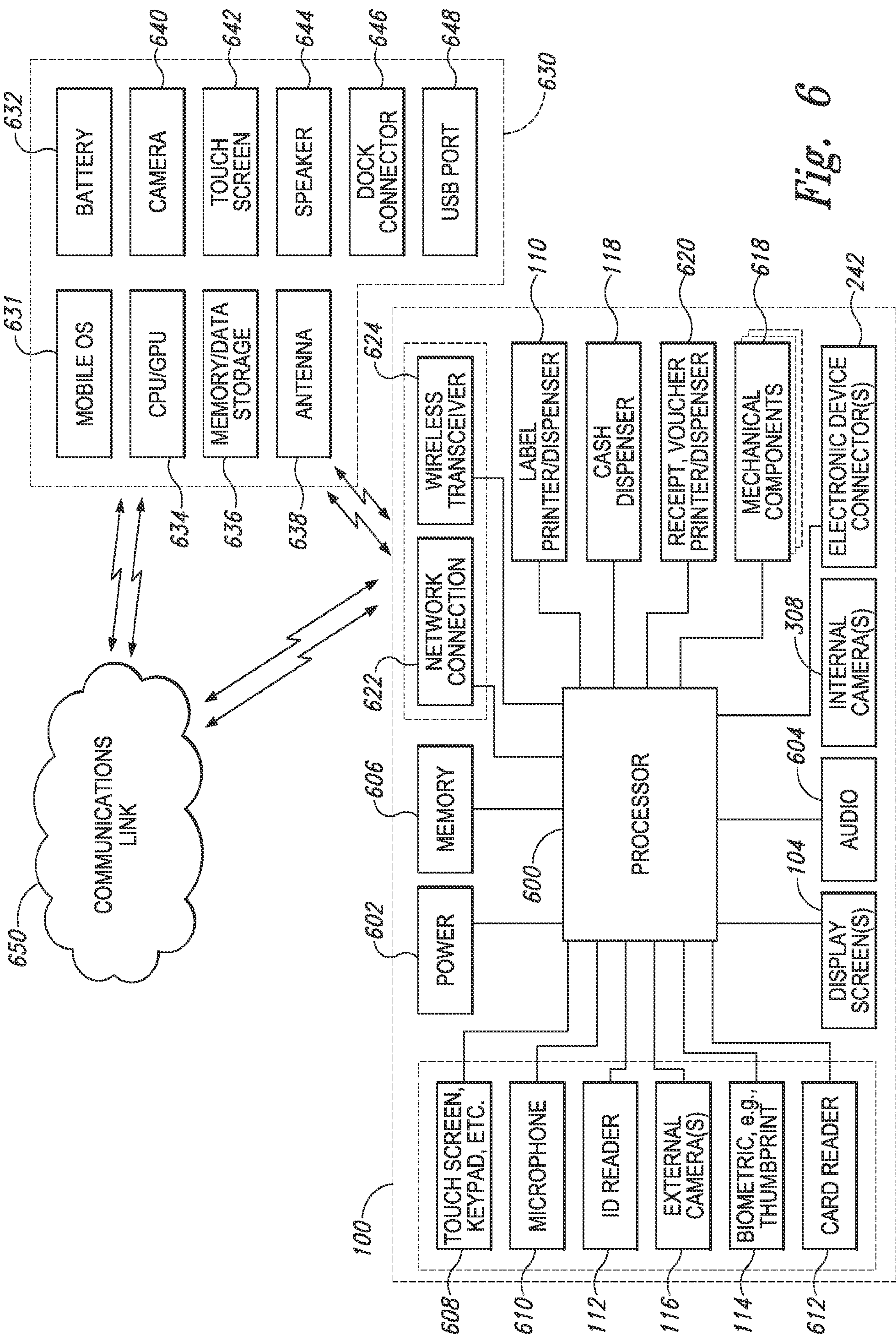


Fig. 6

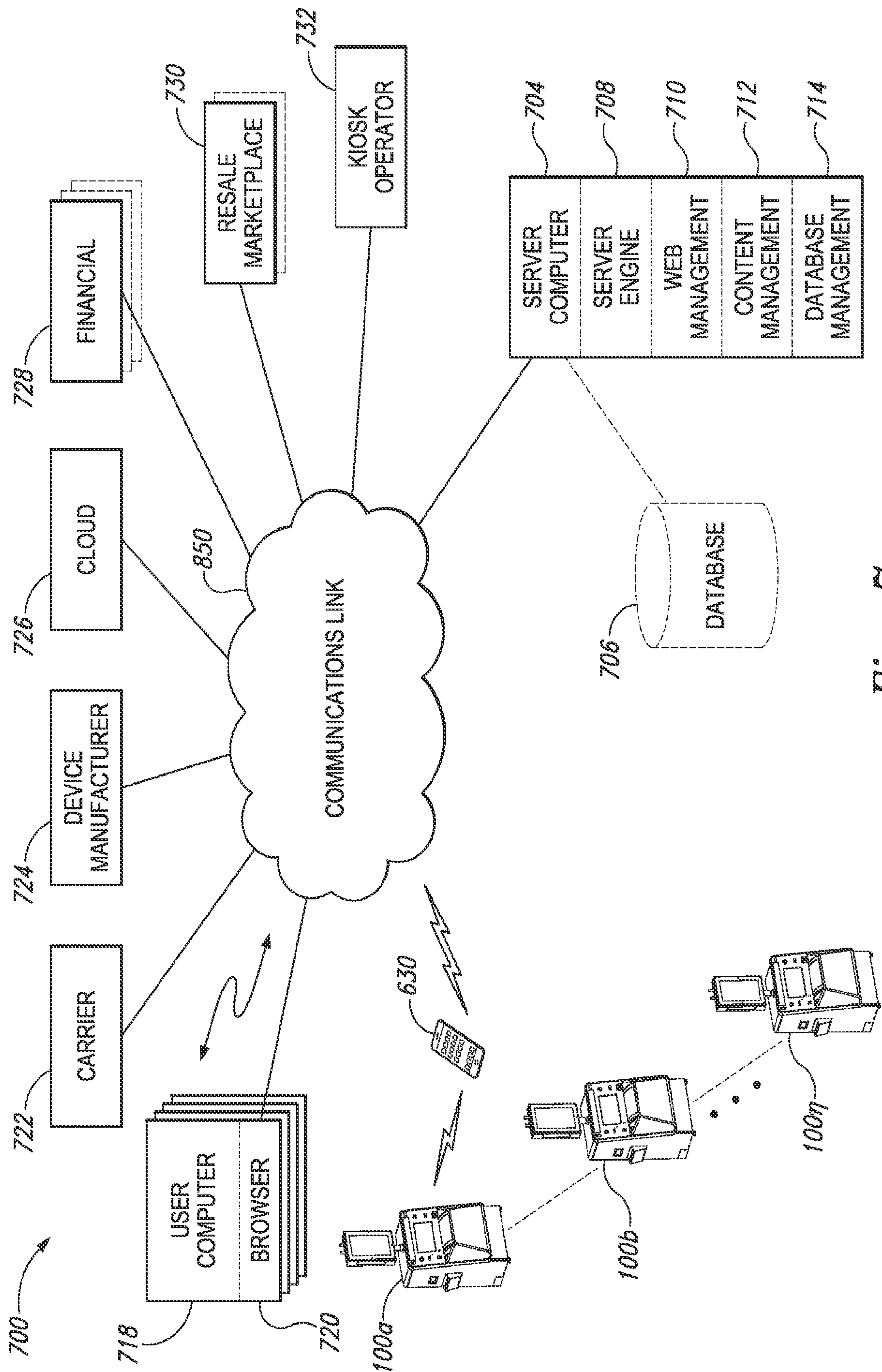
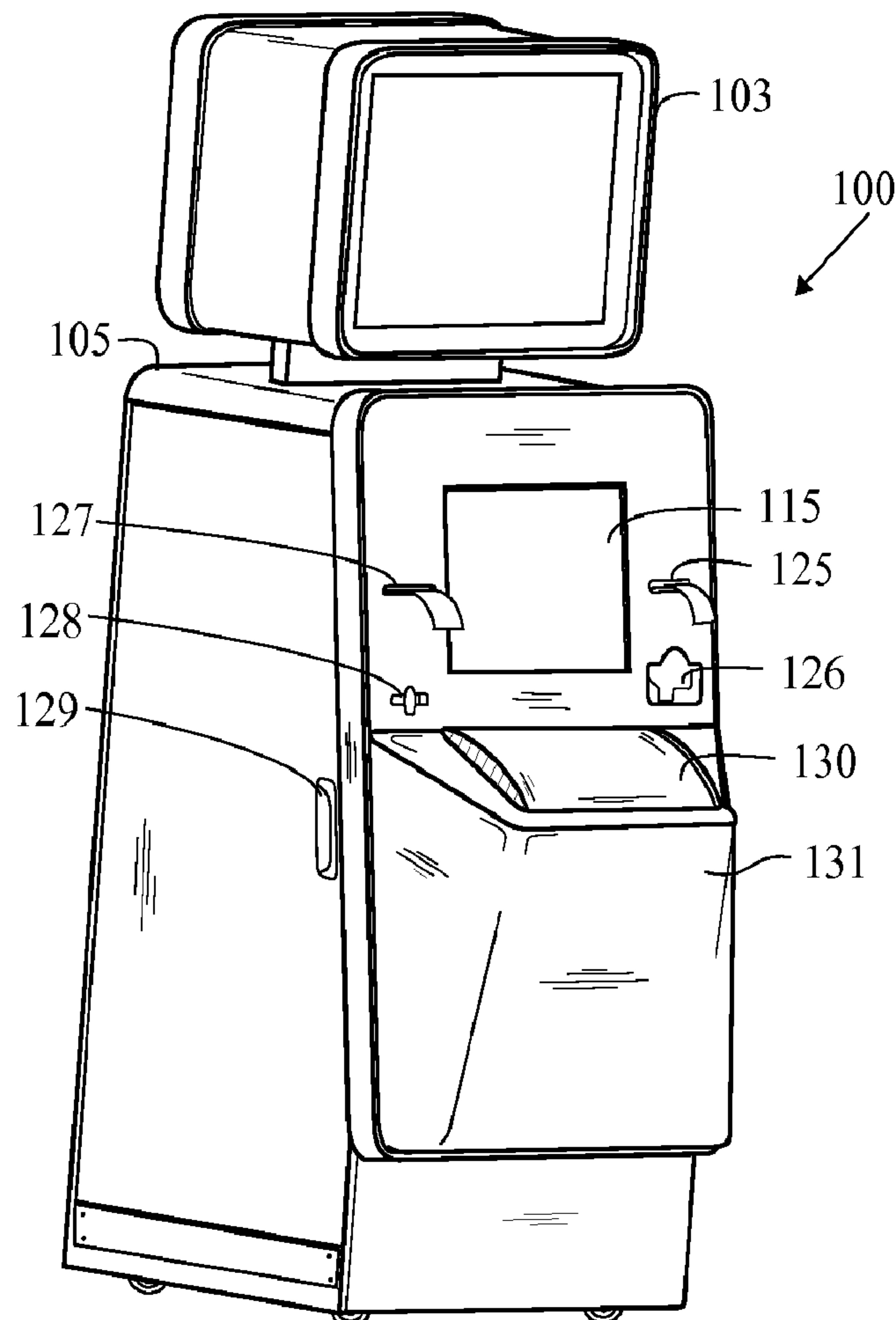


Fig. 7

(19) **United States**(12) **Patent Application Publication**
Bowles et al.(10) **Pub. No.: US 2013/0046699 A1**(43) **Pub. Date: Feb. 21, 2013**(54) **METHOD AND APPARATUS FOR
RECYCLING ELECTRONIC DEVICES**(71) Applicant: **ecoATM, Inc.**, San Diego, CA (US)(72) Inventors: **Mark Vincent Bowles**, La Jolla, CA
(US); **Jeff Ploetner**, San Diego, CA
(US); **John Andrew Beane**, San Diego,
CA (US)(73) Assignee: **ECOATM, INC.**, San Diego, CA (US)(21) Appl. No.: **13/658,828**(22) Filed: **Oct. 24, 2012****Related U.S. Application Data**(63) Continuation-in-part of application No. 13/492,835,
filed on Jun. 9, 2012, which is a continuation of appli-
cation No. 12/785,465, filed on May 23, 2010, now
Pat. No. 8,200,533, which is a continuation-in-part of
application No. 12/727,624, filed on Mar. 19, 2010,
now Pat. No. 7,881,965, which is a continuation-in-
part of application No. 12/573,089, filed on Oct. 2,
2009, now Pat. No. 8,195,511.(60) Provisional application No. 61/551,410, filed on Oct.
25, 2011, provisional application No. 61/606,997,
filed on Mar. 6, 2012, provisional application No.
61/102,304, filed on Oct. 2, 2008, provisional applica-
tion No. 61/183,510, filed on Jun. 2, 2009.**Publication Classification**(51) **Int. Cl.**
G06Q 30/00 (2012.01)(52) **U.S. Cl.** **705/306**(57) **ABSTRACT**

A recycling kiosk for recycling and financial remuneration for submission of an electronic device is disclosed herein. The recycling kiosk includes an inspection area with preferably two mirrored, domed hemispheres positioned about a transparent table and cameras for imaging an electronic device placed on the table. Inspection of an About page or a barcode within a battery compartment of the electronic device is performed to determine a value for the electronic device. Alternatively, a robotic finger is utilized to inspect the electronic device. The recycling kiosk also includes a processor, a display and a user interface.



