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(54) Title: VERTICALLY TRANSLATING STOWAGE COMPARTMENT FOR AIRCRAFT PASSENGER SUITE

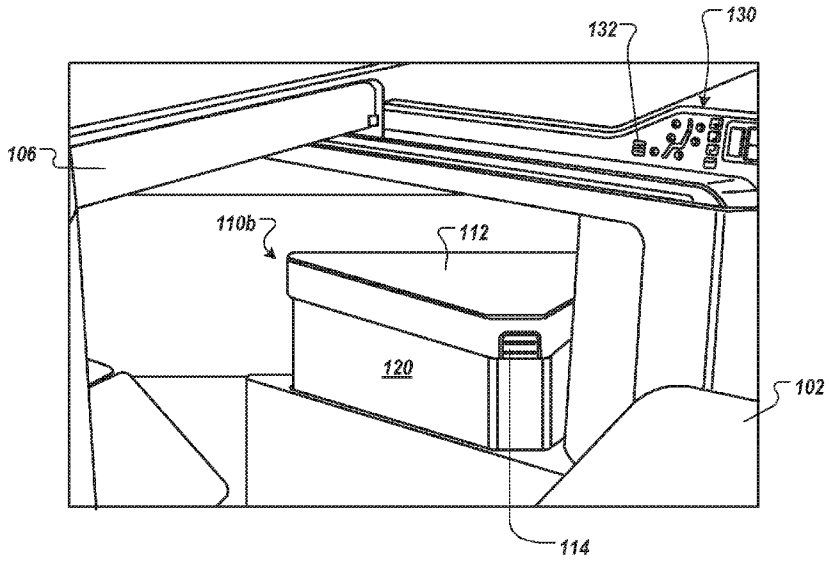

FIG. 1B

(57) Abstract: In an illustrative embodiment, a stowage compartment system for an aircraft passenger suite articulates from a lowered position wherein the top of the compartment is disposed at a height that is approximately even with a footrest or ottoman. In the lowered position, a top surface of the compartment functions as an ottoman or storage counter. In a raised position, the compartment's sidewalls are exposed, and the sidewalls include at least one aperture or door through which an internal volume of the compartment may be accessed.

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VERTICALLY TRANSLATING STOWAGE COMPARTMENT FOR AIRCRAFT PASSENGER SUITE

RELATED APPLICATIONS

[0001] This application claims priority to U.S. Provisional Patent Application Serial No. 62/317,801, entitled "Vertically translating stowage compartment for aircraft passenger seating," filed April 4, 2016. This application incorporates by reference, in its entirety, the following prior patent application to B/E Aerospace, Inc., directed to a lift mechanism: U.S. Patent Application Serial No. 15/289,152, entitled "Vacuum Powered Actuation Mechanism for a Vertically Stowable Aircraft Storage Unit," filed October 8, 2016. All above identified applications are hereby incorporated by reference in their entireties.

SUMMARY OF ILLUSTRATIVE EMBODIMENTS

[0002] In an illustrative embodiment, a stowage compartment system for an aircraft passenger suite articulates from a lowered position wherein the top of the compartment is disposed at a height that is approximately even with a footrest or ottoman. In the lowered position, a top surface of the compartment functions as an ottoman or storage counter. In a raised position, the compartment's sidewalls are exposed, and the sidewalls include at least one aperture or door through which an internal volume of the compartment may be accessed.

[0003] In certain embodiments, the stowage compartment system can include a stowage compartment having an enclosure with a floating pan configured to detect an object placed within the enclosure. In an example, the floating pan can have an integrated sensor configured to communicate to an indicator or a display system a status of the floating pan. The stowage compartment system, for example, may alert a passenger and/or flight crew to items left within the stowage compartment at time of disembarkation.

[0004] In certain embodiments, the stowage compartment can include a temperature control system configured to heat and/or cool the contents of the stowage compartment. In some examples, a passenger may heat a pillow or blanket, cool a bottle of wine, or maintain perishable items at a refrigerated temperature.

[0005] The forgoing general description of the illustrative implementations and the following detailed description thereof are merely exemplary aspects of the teachings of this disclosure, and are not restrictive.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate one or more embodiments and, together with the description, explain these embodiments. The accompanying drawings have not necessarily been drawn to scale. Any values dimensions illustrated in the accompanying graphs and figures are for illustration purposes only and may or may not represent actual or preferred values or dimensions. Where applicable, some or all features may not be illustrated to assist in the description of underlying features. In the drawings:

[0007] FIG. 1A is a perspective drawing of a stowage compartment for an aircraft passenger seat including an enclosure, a lid for covering a top of the enclosure, and a mechanism for vertically moving the enclosure according to an example;

[0008] FIG. 1B is a perspective drawing of the stowage compartment of FIG. 1A, where the lid is level with a top surface of a seat bottom of the passenger seat according to an example;