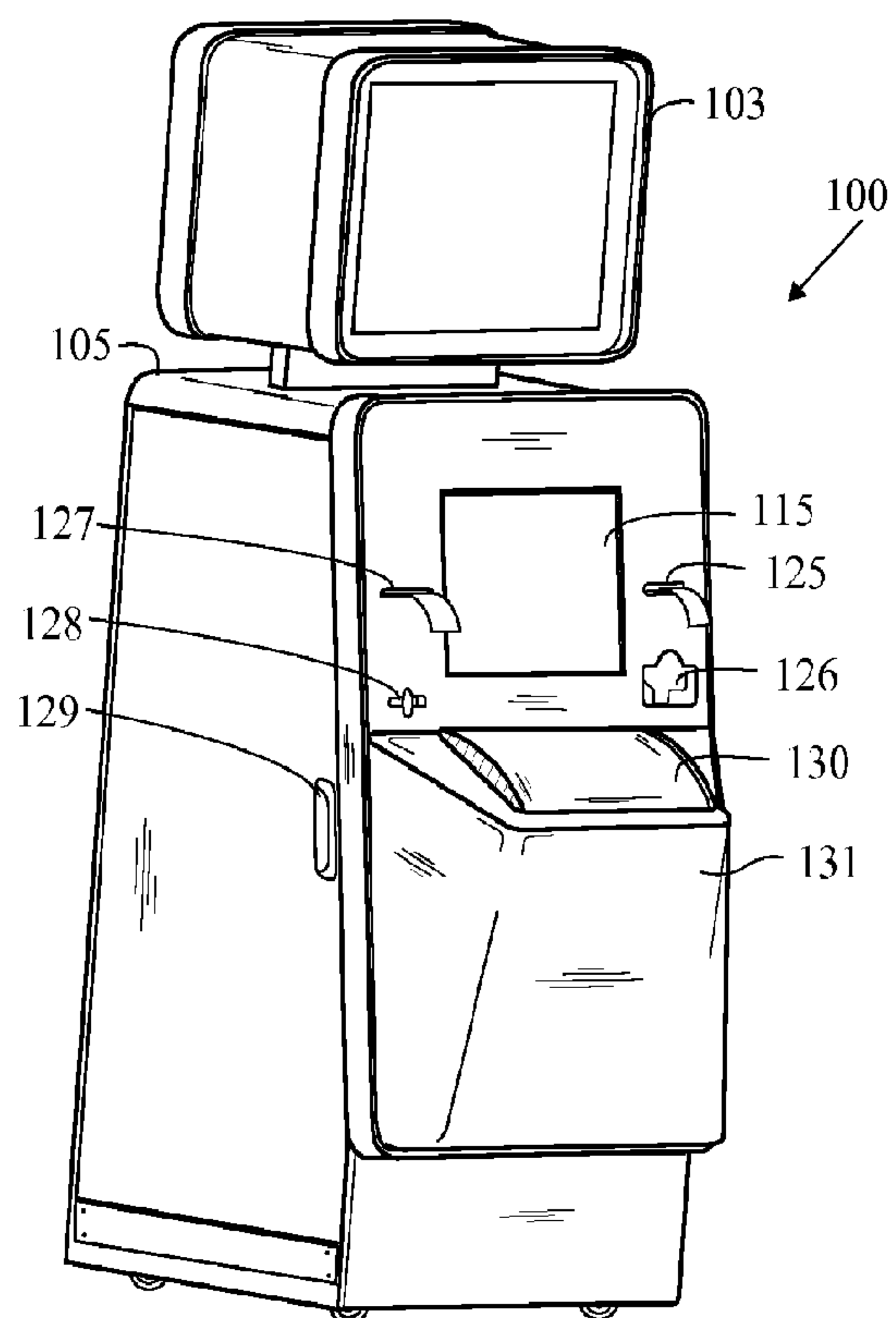


FIG. 1

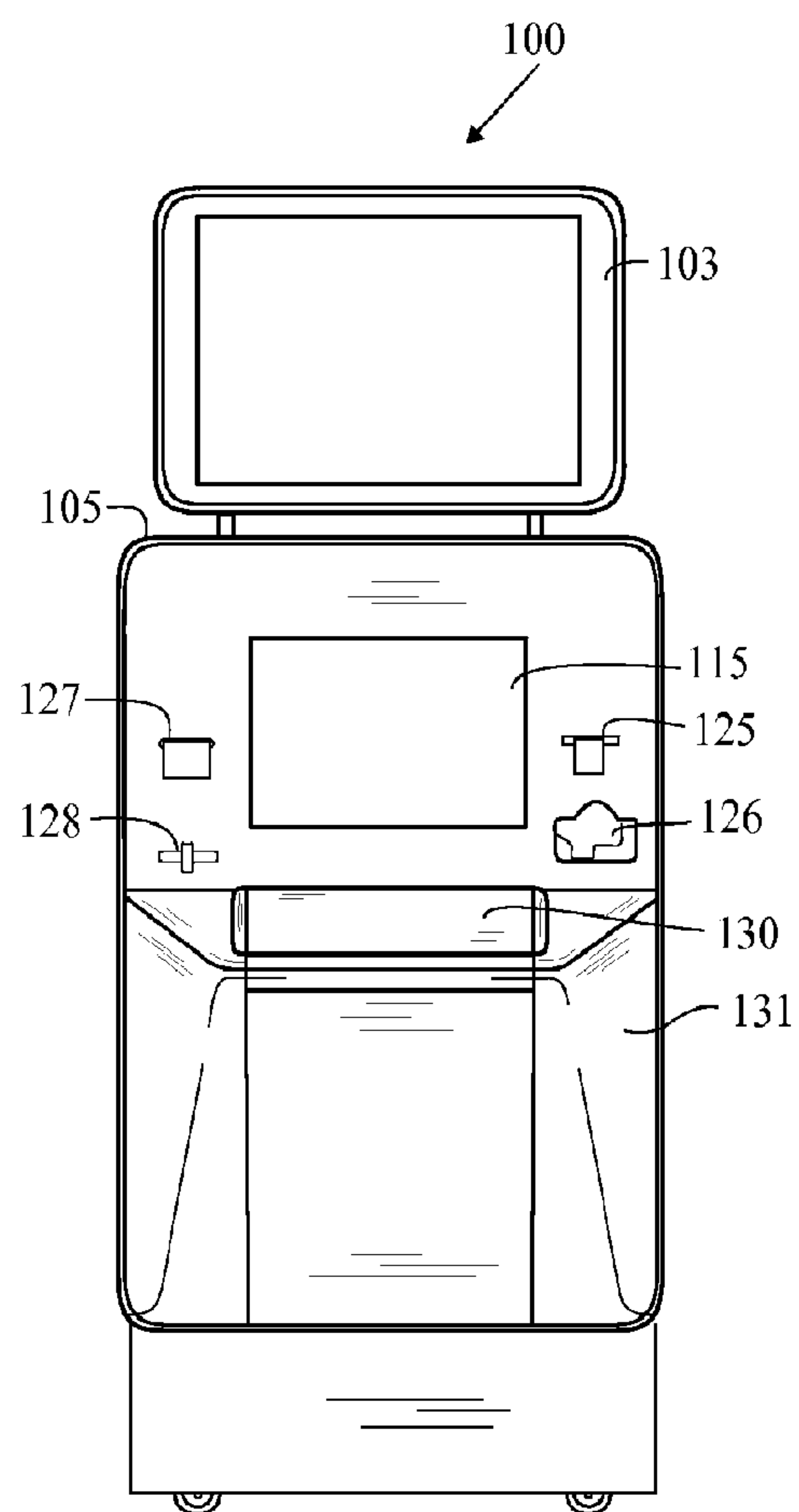


FIG. 1A

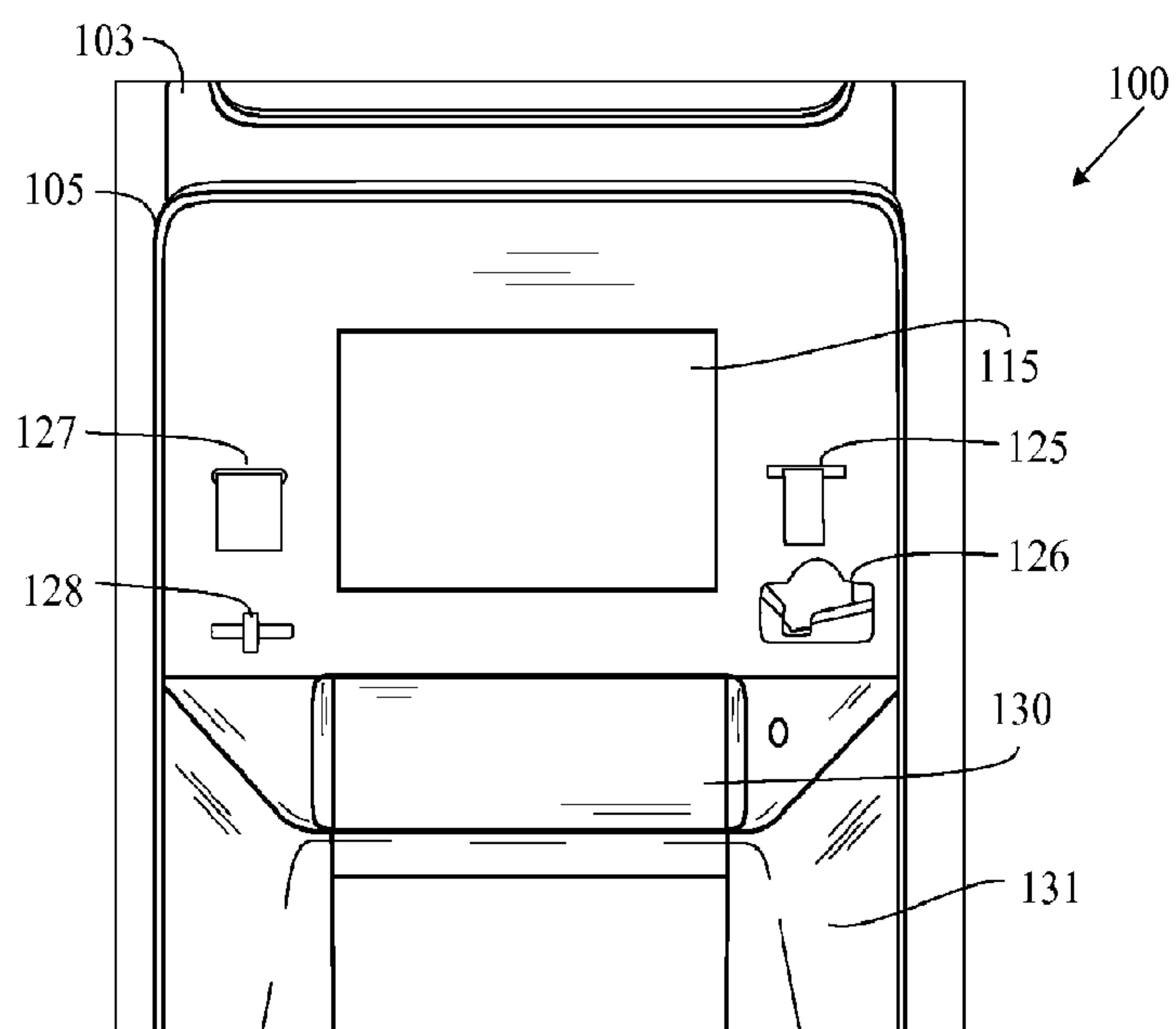


FIG. 1B

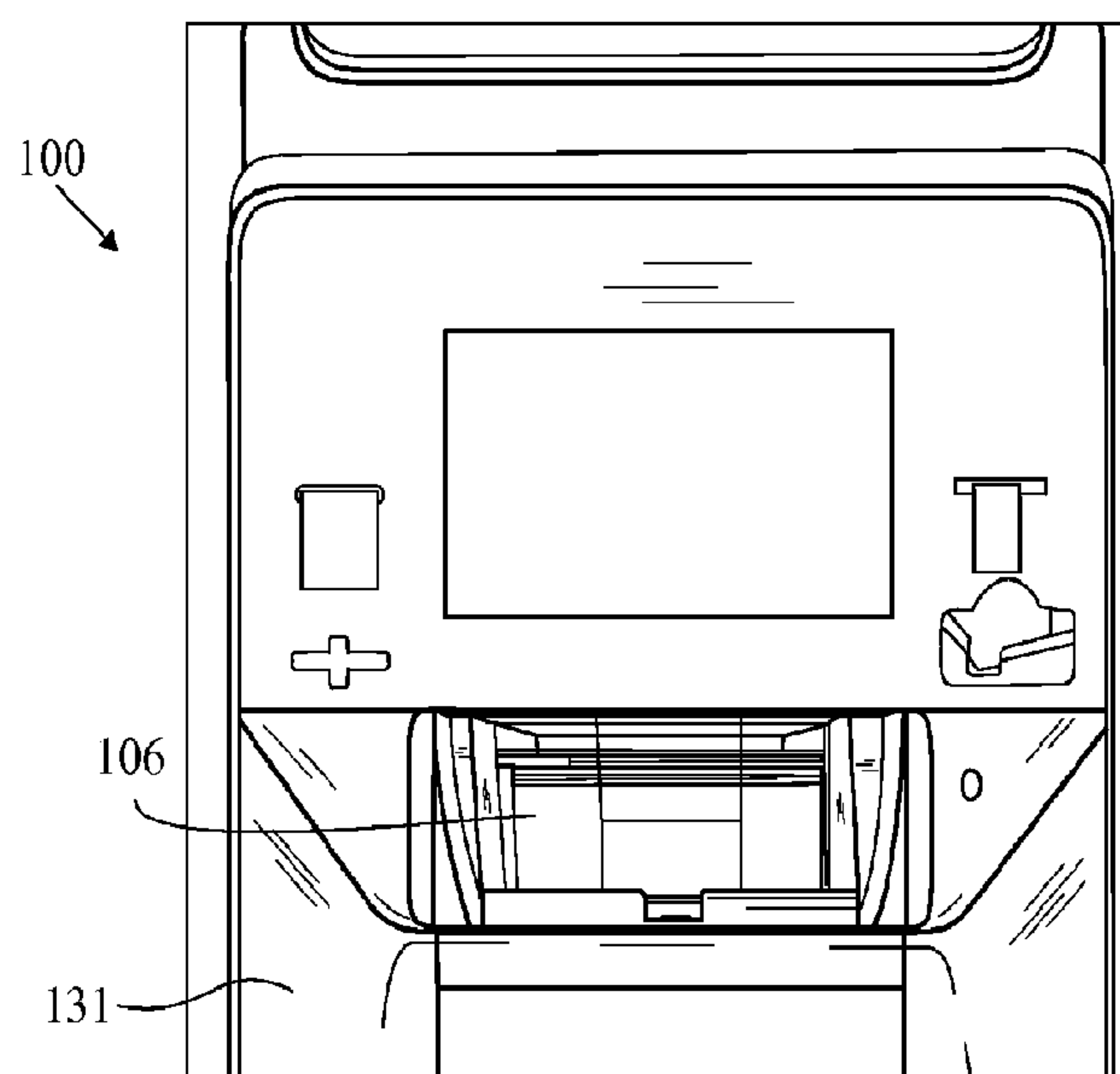


FIG. 1C

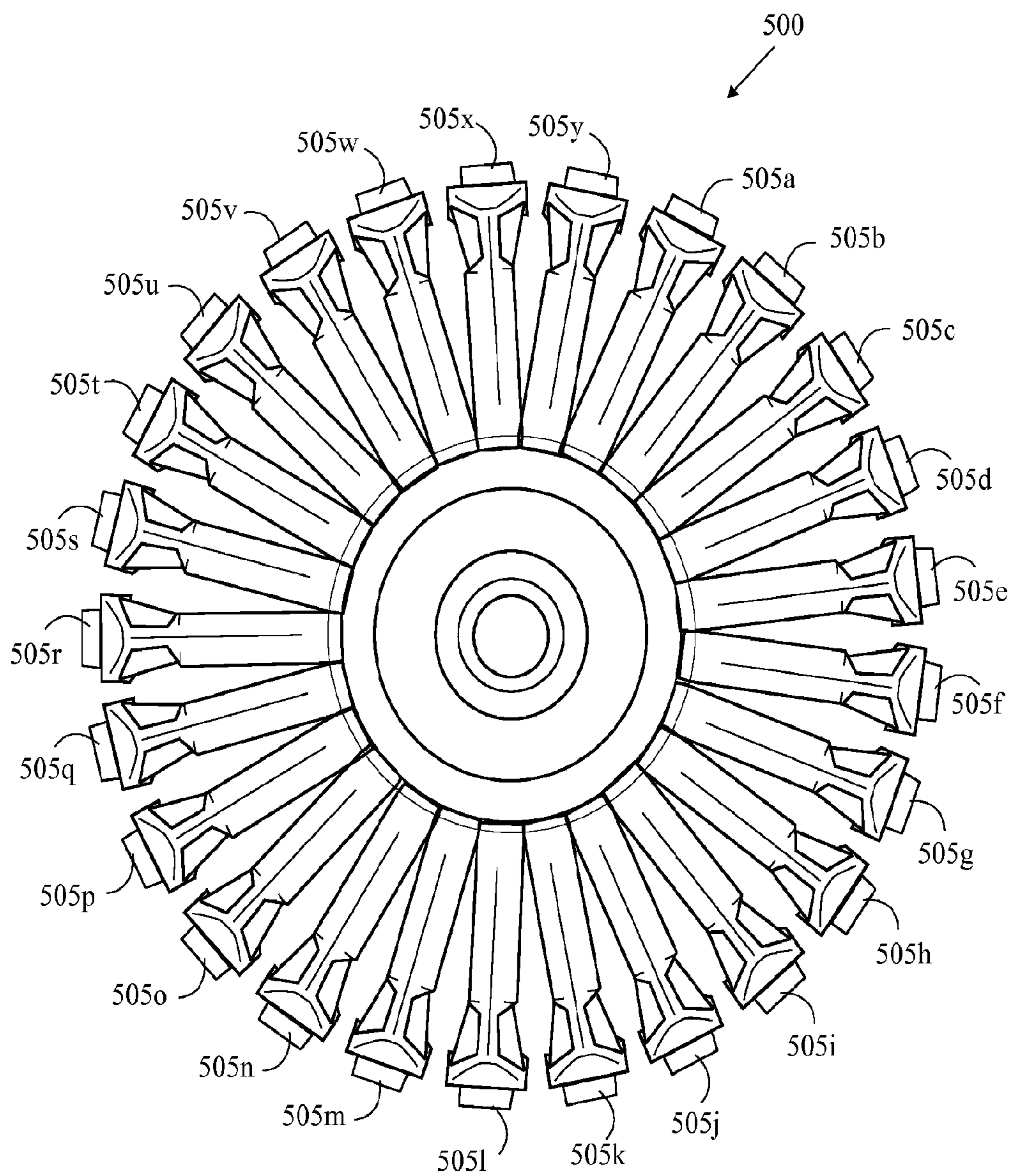


FIG. 2

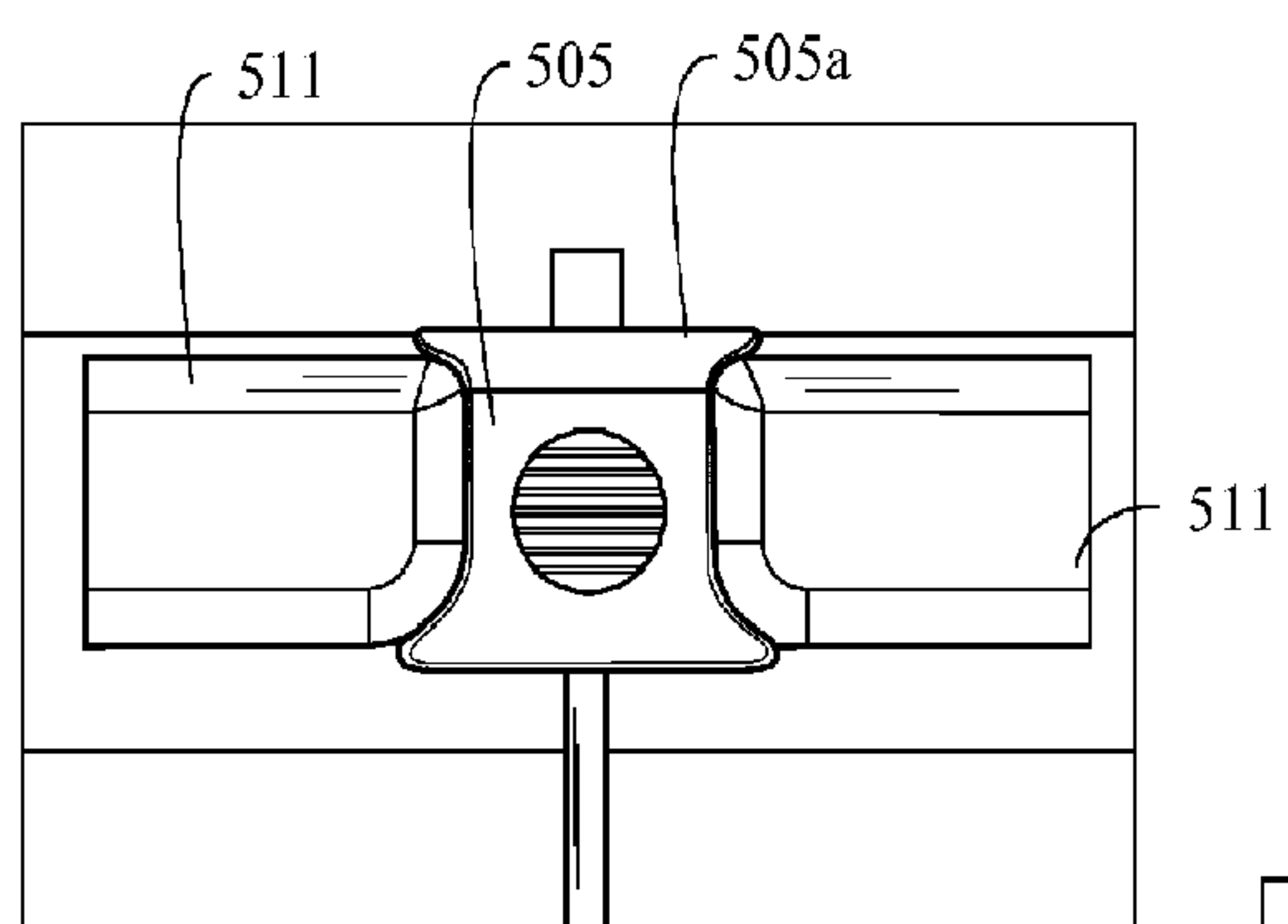


FIG. 2A

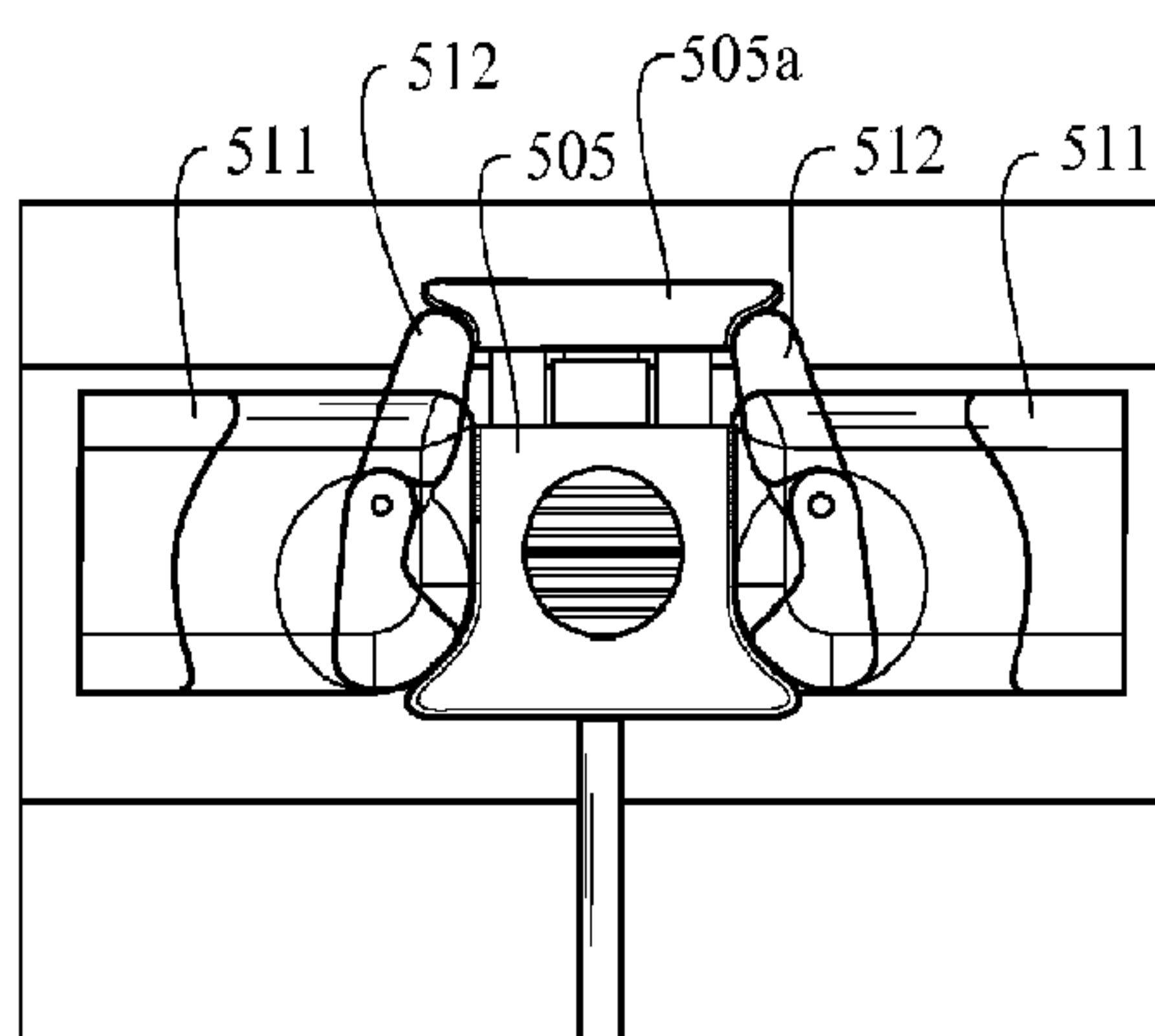


FIG. 2B

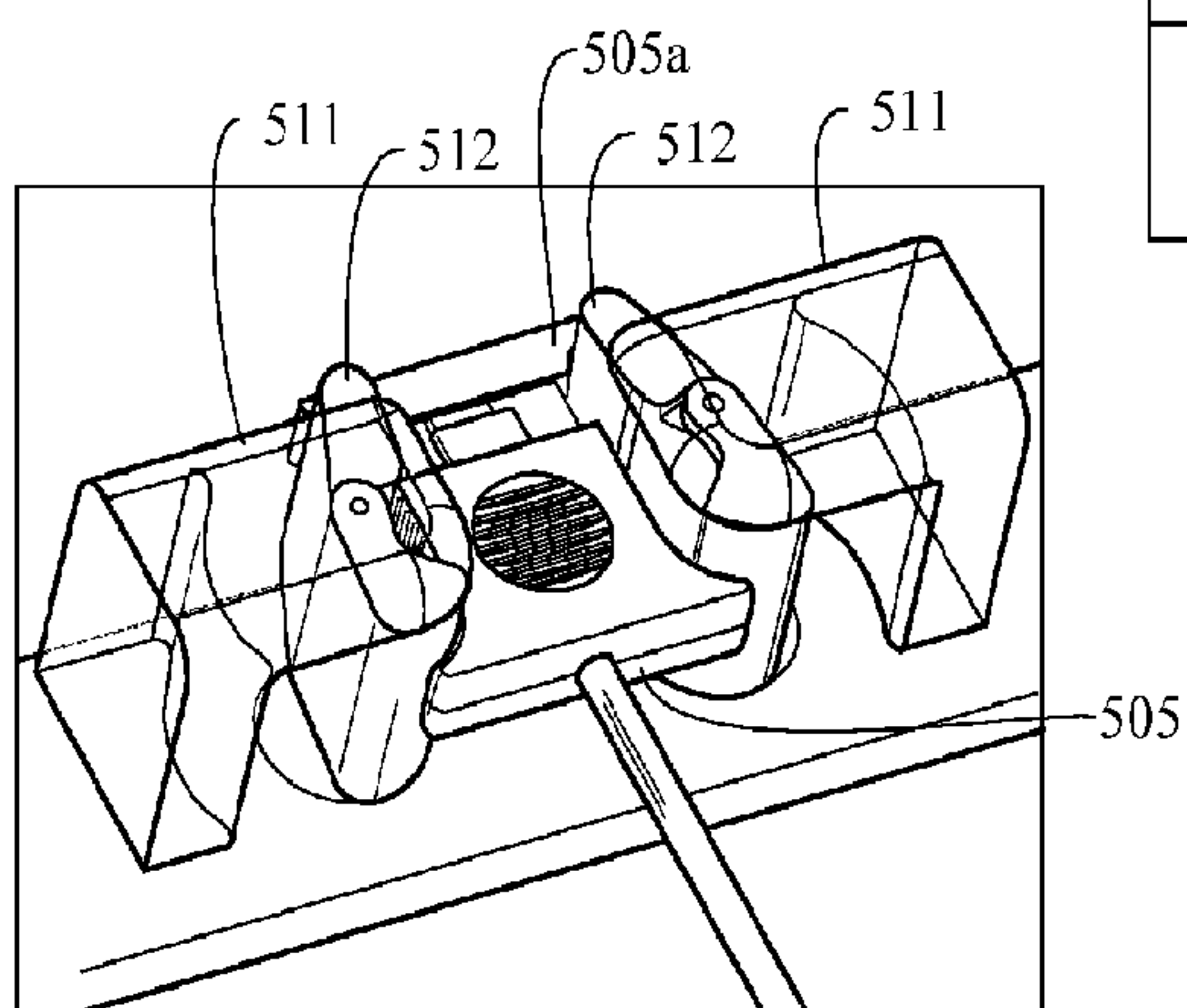


FIG. 2C

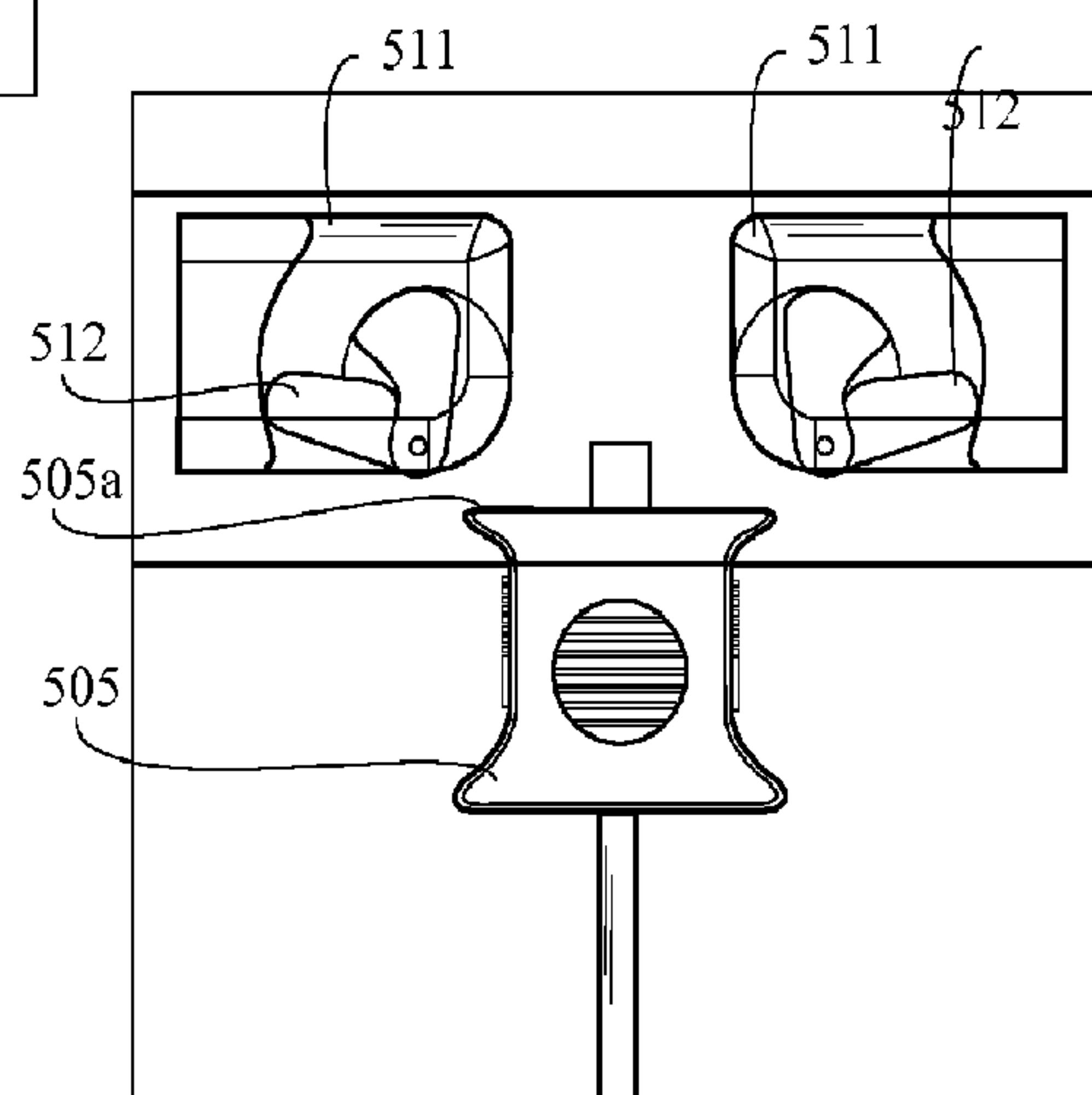


FIG. 2D

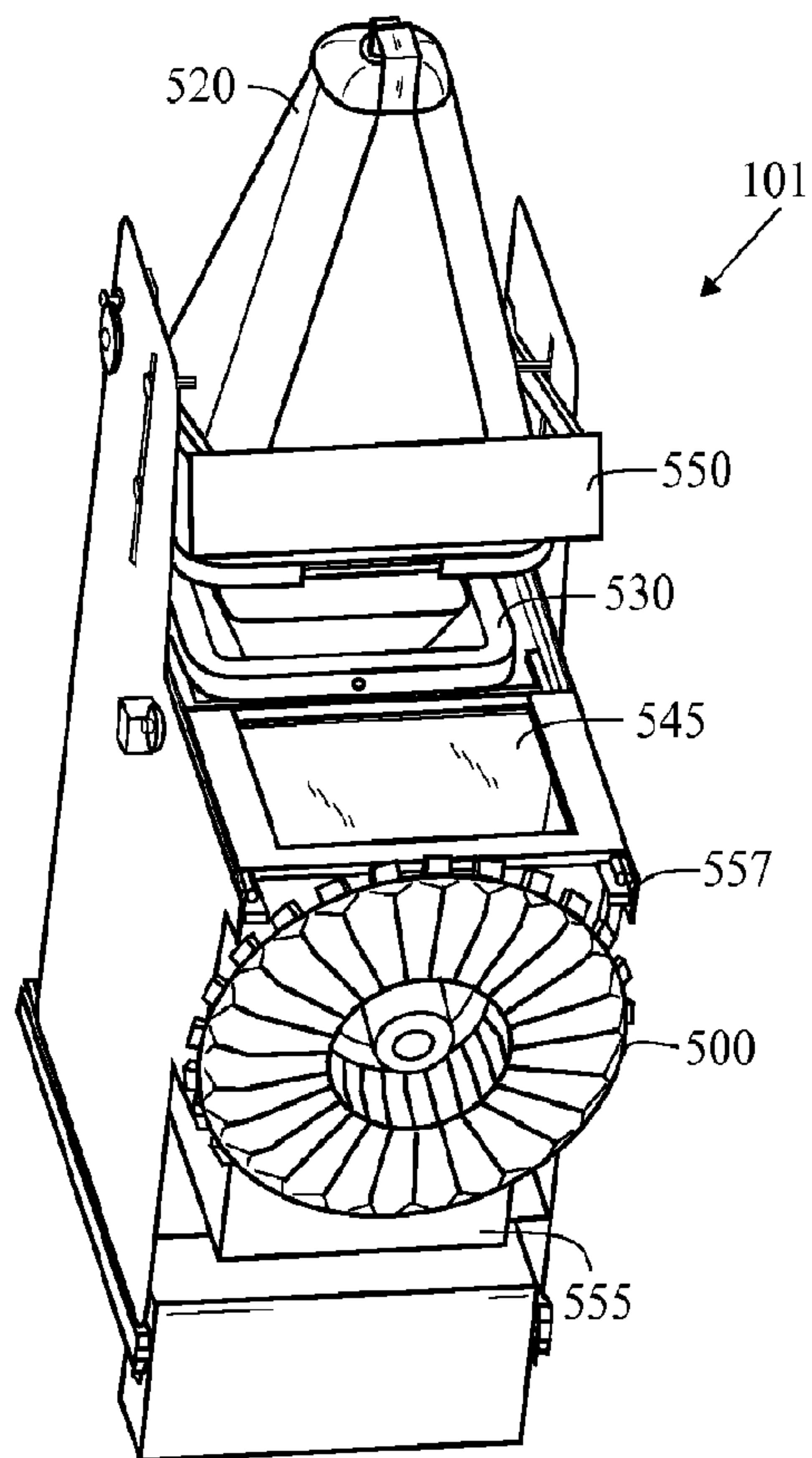


FIG. 3

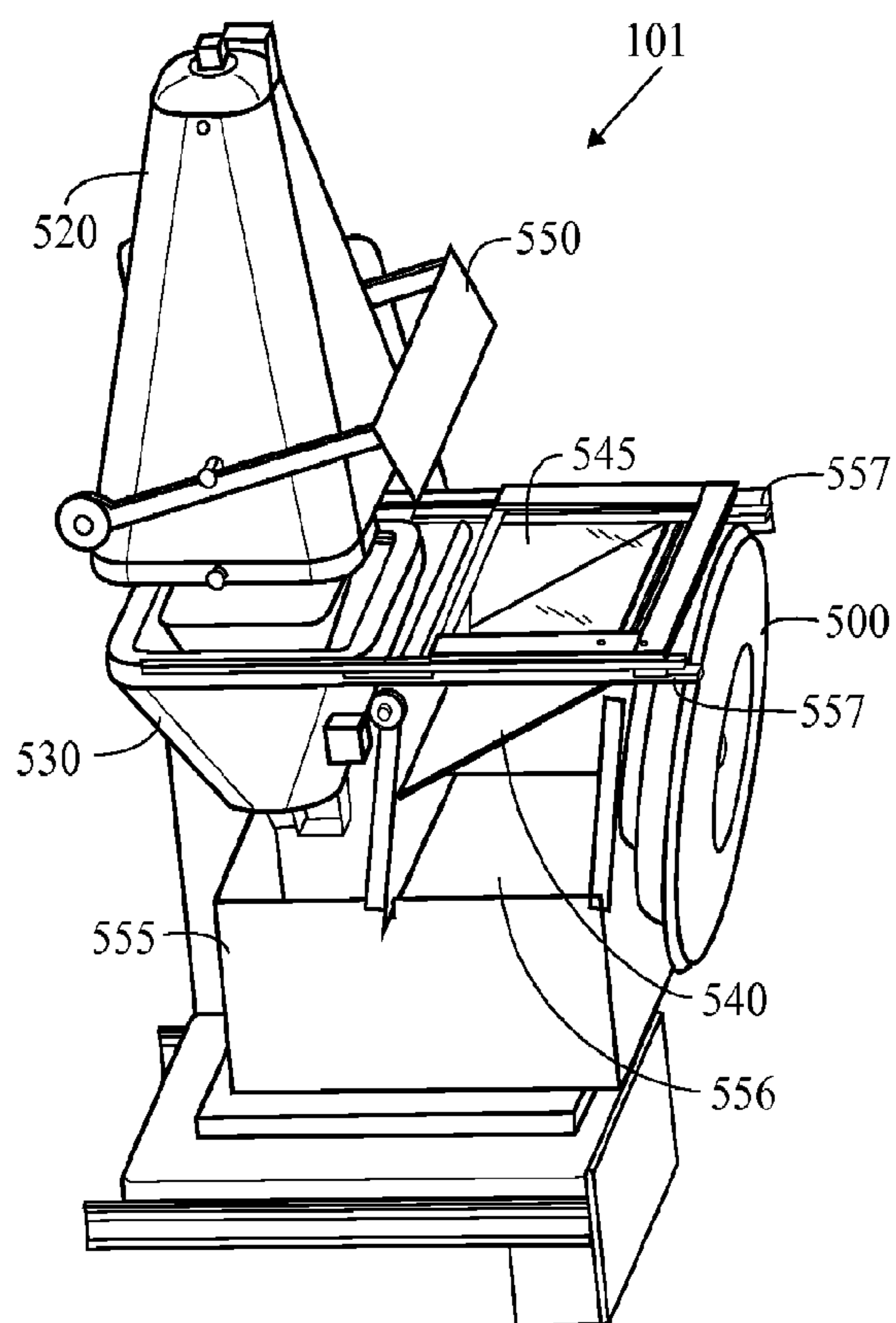


FIG. 3A

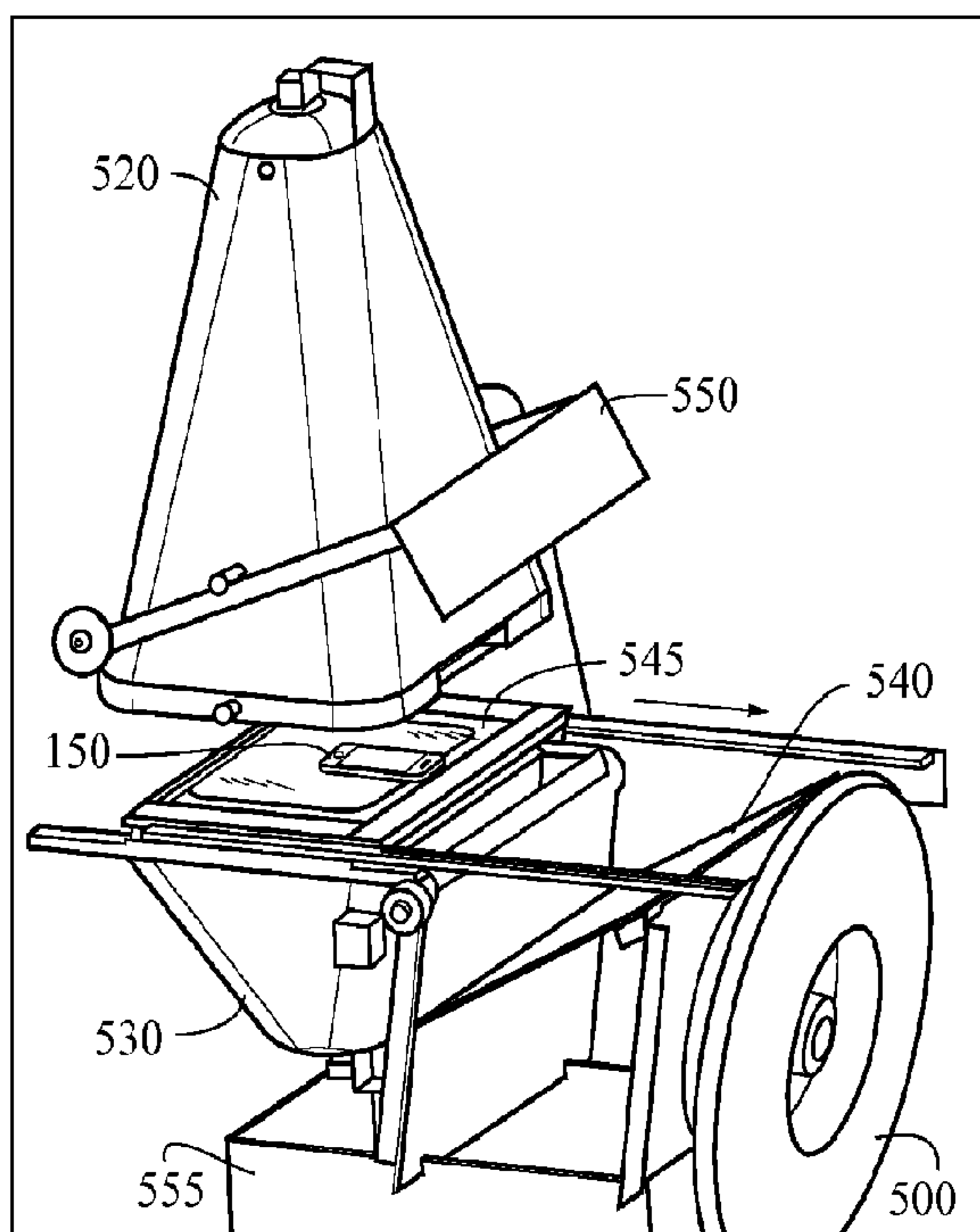


FIG. 3B

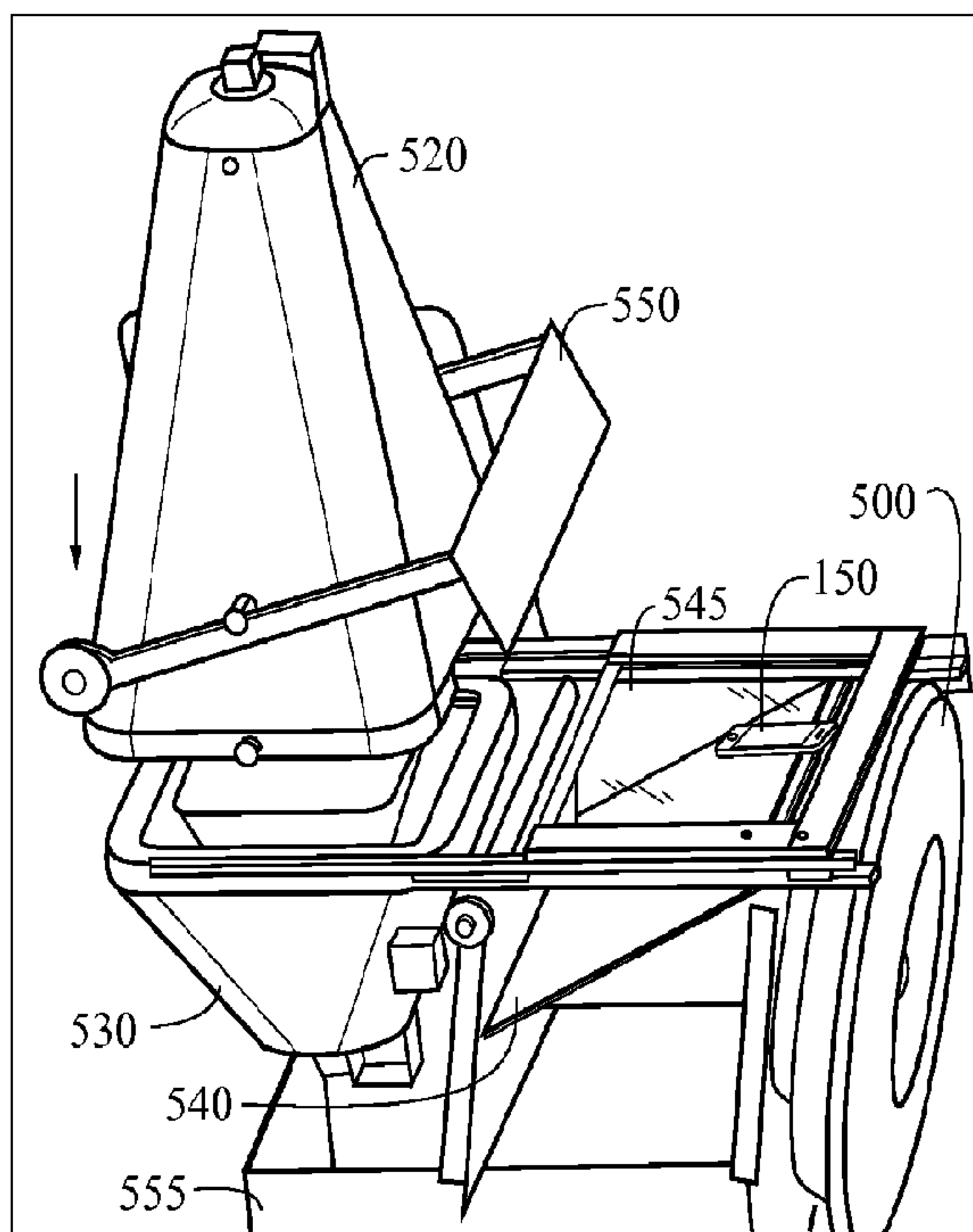


FIG. 3C

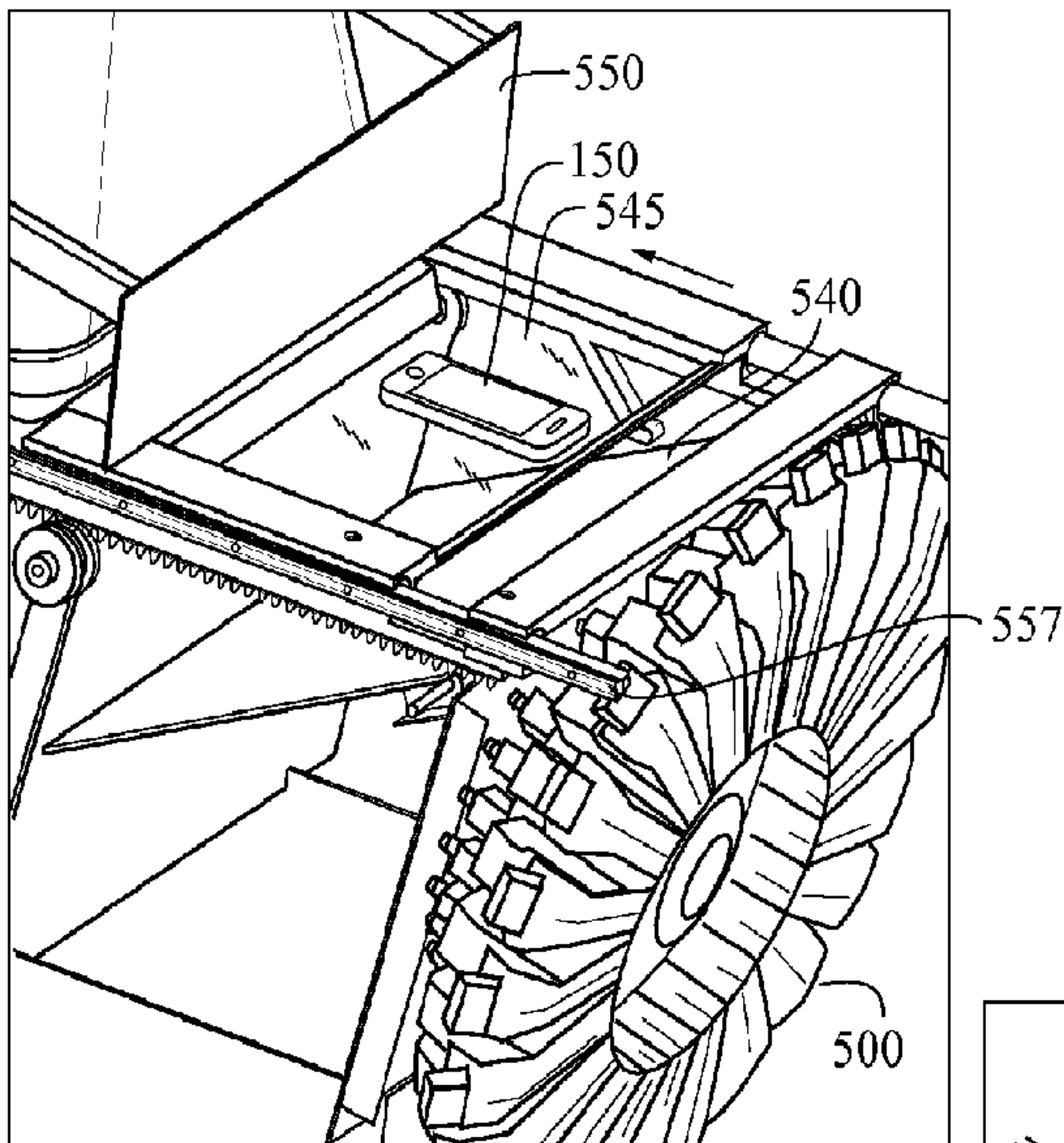


FIG. 4

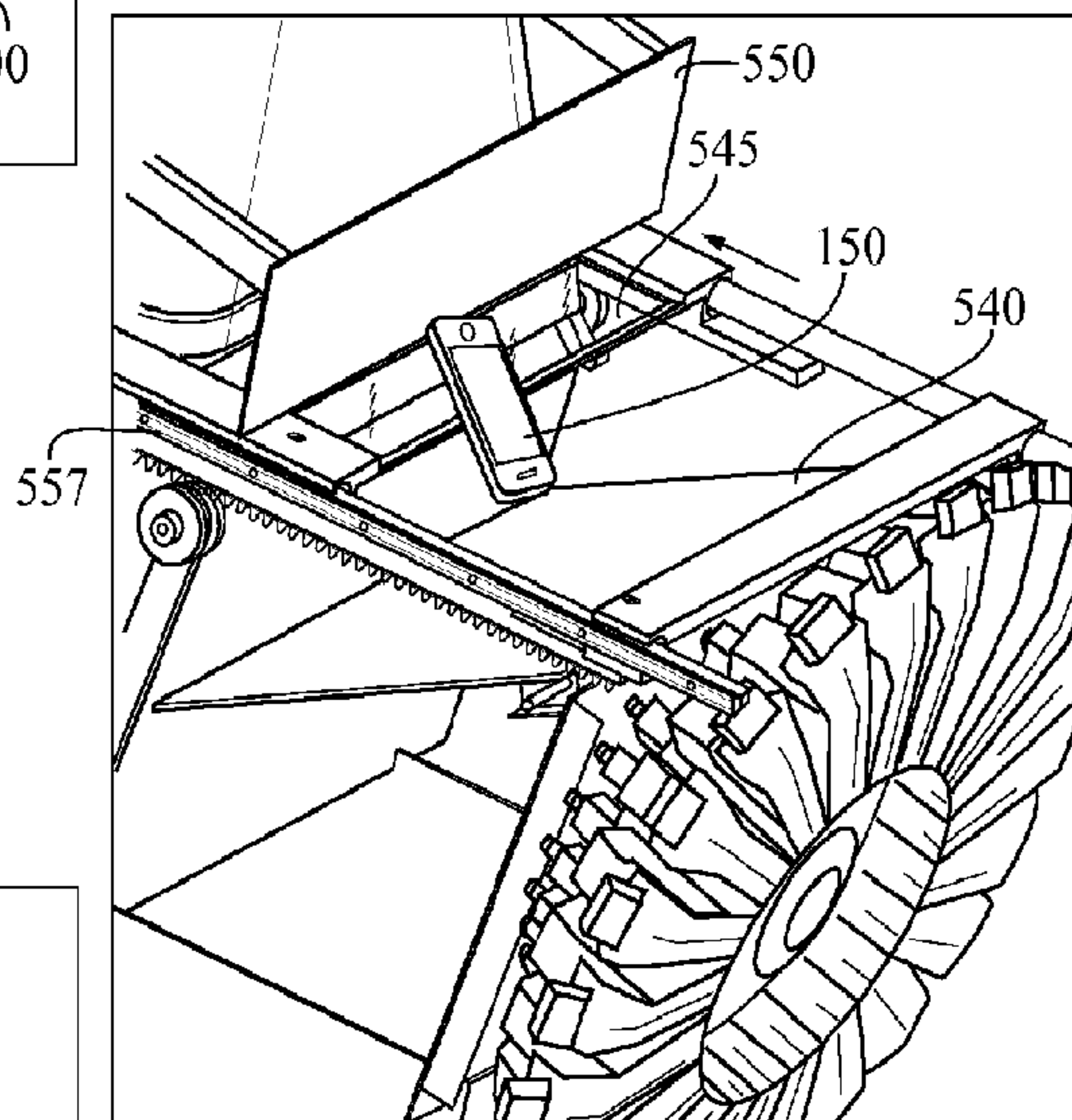


FIG.4A

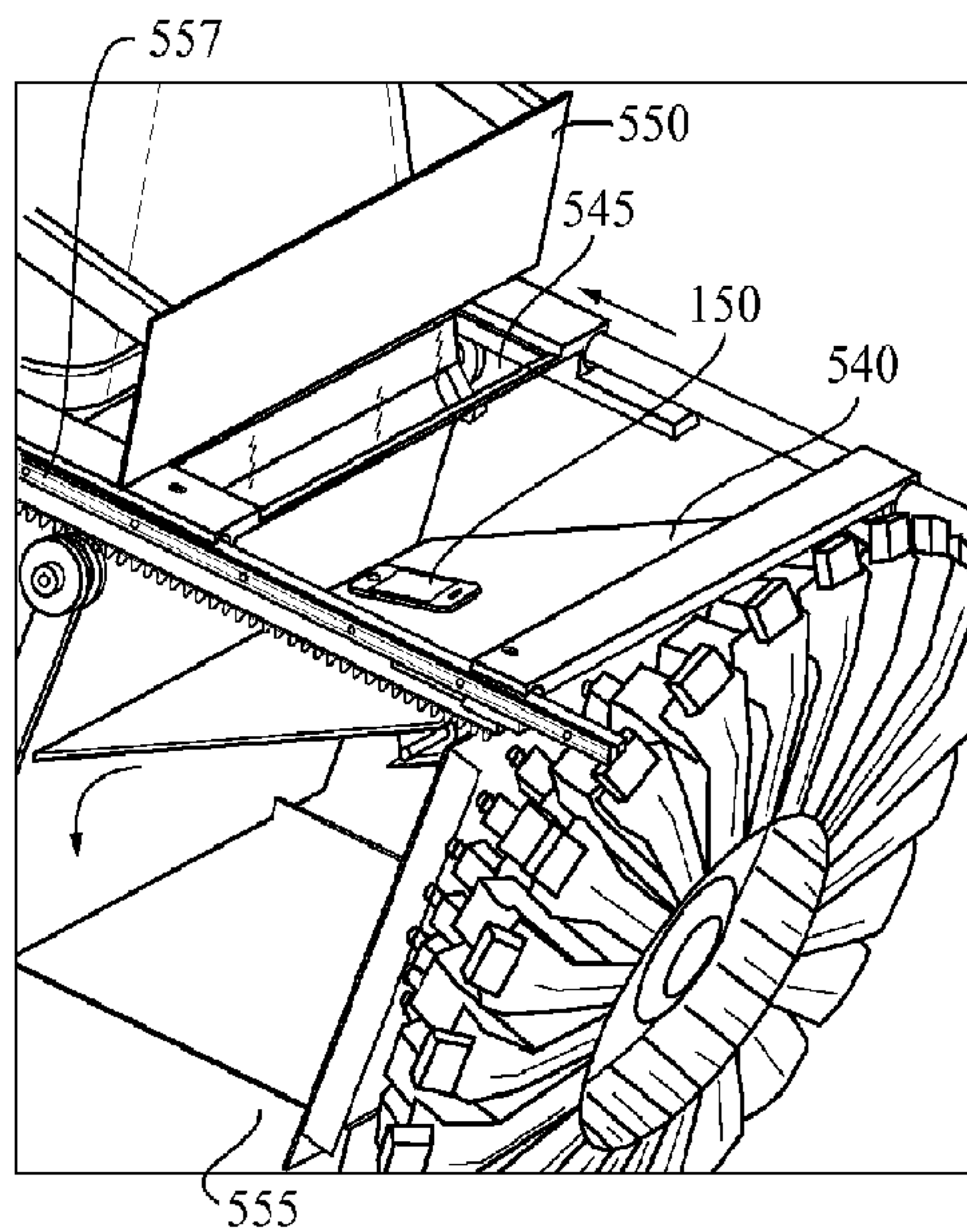


FIG. 4B

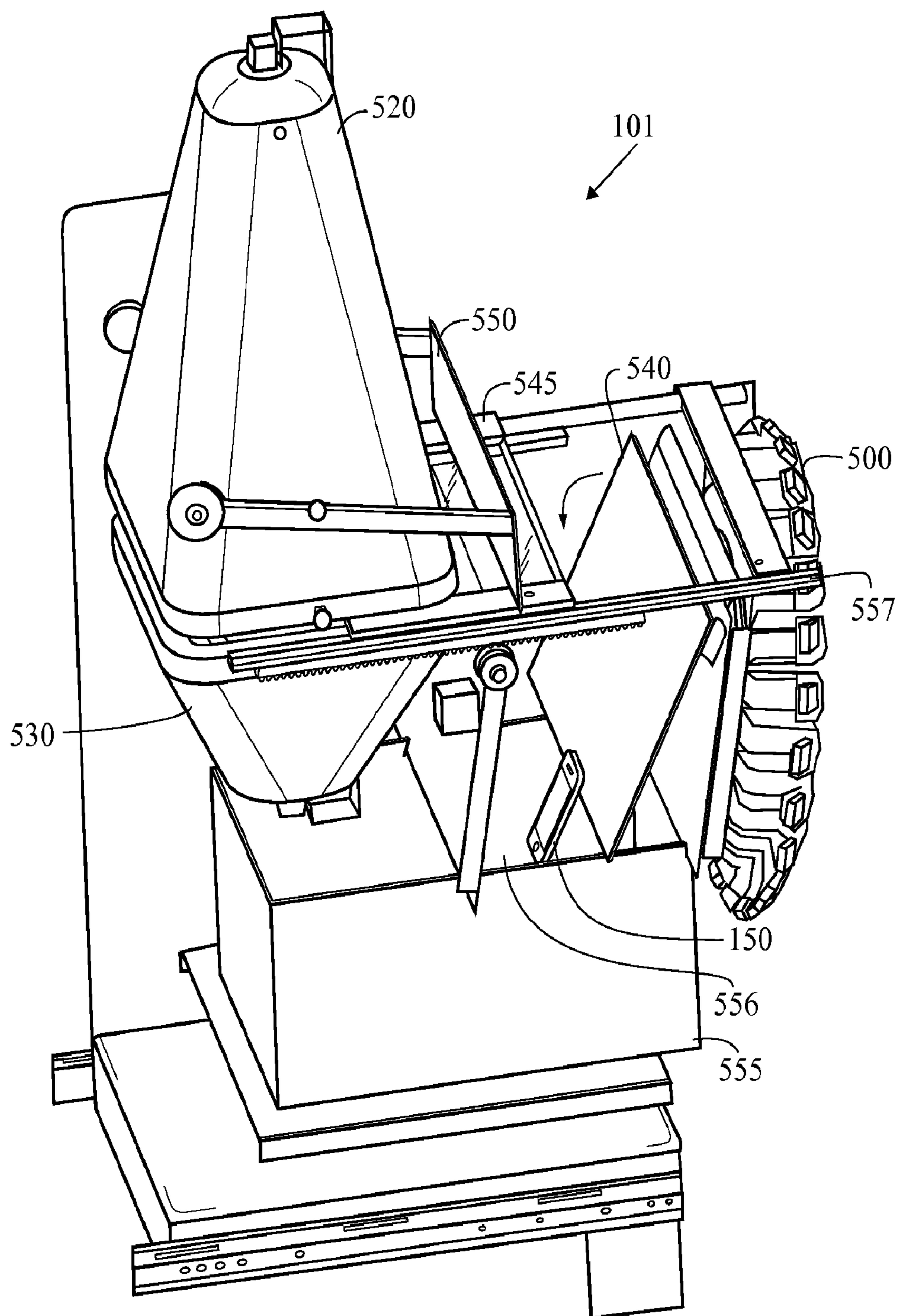


FIG. 4C

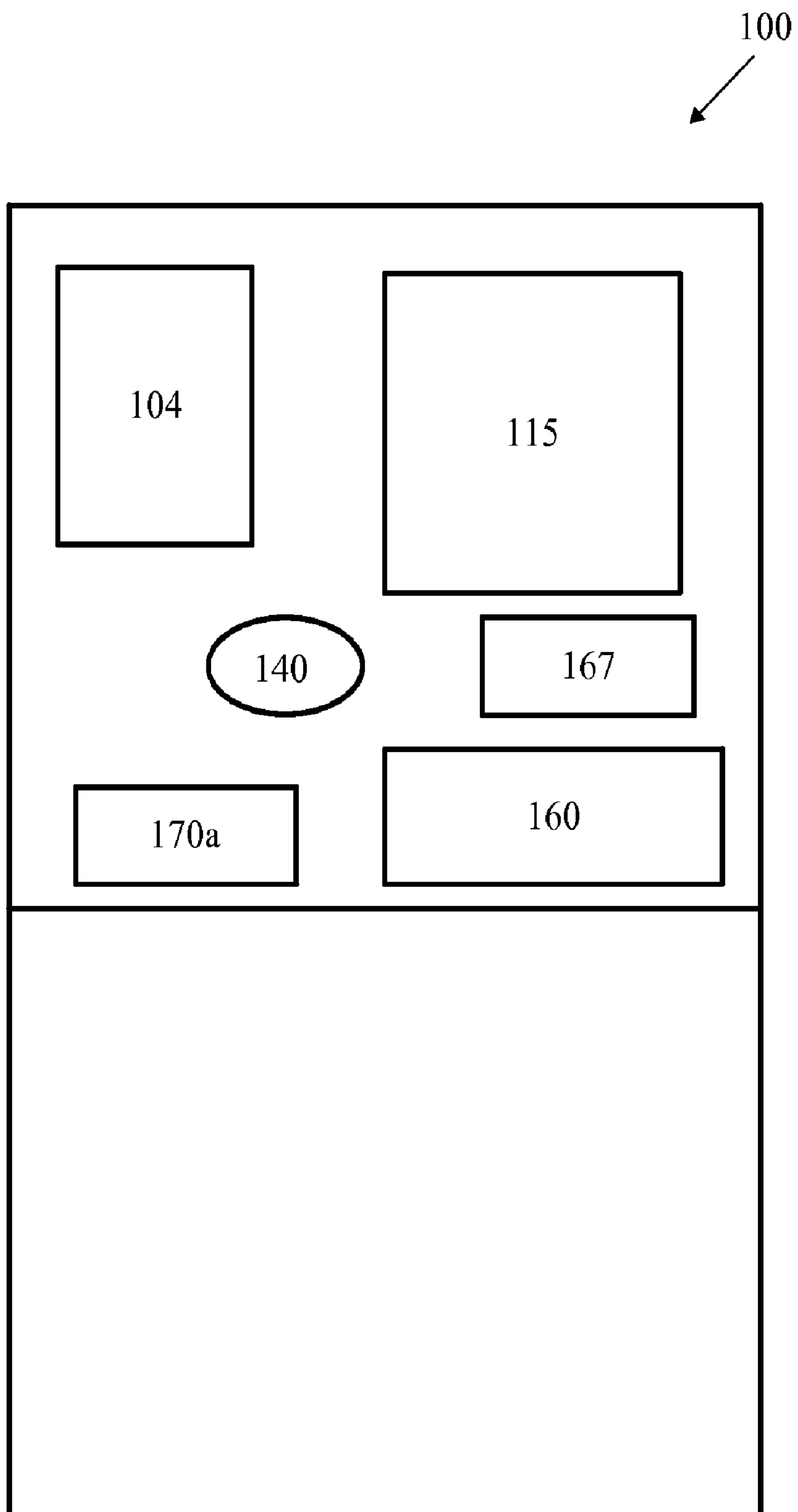


FIG. 5

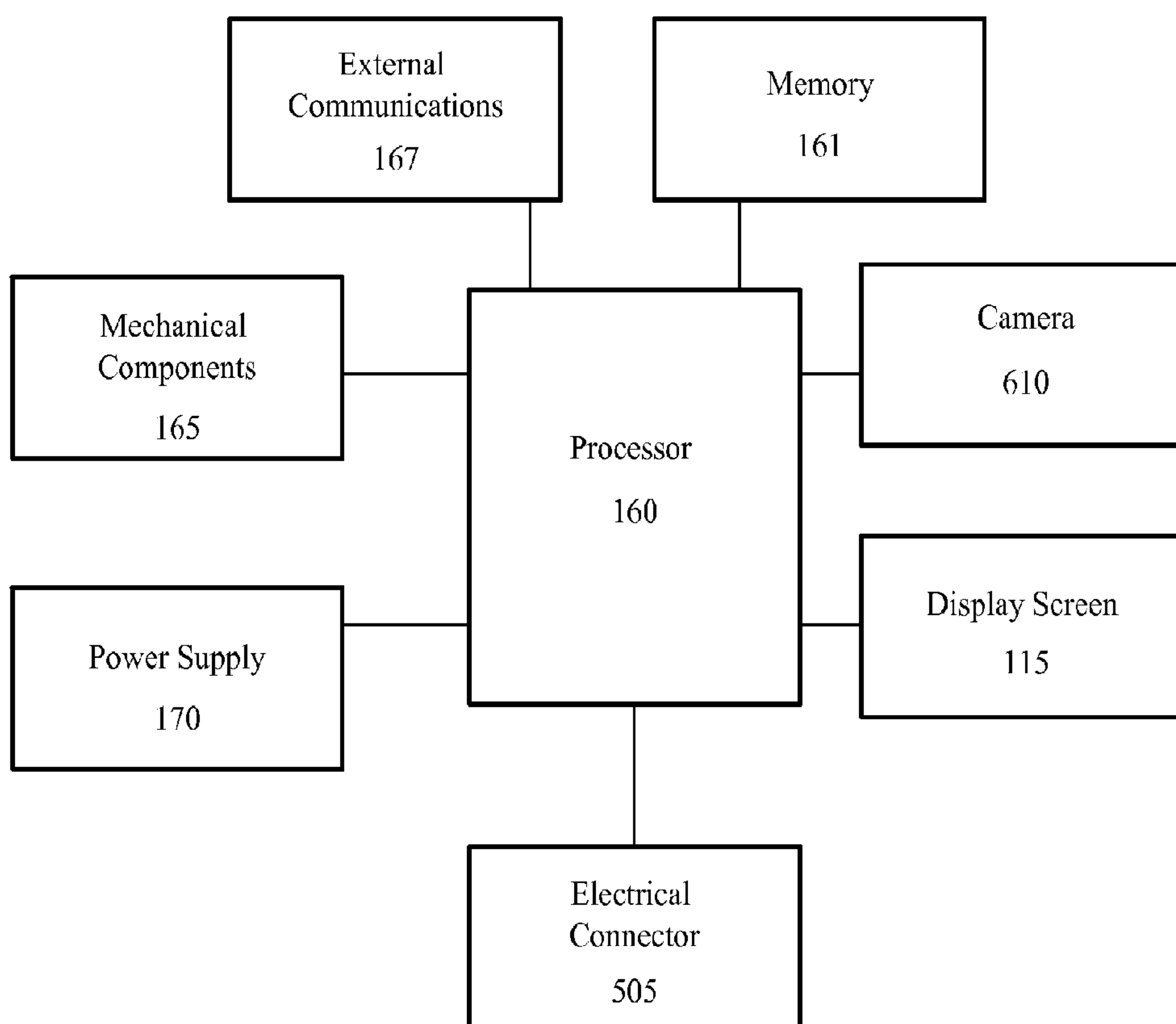


FIG. 6

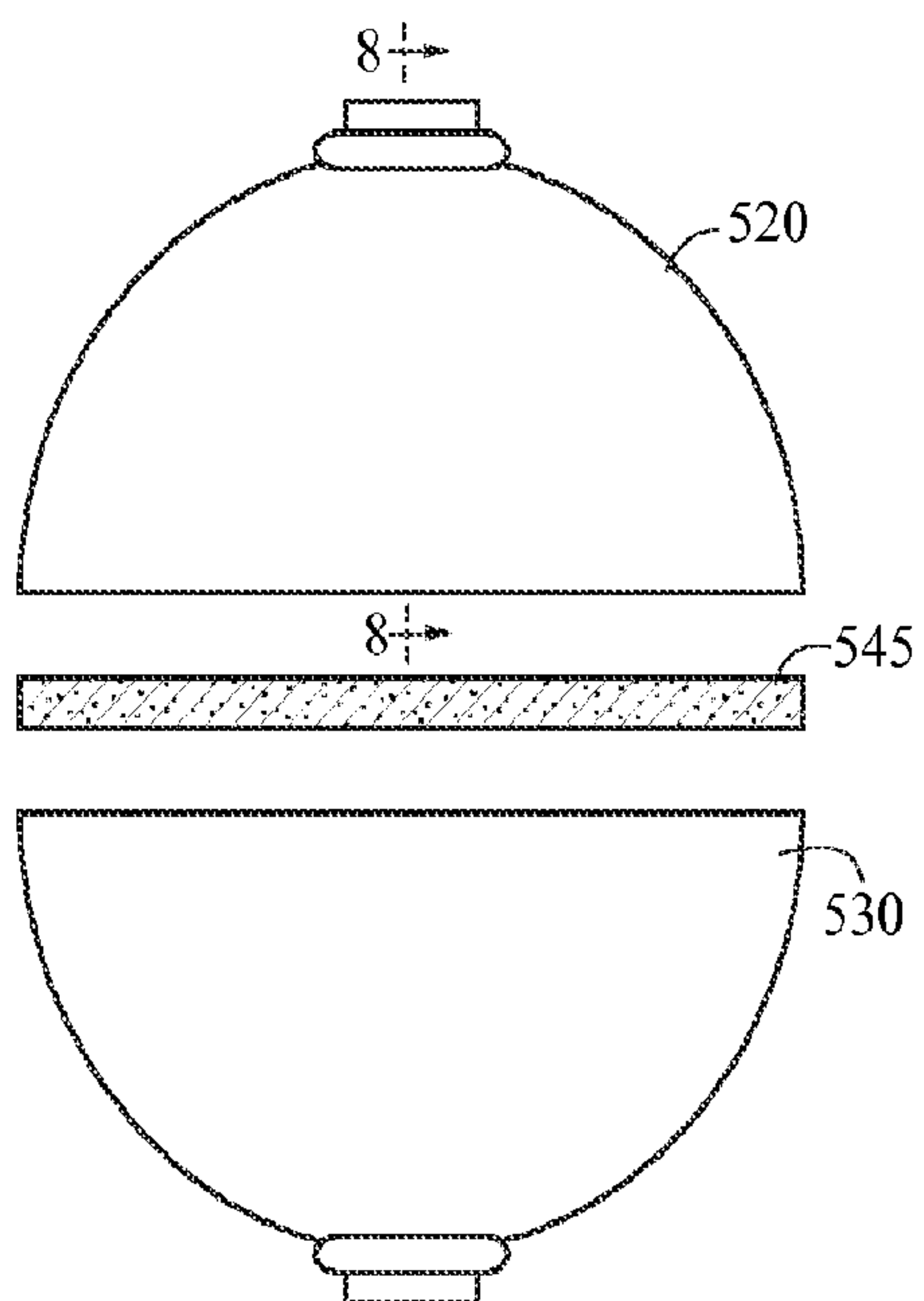