[0009] FIG. 1C is a perspective drawing of the stowage compartment of FIG. 1A, where the enclosure is raised at full height according to an example;

[0010] FIG. 1D is a perspective drawing of the stowage compartment of FIG. 1C, where the enclosure further includes an optional sliding door according to an example;

[0011] FIG. 1E is a perspective drawing of an aircraft passenger cabin including a seat back, seat bottom and ottoman that are configurable as a lie-flat bed, where the stowage compartment can be raised to be level with a top surface of a seat bottom of the passenger seat to form part of a lie-flat bed according to an example;

[0012] FIG. 2 is a perspective drawing of an embodiment of a lid including a movement button, a credential reader, an indicator, and a thermal setting button;

[0013] FIG. 3A is a perspective drawing of a stowage compartment system including a stowage compartment held in a frame assembly, and a lift assembly connected to the stowage compartment through the frame assembly according to an example;

[0014] FIG. 3B is a perspective drawing of the stowage compartment system of FIG. 3A where the stowage compartment is raised to a full height position according to an example;

[0015] FIG. 3C is a perspective drawing of a side of the stowage compartment system of FIG. 3B according to an example;

[0016] FIG. 4 is a bottom view drawing of the stowage compartment system showing the stowage compartment including a thermo-electric system according to an example; and

[0017] FIG. 5 is a hardware block diagram of a control system for the stowage compartment system according to an example; and

[0018] FIG. 6 is a flow chart illustrating a method for interfacing with the lift assembly system according to an example.

DETAILED DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

[0019] The description set forth below in connection with the appended drawings is intended to be a description of various, illustrative embodiments of the disclosed subject matter. Specific features and functionalities are described in connection with each illustrative embodiment;

however, it will be apparent to those skilled in the art that the disclosed embodiments may be practiced without each of those specific features and functionalities.

[0020] Reference throughout the specification to "one embodiment" or "an embodiment" means that a particular feature, structure, or characteristic described in connection with an embodiment is included in at least one embodiment of the subject matter disclosed. Thus, the appearance of the phrases "in one embodiment" or "in an embodiment" in various places throughout the specification is not necessarily referring to the same embodiment. Further, the particular features, structures or characteristics may be combined in any suitable manner in one or more embodiments. Further, it is intended that embodiments of the disclosed subject matter cover modifications and variations thereof.

[0021] It must be noted that, as used in the specification and the appended claims, the singular forms "a," "an," and "the" include plural referents unless the context expressly dictates otherwise. That is, unless expressly specified otherwise, as used herein the words "a," "an," "the," and the like carry the meaning of "one or more." Additionally, it is to be understood that terms such as "left," "right," "top," "bottom," "front," "rear," "side," "height," "length," "width," "upper," "lower," "interior," "exterior," "inner," "outer," and the like that may be used herein merely describe points of reference and do not necessarily limit embodiments of the present disclosure to any particular orientation or configuration. Furthermore, terms such as "first," "second," "third," etc., merely identify one of a number of portions, components, steps, operations, functions, and/or points of reference as disclosed herein, and likewise do not necessarily limit embodiments of the present disclosure to any particular configuration or orientation.

[0022] Furthermore, the terms "approximately," "about," "proximate," "minor variation," and similar terms generally refer to ranges that include the identified value within a margin of 20%, 10% or preferably 5% in certain embodiments, and any values therebetween.

[0023] All of the functionalities described in connection with one embodiment are intended to be applicable to the additional embodiments described below except where expressly stated or where the feature or function is incompatible with the additional embodiments. For example, where a given feature or function is expressly described in connection with one embodiment but not expressly mentioned in connection with an alternative embodiment, it should be understood that the inventors intend that that feature or function may be deployed, utilized or implemented in connection with the alternative embodiment unless the feature or function is incompatible with the alternative embodiment.

[0024] In some implementations, an aircraft passenger suite can include a stowage compartment system including a stowage compartment 110 having an enclosure 120, a lid 112 for covering a top of the enclosure 120, and a lift assembly 340 (See FIGs. 3A-C) configured for vertically moving the stowage compartment 110. Movement of the stowage compartment 110 can be actuated manually by a conveniently-located lever or button, or electronically with seat-located controls accessible by either the passenger or a flight attendant. In some implementations, passenger-operated controls 130 provided for the passenger seat further include a set of stowage compartment controls 132. In an example, the set of stowage compartment controls 132 can include physical buttons or can be provided on a touch screen. In an example, the set of stowage compartment controls 132 can be configured to adjust a height of the stowage compartment 110. In some implementations, the stowage compartment can be automatically stowed during taxi, take off, and landing ("TTL") TTL. In some implementations, the lid can include one or more buttons configured to activate a feature of the stowage compartment system, as well as one or more indicators configured to indicate a compartment status.