FIG. 7

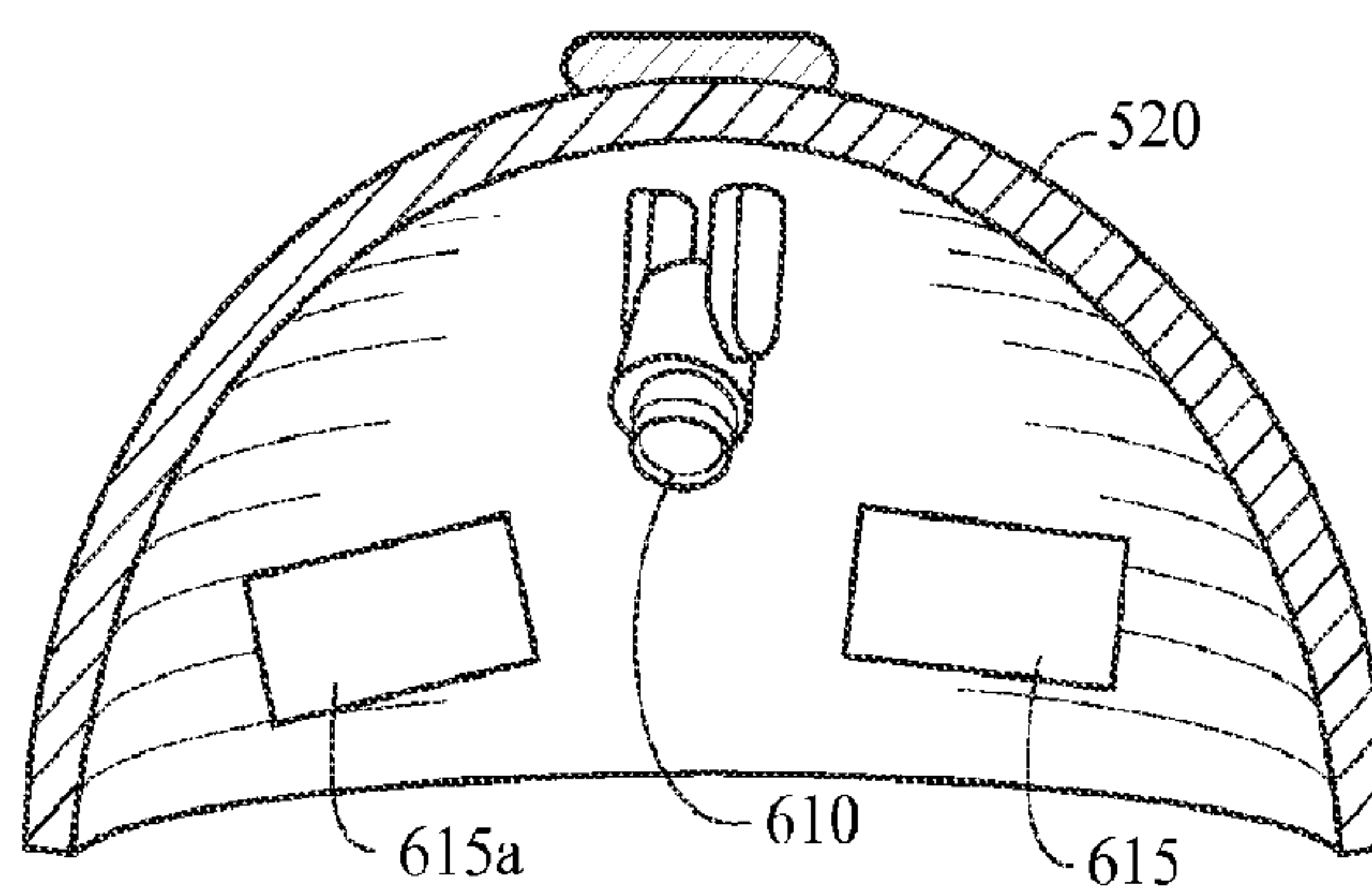


FIG. 8

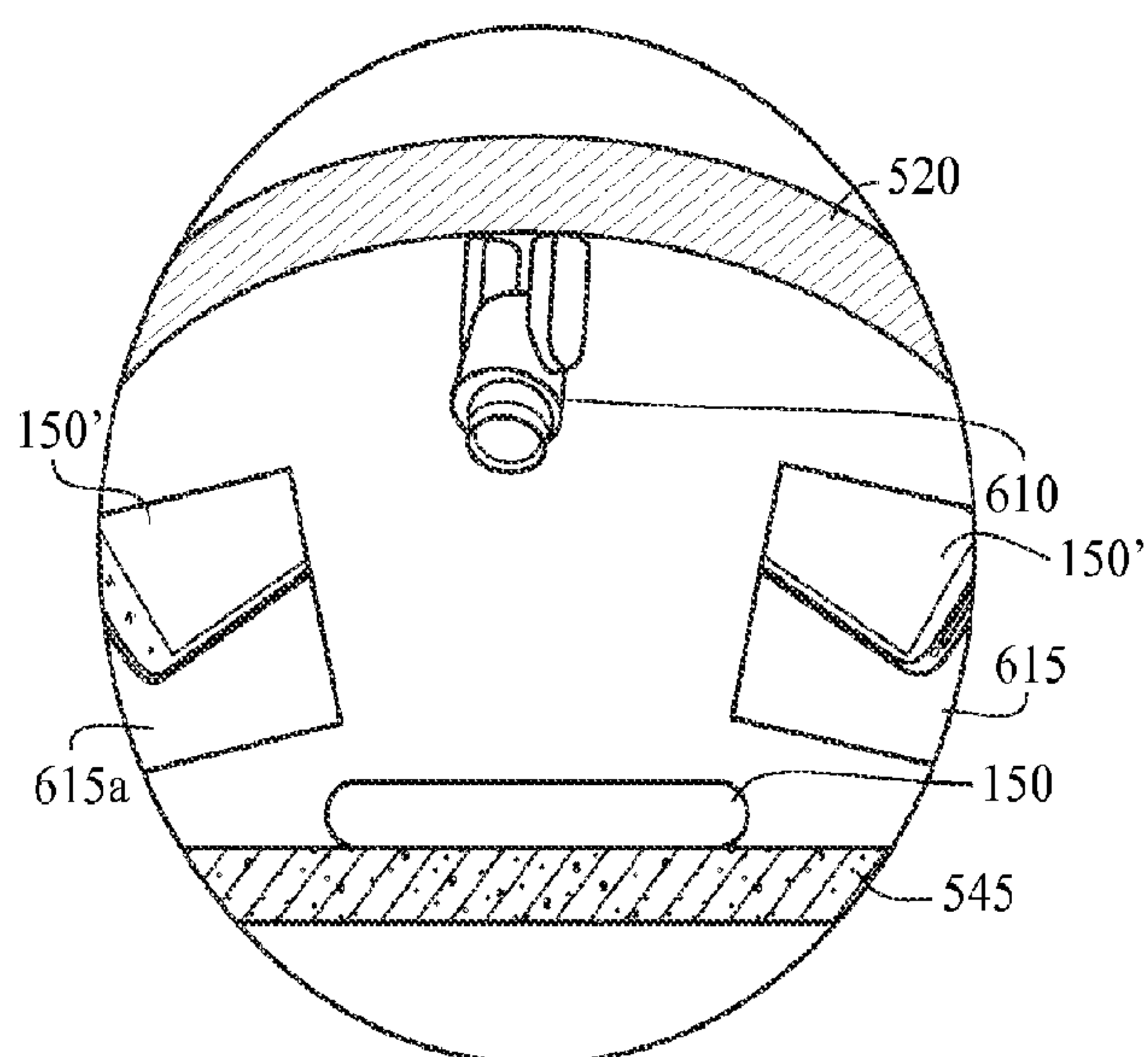


FIG. 9

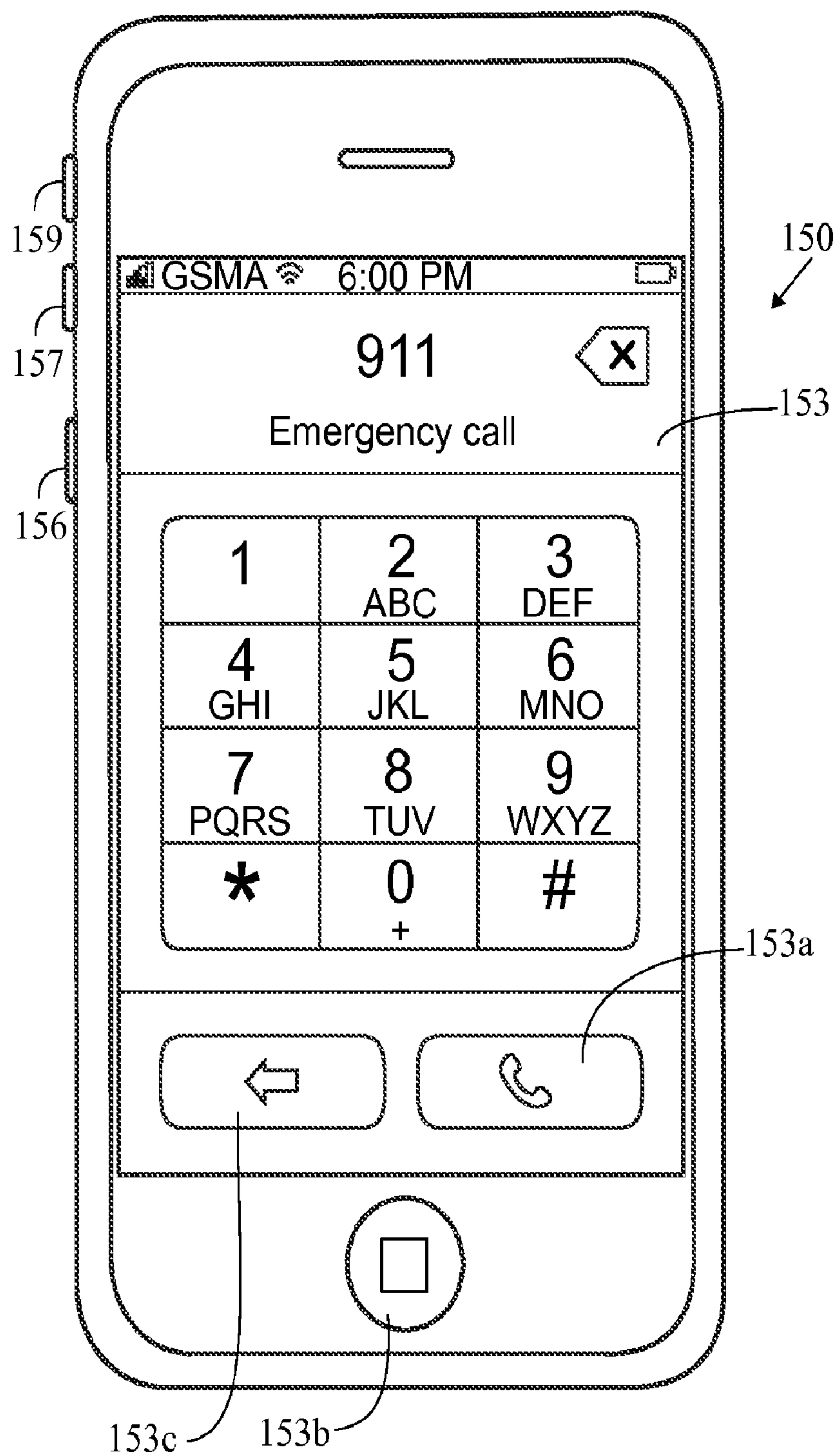


FIG. 10

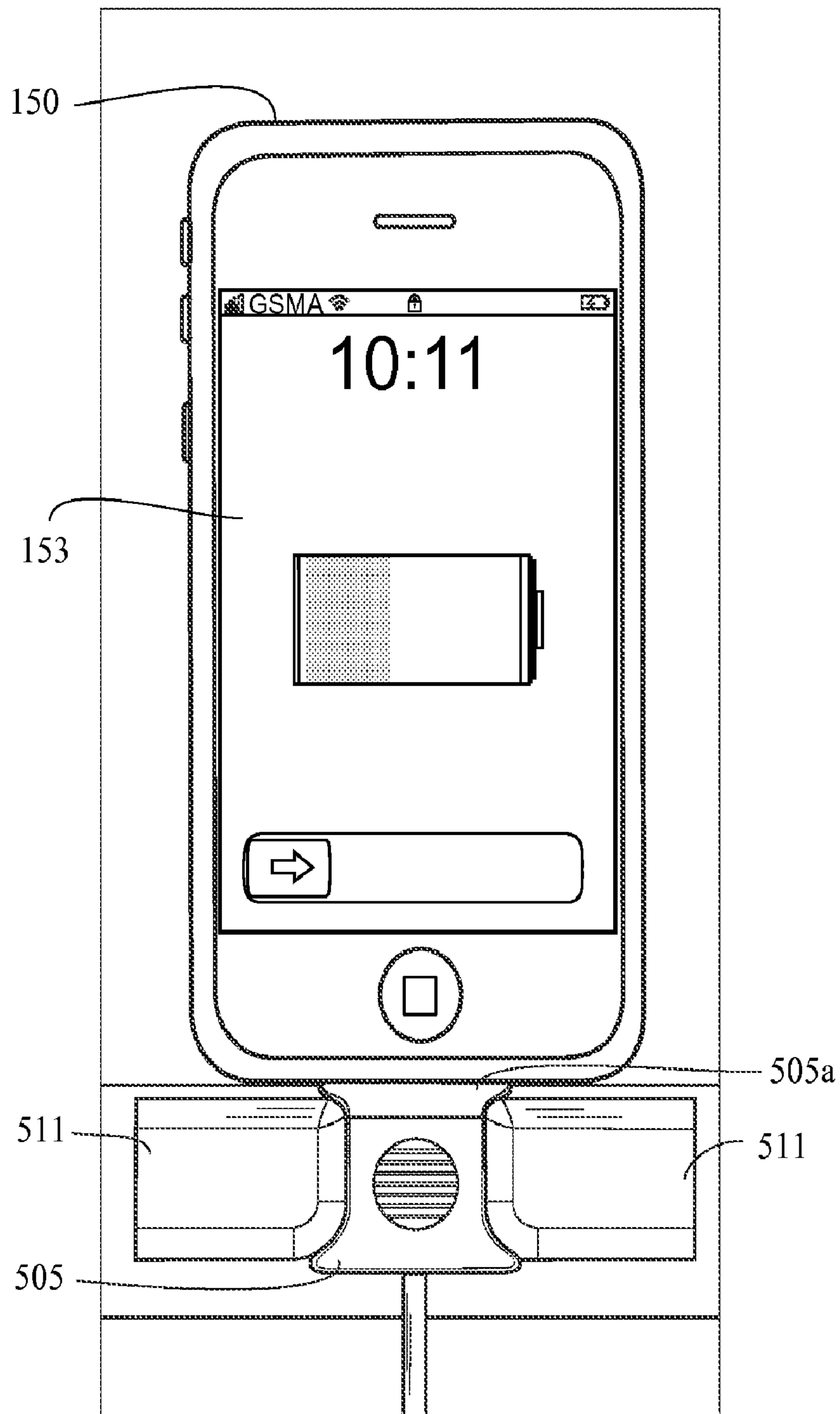


FIG. 11

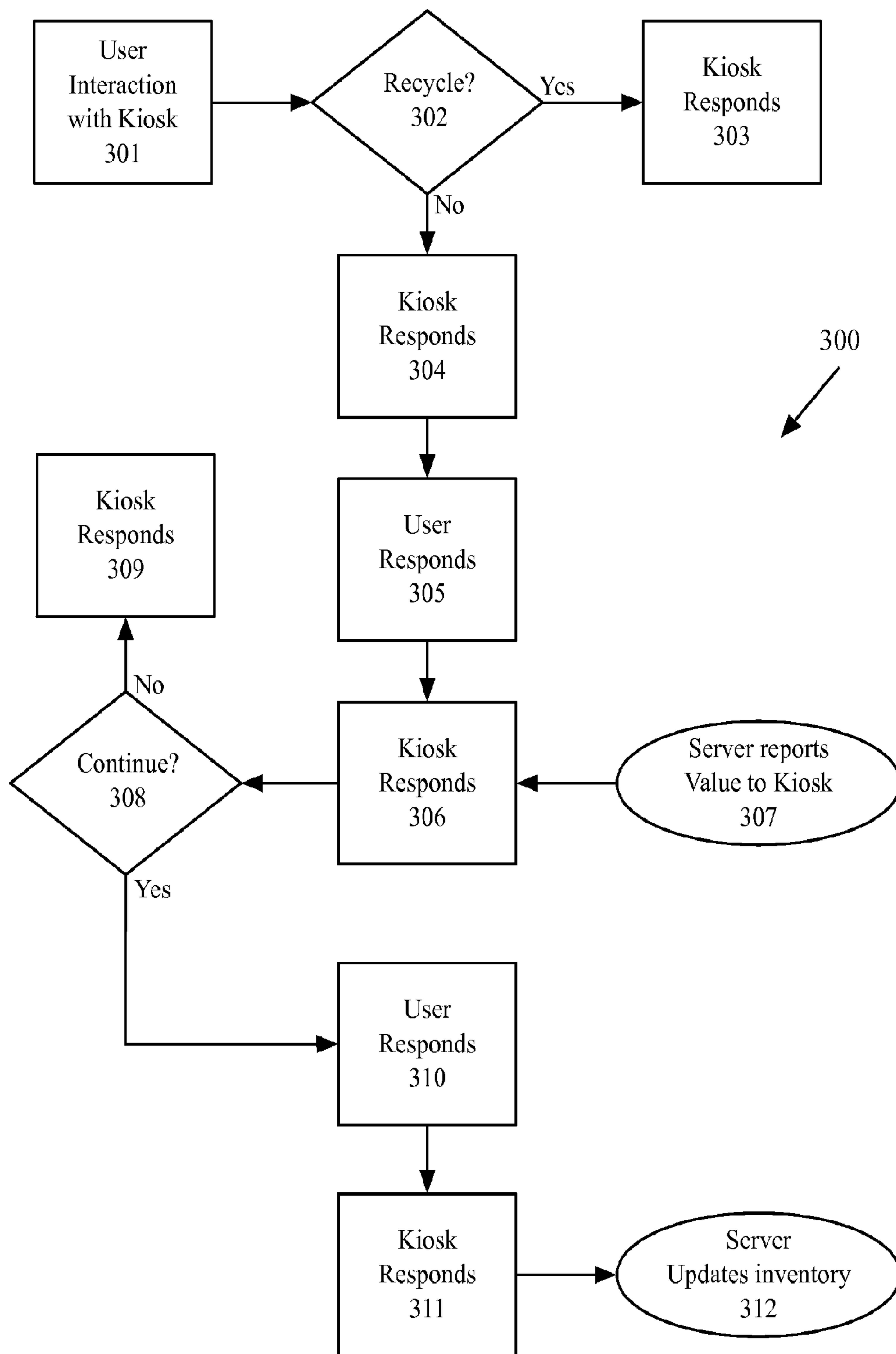


FIG. 12

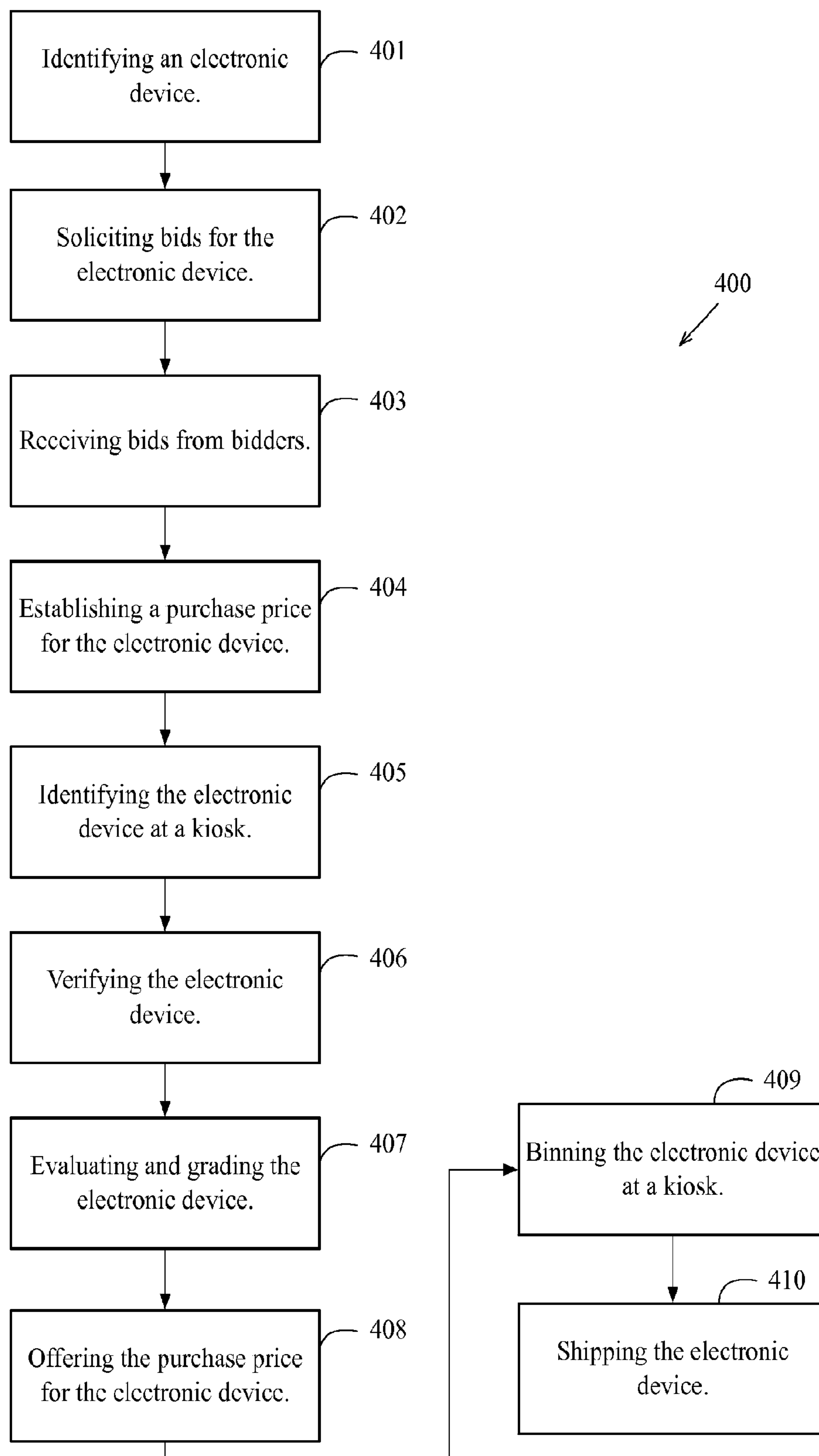


FIG. 13

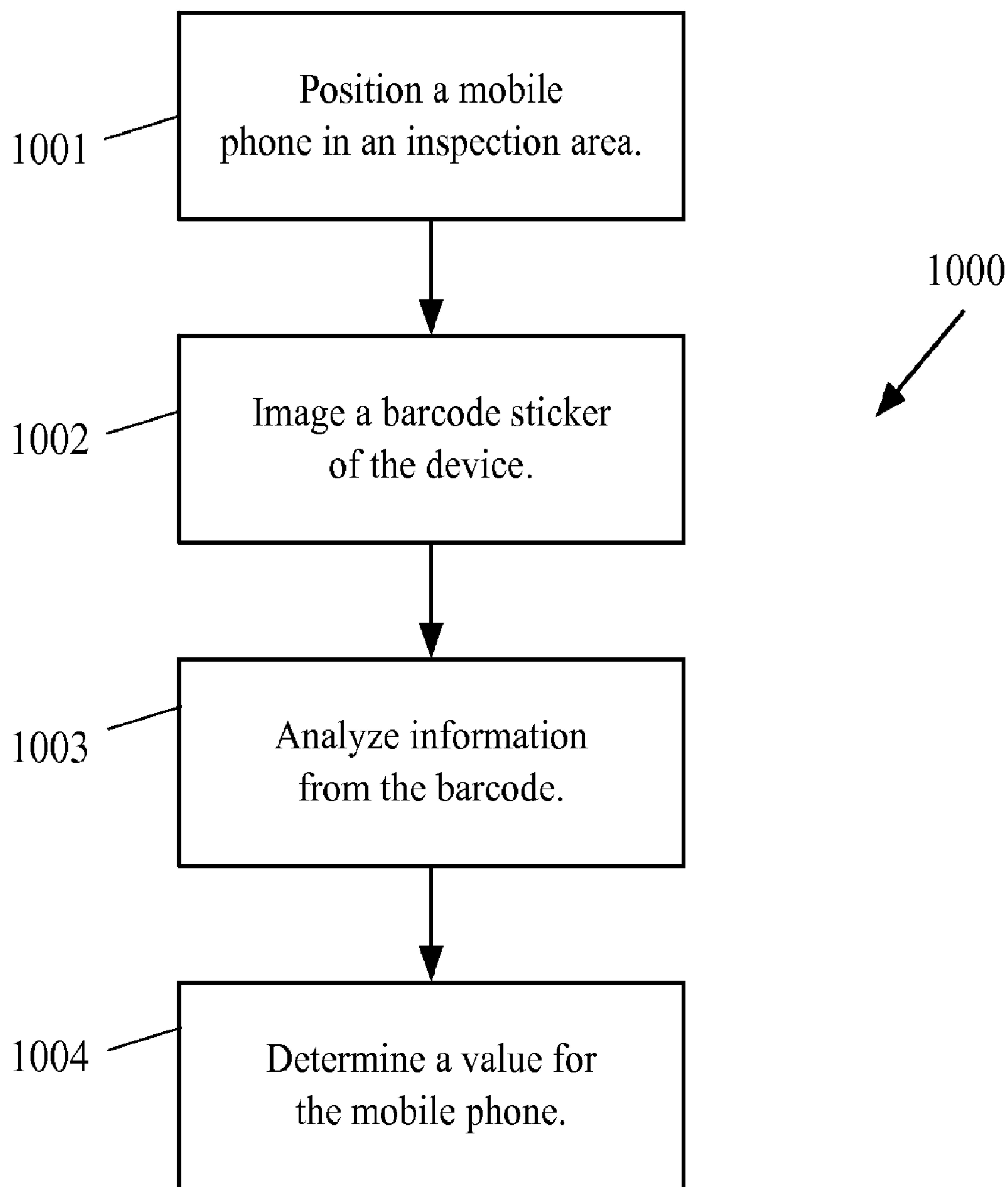


FIG. 14

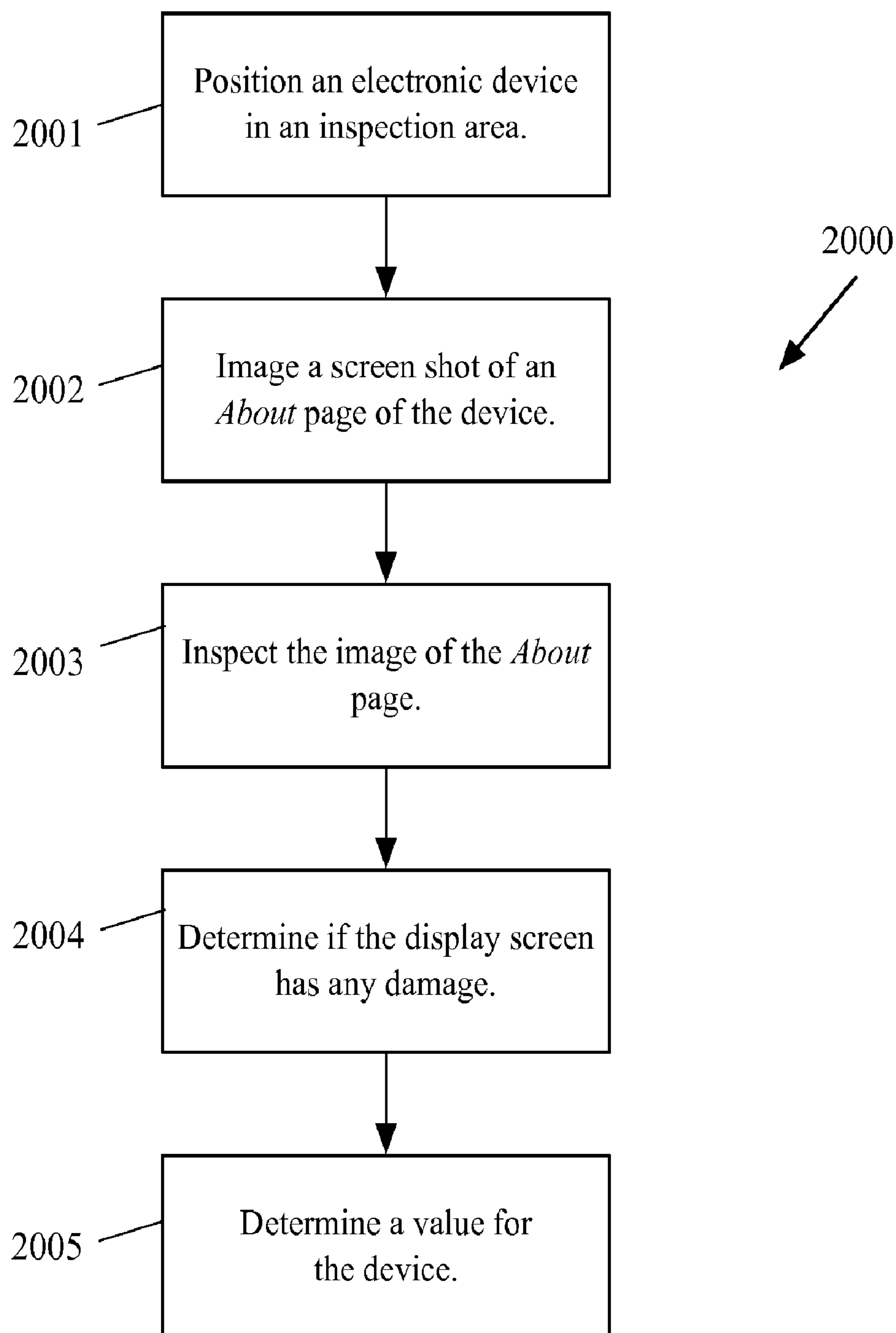


FIG. 15

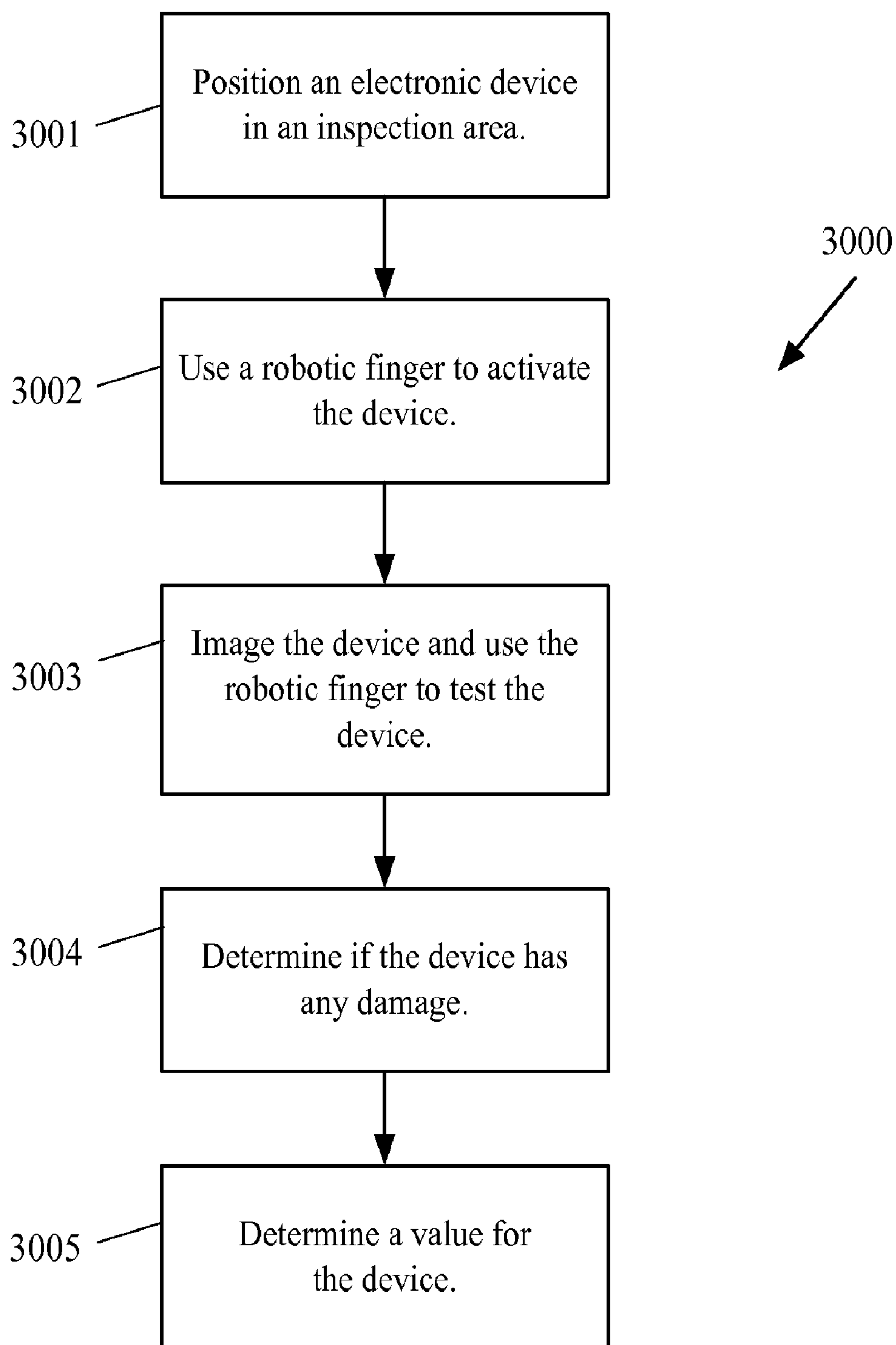
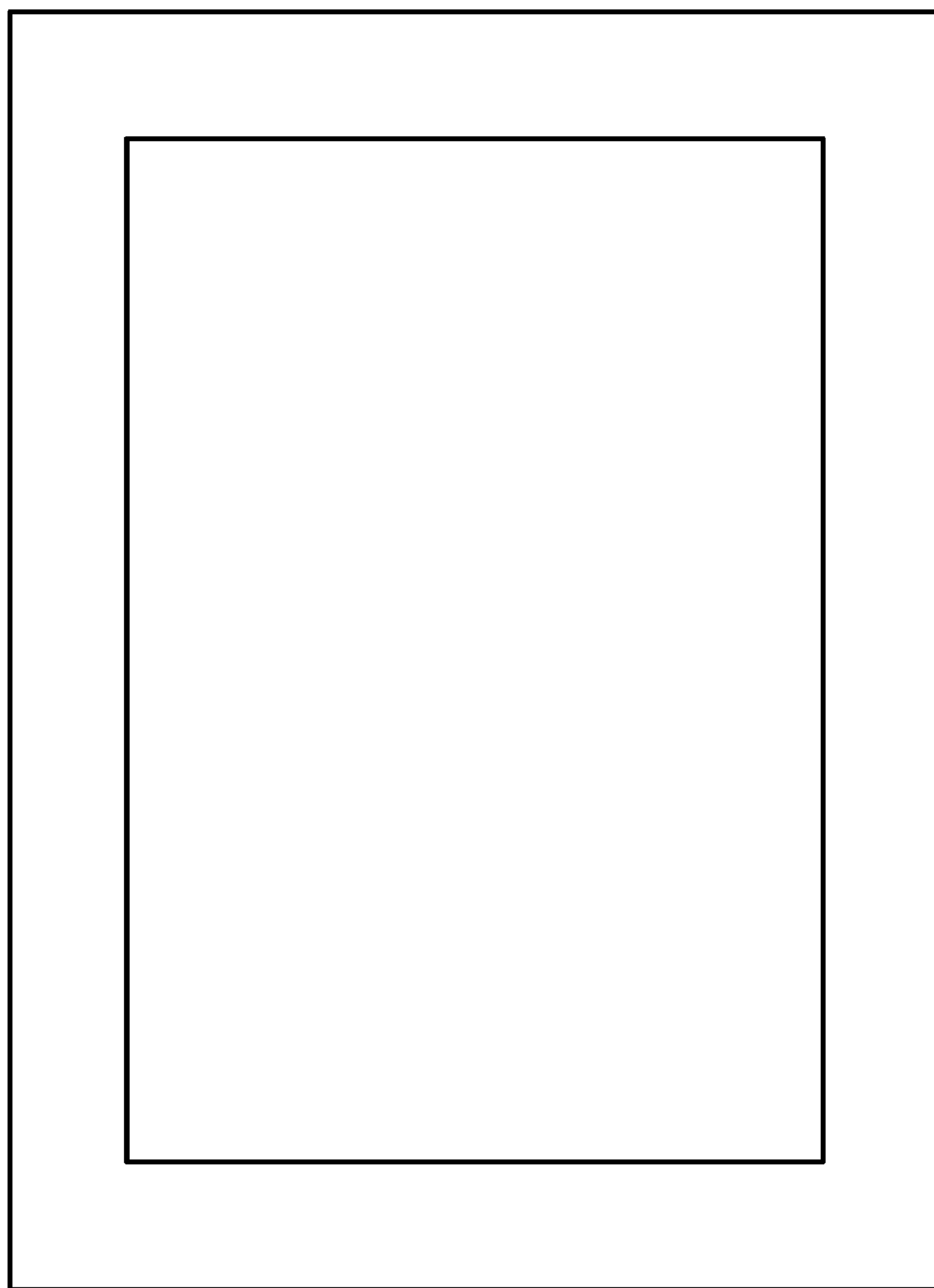