[0025] Turning to FIG. 2, a stowage compartment 200 can include a lid 202 having any one of the activation control 114, a credential reader 210, a thermal setting button 212, and one or

more indicators 214. In an example, the credential reader 210 can be a reprogrammable biometric reader such as a fingerprint sensor configured to lock and unlock the stowage compartment 200. In an example, the credential reader 210 can be a reprogrammable mechanical or digital PIN code lock. In another example, the credential reader 210 can be a credit card reader configured to receive a payment. In an example, the credential reader 210 can be configured to control movement of a mechanical lock and aperture. In this case the mechanical lock can be either on the stowage compartment 200 or the frame assembly 320 (See FIG 3A). In another example, the credential reader 210 can be configured to control power to the lift assembly 340. Alternatively, the credential reader 210 can be configured to send a signal to activate the activation control 114, which in turn can control operation of the lift assembly 340 through a control system 500 (See FIG. 5).

[0026] In an example, the lid 112 can be secured to the stowage compartment 200 or the frame assembly 320 (See FIG 3A). Alternatively, the lid can be connected to the enclosure with a hinge (not shown) such that the lid can be lifted to allow access to the enclosure while the stowage compartment is in a lowered position.

[0027] In some implementations, the enclosure can further include a door 150. As shown in FIG. 1D, the door can be a sliding door, for example to allow the surfaces of the enclosure to be maintained within a footprint of the enclosure. In this manner, the door 150 will not be broken off through actuation while the door is open. Conversely, a hinged door may provide a larger access opening to the enclosure and can include a sensor communicating with the lift mechanism to disallow stowing while the door is in an open position. In an aspect, the door 150 can be configured to keep the enclosure closed when the stowage compartment is raised or lowered for safety. In another aspect, the door 150 can be help maintain the heating and cooling of contents within the enclosure when the stowage compartment is in a raised position. Other safety precautions are further described below.

[0028] In an example, the thermal setting button 212 can be configured to control a thermo-electric system further described below to heat or to cool contents stored in the stowage compartment (See FIG. 4). FIG. 1D shows a vent 140 within the enclosure that can be connected to a duct 414 of the thermo-electric system 400 as best shown in FIG. 4. In an example, the vent 140 is attached to a wall of the enclosure such that the vent 140 allows clearance for the floating pan 122.

[0029] In some implementations, a passenger seat can include a lie-flat mode that permits a passenger to convert an upright seat into a lie-flat seat. In an example, the stowage compartment can be configured to extend a bottom portion of the seat bottom of the passenger seat. The stowage compartment can be positioned near a deck of the aircraft during taxi, takeoff, landing and when the seat is otherwise in an upright position. When commanded by a passenger or flight attendant-activated switch, the lid of the stowage compartment rises to present its contents to the passenger. In the lowered position, the lid is positioned at the same height as the seat in its lie-flat configuration and forms an additional part of the bed surface.

[0030] Turning to FIGs. 1B and 1E, a stowage compartment 110 can be raised such that the lid projects above a top surface of a seat bottom 102 of the passenger seat according to an example. The stowage compartment may be repositioned so that the lid serves as an ottoman, in which case the lid is preferably padded to provide a comfortable bed surface. In such embodiments, the lid may form part of the sleeping surface when the seat is in a lie-flat position. The term "lie-flat" refers to a condition where the seat, ottoman and other features are configured to form a relatively flat bed, the surface of which may be horizontal or nearly horizontal, with the head end of the bed somewhat higher than the foot end. The later condition is referred to as a "near lie-flat" bed. As used in this application, the term "lie-flat bed" refers to beds that are horizontal and beds that have a head end somewhat higher that the foot end.

[0031] FIGs. 3A-3C show drawings of a stowage compartment system 300 including a stowage compartment assembly 310 held in a frame assembly 320, and a lift assembly 340 connected to the stowage compartment assembly 310 through the frame assembly 320 according to an illustrative embodiment. The frame assembly 320 may be integrated into the passenger suite structure. The stowage compartment assembly 310 includes an enclosure 315 having a lid 312. The lid 312 may include an activation control 314 for activating the lift assembly 340, in some implementations. As best shown in FIGs. 3A, 3B and 4, the frame assembly 320 can include an upper frame 322, a set of side panels 324a, 324b (side panel 324a is shown removed), a set of vertical support members 326a, 326b, 326c, a mounting support member 328.