FIG. 16



153

FIG. 17

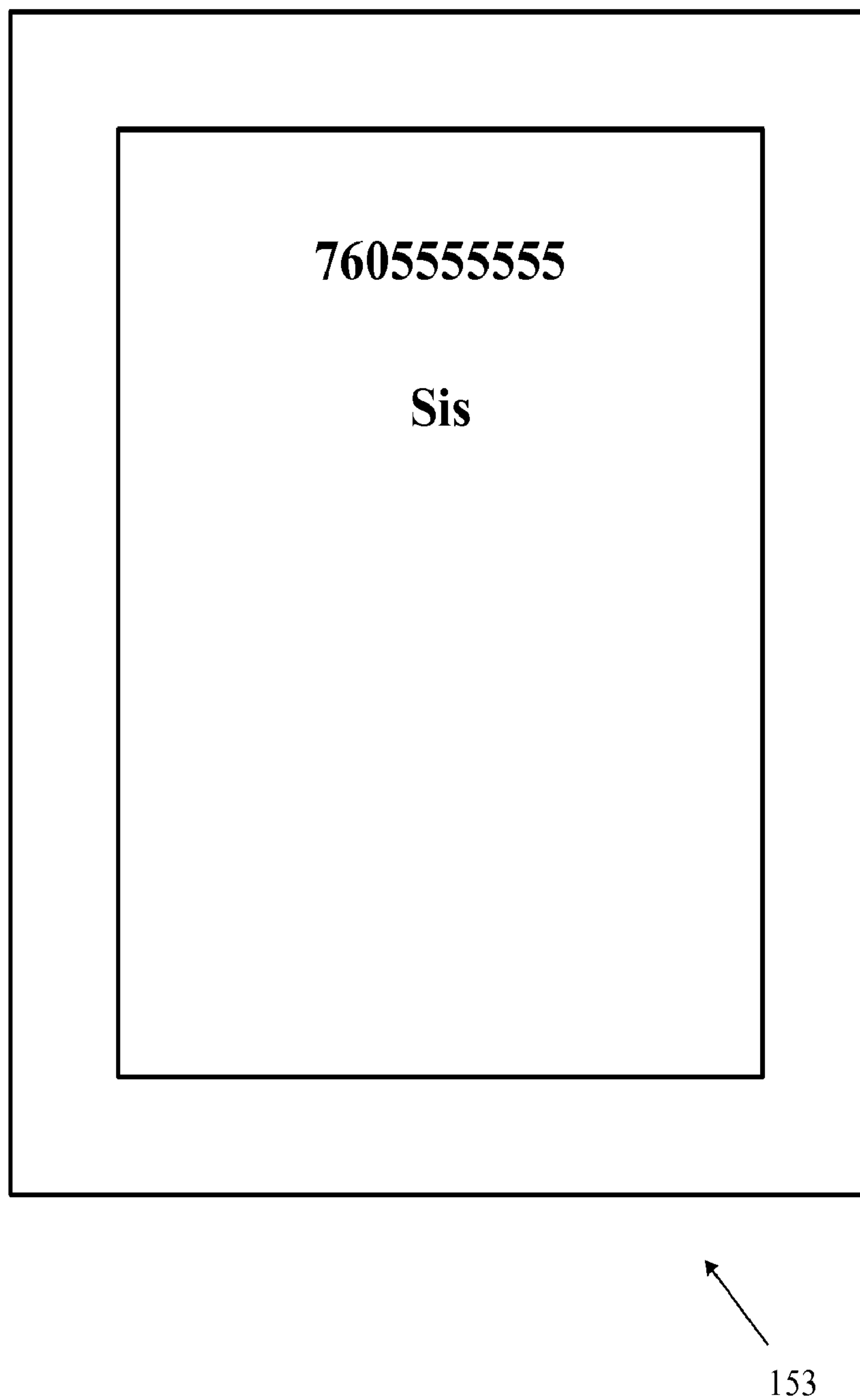


FIG. 18

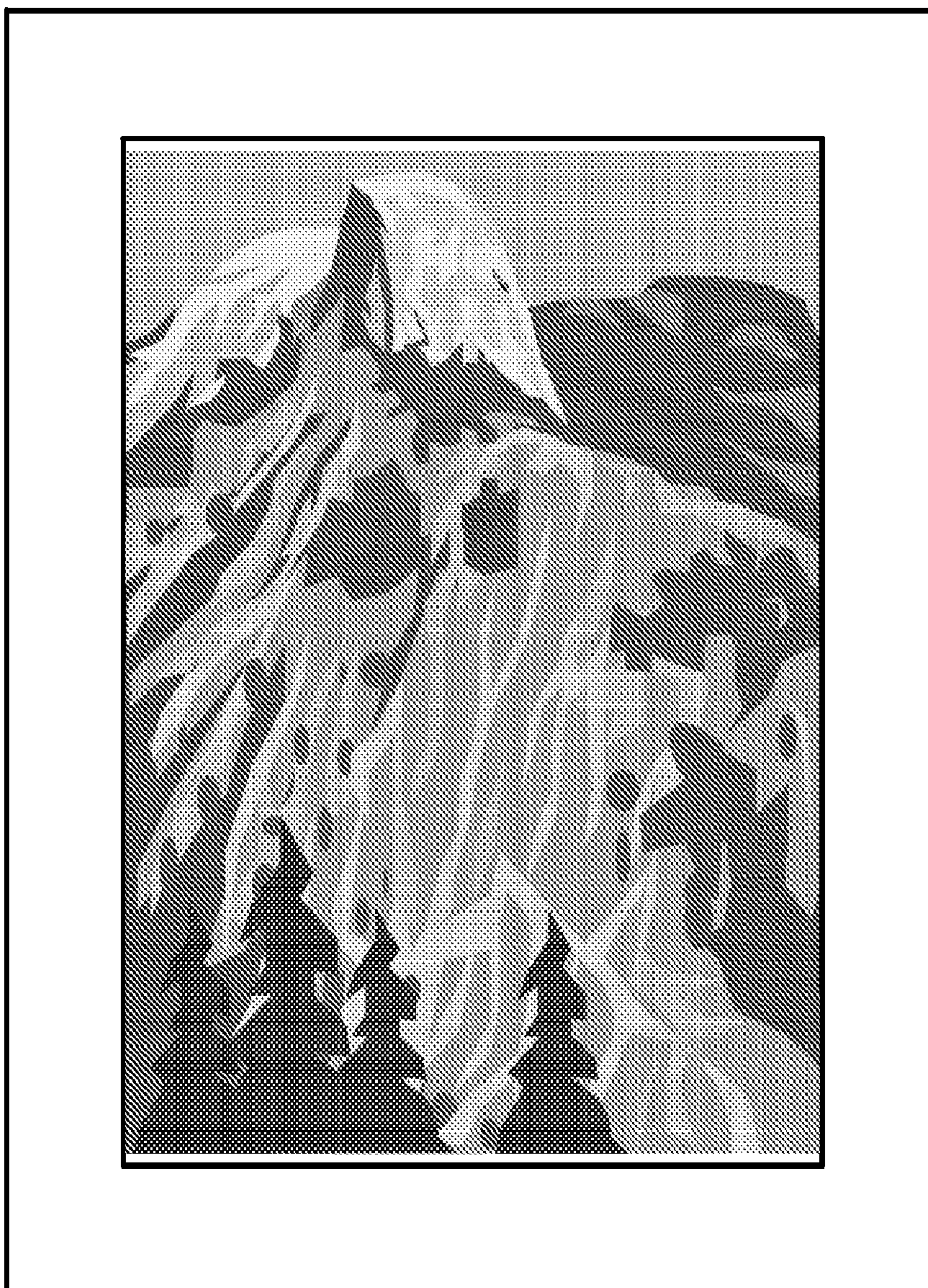


FIG. 19

153

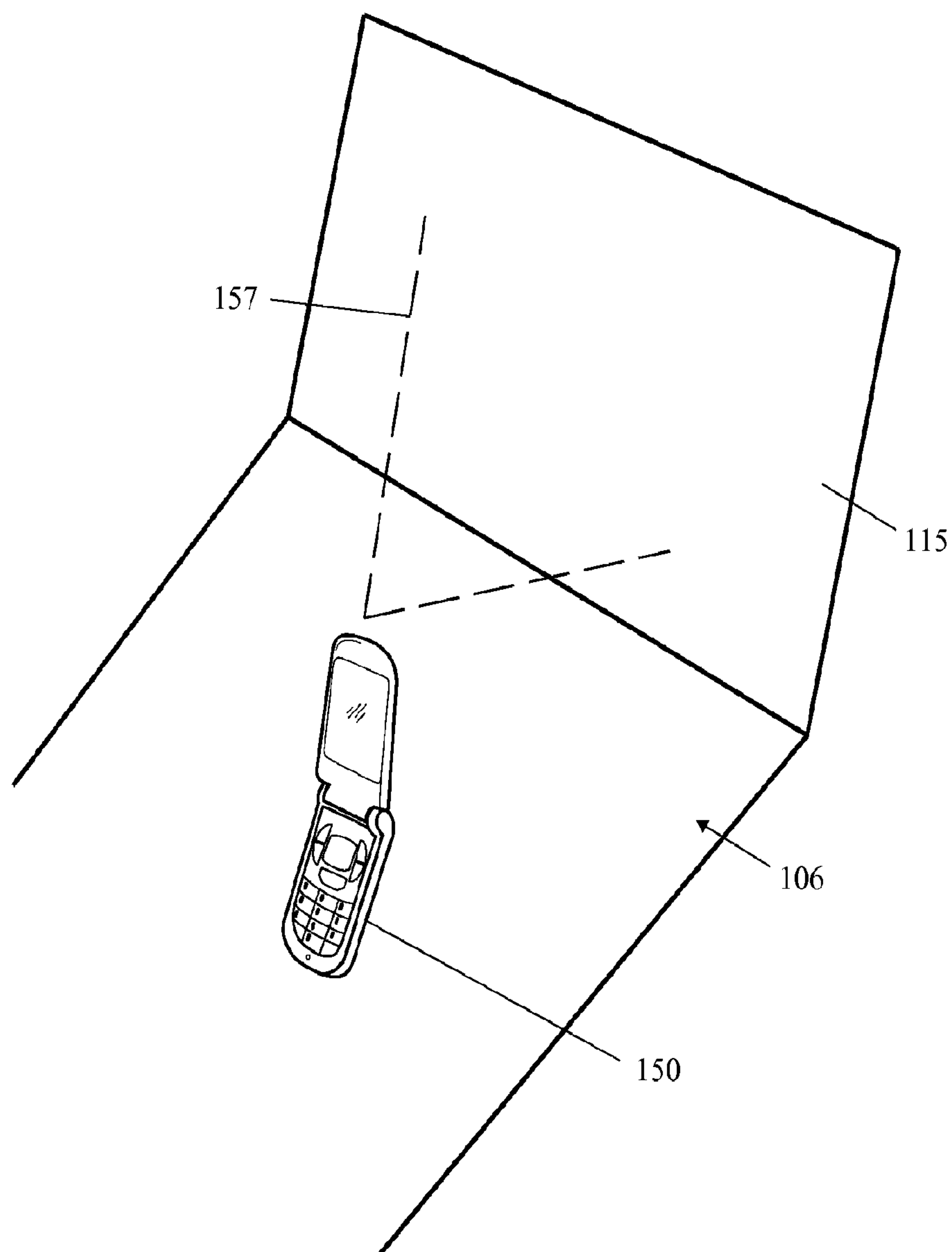


FIG. 20

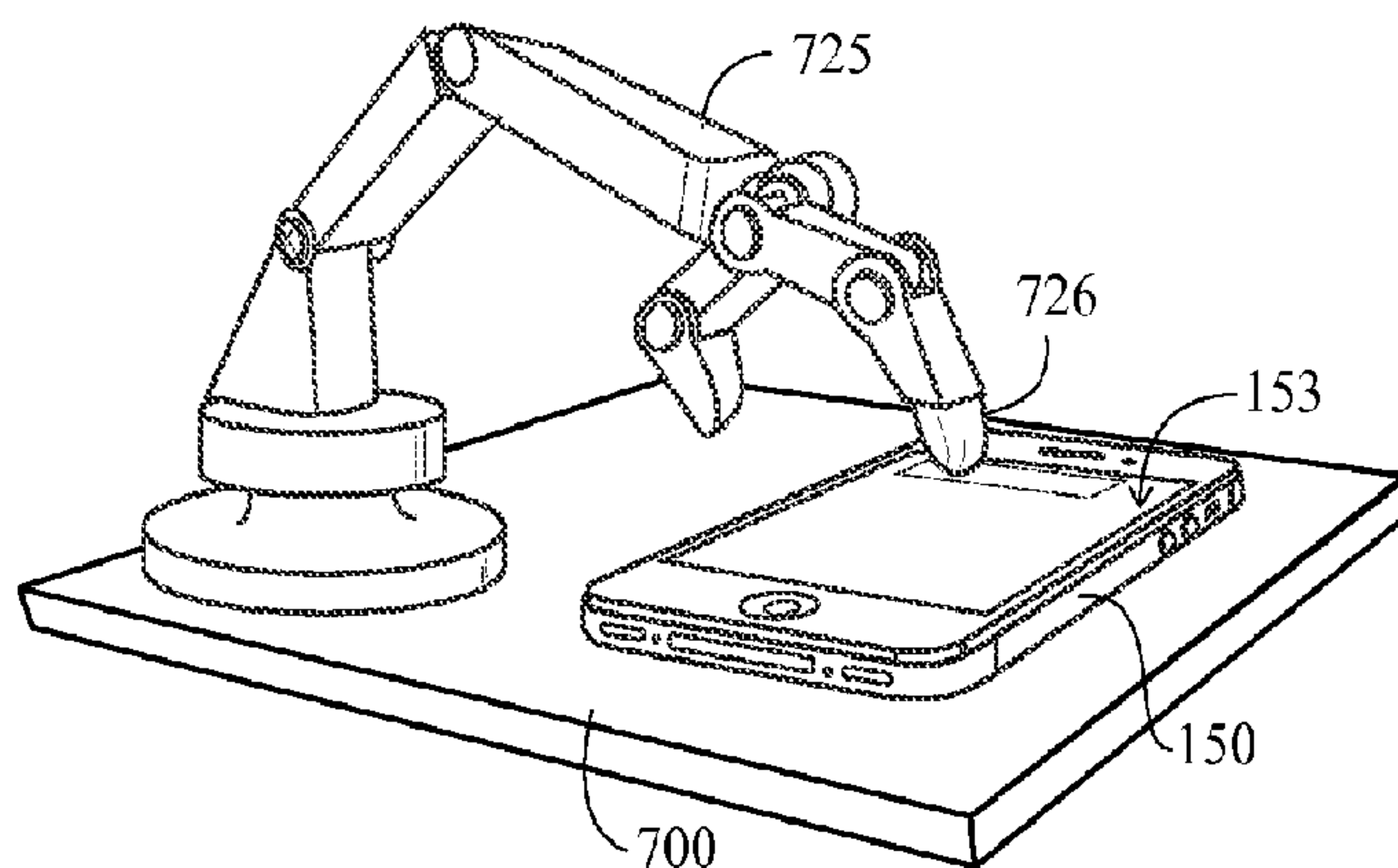


FIG. 21

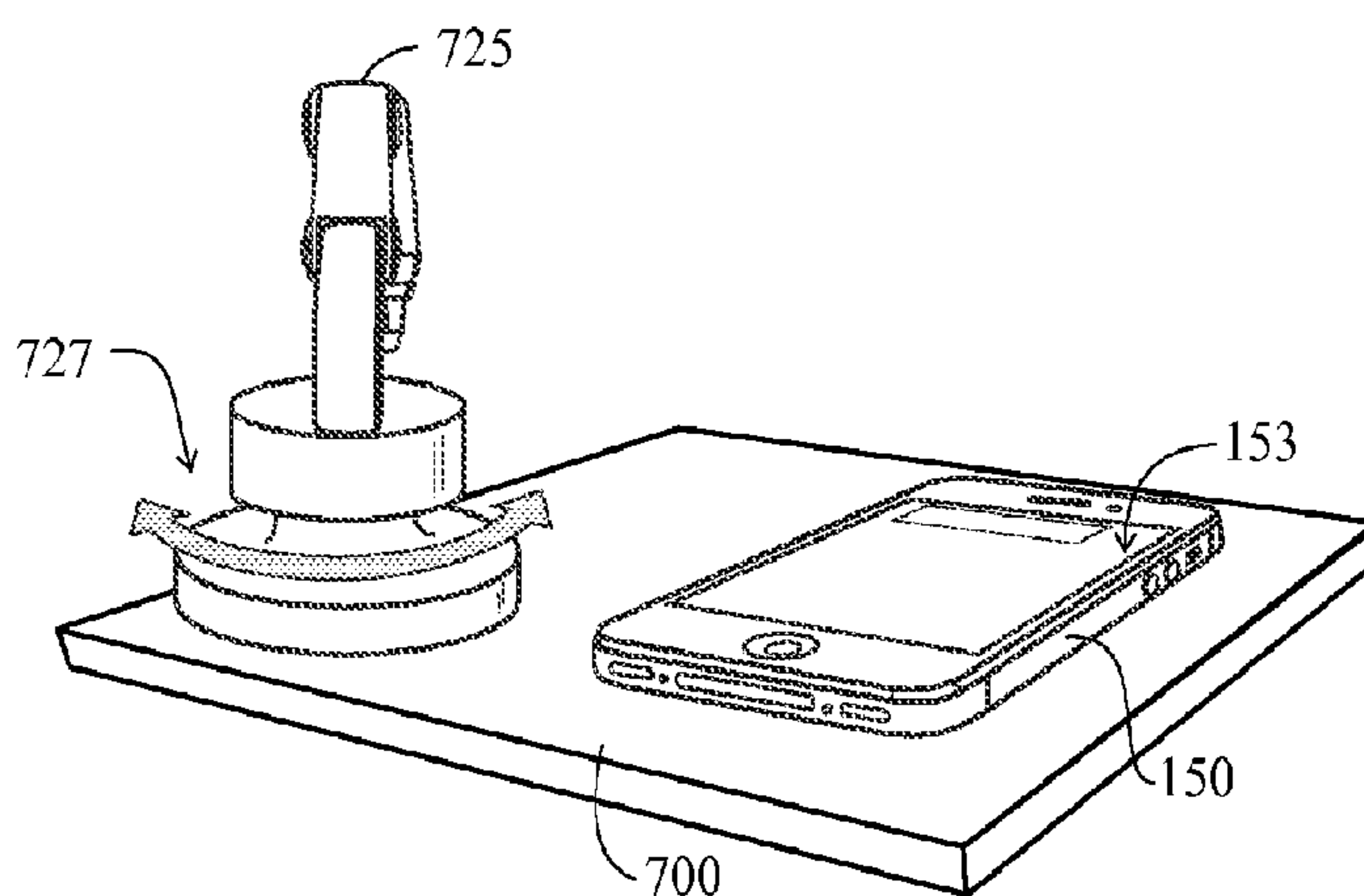


FIG. 22

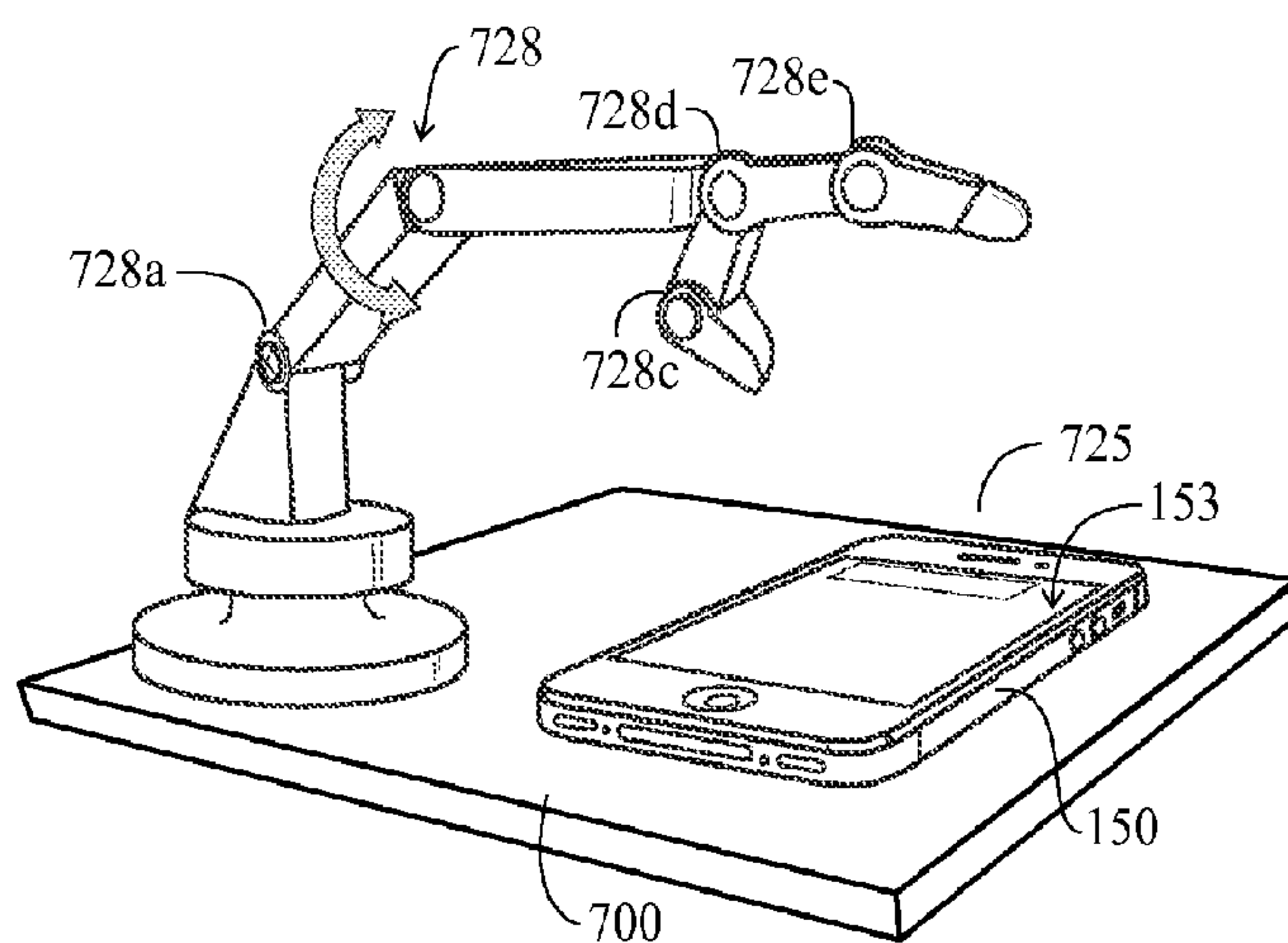


FIG. 23

METHOD AND APPARATUS FOR RECYCLING ELECTRONIC DEVICES

CROSS REFERENCE TO RELATED APPLICATION

[0001] The present application claims priority to U.S. Provisional Patent Application 61/551410 filed on Oct. 25, 2011, claims priority to U.S. Provisional Patent Application 61/606997 filed on Mar. 6, 2012, and is also a continuation-in-part application of U.S. patent application Ser. No. 13/492835, filed on Jun. 9, 2012, which is a continuation application of U.S. patent application Ser. No. 12/785465, filed on May 23, 2010, now U.S. Pat. No. 8,200,533, issued on Jun. 12, 2012, which is a continuation-in-part application of U.S. patent application Ser. No. 12/727624, filed on Mar. 19, 2010, now U.S. Pat. No. 7,881,965, which issued on Feb. 1, 2011, which is a continuation-in-part application of U.S. patent application Ser. No. 12/573089, filed on Oct. 2, 2009, now U.S. Pat. No. 8,195,511, issued on Jun. 5, 2012, which claims priority to U.S. Provisional Patent Application 61/102304 filed on Oct. 2, 2008, now abandoned, and 61/183510 filed on Jun. 2, 2009, now abandoned, all of which are herein incorporated by reference in their entireties.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

[0002] Not Applicable

BACKGROUND OF THE INVENTION

[0003] 1. Field of the Invention

[0004] The present invention generally relates to recycling of electronic devices. More specifically, the present invention relates to a kiosk having a robotic finger to analyze an electronic device for recycling.

[0005] 2. Description of the Related Art

[0006] There has been a large increase in the number of electronic devices used by the typical consumer. These devices include cell phones, PDA's, mp3 players, GPS devices, cameras, beepers, remote controls, cordless phones, calculators, etc. The rapid pace at which new technology and models of electronic devices are introduced creates a situation where many consumers upgrade or replace one or more recyclable device on a frequent basis. Often, the consumer does not dispose of the prior electronic device, but rather just stops using it and begins using the new device. This may happen over several generations of such devices.

[0007] In addition to the electronic devices mentioned above, there are many other types of devices that have relatively high frequency replacement rates, including portable mobile electronic devices, such as cell phones, MP3 players, etc, and non-portable electronic devices, such as computers, printers, and the like. In addition to electronic devices, there are content based digital media such as games on CD, DVD, or cartridge, or entertainment mass storage items such as CDs, DVDs, BluRay, etc. There is a need for handling of such items in an ecologically friendly manner, both via recycling or by proper disposal procedures. It has not been convenient for owners of electronic devices to either recycle such devices or to properly dispose of such devices. There is currently little incentive for a device owner to "do the right thing" with a used device. When the owner just stops using a device and simply puts it in storage: the opportunity for recycling or re-use by another party is lost. If the owner just throws the device away

in normal trash containers, the proper recycling or safe disposing of the device is thwarted.

[0008] One particular problem associated with this phenomenon can be illustrated by an example of mobile phones. There are more than 3.6 billion mobile phone users in the world with an annual growth of 10% per annum. The replacement rate of mobile handsets is roughly every 18 months as new models have more features and new standards evolve. Wireless carriers also offer new phones below cost, or free, as incentives to get customers to sign lucrative two-year service contracts ensuring a constant build-up of old mobile phones. Old mobile phones and other mobile devices (pagers, PDAs) present a growing threat to the environment. As of 2007, there are more than 750 million mobile phones waiting to be recycled in the US, either in drawers or already in the waste stream. Another 150+ million or so are added every year. Once in the waste stream, these devices may leak Lead, Mercury, Cadmium, Arsenic and other toxic substances into the water supply. Municipalities often incinerate their waste, instantly putting these toxic elements into the air, and they return to earth in rain water. A problem that needs to be solved is to make it easy and accessible for the public to recycle or resell their mobile phones and other recyclable devices. Two reasons why mobile phones are not being recycled or resold are difficult access to recycling or reselling facilities, and secondly security concerns about the information stored on the mobile phone. In addition to mobile phones, the same problems apply to many other electronic devices.

[0009] Technology has not yet provided a resolution to this problem. One invention is Bishop, U.S. Pat. No. 4,951,308 for Automated Vending Of Cellular Hand-Held Telephones And Cellular Telephone Services, which discloses a vending machine that dispenses cellular telephones purchased by consumers through the vending machine. Bishop essentially adds to the problem by making it easier to acquire mobile phones.

[0010] Taylor et al., U.S. Patent Publication Number 2009/0190142, for a Method And System For Connecting A Data Storage Device To A Kiosk, discloses a kiosk with a docking port and an optical recognition device for identifying a data port on a data storage device. Taylor is directed at printing digital images at a photo kiosk.

[0011] The prior art has failed to recognize the problems associated with recycling mobile phones in a manner that is enticing to a consumer yet financially rewarding to the recycler. Further, the prior art has failed to determine an automated means for visually inspecting a LCD screen of a mobile phone to determine if the LCD screen is damaged.

BRIEF SUMMARY OF THE INVENTION

[0012] The present invention enables one to securely recycle, donate, trade-in, and/or sell mobile phones in a publicly accessible location. In an embodiment where mobile phones are recycled, the invention is used by a mobile phone owner to submit his/her mobile phone for recycling via a recycling kiosk and receive compensation in some manner. The compensation might be dispersed via cash, voucher, credit or debit card, or other magnetic or electronic transaction methods.

[0013] In one embodiment, a method for conducting the collection of previously used electronic devices for the purpose of recycling and refurbishing uses a kiosk in a publicly accessible location. The kiosk displays one or more transaction options. The method further includes interaction between the user and the kiosk display options which may include

powering the electronic device, testing and optical scanning, erasing of the stored data in the electronic device, determination and acceptance by consumer of compensation for the electronic device's value. The method may further include selection by consumers through interaction with the kiosk a variety of compensation methods including dispensing of cash, or redeemable voucher via coupon, or credit card debiting or crediting, electronic donation to user specified charity or charities, or other electronic payment methods.

[0014] One aspect of the present invention is a method for analysis of an electronic device and financial remuneration to a user for submission of the electronic device. The method comprises positioning an electronic device in an inspection area of a kiosk, wherein the inspection area has an imaging component such as a camera. The inspection area preferably has near-infrared lighting. The method further comprises imaging a barcode sticker of the electronic device and analyzing information derived from the barcode sticker of the electronic device. Lastly, the method comprises determining a value for the electronic device. The method may further comprise automatically binning the electronic device after determining the value of the electronic device. Preferably, the method comprises the user to remove a back panel and a battery of the electronic device prior to positioning the electronic device in the inspection area.

[0015] The kiosk of the method comprises a housing, the housing comprising a user interface on an exterior surface of the housing for the user to input information, an upper dome and a lower dome, wherein the upper dome and the lower dome comprise a plurality of mirrors. The kiosk further comprises a robotic finger mechanism. The kiosk further comprises an upper chamber imaging component (such as a camera), a lower chamber imaging component (such as a camera or scanner) and a transparent surface. The kiosk further comprises a processor within the housing and in communication with the at least one imaging component, the processor configured to identify the brand and model number of the electronic device based on at least one of the information from the user and the images from the at least one imaging component, the processor configured to determine a financial remuneration value for the electronic device.

[0016] Another aspect of the present invention is a method for analysis of an electronic device and financial remuneration to a user for submission of the electronic device. The method comprises positioning an electronic device in an inspection area of a kiosk, the inspection area having a camera. The method further comprises imaging a screen shot of a about page of the electronic device, and inspecting the screen shot of the about page of the electronic device obtained by at least one camera disposed in the inspection area to determine if the electronic device has any defects. The method further comprises determining a value for electronic device. Lastly the method comprises determining a value for the electronic device.

[0017] The kiosk of the method comprises a housing, a user interface on an exterior surface of the housing for the user to input information, an upper dome and a lower dome, wherein the upper dome and the lower dome comprise a plurality of mirrors. The kiosk further comprises an upper chamber camera, a lower chamber camera and a transparent surface. The kiosk also comprises a processor within the housing and in communication with the at least one camera, the processor configured to identify the brand and model number of the electronic device based on at least one of the information

from the user and the images from the at least one camera, the processor configured to determine a financial remuneration value for the electronic device. Preferably, the method further comprises comparing information derived from the barcode sticker to information derived from the about page.

[0018] An additional aspect of the present invention is a method for analysis of an electronic device and financial remuneration to a user for submission of the electronic device. The method comprises positioning an electronic device in an inspection area of a kiosk wherein the inspection area has a camera. The method further includes using a robotic finger to activate the electronic device and imaging the electronic device. The image of the electronic device obtained by at least one camera disposed in the inspection area is inspected to determine if the electronic device has any defects. Lastly, the method includes determining a value for electronic device.

[0019] Yet another aspect of the present invention is a dome shaped apparatus, the dome shaped apparatus comprising an upper dome, a lower dome and the upper and lower dome comprising a plurality of walls, wherein the plurality of walls are composed of mirrors. The dome shaped apparatus further comprises a transparent surface and at least one camera, the camera capable of obtaining a multiple views of an electronic device placed within the dome shaped apparatus. The upper dome preferably comprises an upper chamber camera. The lower dome preferably comprises a lower chamber camera. Preferably, a combination of the each of the upper dome and lower dome cameras and the plurality of mirrors allow for an image of the device placed on the transparent surface. Preferably, the combination of the each of the upper dome and lower dome cameras and the plurality of mirrors allow for a 360 degrees of the electronic device placed on the transparent surface.

[0020] Yet another aspect of the present invention is a method for reading a serial number of a mobile phone for the purpose of tracking the mobile phone. The method includes dialing *#06# into the mobile phone using a robotic finger mechanism. The method also includes displaying the IMEI number or unique serial number on a display screen of the mobile phone. The method also includes reading the IMEI number or unique serial number on a display screen of the mobile phone with an imaging system of the kiosk that utilizes OCR to identify and track the serial number/mobile phone.

[0021] Having briefly described the present invention, the above and further objects, features and advantages thereof will be recognized by those skilled in the pertinent art from the following detailed description of the invention when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0022] FIG. 1 is a perspective view of a recycling kiosk.

[0023] FIG. 1A is a front view of the recycling kiosk of FIG. 1.

[0024] FIG. 1B is an isolated view of a front of the recycling kiosk of FIG. 1.

[0025] FIG. 1C is an isolated view of a front of the recycling kiosk of FIG. 1.

[0026] FIG. 2 is an isolated view of an electrical connector wheel.

[0027] FIG. 2A is an isolated view of an electrical connector is a staging area.

[0028] FIG. 2B is an isolated view of an electrical connector in a detached position.

[0029] FIG. 2C is an isolated view of an electrical connector being detached.

[0030] FIG. 2D is an isolated view of an electrical connector being retracted.

[0031] FIG. 3 is a perspective view of internal components of a kiosk.

[0032] FIG. 3A is a perspective view of internal components of a kiosk.

[0033] FIG. 3B is a perspective view of internal components of a kiosk.

[0034] FIG. 3C is a perspective view of internal components of a kiosk.

[0035] FIG. 4 is an isolated view of a phone on an inspection plate of a kiosk.

[0036] FIG. 4A is an isolated view of a phone being transferred in the kiosk.

[0037] FIG. 4B is an isolated view of a phone being transferred in the kiosk.

[0038] FIG. 4C is an isolated view of a phone being binned in the kiosk.

[0039] FIG. 5 is a block diagram of components of a recycling kiosk.

[0040] FIG. 6 is a block diagram of components of a recycling kiosk.

[0041] FIG. 7 is an isolated view of an inspection area of a kiosk.

[0042] FIG. 8 is an isolated view of a camera in a dome of a kiosk.

[0043] FIG. 9 is an isolated view of a phone in an inspection area of a kiosk.

[0044] FIG. 10 is a front view of a phone.

[0045] FIG. 11 is a front view of a phone connected to an electrical connector.

[0046] FIG. 12 is a flow chart for recycling an electronic device.

[0047] FIG. 13 is a flow chart for a pre-acquisition auction method.

[0048] FIG. 14 is a flow chart of a method for analyzing an electronic device.

[0049] FIG. 15 is a flow chart of a method for analyzing an electronic device.

[0050] FIG. 16 is a flow chart of a method for analyzing an electronic device.

[0051] FIG. 17 is an isolated view of a LCD screen of a mobile phone illustrating a white screen.

[0052] FIG. 18 is an isolated view of a LCD screen of a mobile phone illustrating a telephone number.

[0053] FIG. 19 is an isolated view of a LCD screen of a mobile phone illustrating a national park.

[0054] FIG. 20 is an isolated view of a mobile phone in an inspection area of a recycling kiosk illustrating a field of view of a camera of the mobile phone.

[0055] FIG. 21 is a perspective view of a robotic finger mechanism analyzing a mobile phone for recycling.

[0056] FIG. 22 is a perspective view of a robotic finger mechanism analyzing a mobile phone for recycling.

[0057] FIG. 23 is a perspective view of a robotic finger mechanism analyzing a mobile phone for recycling.

DETAILED DESCRIPTION OF THE INVENTION

[0058] The invention allows for automatic analysis of an electronic device utilizing a robotic finger to determine if the

electronic device is damaged in order to ascertain a value for recycling the electronic device. The method for analyzing an electronic device is preferably performed at a recycling kiosk. The robotic finger is preferably located within an inspection area of the kiosk.

[0059] FIGS. 21-23 illustrate a robotic finger mechanism 725 using "fingertips" 726 to touch a touchscreen display 153 of a mobile phone 150 located on a transparent plate of an inspection area of a kiosk. The robotic finger mechanism 725 preferably operates similar to a human finger, in movement and touch on the display 153. The robotic finger mechanism 725 preferably includes a base 727, a pivot arm 728 having a first pivot 728a, a second pivot 728b, a third pivot 728c, a fourth pivot 728d and a fifth pivot 728e. The fingertip 726 preferably mimics the touch of a human finger. The robotic finger mechanism 725 can preferably rotate, oscillate and grip. The robotic finger mechanism 725 preferably has multiple degrees of movement. The robotic finger mechanism 725 allows for the kiosk to activate a phone and navigate through menu screens on a display of a mobile phone. The robotic finger mechanism 725 can also power-on and power-off a mobile phone.

[0060] A preferred electronic device is a mobile phone. Mobile phones are preferably partitioned into three basic shapes: 1) a flip phone or clam shell type such as the MOTOROLA RAZR; 2) a slider phone which exposes a keyboard or screen such as the MOTOROLA DROID; and 3) a bar shape phone such as the Apple iPhone or the Research In Motion BLACKBERRY. The invention is also utilized with a network of kiosks in public spaces that perform a combination of recycling processing steps that receive, identify, visually inspect, electrically test, electrically erase, grade quality, containerize (bag), label, and inventory recyclable electronic devices. Each kiosk determines some form of compensation to an owner of the device. This compensation is preferably in the form of a direct payment, a credit on an account, a donation to a charity, a discount coupon for future purchases, or some similar form of compensation. The device owner has the choice to accept the offered compensation or reverse the transaction and retrieve the device.

[0061] In the following description, an example is given with respect to mobile phones. However, those skilled in the pertinent art will recognize that the system can be implemented with any number of other devices that have a LCD screen, without departing from the spirit and scope of the system.

[0062] As shown in FIGS. 1, 1A, 1B and 1C, a kiosk for recycling electronic devices and providing financial remuneration is generally designated 100. The electronic device may be a Smart Phone, mobile phone, tablet computer, IPOD® device, MP3 Player, GPS device, e-reader, etc. The kiosk 100 has a housing 105 in a pseudo-rectangular cube shape. A header 103 allows for marketing and videos. An access door 130 in a front body area 131 provides access to an inspection area 106 for electronic devices. The front of the housing 105 has a display screen 115 for providing information to a user, and acts as a user interface in a touch screen embodiment. The exterior of the housing 105 also preferably has a label printer 125, a voucher dispenser 126, a receipt printer 127, and a cash or card dispenser 128. The exterior housing may also have a thumbprint reader.

[0063] The kiosk 100 allows for automatic visual analysis of an electronic device to identify the electronic device and to determine electronic device is damaged in order to ascertain

a value for recycling the electronic device. Further, the kiosk **100** also allows for electrical analysis of the electronic device. An additional explanation of a recycling kiosk is set forth in U.S. patent application Ser. No. 13/438924, filed on Apr. 4, 2012, for a Kiosk For Recycling Electronic Devices, which is hereby incorporated by reference in its entirety.

[0064] As shown in FIGS. 2, 2A, 2B, 2C and 2D, the kiosk **100** comprises a carousel **500** containing a plurality of electrical connectors **505a-505y**. Each of the electrical connectors **505** has a unique connection plug for removable connection to an electronic device. Each of the electrical connectors **505a-505y** has a cartridge removeably secured in the carousel **500**. Thus, new electrical connectors **505** can be substituted for older electrical connectors **505**. Further, the kiosk **100** is designed to allow for automatic removal of the electrical connector **505** using detachment mechanism **511**. In FIG. 2A, the electrical connector **505** is in a staging area, where it would be connected to a port of an electrical device (as shown FIG. 11). Next, as shown in FIGS. 2B and 2C, hinged arms **512** of the detachment mechanism **511** engage a moveable member of the electrical connector **505** to force the outward movement of the moveable member and the disconnection of the electrical connector **505** from a port of an electronic device (as shown in FIG. 11). As shown in FIG. 2D, the electrical connector **505** is retracted by a cable from the detachment mechanism **511**.

[0065] As shown in FIGS. 3, 3A, 3B and 3C, the internal mechanism **101** of the kiosk **100** includes an upper chamber **520**, a lower chamber **530**, a binning plate **540**, a transparent plate **545**, a door **550**, a bin **555** and the carousel **500**. Preferably the robotic finger mechanism **725** is located within the internal mechanism **101**. Preferably, the carousel **500** is able to hold approximately 25 electrical connectors **505**, wherein the electrical connectors **505** are interchangeable to easily adapt to the variations in USB and other like connections. As shown in FIG. 3B, a mobile phone **150** is placed on the transparent plate **545** and transferred to an inspection area **106** within upper chamber **520** and lower chamber **530**. Both the upper chamber and the lower chamber preferably have a bell-like shape. As shown in FIG. 3C, the mobile phone is moved between the upper chamber **520** and the lower chamber **530** for visual analysis. The transparent plate, preferably composed of glass or a transparent plastic material, allows for imaging components within the upper chamber **520** and lower chamber **530** to obtain multiple view images of the mobile phone **150**. Preferably, a 3-D profile of the mobile phone is generated in order to provide visual analysis for identification and condition of the mobile phone. Once the visual analysis is complete, the transparent plate **545** moves out from between the upper chamber **520** and lower chamber **530**.

[0066] FIGS. 4, 4A, 4B, and 4C, show the automatic transport and binning of an electronic device **150** within the internal mechanism **101** of the kiosk **100**. As shown in FIG. 4, the door **550** is lowered to reside above the transparent plate **545**, which is then moved inward with the mobile phone **150** thereon. As shown in FIG. 4A, as the transparent plate **545** is moved inward, the mobile phone is blocked by the door **550** and engages binning plate **540** as the mobile phone begins to fall into an opening created by the inward movement of the transparent plate **545**. As shown in FIG. 4B, once the mobile phone is on the binning plate **540**, the binning plate **540** is slowly lowered on one side to open into the bin **555**. As shown in FIG. 4C, the mobile phone **150** slowly falls through an opening **556** into the bin **555** to secure the mobile phone **150**

and for collection at a later time. The entire process performed at a rate of speed to prevent damage to the electronic device being recycled.

[0067] The kiosk **100** is of a typical size and shape of a vending machine, such as a soda machine, coin changing machine, can recycling machine, or other vending machines. The housing **105** of the kiosk **100** protects the internal mechanism **101** and secures electronic devices submitted for recycling. The housing **105** is preferably constructed of a metal material, such as steel or aluminum, to prevent authorized access to the kiosk **100**.

[0068] The inspection area **106** is preferably designed to permit a detailed visual inspection of an electronic device such as a mobile phone, tablet computer, e-reader, MP3 players, PDA. The walls of the inspection area are preferably white and/or mirrored to provide imaging of the electronic device.

[0069] The couplings from the kiosk **100** and to a remote computer are preferably a single coupling to a communications network such as the internet via wired LAN, wireless LAN, cellular or any other proprietary communications system. The Kiosk **100** preferably includes a processor **160** for processing the information obtained from the mobile phone and for controlling the components of the kiosk **100**. Preferably, the processor **160** is a standard personal computer ("PC") or other type of embedded computer running any operating system such as Linux or MAC OS. The processor **160** is most preferably a small form factor PC with integrated hard disk drive ("HDD"), central processing unit ("CPU") and universal serial bus ("USB") ports to communicate with the other components of the kiosk **100**. One most preferred CPU is a DELL PC OPTIPLEX **780**. Alternatively, the processing means is a microprocessor with a standalone motherboard which interfaces to a discrete HDD, power supply and the other components of the kiosk **100**. The kiosk **100** preferably includes a memory **161** or other storage device, such as a disk drive, that stores the executable applications, test software, databases and other software required to operate the recycling kiosk **100**.

[0070] The external communication component for the kiosk **100** preferably includes a wired Ethernet to provide connection to the internet, or alternatively the external communication component includes a wireless modem such as GSM, CDMA, 3G and 4G technologies for data communications.

[0071] As shown in FIGS. 7-9, the visual inspection of an electronic device such as a mobile phone **150** in the inspection area **106** is preferably performed by at least one camera **610** within the upper chamber **520**. The lower chamber **530** also preferably has at least one camera or other imaging component such as a scanner. Alternatively, the visual inspection is performed by multiple cameras. A preferred camera **610** is a 1 megapixel machine vision camera. If a single camera **610** is utilized in the inspection area **106**, the camera **610** preferably is movable to increase a field of view of the inspection area **106** to inspect the electronic device **150** such as a mobile phone placed on the transparent plate **545**. The camera **161** is preferably movable. Preferably the camera **610** is positioned to image a LCD screen **153** of the electronic device **150** to determine if the LCD screen **153** is damaged. The interior surfaces of the upper chamber **520** and lower chamber **530** preferably include mirrors **615** in order to optimize viewing of an electronic device positioned within the inspection area **106**. As shown in FIG. 9, a reflection **150'** of a mobile phone

150 is illustrated. The camera **610** is also preferably movable to image a data port of the electronic device to determine the type of electrical connector **505** for the electronic device in order to perform an electrical analysis of the electronic device. Alternatively, the entire interior surfaces of the upper chamber **520** and the lower chamber **530** are mirrored for optimization of imaging of the electronic device. The camera (s) alternatively are CCD or CMOS.

[0072] FIG. 6 is a block diagram of the main components of the kiosk **100**. A processor **160** is preferably in communication with the other components of the kiosk **100**. The memory **161** preferably contains a database of information on multiple mobile phones including images, physical characteristics, prices and other similar information. The external communications **167** preferably communicates through a wireless connection or Ethernet with a network to receive and transmit information to a remote site. The power supply **170** is preferably received through a plug-in connection to a wall outlet. The mechanical components **165** include the electrical connector carousel **500**, the transparent plate **545**, the binning plate **540**, the door **550**, and other similar components. The camera **610** or cameras, electrical connectors, and a user interface interact with the processor **160** as discussed above. FIG. 5 illustrates an internal back of a recycling kiosk **100**. As shown a processor **160** is preferably a personal computer having a battery backup **170a**, a wireless connection **167** for external communications, an electrical connection **140**, a receipt dispenser **104** and a display screen **115**.

[0073] The processor **160** identifies the electronic device **150** submitted for recycling using information from the visual inspection and user interface. The processor **160** also determines the proper electrical connector **505** for connection to the data port of the electronic device **150** using information obtained during the visual inspection or from the user interface. The processor **160** also directs and receives information from the electrical analysis of the electronic device **150** performed using the electrical connector **505** connected to the data port of the electronic device **150**. The processor also preferably determines a financial remuneration for the submitted electronic device **150** based on the visual inspection, optionally the electrical analysis and data stored in the memory **161** of the kiosk or information provided externally through the external communication component **167**.

[0074] A flow chart for a preferred recycling method is shown in FIG. 12. At step **301** a customer elects to sell or recycle an electronic device. The customer checks to see if the electronic device is supported for sale/refurbishing from a list on the screen of the kiosk. The customer activates the on-screen menu system and either enters the phone model directly or goes through a series of menus to determine if the electronic device is eligible for sale or only for recycling. At decision block **302** it is determined if the electronic device is only available for recycling. If yes, (i.e. it is not on the list of electronic device available for reselling) the customer can insert the electronic device into receptacle at step **303** and the electronic device falls into bin **112** for recycling.

[0075] If the electronic device is supported for refurbishment/resale the customer is then encouraged to engage the testing/rating operation of the system. At step **304**, the system has determined the correct connector to couple to the electronic device. Connectivity options and are not limited to cable, standard or proprietary connectors, hard docks, reading removable or external physical memory or other wireless methods like WiFi, Bluetooth, RFID, NFC, and the like. At

step **305** the electronic device is connected and inserted into inspection area **106**. If this has been done correctly, the customer is given some indication (e.g. a green light) and the system proceeds to step **306**. At step **306** the electronic device is tested for operation using diagnostics and operating via, for example, the OMSI interface. The diagnostics preferably includes electrical and physical testing including testing the electronic device's battery, screen, memory, button functionality and structural integrity.

[0076] Preferably, the electronic device is imaged and analysis software is used to identify scratches, cracks, wear patterns, dents, broken or missing pieces, inclusion of features such as lenses, buttons, connectors, badges, labeling and/or branding. Identification may be done by image comparison or other similar methods where the image taken of the electronic device is normalized and compared to a reference image. Other inspection methods may be used in conjunction with visual and/or electrical testing including weighing to determine specific weight and use that data to further refine verification of manufacturer and verification of exact device model. In another embodiment, the photographic image is used to identify the correct manufacturer and model number/product number. Visual identification could include any combination of the following: calculations based upon measurement, physical (e.g., mm, inches), pixel count or other. Identification based upon electronic device dimensions, location/size of buttons, LCD and other physical characteristics. One camera or multiple cameras may be used to determine height, width, depth as needed. Identification based on OCR (Optical Character Recognition) of identifiers such as Carrier (for phone and tablet computers), brand, model, serial number, other identifiers. Identification based upon barcodes. Consumer may be asked to orient CE on its front, back, side and then asked to change orientation as needed. Consumer may even be asked to remove CE cover(s), batteries and the like in order to gain access to identifiable items, such alphanumeric or barcode data. The kiosk **100** provides a way to use visual inspection with electrical inspection to identify a device, determine its value, and reduce possible fraud.

[0077] In one embodiment, the kiosk **100** communicates with the carrier associated with a mobile phone to collect any information that could be germane to the device, including, for example, validation or authentication, registered ownership, account status, time in service, and the like. In some cases, when the customer's identification information does not match the registered owner information, the kiosk **100** automatically contacts the assumed owner in some manner (automated telephone call, email, text message, etc.) to alert the owner of the phone of the possible transaction.

[0078] Another feature of an embodiment of the kiosk **100** is to determine if there is personal information on the electronic device. This is determined by the presence of data in particular storage registers in the memory (e.g., quick-key stored numbers) or by looking at file types (jpegs, mp3's, etc.), or just assuming all non-default storage locations must contain personal data. The customer is offered the chance to erase the data from the phone. One option allows the customer to request that the data be first downloaded and then sent to a location designated by the customer (e.g., email address, website, etc.). In another embodiment, there is a slot for the customer to enter a memory card (e.g. USB drive, memory stick, etc.) whereupon the kiosk **100** uploads the data to the memory device. In still another embodiment, the kiosk **100** offers a web location from which the user retrieves the data at

some later time if desired. In another embodiment, the user elects to have the data placed in another electronic device purchased by the customer at the kiosk **100** or in the location of the kiosk **100** or some other store. The customer preferably selects a user name and password to access the system provided storage location.

[0079] Once the value is determined, the value is provided at step **307** to the kiosk. The kiosk **100** then offers the customer a price or other remuneration for the phone that is typically less than the resale value. In other embodiments, the kiosk **100** offers the customer a price or remuneration that is at the current real-time market price. At step **308** it is determined if the user wishes to accept the offer. If not, the kiosk **100** proceeds to step **309** and opens the door and releases the electronic device back to the customer. If the user wishes to accept the offer, the kiosk **100** proceeds to step **310**. At a point where the user accepts a price, the kiosk **100** may then lock down the inspection area to prevent further access to the electronic device by the user. The kiosk **100** then disconnects any cables that have been attached. At step **310**, the user indicates acceptance of the decision by confirming on the keypad or touch-screen. At this point the kiosk **100** proceeds with deleting the personal data from the electronic device. In addition, once the transaction is confirmed, the kiosk **100** tags the electronic device with a transaction number that is associated with the diagnostic data and the transaction itself. This is preferably a printed adhesive label that is affixed physically to the phone and/or the loading of electronic data corresponding to the transaction number onto the phone itself for traceability purposes.

[0080] At step **311**, the kiosk **100** completes any additional testing and diagnostics of the electronic device, disconnects the cable from the electronic device, and prints a receipt for the customer. Transfer of funds may be authorized via the kiosk **100** by crediting a customer credit card or account by dispensing cash, or by dispensing a voucher or coupon. At step **312** the kiosk **100** updates its inventory database and transmits the update via a communications network to a kiosk server.