[0032] In some implementations, the set of vertical support members 326a, 326b, 326c and the mounting support member 328 are each coupled to the side panels 324a, 324b and the upper frame 322. The vertical support members 326a and 326b and the mounting support member 328, for example, may be fixed to the side panel 324a using a number of fasteners 332a and 332b. The vertical support members 326a and 326c and the mounting support member 328, for example, may be fixed to the side panel 324b using a number of fasteners 332b and 332c. The vertical side panels 324a, 324b, in some implementations, are formed of a lightweight material, such as a thin plexiglass or polymer material. The upper frame 322 and side panels 324a, 324b, along with the support members 326a, 326b, 326c, 328 together create a substantially wedge-shaped frame to laterally encase the triangular enclosure 315 of the stowage compartment assembly. A set of brackets 330 mounted to the side panels 324a, 324b provide additional support for a lower surface of the enclosure 314 while the enclosure 314 is in a lowered position. For example, the set of brackets 330 disallow vertical movement below the bottom frame of the frame assembly 320. In some embodiments, the side panels 324a, 324b may have insulative properties to provide additional thermal control to the enclosure. In further embodiments, the panels 324a, 324b may be fire retardant.

[0033] In other implementations, the set of vertical support members 326a, 326b, 326c and the mounting support member 328 may be connected by a both the upper frame 322 and a lower frame (as opposed to the side panels 324a, 324b and brackets 330), surrounding the stowage compartment assembly 310 within the frame assembly 320. For example, greater protection can be provided to ensuring the enclosure 315 cannot fall through a bottom of the frame assembly 320 if the entire structure were framed.

[0034] In some embodiments, the mounting support member 328 provides articulating support for the lift assembly 340. For example, as illustrated the mounting support member 328 is a U-shaped surface providing a third vertical wall, along with the panels 324a, 324b, for supporting the lift assembly 340. The lift assembly 340 may include a motor 342 that can receive power and/or control signals from wiring 344 which can be in communication with a controller system described below. The motor 342 is configured to turn a geared axel 346 that is coupled a lead screw 350 by a chain 348. The lead screw 350 may be held vertically in place by a bottom mount 352 and a top mount 354 which are both secured to the mounting support member 328. For example, the bottom mount 352 is secured to a bottom of the "U" shaped surface of the mounting support member 328, while the top mount 354 connects across a top of the "U" shaped surface of the mounting support member 328. This allows a carriage 356 to travel along the lead screw 350 within the aperture of the "U" shaped opening of the support member 328, between the bottom mount 352 and the top mount 354. When the lead screw 350 is rotated, for example, the carriage 356 is configured to move either up and down depending on a direction of rotation.

[0035] In some implementations, a platform 360, supporting the stowage compartment assembly 310, is secured to the carriage 356 by a bracket 358 such that the platform 360 is raised and lowered along with the carriage 356. As best shown in FIG. 4, the platform 360 can be further supported and connected to the carriage 356 by an extension 430 coupled to the

bracket 358. In some implementations, the extension 430 can be used to support a floating pan 122 as described in further detail below.

[0036] In some implementations, the stowage compartment system 300 can include one or more sensors configured as primary or secondary feedback to control movement. In an example, a proximity (e.g., "strike") sensor 370a can be attached to the support member 328 or the top mount 354 and can indicate when the carriage 356 has reached a highest vertical point. Similarly, a proximity ("strike sensor") 370b can be attached to the support member 328 or the bottom mount 352 and can indicate when the carriage 356 has reached a lowest vertical point. Additional strike sensors or other sensor types can be introduced to provide greater precision in location of the carriage 356. In another embodiment, the motor 342 and/or the lead screw 350 can be calibrated for marking a predetermined number of turns per vertical increment.

[0037] In some embodiments, the strike sensor includes a mating sensor element on the carriage 356 to determine proximity. For example, a Hall effect sensor may be used to determine proximity to a magnetic field (e.g., a magnet presented upon a surface of the carriage 356), which can be translated to a range of positions. In another embodiment, a reed switch is opened or closed by a magnetic field, such that a binary position (e.g., at this position, not at this position) may be readily determined based upon a switch position. In a further embodiment, an optical switch may be used to determine whether a beam of light has been broken, which can translate to whether the carriage has reached the position of the beam or not.

[0038] In an example, an object within the enclosure may be sensed using one or more infrared (IR) transceiver pairs. According to such an example, an IR transmitter may be fixedly attached to a side wall of the enclosure, and may point inward across the bottom of the enclosure or floating pan 122. When a beam from the IR transmitter is blocked by the objects, the IR receiver may not receive the beam from the IR transmitter and thus may detect objects in the

stowage compartment 110. In some examples, one or more IR receiver pairs may be employed within the stowage compartment 110, and may be arranged horizontally, for example, to greater area across the bottom of the enclosure or floating pan 122. In some embodiments, a mirrored or reflective surface points may be used to reflect a single beam along a multi-segment optical path. When the bin is empty, the beam will be arranged to transit from an emitter to a detector via a multi-segment path that includes reflections off of one or more reflective surfaces within the stowage compartment. When a beam transmitted by the emitter is not received by the detector, then a signal may be generated to, for example, the controller or headend computer system, to indicate that an object is in the stowage compartment.