[0081] One preferred method for a pre-acquisition auction is illustrated in the flow chart of FIG. **13**. A method for analysis of an electronic device and financial remuneration to a user for submission of the electronic device is generally designated **400**. At block **401**, an electronic device is identified. At block **402**, bids are solicited for a used model of the electronic device in a predetermined condition. The bids are preferably solicited online through a website and the bidders are preferably pre-qualified. At block **403**, bids for the used model of the electronic device are received from a plurality of bidders. At block **404**, a purchase price to pay for the used model of the electronic device is set based on the plurality of bids received from the plurality of bidders. Typically, the purchase price is based on the winning bid. The shipping information for the winning bidder is preferably obtained at this time. At block **405**, a used model of the electronic device is identified at a recycling kiosk for the electronic device. Preferably, a consumer desires to recycle the electronic device. At **406**, the integrity of the used model of the electronic device is verified at the recycling kiosk. Preferably, the condition of the electronic device is established at the kiosk, with the kiosk determining any damage to the electronic device based on visual and electronic analysis of the electronic device. At block **407**, the electronic device is evaluated and graded. At block **408**, the purchase price for the used

model of the electronic device is offered to a consumer at the kiosk. At block **409**, the electronic device is automatically binned after purchasing the used model of the electronic device from the consumer at the kiosk. At block **410**, the electronic device is shipped to the winning bidder.

[0082] One preferred method of the present invention is illustrated in the flow chart of FIG. **14**. The method **1000** begins at block **1001** with an electronic device **150** positioned within an inspection area, **106** of a kiosk **100** wherein the inspection area has a camera and a robotic finger mechanism. At block **1002**, the method further comprises imaging a barcode sticker of the electronic device. At block **1003**, the method includes analyzing information derived from the barcode sticker of the electronic device. At block **1004**, the value of the mobile phone is determined as discussed in more detail below. Preferably, the method further comprises automatically binning the electronic device after determining the value of the electronic device. Additionally, the method preferably comprises instructing the user to remove a back panel and a battery of the electronic device prior to positioning the electronic device in the inspection area.

[0083] Preferably, the kiosk **100** of the method comprises a housing **105**, the housing **105** comprising a user interface on an exterior surface of the housing for the user to input information, an upper dome and a lower dome, wherein the upper dome and the lower dome comprise a plurality of mirrors. The kiosk **100** further comprises an upper chamber camera, a lower chamber camera and a transparent surface. The kiosk **100** further comprises a processor **160** within the housing and in communication with the at least one camera, the processor **160** configured to identify the brand and model number of the electronic device based on at least one of the information from the user and the images from the at least one camera, the processor **160** configured to determine a financial remuneration value for the electronic device.

[0084] An alternative method of the present invention is illustrated in the flow chart of FIG. **15**. The method **2000** begins at block **2001** wherein an electronic device is placed in an inspection area of a kiosk **100**, the inspection area **106** having an imaging component such as a camera and a robotic finger mechanism. At block **2002**, the method comprises imaging a screen shot of a page (preferably an about page) of the electronic device. At block **2003**, the screen shot of the page of the electronic device obtained by at least one imaging component disposed in the inspection area is inspected. At block **2004**, it is determined if a display screen of the electronic device. At block **2005** a value for the electronic device is determined. The method preferably comprises comparing information derived from the barcode sticker to information derived from the page to determine whether the information agrees or conflicts.

[0085] Alternatively, the method comprises imaging a screen shot of a known screen of a battery charging screen display of the electronic device and inspecting the screen shot of the known screen of the battery charging screen display of electronic device obtained by at least one camera.

[0086] The present invention further includes is a dome shaped apparatus, the dome shaped apparatus comprising an upper dome, a lower dome. The upper and lower dome comprises a plurality of walls, wherein the plurality of walls are composed of mirrors. The dome shaped apparatus further comprises a transparent surface and at least one camera, the camera capable of obtaining a multiple views of an electronic device placed within the dome shaped apparatus. The upper

dome preferably comprises an upper chamber camera. The lower dome preferably comprises a lower chamber camera. Preferably, a combination of each of the upper dome and lower dome cameras and the plurality of mirrors allow for an image of the device placed on the transparent surface. Preferably, the combination of each of the upper dome and lower dome cameras and the plurality of mirrors allow for a 360 degree of the electronic device placed on the transparent surface. Preferably, each of the upper dome and lower dome cameras are moveable.

[0087] Alternatively, the method begins with a mobile phone 150 positioned within an inspection area 106 of a kiosk 100. The mobile phone is powered up utilizing a robotic finger mechanism. A term is inputted into the mobile phone 150 utilizing a robotic finger mechanism for display on a LCD screen of the mobile phone 150. A preferred term is a telephone number for display on a LCD screen 153 as shown in FIG. 18. The term may also be a word, characters, or like inputs. The LCD screen 153 is inspected for damage such as cracks, pixel defects, discoloration and the like. The kiosk 100 inspects the LCD screen 153 for defects in the display of the telephone number or like term. Further, the luminescence of the LCD screen 153, particularly the telephone number, can also be measured to determine if the luminescence is performing at levels set forth by the manufacturer of the mobile phone 150. An optional electrical analysis is performed on the mobile phone 150 as discussed in more detail below. Lastly, the value of the mobile phone is determined as discussed in more detail below.

[0088] An alternative method of the present invention is illustrated in the flow chart of FIG. 16. The method 3000 begins at block 3001 with an electronic device 150 positioned within an inspection area 106 of a kiosk 100, the inspection area having a camera. At block 3002, a robotic finger is used to activate the electronic device. At block 3003, the electronic device is imaged. At block 3004, the image of the electronic device obtained by the at least one camera disposed in the inspection area is inspected to determine if the electronic device has any defects. At block 3005, a value for the electronic device is determined.

[0089] Preferably, the method further comprises automatically binning the electronic device after determining the value of the electronic device. The method preferably comprises using the robotic finger to call a test phone number or alternatively to send a text a test phone number. The text preferably comprises each letter of the alphabet which allows determining the functionality of all letters of the keyboard. The method further comprises the text comprises a character string comprising the numbers 1 through 10, allowing determination of the functionality of all numbers on the keyboard. Further, the robotic finger may be used to send a text comprising each symbol on the keyboard. The method further comprises using the robotic finger to active a camera mode of the electronic device.

[0090] Yet another aspect of the present invention is an apparatus for recycling electronic devices. The apparatus comprises an inspection area, a transparent plate within the inspection area, a robotic finger within the inspection area and at least one camera within the inspection area. The robotic finger is programmed to inspect an electronic device positioned on the transparent plate. Preferably, the robotic finger has an inspection end composed of a polymer material similar to human skin. The robotic finger can swipe on touchscreen of an electronic device. The electronic device is a mobile phone,

tablet computer, or MP3 player. The apparatus preferably comprises a robotic finger having a plurality of phalanges and joints for multi-dimensional movement. Further, the robotic finger has a rotating base for 360 degrees movement. Additionally, the robotic finger has an oscillator for vertical movement. The robotic finger comprises a plurality of modular components for dimensional changes to the size and shape of the robotic finger. The robotic finger comprises an electrical connection for connection to a port of the electronic device.

[0091] An alternative method of the present invention comprises a mobile phone 150 positioned within an inspection area 106 of a kiosk 100. The mobile phone is powered up utilizing a robotic finger mechanism. A known image is displayed on a LCD screen of the mobile phone 150. One example of a known image for display on a LCD screen 153 is a national park such as Yosemite National Park as shown in FIG. 19. An alternative known image is a start up logo of a carrier for the mobile phone such as the well-known VERIZON logo or the AT&T logo. The known image may be sent to the mobile phone by the kiosk 100 either directly through electrical connection or wirelessly by telephoning the mobile phone 150. The LCD screen 153 is inspected for damage such as cracks, pixel defects, discoloration and the like. The kiosk 100 inspects the LCD screen 153 for defects in the display of the known image by comparing the displayed known image with a stored known image, preferably using optical recognition software. Further, the luminescence of the LCD screen 153, particularly the telephone number, can also be measured to determine if the luminescence is performing at levels set forth by the manufacturer of the mobile phone 150. An optional electrical analysis is performed on the mobile phone 150 as discussed in more detail below. The value of the mobile phone is determined as discussed in more detail below.

[0092] One example of a known image for display on a LCD screen 153 is a national park such as Yosemite National Park as shown in FIG. 19. An alternative known image is a start up logo of a carrier for the mobile phone such as the well-known VERIZON logo or the AT&T logo. The known image may be sent to the mobile phone by the kiosk 100 either directly through electrical connection or wirelessly by telephoning the mobile phone 150. At block 3004, the LCD screen 153 is inspected for damage such as cracks, pixel defects, discoloration and the like. The kiosk 100 inspects the LCD screen 153 for defects in the display of the known image by comparing the displayed known image with a stored known image, preferably using optical recognition software. Further, the luminescence of the LCD screen 153, particularly the telephone number, can also be measured to determine if the luminescence is performing at levels set forth by the manufacturer of the mobile phone 150. At block 3005, an optional electrical analysis is performed on the mobile phone 150 as discussed in more detail below. At block 3006, the value of the mobile phone is determined as discussed in more detail below.

[0093] Preferably, visual inspection and recognition software is utilized by the kiosk 100 to analyze a mobile phone 150. In one preferred method, a recognition algorithm is applied to a specific make and model of a mobile phone 150. The visual inspection and recognition software determines the borders of a mobile phone 150 under inspection to determine the external dimensions of the mobile phone 150. The external dimensions are utilized to determine a subset of possible mobile phones from a master database of mobile phones stored in the memory 161 of the kiosk 100 or available

online to the kiosk **100** using external communications. The visual inspection and recognition software then preferably uses a set of secondary and tertiary features to further distinguish the mobile phone **150**. These secondary and tertiary features can include placement and size of the display screen, placements and size of the keyboard, unique buttons, placement of ports, and other distinguishing features. Once an exact make and model of the mobile phone is determined, the visual inspection and recognition software subtracts an image of the mobile phone **150** from an image of a perfect mobile phone for the same make and model. The result of the subtraction is preferably a quantifiable number of pixels that are calibrated into categories of broken or missing parts, cracked screen, and low, medium or high wear.

[0094] Alternatively, the visual inspection is performed using neural network pattern recognition techniques to identify the mobile phone **150**, then filter algorithms are utilized to determine defects such as cracked screens. Further, those skilled in the pertinent art will recognize that other visual inspection techniques may be employed without departing from the scope and spirit of the present invention.

[0095] Further, visual inspection optionally includes obtaining a heat signature for the mobile phone **150**. One preferred method of obtaining a heat signature of a mobile phone **150** is to raster a laser across the mobile phone to characterize a heat decay profile of the submitted mobile phone **150**. This heat decay profile is then compared to a heat decay profile for a perfect sample of the same mobile phone **150**. The heat decay profile indicates the wear of the external surface of the mobile phone **150**, which is used in calculating the financial remuneration for the mobile phone **150**.

[0096] Yet another method of the present invention comprises positioning an electronic device in an inspection area of a recycling kiosk **100**, powering up the electronic device utilizing a robotic finger mechanism and displaying a known image on a LCD screen of the electronic device. The known image on the LCD screen of the electronic device is compared with a stored duplicate of the known image stored on the recycling kiosk to determine any defects in the LCD screen of the electronic device and to define an analyzed electronic device. The method further comprises determining a value for the analyzed electronic device.

[0097] In one embodiment of this method, the known image is a start-up image for the carrier of the electronic device. In an alternative embodiment, the known image is an image of a national park. The method may further comprise performing an electrical analysis of the electronic device.

[0098] From the foregoing it is believed that those skilled in the pertinent art will recognize the meritorious advancement of this invention and will readily understand that while the present invention has been described in association with a preferred embodiment thereof, and other embodiments illustrated in the accompanying drawings, numerous changes modification and substitutions of equivalents may be made therein without departing from the spirit and scope of this invention which is intended to be unlimited by the foregoing except as may appear in the following appended claims. Therefore, the embodiments of the invention in which an exclusive property or privilege is claimed are defined in the following appended claims.

We claim as our invention the following:

1. A method for analysis of an electronic device and financial remuneration to a user for submission of the electronic device, the method comprising:

positioning an electronic device in an inspection area of a kiosk, the inspection area having at least one camera;
using a robotic finger to activate the electronic device,
imaging the electronic device;
inspecting an image of the electronic device obtained by at least one camera disposed in the inspection area to determine if the electronic device has any defects; and
determining a value for electronic device.

2. The method according to claim 1 further comprising automatically binning the electronic device after determining the value of the electronic device.

3. The method according to claim 1 further comprising using the robotic finger to dial a test phone number.

4. The method according to claim 1 wherein the method further comprises using the robotic finger to activate a camera mode of the electronic device.

5. The method according to claim 1 further comprising using the robotic finger to navigate a menu of the electronic device to expose the make, model or about page.

6. The method according to claim 1 further comprising using the robotic finger to enter test characters or testing all of the physical buttons or virtual buttons on a touch screen.

7. The method according to claim 6 wherein the test characters comprise each letter of the alphabet, punctuation and other keys of the electronic device.

8. The method according to claim 6 wherein the test characters comprises a character string comprising the numbers 0 through 9.

9. The method according to claim 6 further comprising using the robotic finger to activate each of the function keys.

10. The method according to claim 6 further comprising extracting text on the screen, MEID number, IMEI number, serial number or other identifying components of the electronic device.

11. The method according to claim 1 wherein the image is an about page of the electronic device, and further comprising comparing information derived from the ID label to information derived from the about page.

12. The method according to claim 11 further comprising analyzing the content of the page and comparing the analyzed content to standard data of the content of the page.

13. The method according to claim 1 wherein the kiosk further comprises:

a housing;
a user interface on an exterior surface of the housing for the user to input information;
an upper chamber and a lower chamber, wherein the upper chamber comprises a plurality of mirrors;
an upper chamber camera;
a lower chamber camera;
a transparent surface; and
a processor within the housing and in communication with the at least one camera, the processor configured to identify the brand and model number of the electronic device based on the images from the at least one camera, the processor configured to determine a financial remuneration value for the electronic device.

14. An apparatus for recycling electronic devices, the apparatus comprising:

an inspection area;
a transparent plate within the inspection area;
a robotic finger; and
at least one camera within the inspection area.

15. The apparatus according to claim 14 wherein the robotic finger is programmed to test an electronic device positioned on the transparent plate.

16. The apparatus according to claim 14 wherein the robotic finger has an inspection end composed of a polymer material similar to human skin.

17. The apparatus according to claim 14 wherein the robotic finger can swipe on the touch screen of an electronic device.

18. The apparatus according to claim 14 wherein the electronic device is a mobile phone, tablet computer, or MP3 player.

19. The apparatus according to claim 14 wherein the robotic finger has a plurality of phalanges and joints for multi-dimensional movement.

20. The apparatus according to claim 14 wherein the robotic finger has a rotating base for 360 degrees rotation.

21. The apparatus according to claim 14 wherein the robotic finger has an actuator for vertical or horizontal movement.

22. The apparatus according to claim 14 wherein the robotic finger comprises a plurality of modular components for dimensional changes to the size and shape of the robotic finger.

23. The apparatus according to claim 14 wherein the robotic finger comprises an electrical connection for connection to a port of the electronic device.

* * * * *

CLAIMS

We claim:

1. A consumer operated kiosk comprising:
an inspection area configured to receive a mobile phone for purchase from a first user;
a processing system configured to prepare the mobile phone for resale; and
a dispensing system configured to dispense the mobile phone to a second user after the mobile phone has been prepared for resale and purchased by the second user.
2. The consumer operated kiosk of claim 1 wherein the processing system includes a robotic device configured to interact with the mobile phone to prepare the mobile phone for resale.
3. The consumer operated kiosk of claim 1 wherein the processing system includes a robotic finger configured to contact the mobile phone to test operation of the mobile phone and/or remove data from the mobile phone to prepare the mobile phone for resale.
4. The consumer operated kiosk of claim 1 wherein the processing system includes a robotic device configured to interact with the mobile phone to prepare the mobile phone for resale, and wherein the robotic device carries a camera configured to obtain an image of the mobile phone.
5. The consumer operated kiosk of claim 4 wherein the image is viewable by a remote operator.
6. The consumer operated kiosk of claim 4 wherein the image is viewable by a remote operator so that the remote operator can facilitate positioning of the robotic device relative to the mobile phone.

7. The consumer operated kiosk of claim 1, further comprising a storage area configured to receive the mobile phone from the processing system and display the mobile phone to prospective purchasers.

8. The consumer operated kiosk of claim 7, further comprising a transport system configured to move the mobile phone from the inspection area to the processing system, and from the processing system to the storage area.

9. The consumer operated kiosk of claim 8 wherein the transport system is further configured to move the mobile phone from the storage area to the dispensing system.

10. The consumer operated kiosk of claim 8 wherein the transport system includes:

a bridge configured to move in one of a vertical or lateral direction relative to the processing system; and

a robotic arm having a proximal end portion and a distal end portion, wherein the proximal end portion is movably coupled to the bridge and configured to move in the other of the vertical or lateral direction relative to the processing system, and wherein the distal end portion carries a gripping member configured to releasably grip the mobile phone for movement via the transport system.

11. The consumer operated kiosk of claim 1 wherein the mobile phone is a first mobile phone, and wherein the kiosk further comprises:

data transfer apparatus configured to transfer data from a second mobile phone to the first mobile phone after the first mobile phone has been dispensed to the second user.

12. The consumer operated kiosk of claim 1 wherein the inspection area includes:

a wired and/or wireless connectivity device configured to connect to the mobile phone; and

one or more cameras, wherein the kiosk is configured to:
receive characteristic information about the mobile phone via the wired and/or wireless connectivity device;
perform a visual inspection of the mobile phone via the one or more cameras;
determine a price for the mobile phone based at least in part on the characteristic information and the visual inspection; and
purchase the mobile phone from the first user for the price.

13. A consumer operated kiosk comprising:
a user interface;
an inspection area configured to receive an electronic device from a first user;
a wired and/or wireless connectivity device operably associated with the inspection area and configured to connect to the electronic device;
a transport system;
a storage area; and
one or more processors operably connected to the wired and/or wireless connectivity device and the transport system, wherein the one or more processors are configured to:
receive characteristic information about the electronic device via the wired and/or wireless connectivity device;
facilitate a purchase of the electronic device from the first user based at least in part on the characteristic information;
cause the transport system to move the electronic device from the inspection area and place the electronic device in the storage area;
receive a selection of the electronic device from a second user via the user interface; and
facilitate dispensing the electronic device to the second user at least partially in response to receiving the selection.

14. The consumer operated kiosk of claim 13, further comprising:
a processing system configured to prepare the electronic device for resale after the electronic device has been purchased from the first user, wherein the

processing system is operably connected to the one or more processors, and wherein the one or more processors are further configured to:
cause the transport system to move the electronic device to the processing system prior to placing the electronic device in the storage area; and
cause the processing system to prepare the electronic device for resale.

15. The consumer operated kiosk of claim 14 wherein the electronic device is mobile phone, and wherein the processing system includes a robotic device configured to interact with the mobile phone to prepare the mobile phone for resale.

16. The consumer operated kiosk of claim 14 wherein the electronic device is mobile phone, and wherein the processing system includes a robotic finger configured to contact the mobile phone to test operation of the mobile phone and/or remove data from the mobile phone to prepare the mobile phone for resale.

17. The consumer operated kiosk of claim 13 wherein the one or more processors are further configured to:
determine a first price for the electronic device based at least in part on the characteristic information;
present, to the first user, an offer to purchase the electronic device for the first price;
receive an acceptance of the offer from the first user;
cause the kiosk to facilitate payment of the first price to the first user in exchange for the electronic device;
present, to the second user, an offer to sell the electronic device for a second price; and
confirm receipt of payment of the second price from the second user, wherein dispensing the electronic device to the second user includes dispensing the electronic device at least partially in response to confirming receipt of the payment of the second price.

18. The consumer operated kiosk of claim 13, further comprising one or more cameras operably associated with the inspection area, wherein the one or more processors are further configured to:

perform a visual inspection of the electronic device when the first electronic device is positioned in the inspection area; and
determine a price for the electronic device based at least in part on the characteristic information and the visual inspection.

19. A method for operating a kiosk, the method comprising:

receiving an electronic device from a first user in an inspection area of the kiosk, wherein the kiosk further includes a user interface, a wired connector and/or a wireless transceiver operably associated with the inspection area, at least one camera operably associated with the inspection area;
receiving, via the wired connector and/or the wireless transceiver, characteristic information about the electronic device;
receiving, via the at least one camera, an image of the electronic device;
purchasing, via the kiosk, the electronic device from the first user for a price based at least part on the characteristic information and/or the image;
receiving, via the user interface, a selection of the electronic device from a second user; and
dispensing the electronic device to the second user.

20. The method of claim 19 wherein the kiosk further includes a processing system configured to prepare the electronic device for resale and a storage area, and wherein the method further comprises:

after purchasing the electronic device from the first user, moving the electronic device to the processing system;
preparing the electronic device for resale at the processing system; and
after preparing the electronic device for resale, moving the electronic device from the processing system to the storage area.

21. The method of claim 19 wherein electronic device is a mobile phone, wherein the kiosk further includes a robotic device configured to contact the mobile phone, and wherein the method further comprises:

after purchasing the mobile phone from the first user, contacting the mobile phone with the robotic device to test operation of the mobile phone and/or remove data from the mobile phone to prepare the mobile phone for resale.