[0039] In some implementations, a stowage compartment system can be configured to detect usage of the enclosure such as an object placed within the enclosure. In an example, the stowage compartment system can be configured to detect usage mechanically such as by measuring a weight of an object placed in the enclosure. In another example, the stowage compartment system can be configured to detect usage optically such as using a camera, laser, or photodiode (not shown) for sensing an obstruction on a bottom of the enclosure.

[0040] Turning to FIG. 1C, a stowage compartment system can include a stowage compartment 110c having an enclosure with a floating pan 122 resting on a bottom of the enclosure. In an example, the floating pan 122 can have an integrated sensor configured to communicate to the indicator 214 or another display system a status of the floating pan 122. In another example, a weight sensor can be placed between the floating pan 122 and the platform 360.

[0041] In an illustrative example, the weight sensor may provide an object detection signal, for example, based on a change in a resistive output in response to a weight load placed on the floating pan 122. In some examples, the resistive output is read by processing circuitry. In an illustrative example, an aircraft headend computer processing subsystem may read the output

of the object detection signals and may alert passengers, attendants, and/or crew of the presence, absence, weight, and/or location of objects within the stowage compartments.

[0042] In some implementations, the floating pan 122 and/or the weight sensor can be configured to compensate for altitude of the aircraft. In an example, the floating pan 122 and/or the weight sensor can be in communication with a barometer configured to determine a pressure within the stowage compartment (not shown).

[0043] In an example, the weight sensor can be used to determine if the enclosure is storing any personal items. In an example, the weight sensor can be configured to control an indicator 214 on the lid 202 or within the set of stowage compartment controls 132. Examples of weight sensors can include a force-sense resistor, a spring, electrical contacts, as well as any other sensor for determining a weight of an object placed in the container. In some implementations,

[0044] In some implementations, a stowage compartment can include a thermo-electric system 400 configured to provide conditioned air to the enclosure. In an example, the thermo-electric system 400 can include a fan 410 connected to a thermo-electric element 420 with a duct 414. The fan 410 can be connected to the platform 360 with a set of fasteners 412. The thermo-electric element 420 can be connected to the platform 360 with a set of fasteners 422. In an example, the thermo-electric element 420 can include a coil heater configured to heat air passing through the duct 414 blow from the fan 410. In an example, the thermo-electric element 420 can be configured to vary an amount of heating of the air. For example, a blanket can be stored in the stowage compartment and kept warm until use. Each passenger may have a different preference for how warm to have their blanket. In an example, the set of stowage compartment controls 132 can include a timer configured to activate the thermo-electric element 420 for a preset amount of time. In an example, the set of stowage compartment controls 132 can further include a temperature sensor configured to determine when the enclosure has reached a predetermined temperature. In an example, the temperature sensor can

be a digital thermometer. In another example, the temperature sensor can be an infrared camera or infrared laser configured to detect a temperature of a surface or an object within the enclosure.

[0045] In certain embodiments, the thermo-electric system 400 can include a chiller plate (not shown) to cool contents stored in the stowage compartment. In an example, a pillow can be stored in the stowage compartment cooled when not in use. In another example, the thermo-electric system 400 can be configured to make the stowage compartment system function as a wine chiller. In an example, the set of stowage compartment controls 132 can include custom settings including for white/red wine settings, etc. In this case a passenger can have their personal wine at their side.

[0046] Turning to FIG. 5, a hardware block diagram of a control system 500 for a stowage compartment system is illustrated. The components included in the block diagram of the system 500 are non-limiting and can include other components in addition to or instead of those described herein. In some implementations, the system 500 includes a controller 502 that can be configured to control a lift assembly control 520 and a thermo-electric system control 530. The controller 502 may include a processor 504, memory 506, and associated circuitry, and may be connected to an I/O device 508, sensors 510, and one or more indicators 540 via a wired or wireless network connection.

[0047] In some implementations, the controller 502 can be configured to determine when there is an object within the compartment. In an example, the controller 502 can be configured to monitor any one of the floating pan 122, the weight sensor, the optical (IR) sensor, determine a compartment status based on comparing the monitoring to a reference, and control the one or more indicators 540 to reflect the compartment status. In an example, a reference for the floating pan 122 and the weight sensor can be a predetermined absolute threshold or a relative threshold that can be reset after each use. In an example, an exposed surface of the floating

pan 122 can include a pattern, such as a grid, in which the optical sensor can detect. The controller 502 can be configured to determine that there is an object within the compartment when the pattern is obstructed.

[0048] In some implementations, the controller 502 or lift assembly control 520 can be configured to determine if there is an obstruction either above the lid or between the enclosure and the top cover 322. In an example, the stowage compartment can include an optical or infrared sensor configured to determine when an object is placed on top of the lid. Alternatively, the optical sensor can be located above or adjacent to the stowage compartment with a line of sight to the top of the lid. In another example, the stowage compartment can include a door sensor configured to detect if the door is properly closed, therefore, preventing an object from obstructing movement of the stowage compartment. For example, for open to close motion of the door, an orientation sensor such as a Hall sensor or Reed switch may be used with a magnet incorporated, for example, into the stowage compartment to identify proximity. When the controller 502 determines that there is an obstruction of the door is not closed, the controller 502 or lift assembly control 520 can pause any movement instruction and control the one or more indicators 540 to reflect an error.