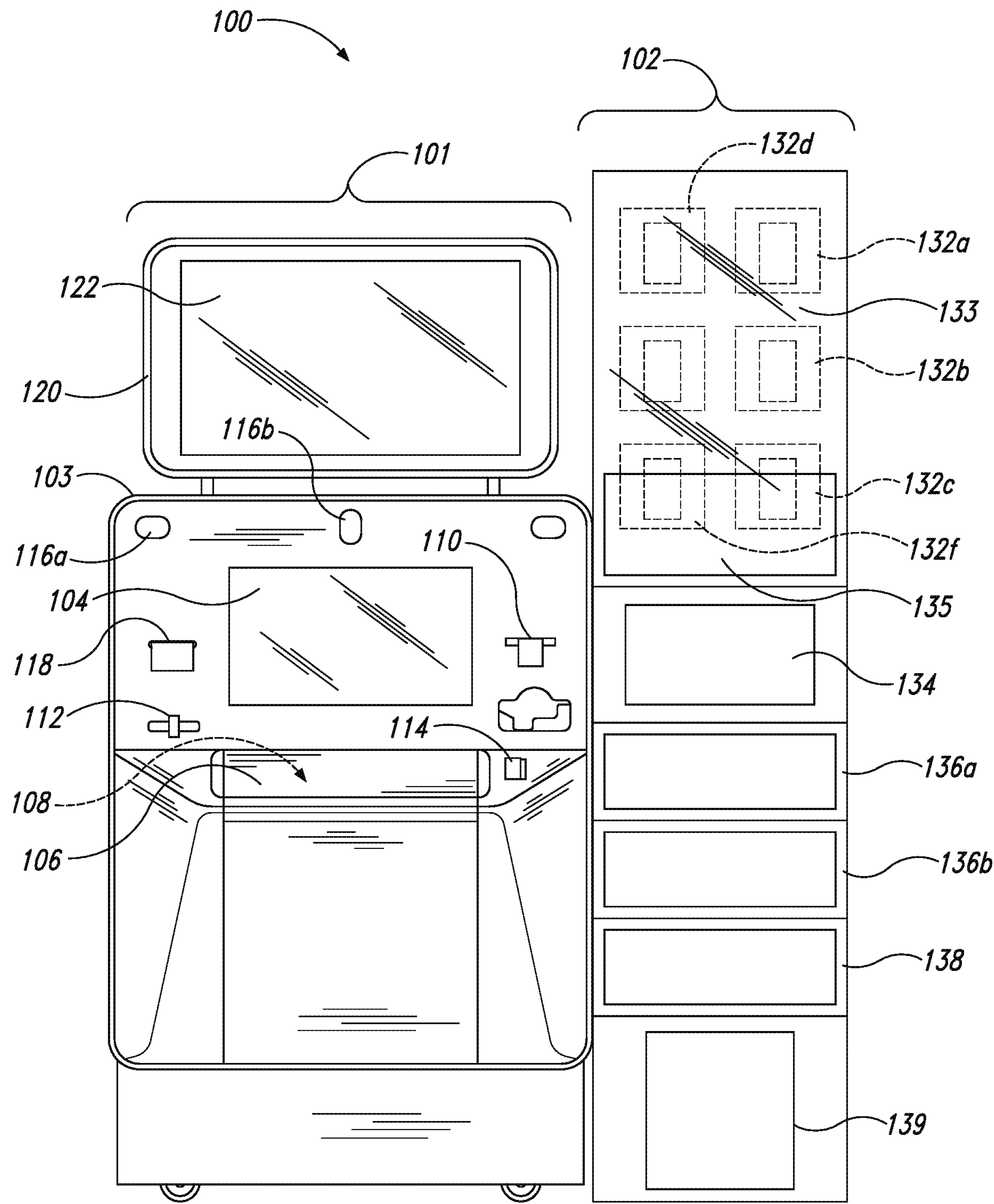


Fig. 1A

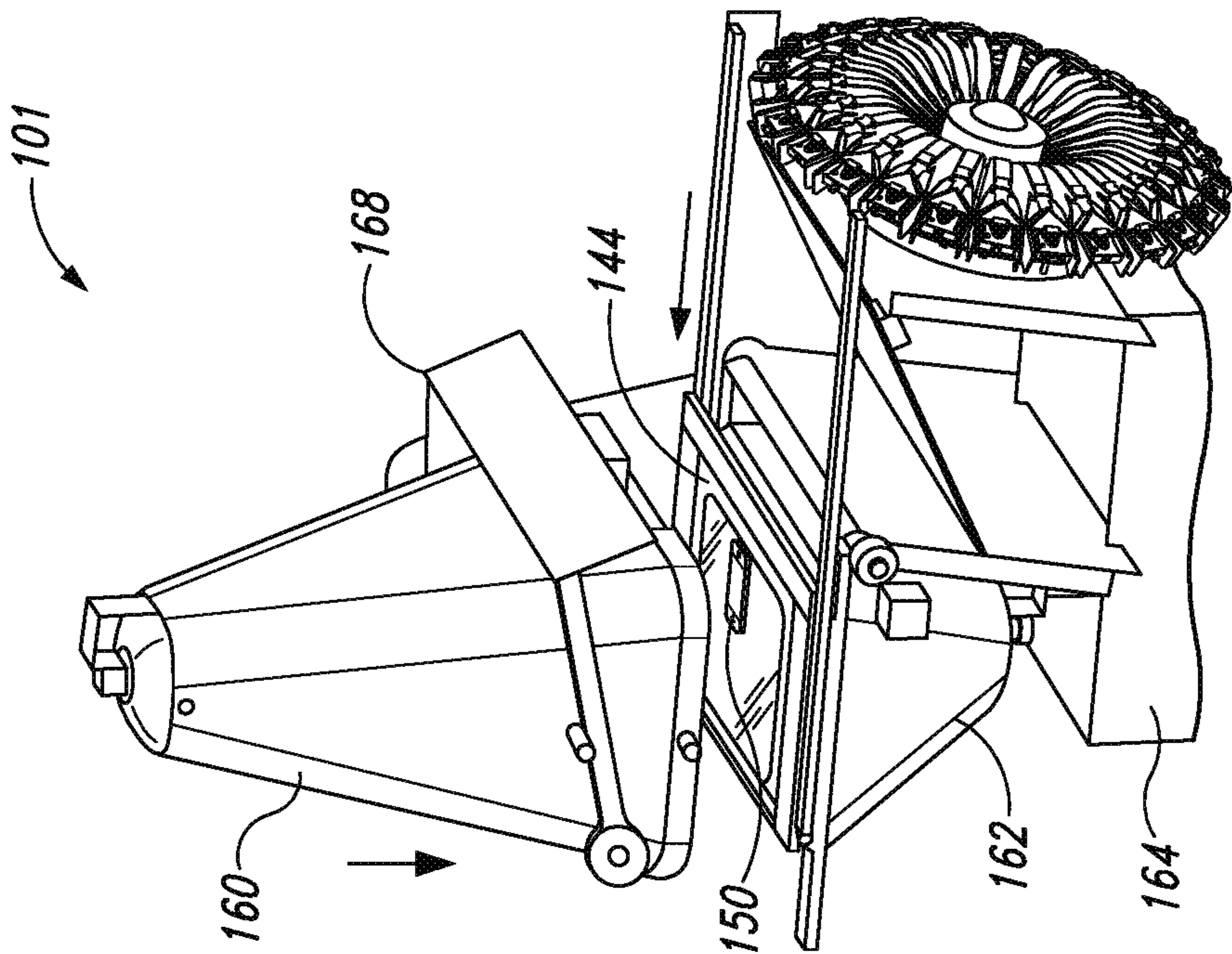


Fig. 1C

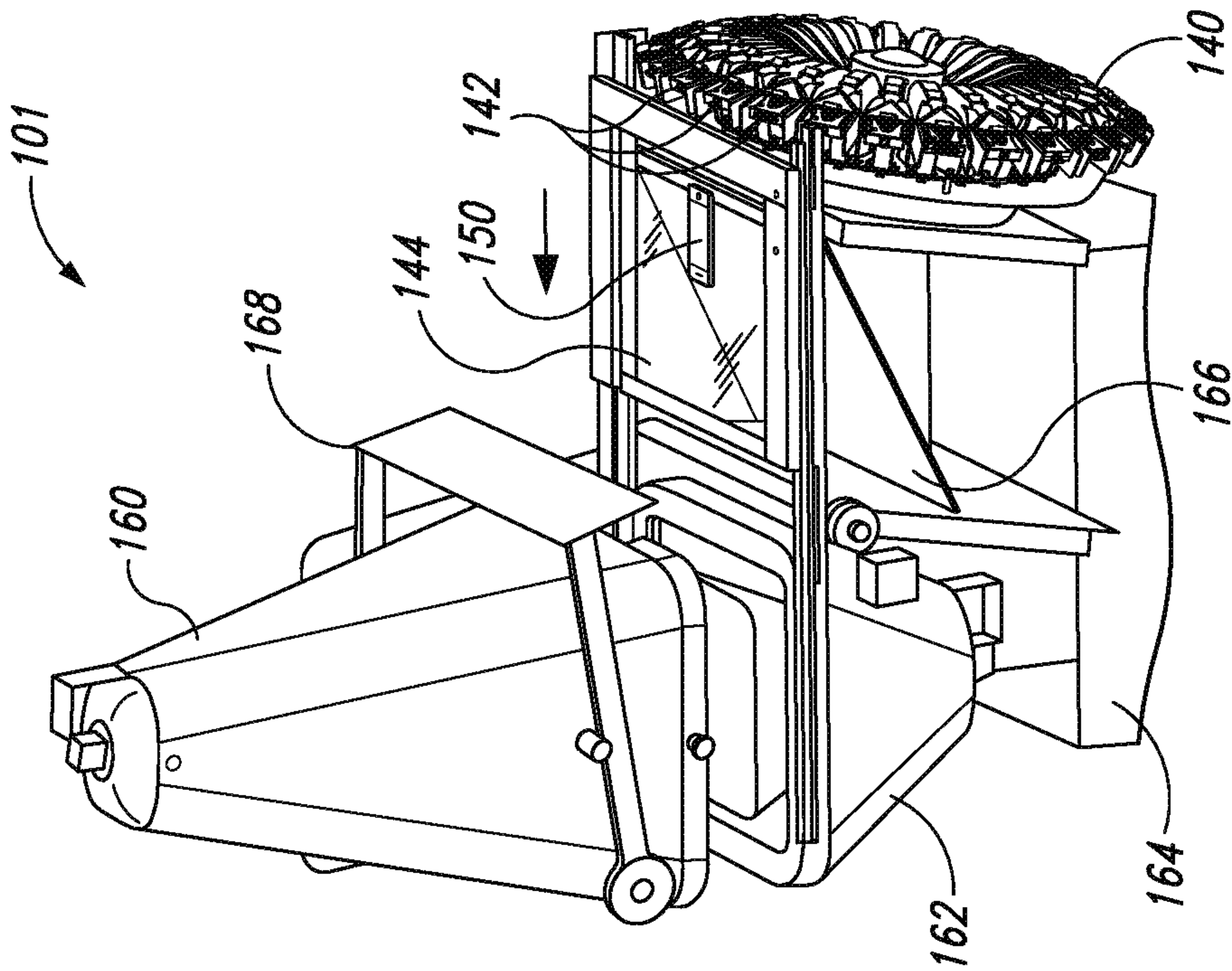


Fig. 1B

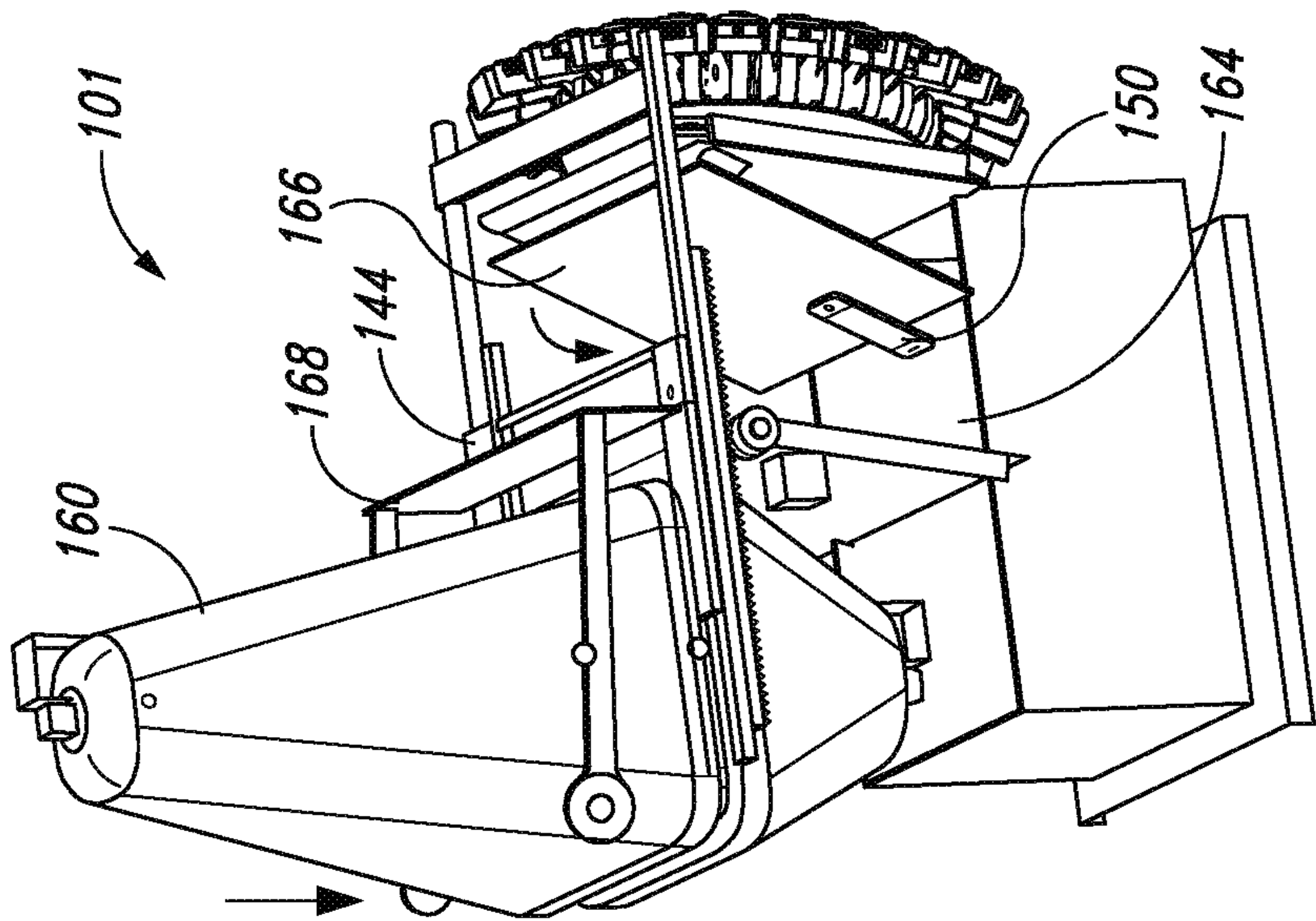


Fig. 1E

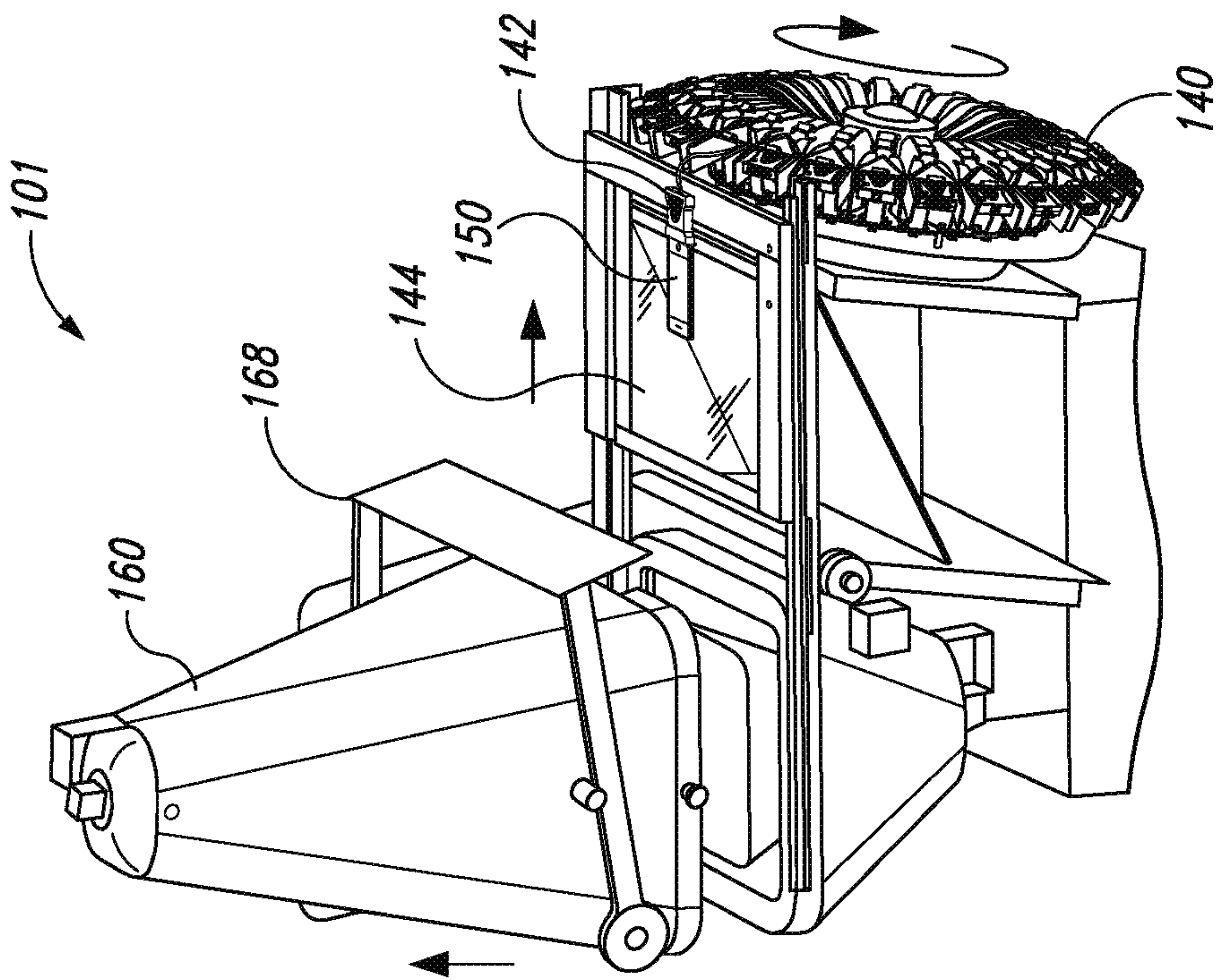
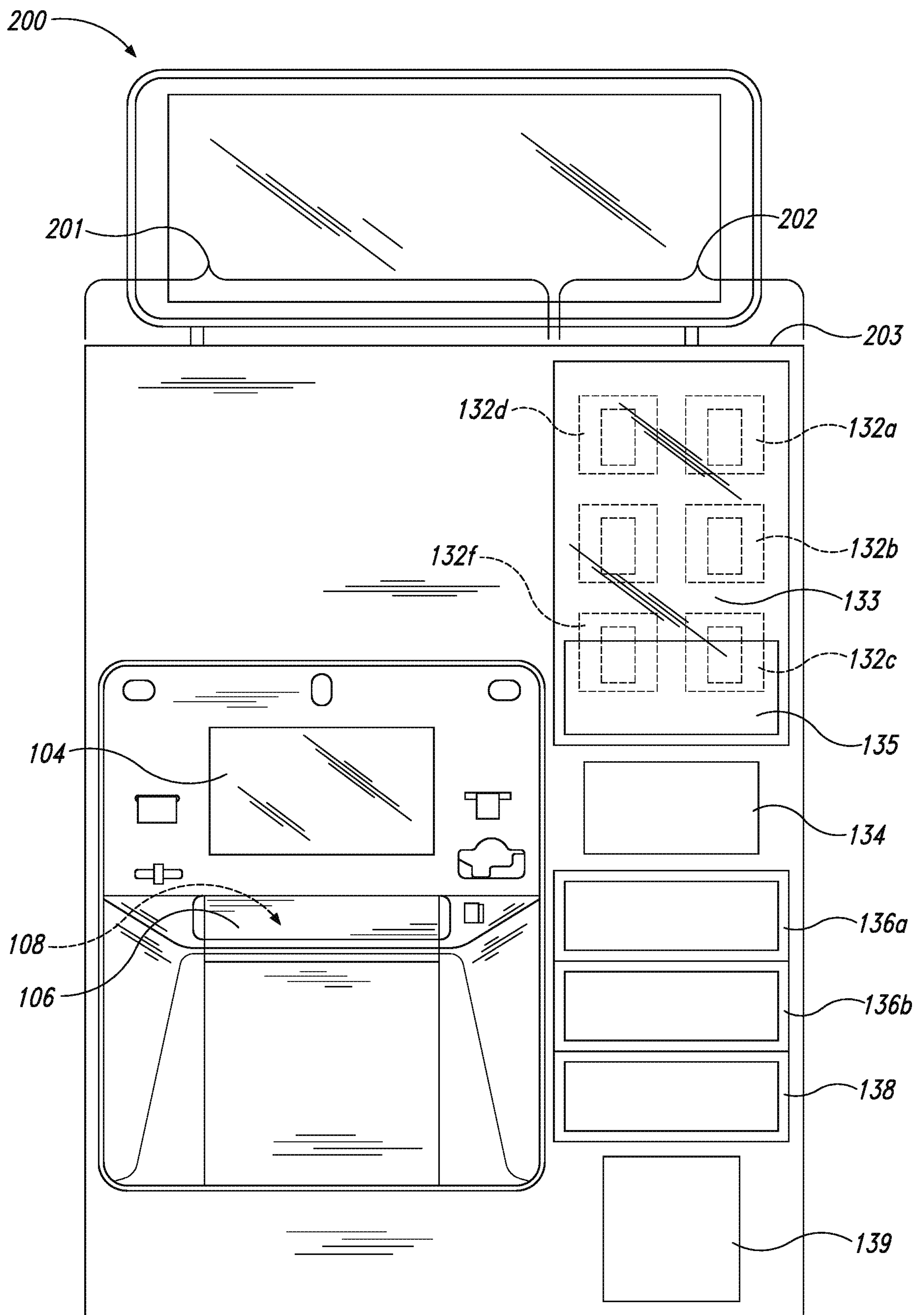


Fig. 1D

*Fig. 2*

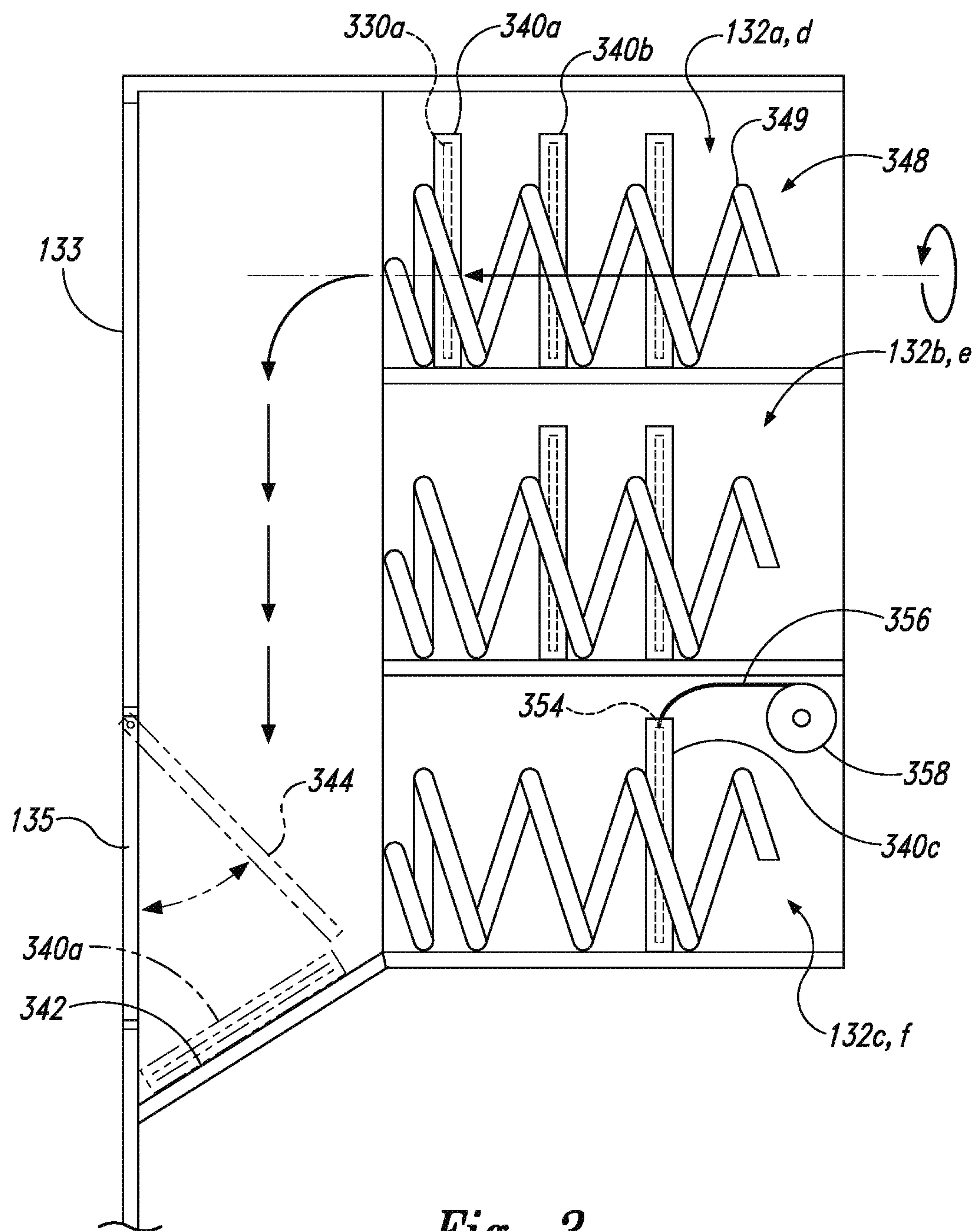
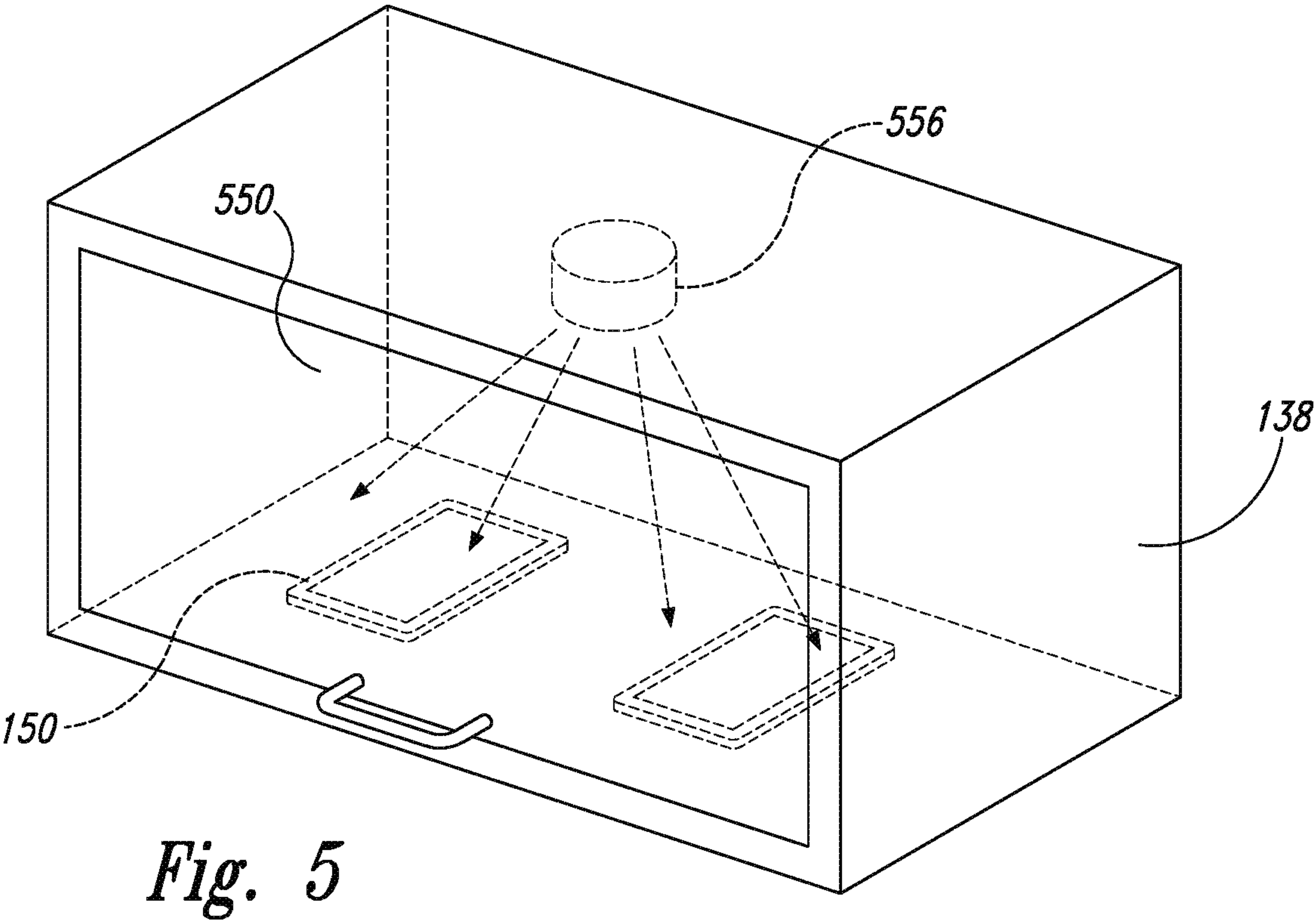
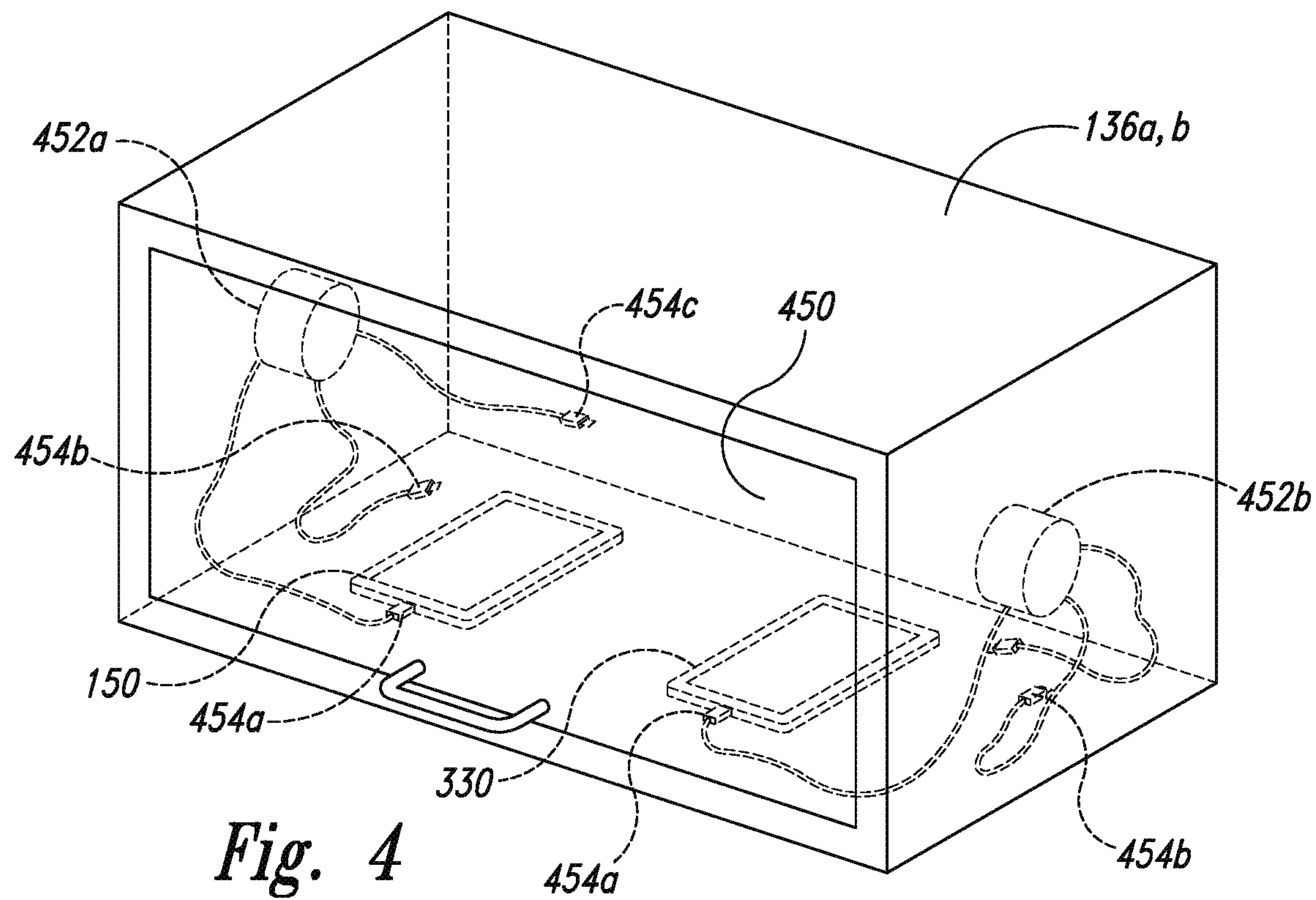


Fig. 3



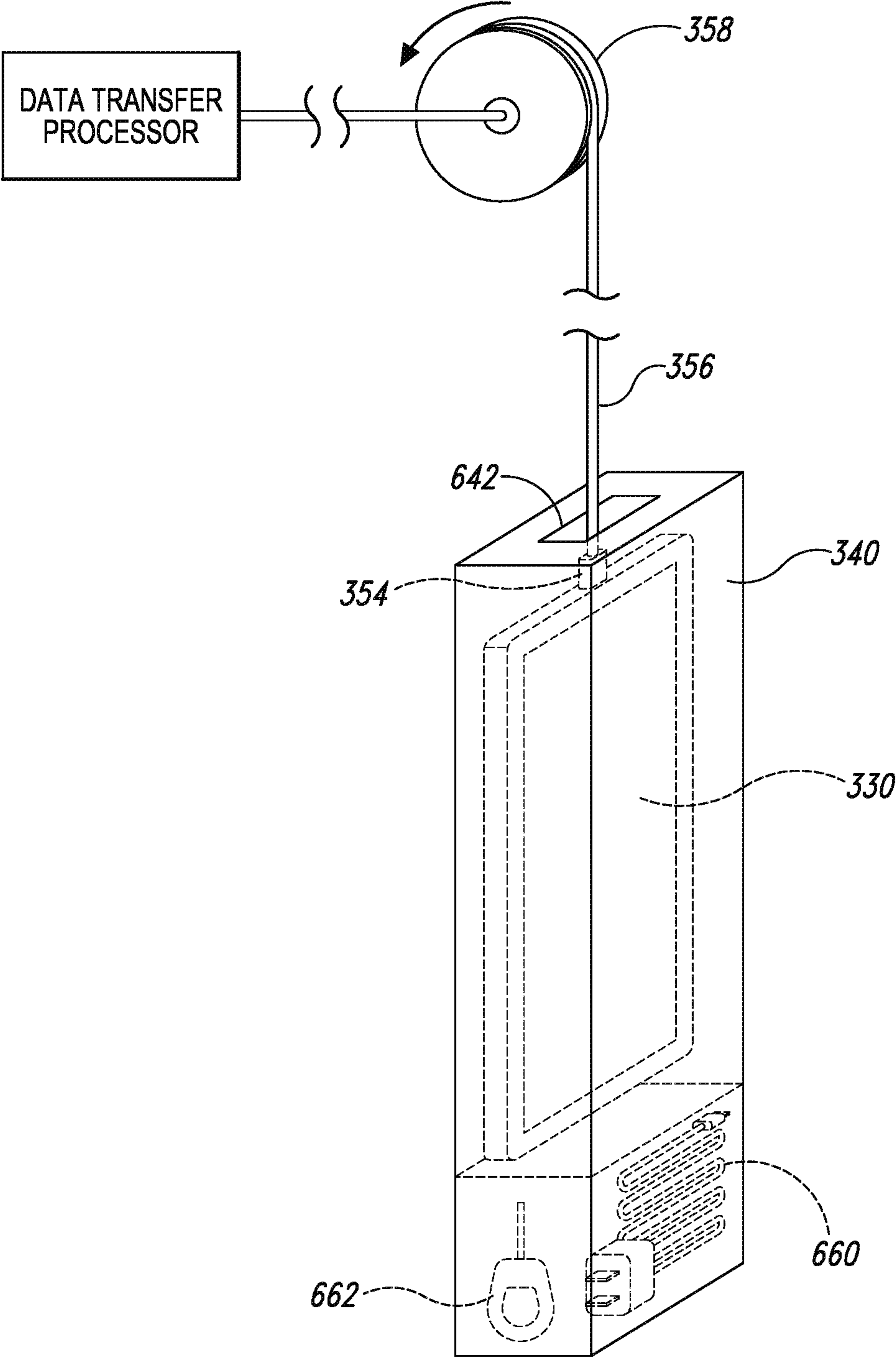


Fig. 6

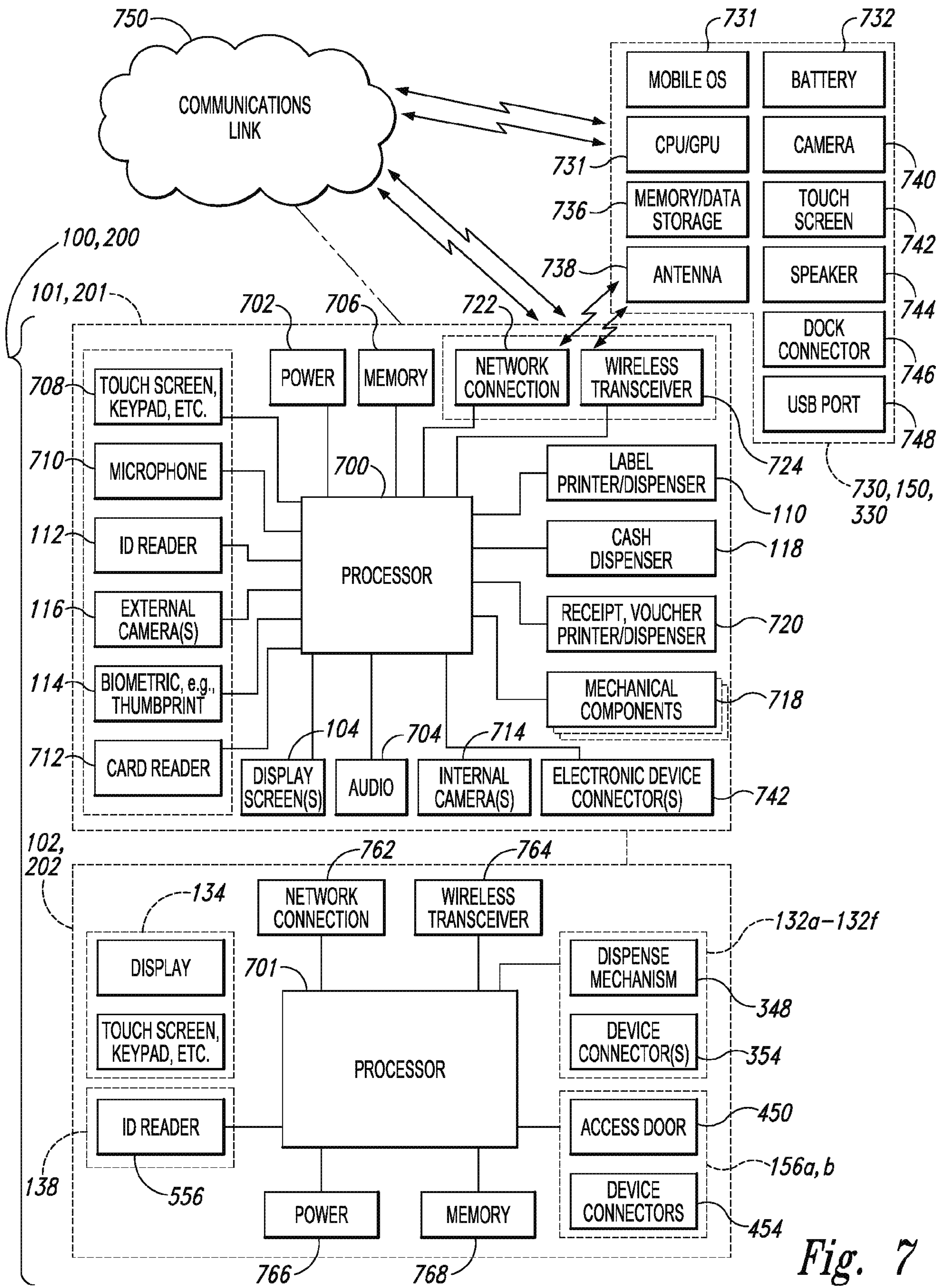
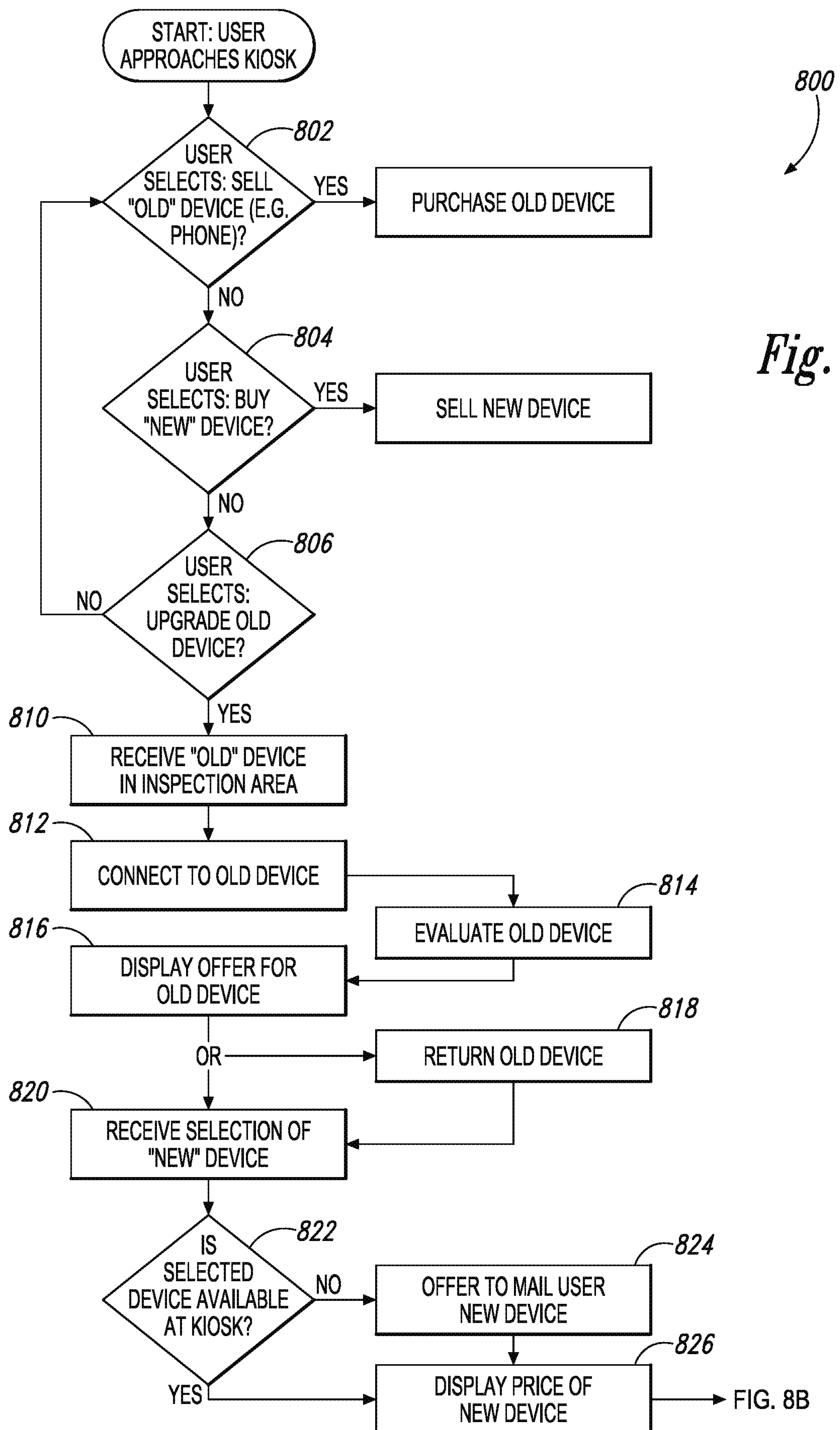
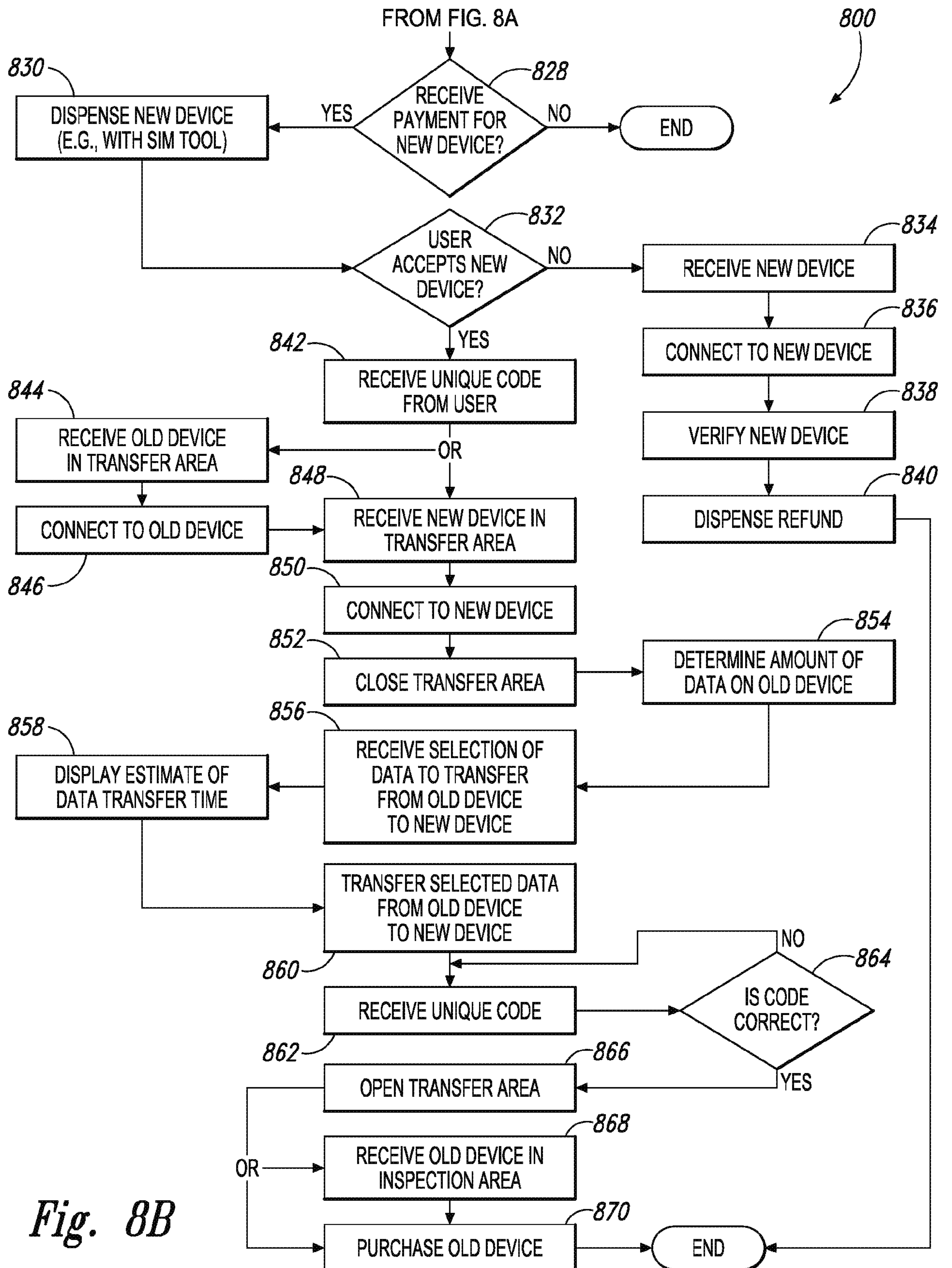


Fig. 7



10/18



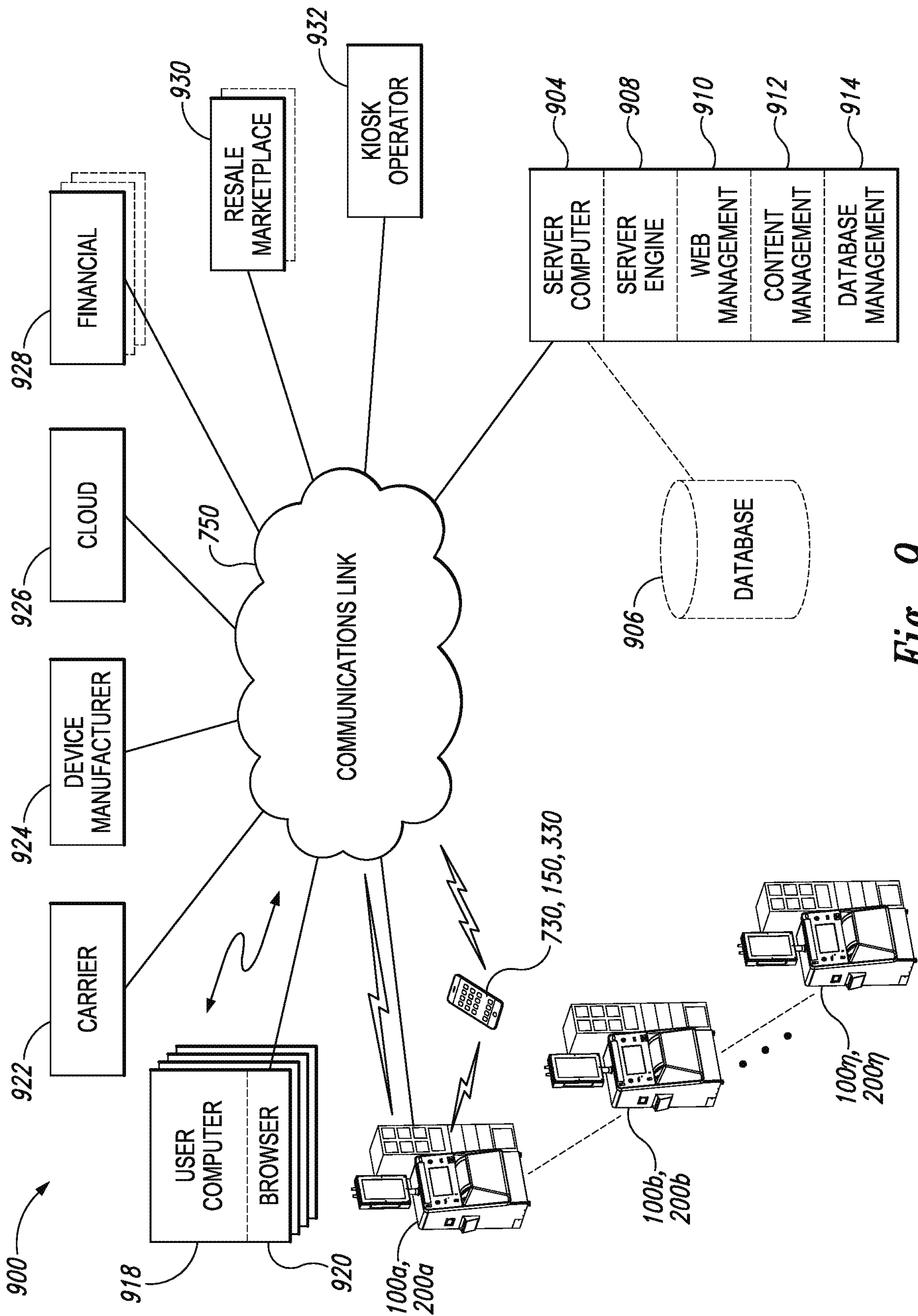
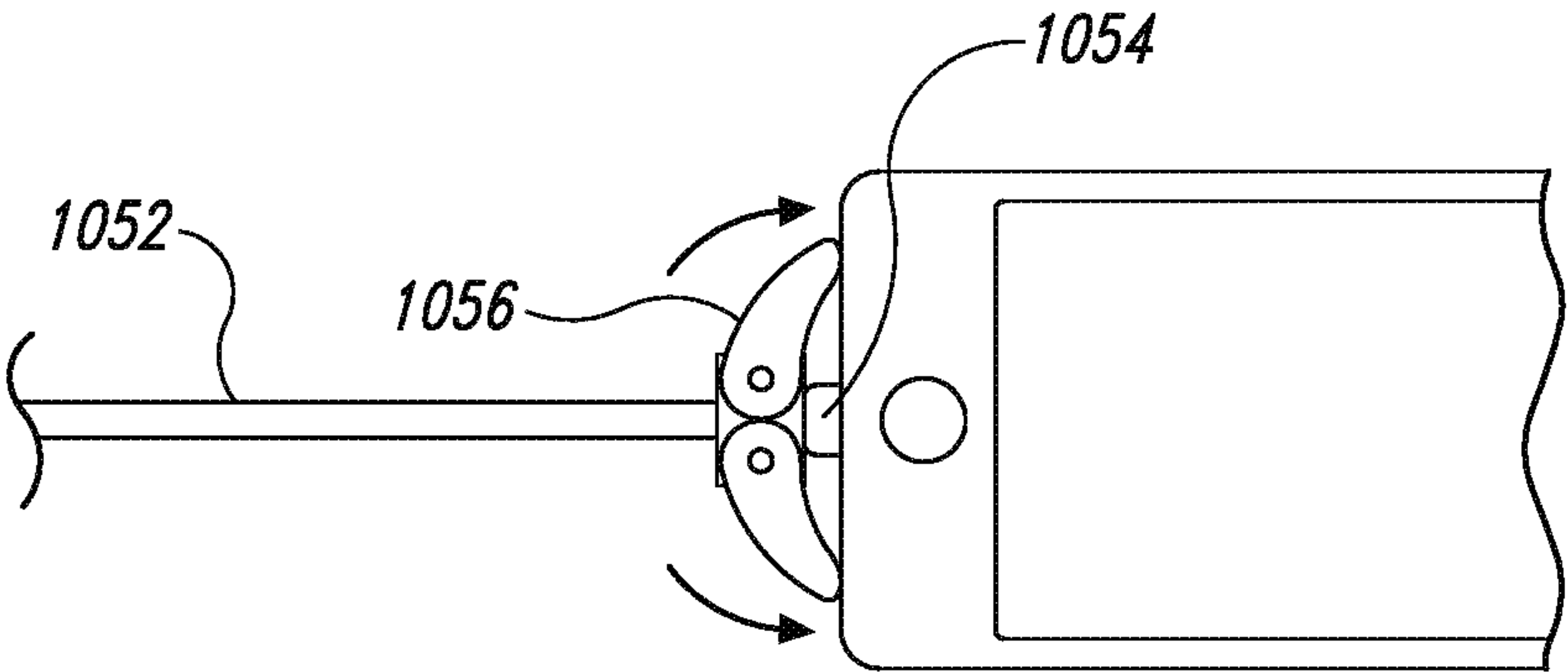
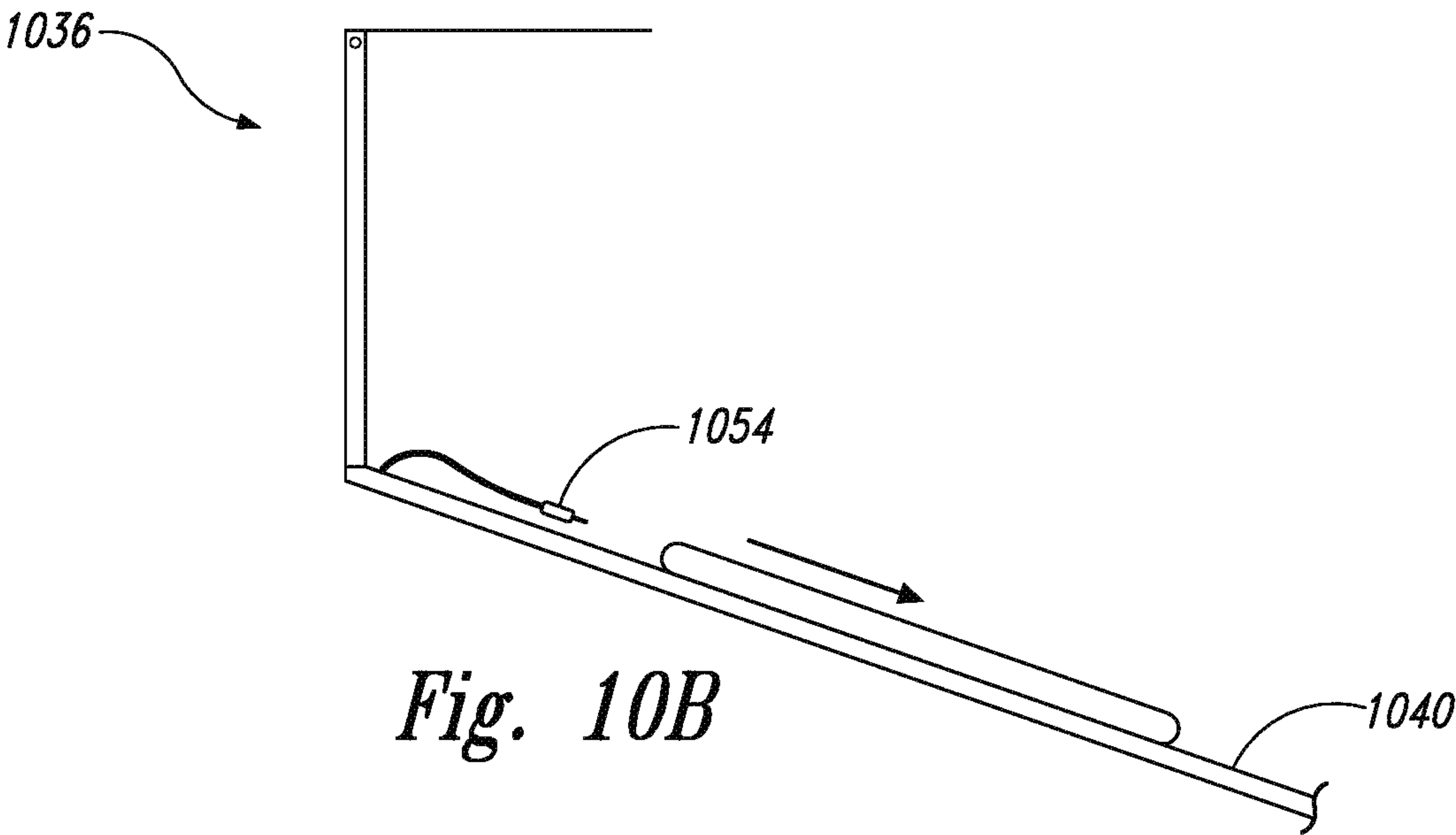
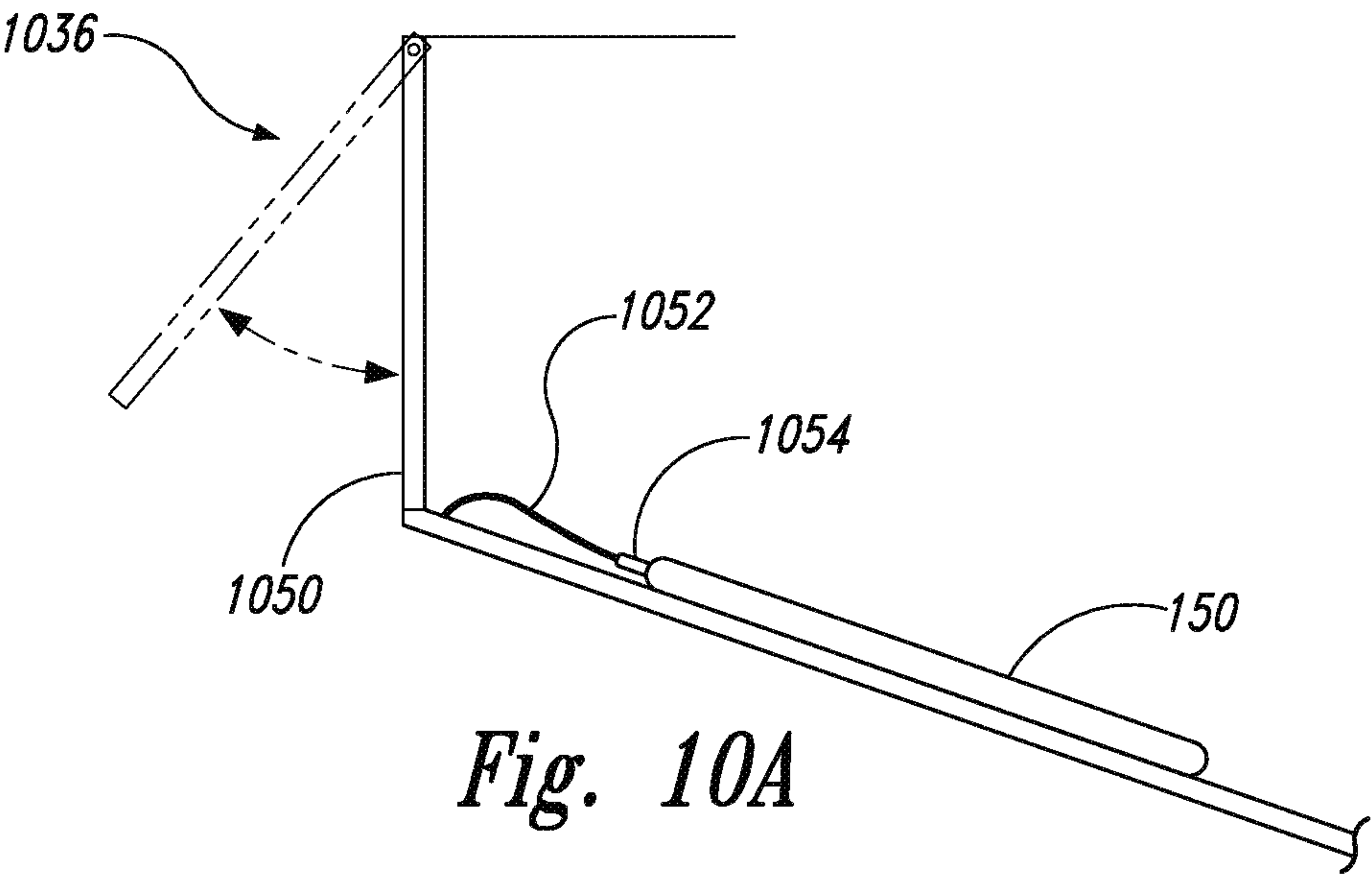


Fig. 9



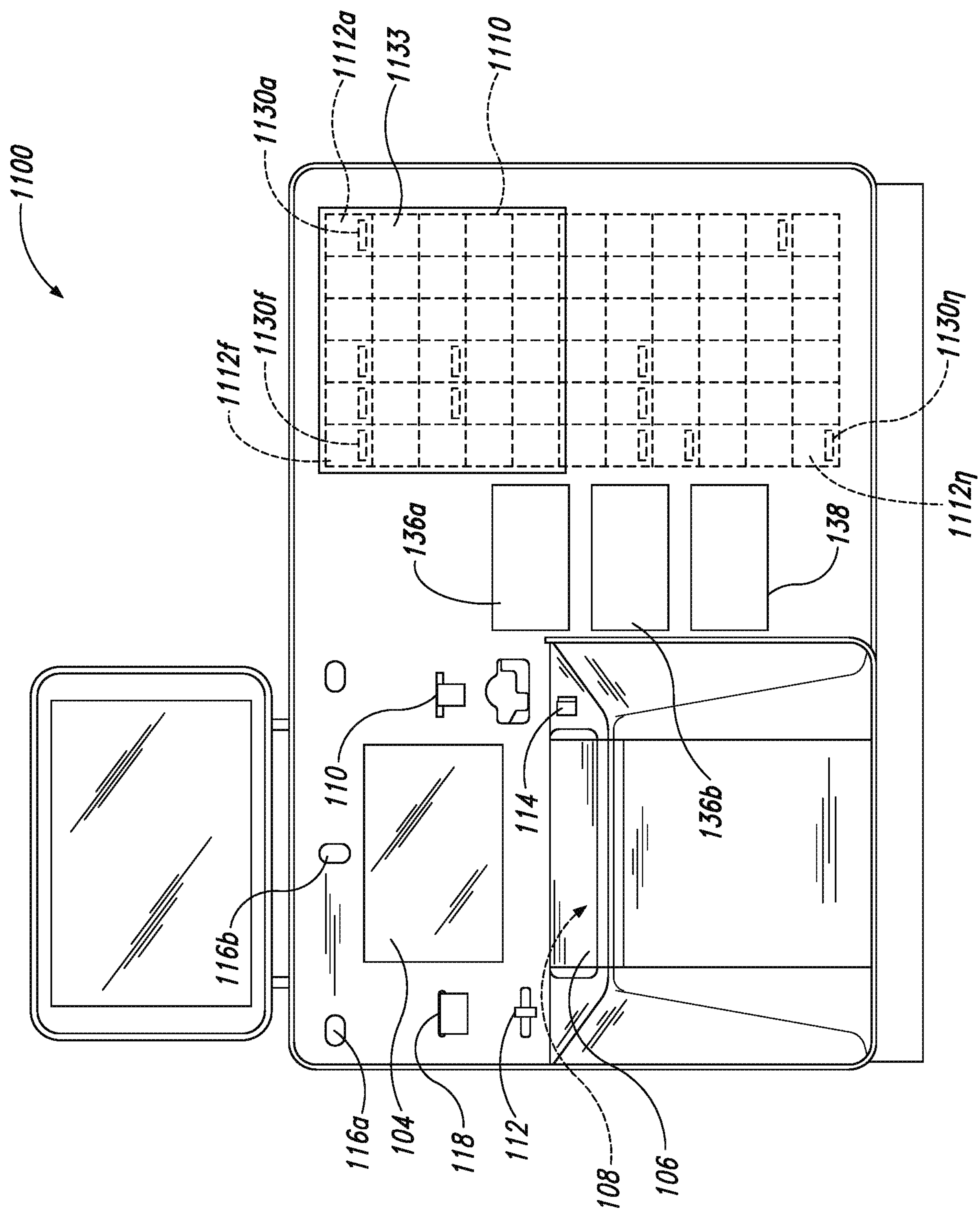


Fig. 11A

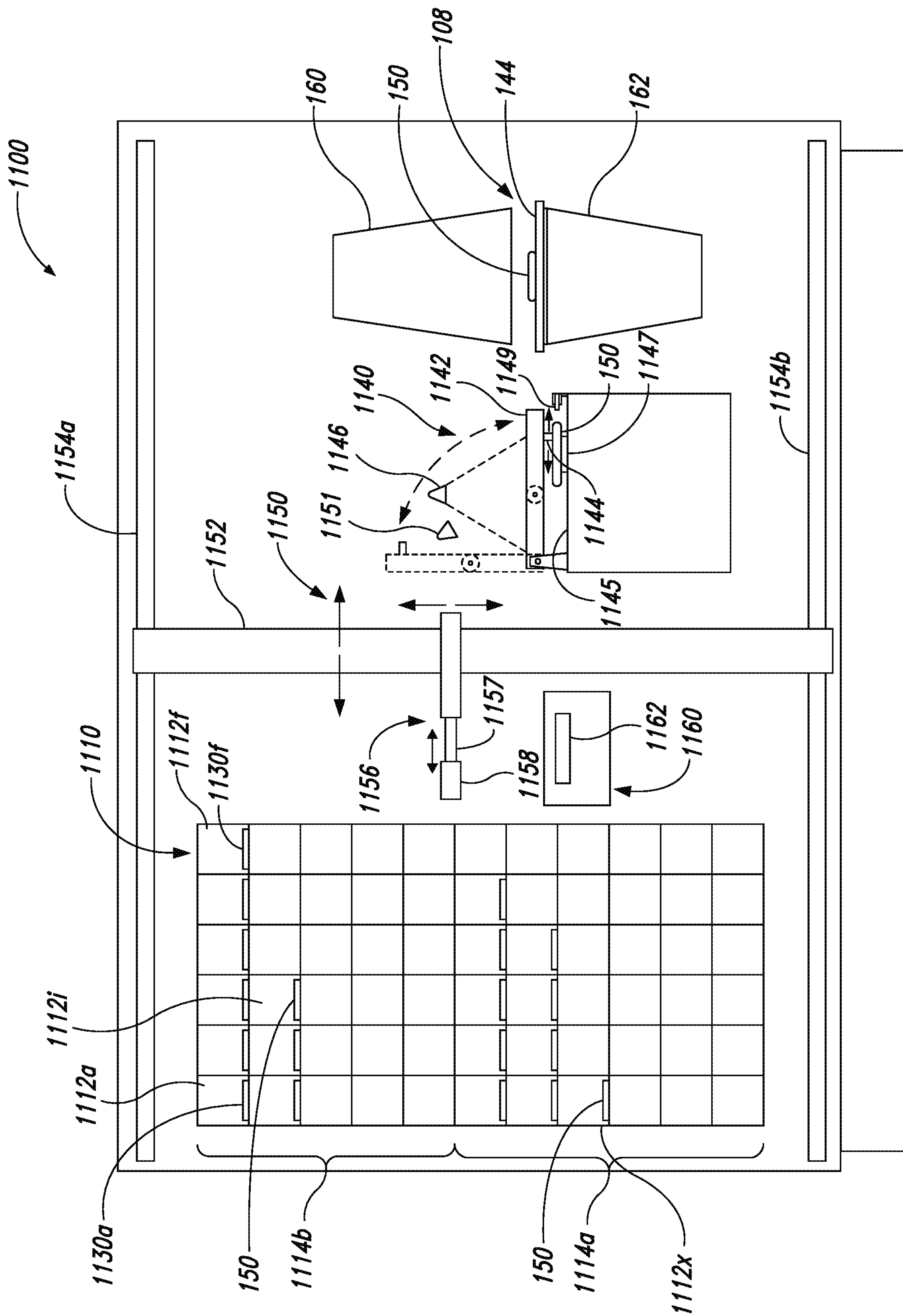


Fig. 11B

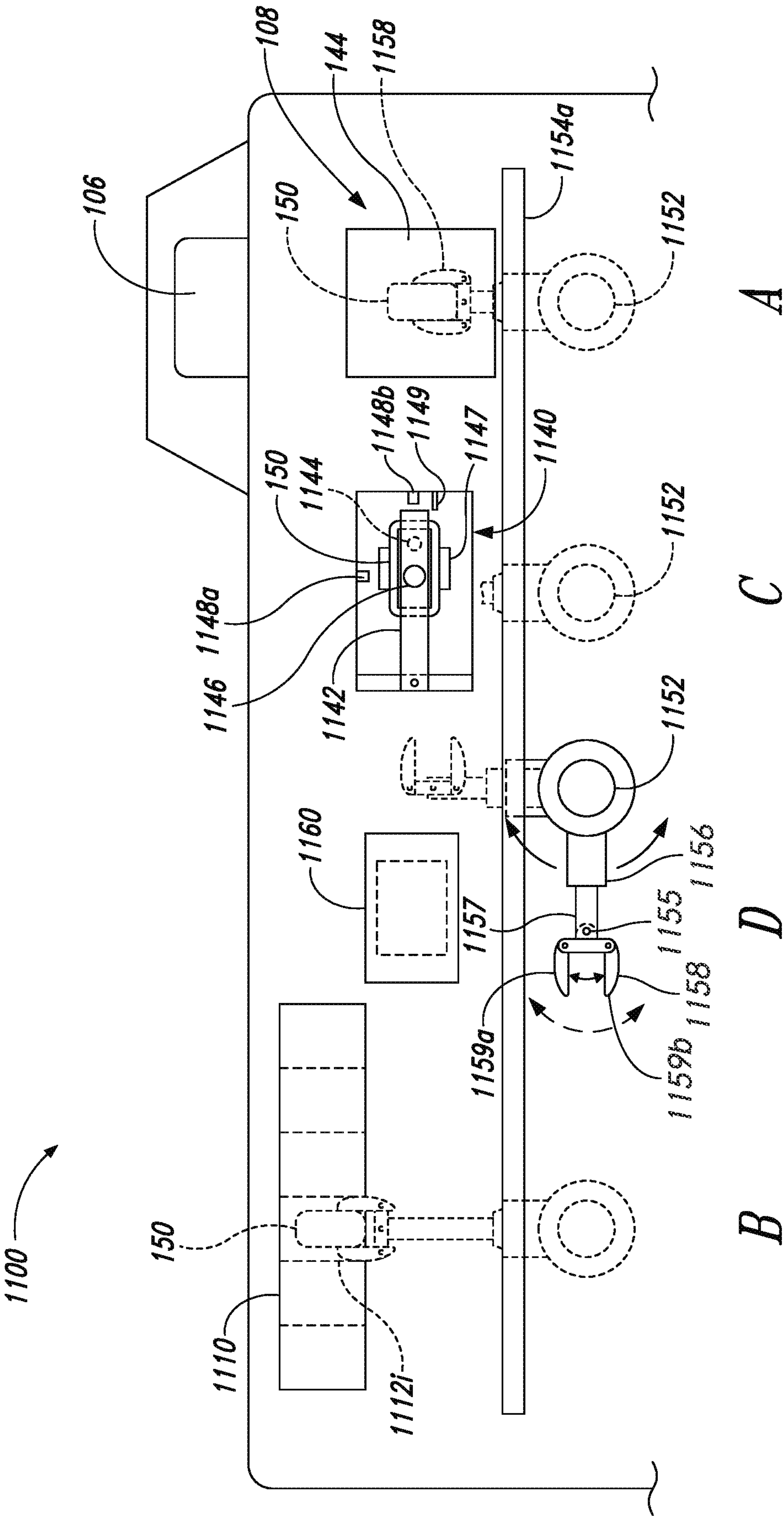


Fig. 11C

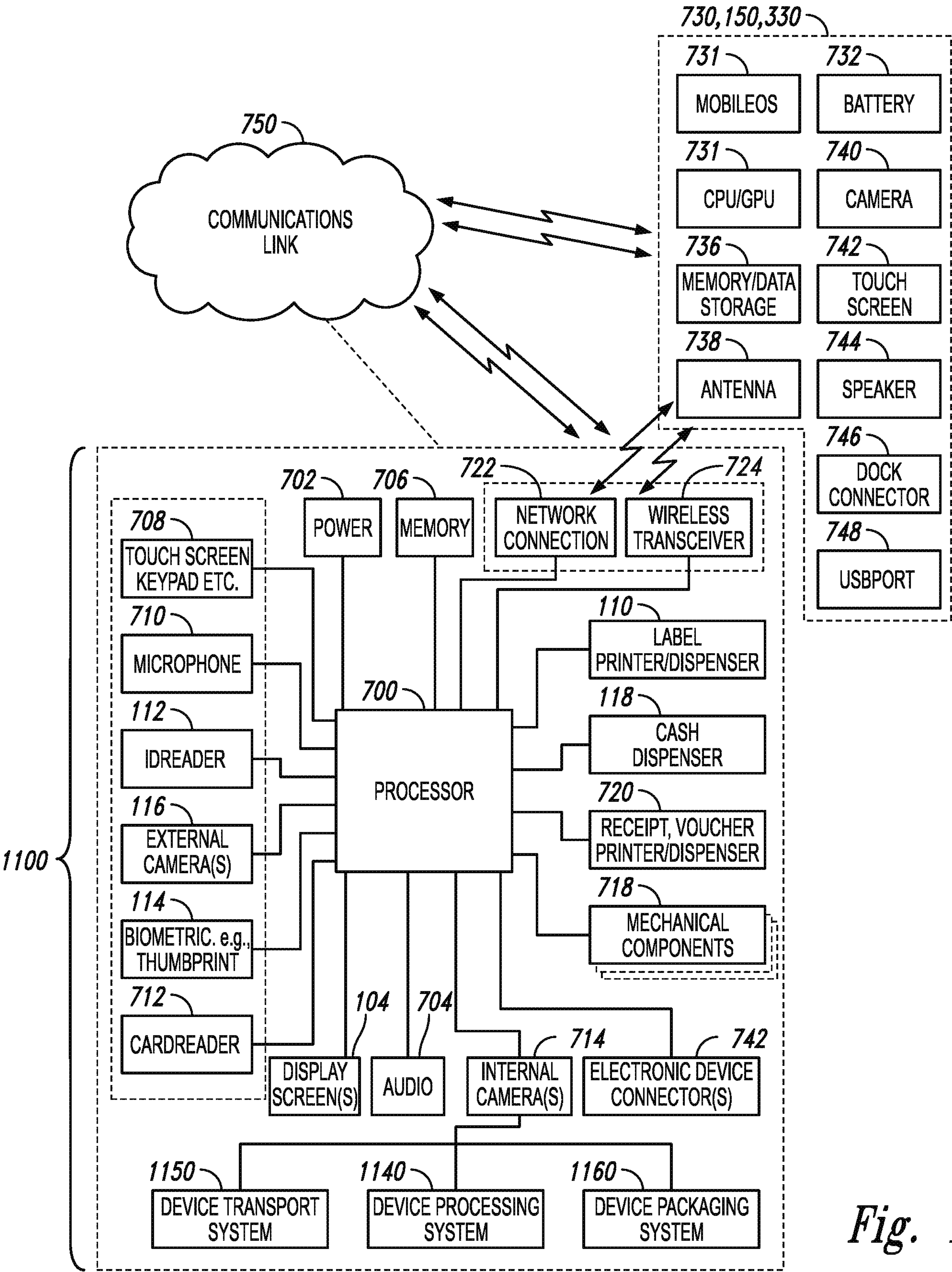
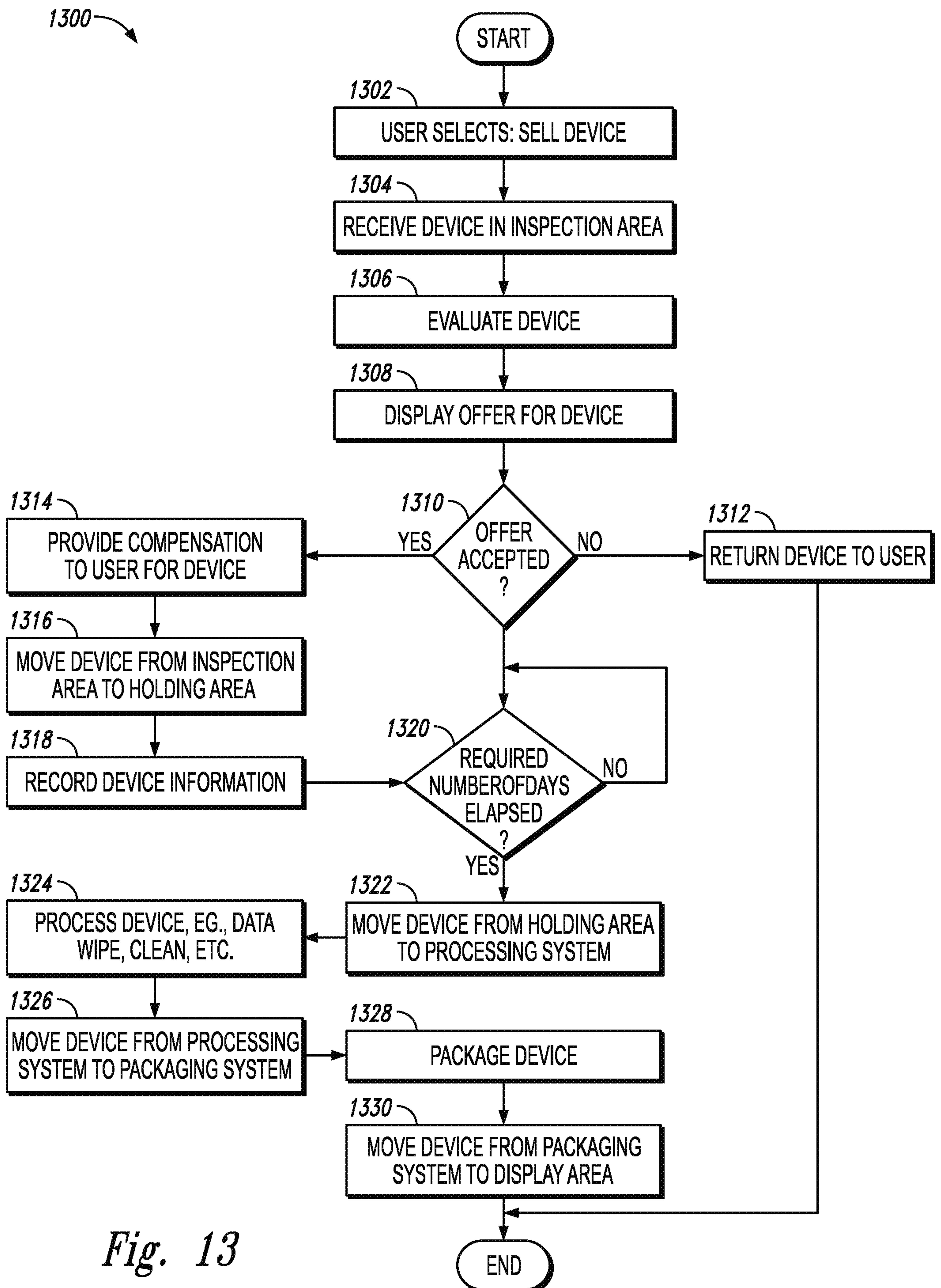
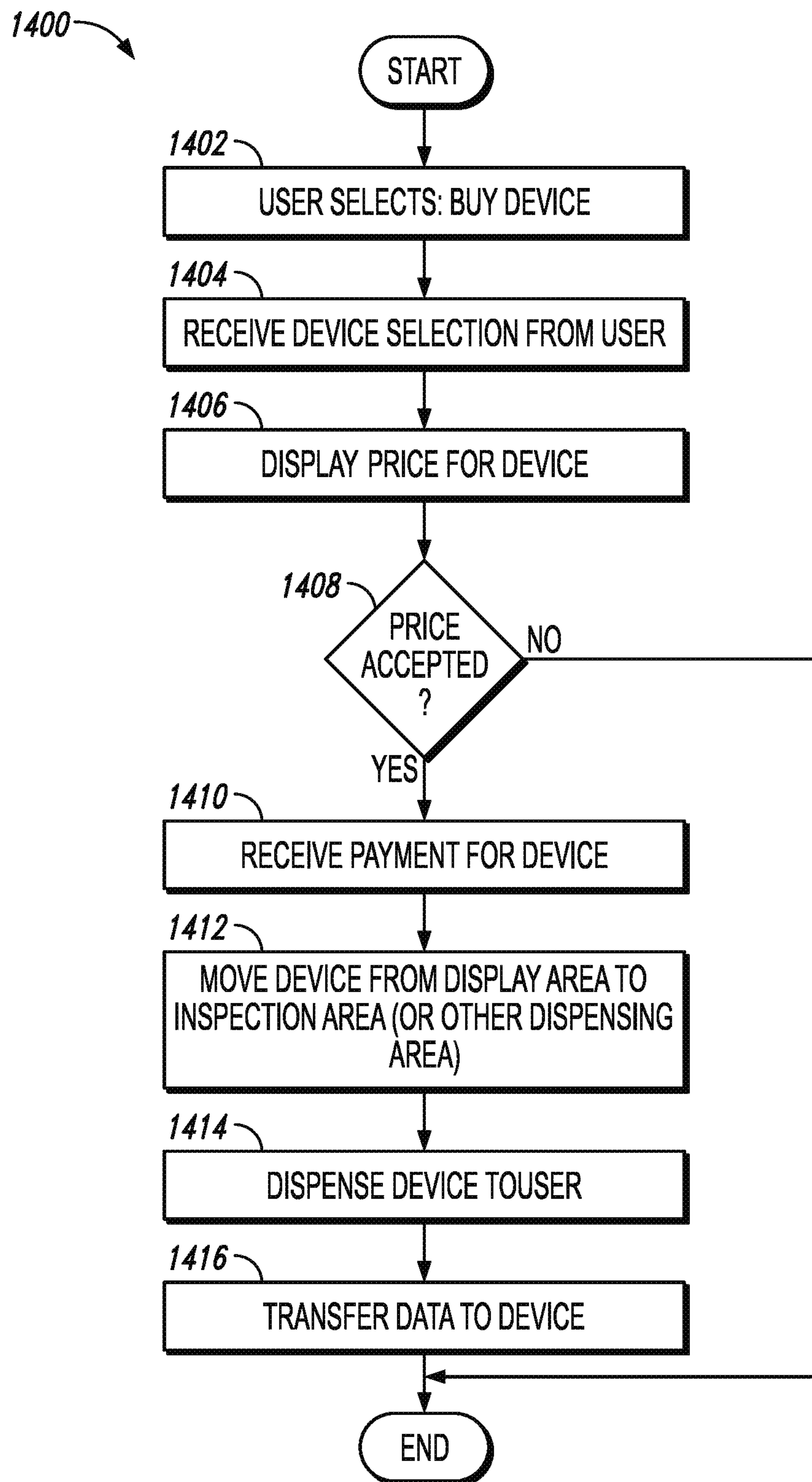


Fig. 12

17/18

*Fig. 13*

*Fig. 14*