[0049] In some implementations, the controller 502 or lift assembly control 520 can be configured to determine when the lift assembly 340 is overloaded. In an example, the motor 342 can be configured to detect an amount of torque being applied to turn the geared axel 346. In an example, the lid can include a pressure sensor configured to determine an amount of weight placed on top of the lid. In another example, the lid can include a sensor configured to determine when an object is placed on top of the lid.

[0050] In some implementations, the controller 502 can be configured for determining when a security credential is met to operate the lift assembly 340. In an example, the controller 502 can be configured for controlling the lift assembly control 520 based on an input from the

credential reader 512 (210). In an example, the credential reader 512 can store a credential in the memory 506 or within the credential reader 512. In an example, the controller 502 can compare a received credential with a credential stored in the memory 506. In another example, the controller 502 can receive a true or false indication from the credential reader 512.

[0051] In some examples, the determination may include receiving inputs from the passenger or flight attendant at an I/O device 508, which can include a video monitor, mobile device, tablet, or other device connected to the controller 502 via a wired or wireless connection, a sensed status of the passenger within a suite or seat from one or more sensors 510 such as the set of controls 130.

[0052] In some implementations, the controller 502 can be configured for operating the thermo-electric system 400 via the thermo-electric system control 530. In an example, when the controller 502 receives a command from the I/O device 508 and/or the sensors 510 to heat or cool the compartment, the controller 502 can instruct the thermo-electric system control 530 to operate the fan 410 and the thermo-electric element 420. In an example, the temperature system control 530 can monitor the command from the I/O device 508 and/or the sensors 510 to set a predetermined temperature. In an example, the temperature system control 530 can heat up and/or cool down, recognize the predetermined temperature has been reached, and control an indicator 540. In an example, the temperature system control 530 can function to maintain the predetermined temperature by activating the fan 410, the chiller plate, and/or the thermo-electric element 420 as needed based on the temperature sensor. In an example, the temperature system control 530 can indicate whether the door to the enclosure or the stowage compartment must be stowed in order to heat/cool efficiently. In some cases, the cabin floor may radiate heat greater than the temperature system control 530 can cool down. In such a case, when the temperature system control 530 determines that the predetermined temperature

cannot be reached, the temperature system control 530 can control an indicator 540 reflecting that. This can prevent items such as stored wine from being damaged due to excess heat.

[0053] Various embodiments may achieve one or more advantages. For example, in some embodiments, the controller 502 may calculate and display a loaded and an unloaded state of some or all of the stowage compartments on an aircraft based on the values received from an array of sensors operatively coupled to each of the stowage compartments. The controller 502 may also calculate and display, for review by the flight crew, an intensity and/or distribution of loads among the stowage compartments. In some implementations, the controller 502 may alert, such as by visual indication for example, passengers or flight crew of items remaining in the stowage compartments, for example, to reduce the rate of unintentionally abandoned items left behind during deplaning.

[0054] Turning to FIG. 6, a flow chart illustrates in example method 600 for interfacing with the lift assembly system and the lift assembly system control. In some implementations, the method 600 begins with receiving an activation signal (602). For example, the lift assembly system may only be activated during times of flight. In a particular example, upon beginning of the boarding process, the activation signal is turned off and turned on during cruising altitude. Examples of receiving an activation signal can further include receiving an input from the set of stowage compartment controls 132 or the activation control 114. In an example, the input from the set of stowage compartment controls 132 or the activation control 114 can indicate a movement direction or a preset position such as full height, stow away height, or bed height.

[0055] In some implementations, sensor information is collected from a number of networked sensors (604). The information, for example, may be gathered through communicating with wireless and/or wired communication interfaces of each sensor within the aircraft including the

door sensor, the weight sensor, the credential reader, the bed configuration, TTL status, and motor status.

[0056] In some implementations, a determination is made if the sensor information is within tolerance (606). When the determination indicates that the sensor information is not within tolerance (No), an indicator is displayed reflecting the sensor information. When the determination indicates that the sensor information is within tolerance (Yes), the motor 342 is activated to move based on the activation signal (610). During movement, the method 600 continually returns to step 604 to determine if a change has occurred.

[0057] While certain embodiments have been described, these embodiments have been presented by way of example only, and are not intended to limit the scope of the present disclosures. Indeed, the novel methods, apparatuses and systems described herein can be embodied in a variety of other forms; furthermore, various omissions, substitutions and changes in the form of the methods, apparatuses and systems described herein can be made without departing from the spirit of the present disclosures. The accompanying claims and their equivalents are intended to cover such forms or modifications as would fall within the scope and spirit of the present disclosures.

CLAIMS

What is claimed is:

1. A passenger suite comprising:

a footwell;

a reclining passenger seat;

a footrest disposed in the footwell, the footrest adapted to abut the passenger seat when the passenger seat is in a lie-flat position;

a storage unit adjacent to a seat bottom portion of the passenger seat when the seat is in a lie-flat position, wherein the storage unit comprises a housing and a vertically translating storage compartment including

a top member that serves as a shelf or ottoman when the storage unit is in a stowed position,

at least one vertical wall member extending downwardly from the top member, the at least one wall member at least partially defining an internal storage space and including at least an aperture or door that provides access to the internal storage space when the storage unit is in an operative position;

wherein the internal storage space is inaccessible when the storage unit is in the stowed position; and

a motor to move the storage unit between the stowed position and the operative position.

2. The suite of claim 1, wherein the internal storage space is temperature controlled independently of the aircraft cabin.

3. The suite of claim 1, wherein the at least one vertical wall includes a sliding door that provides access to the internal storage space when the storage unit is in an operative position.

4. The suite of claim 1, wherein the at least one vertical wall includes an opening that provides access to the internal storage space when the storage unit is in an operative position.

5. The suite of claim 1, further comprising security means to prevent unauthorized access to the internal storage space.

6. The suite of claim 1, further comprising a controller configured to receive user commands, and cause the motor to articulate the storage unit between the stowed position and the operative position.

7. The suite of claim 6, further comprising a passenger interface configured to transmit commands to the controller.

8. The suite of claim 6, wherein the controller is adapted to transmit a signal to a remote crew station concerning a current position of or a condition relating to the storage unit.

9. The suite of claim 1, further comprising a load sensor configured to halt translation of the storage unit in response to detection of an overload condition.

10. The suite of claim 1, further comprising at least one vertical track to guide the storage unit.

11. A passenger suite comprising:

a reclining passenger seat;

a footrest disposed in a footwell;

a storage unit disposed beneath the footrest, wherein the storage unit comprises a housing and a vertically translating storage compartment including

a top member disposed proximate and underneath the footrest,

at least one vertical wall member extending downwardly from the top member,

the at least one wall member at least partially defining an internal storage

space and including at least an aperture or door that provides access to the internal storage space when the storage unit is in an operative position;

wherein the internal storage space is inaccessible when the storage unit is in the stowed position; and

a motor to move the storage unit between the stowed position and the operative position.

12. The suite of claim 11, wherein the internal storage space is temperature controlled independently of the aircraft cabin.

13. The suite of claim 11, wherein the at least one vertical wall includes a sliding door that provides access to the internal storage space when the storage unit is in an operative position.

14. The suite of claim 11, wherein the at least one vertical wall includes an opening that provides access to the internal storage space when the storage unit is in an operative position.

15. The suite of claim 11, further comprising security means to prevent unauthorized access to the internal storage space.

16. The suite of claim 11, further comprising a controller configured to receive user commands and to cause the motor to articulate the storage unit between the stowed position and the operative position.

17. The suite of claim 16, further comprising a passenger interface to transmit commands to the controller.

18. The suite of claim 16, wherein the controller is adapted to transmit a signal to a remote crew station concerning a current position of or a condition relating to the storage unit.

19. The suite of claim 11, further comprising a load sensor configured to halt translation of the storage unit in response to detection of an overload condition.

20. The suite of claim 11, further comprising at least one vertical track to guide the storage unit.

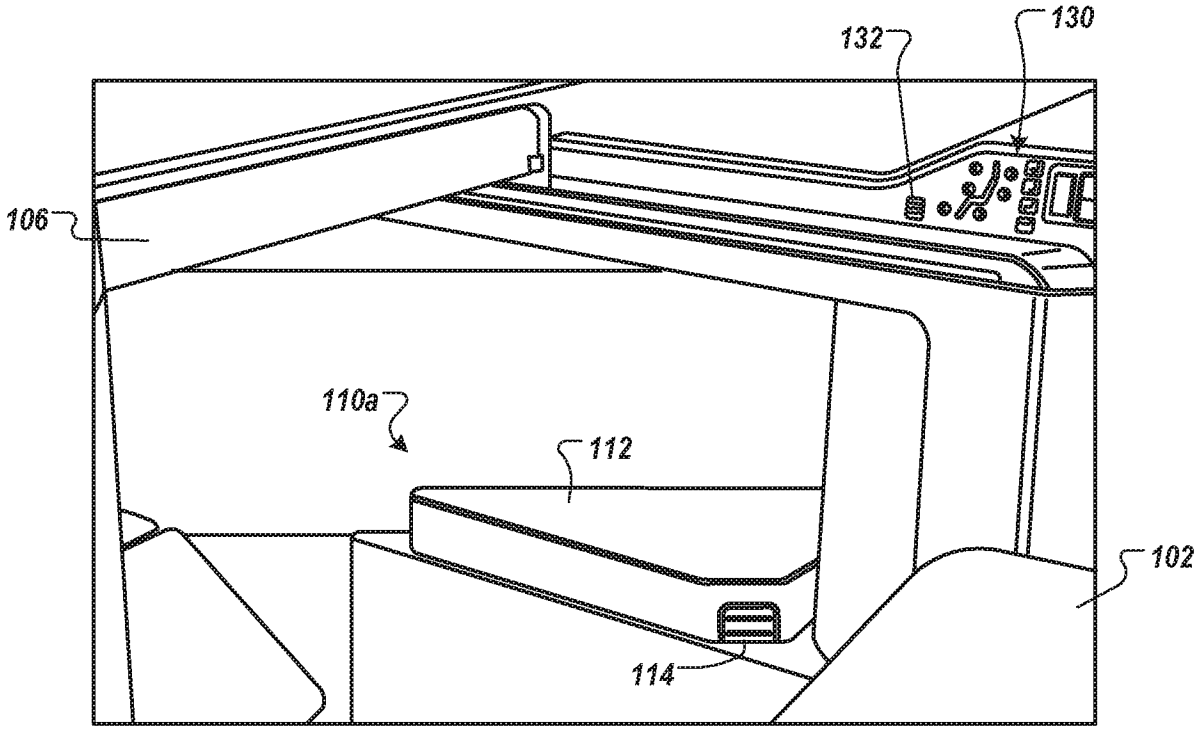


FIG. 1A

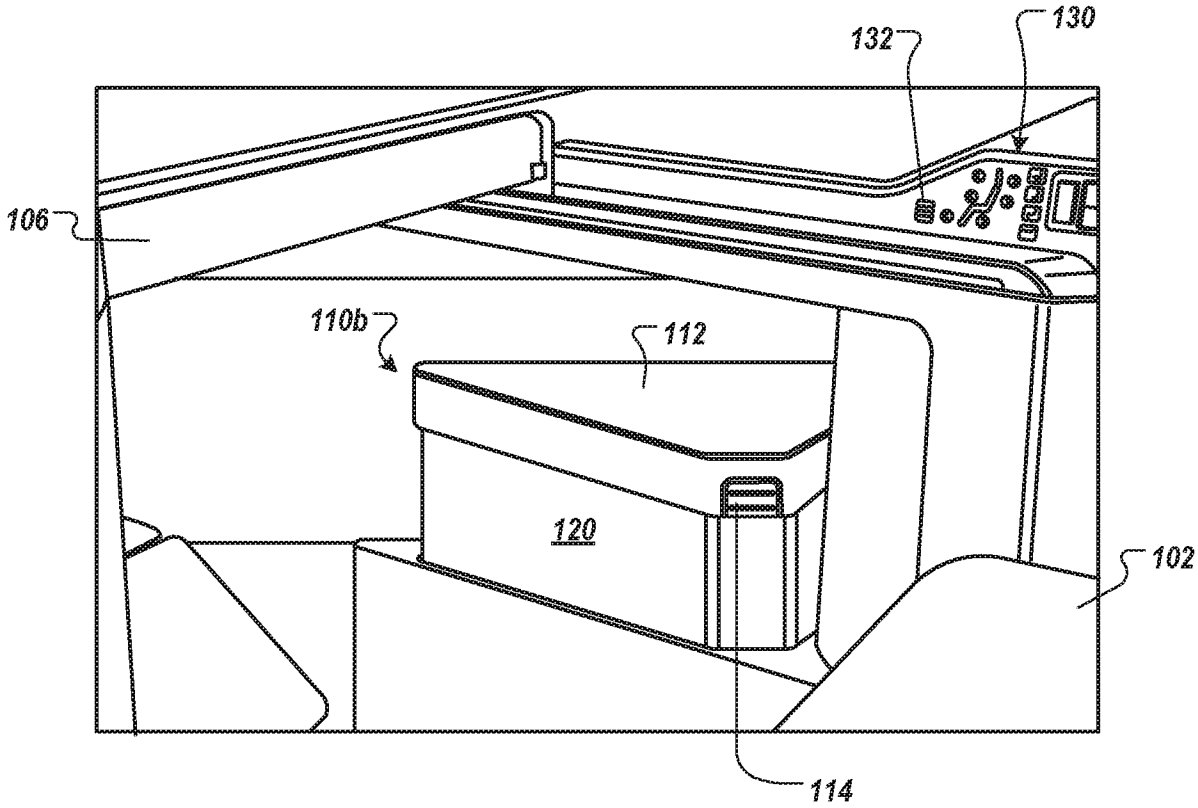


FIG. 1B

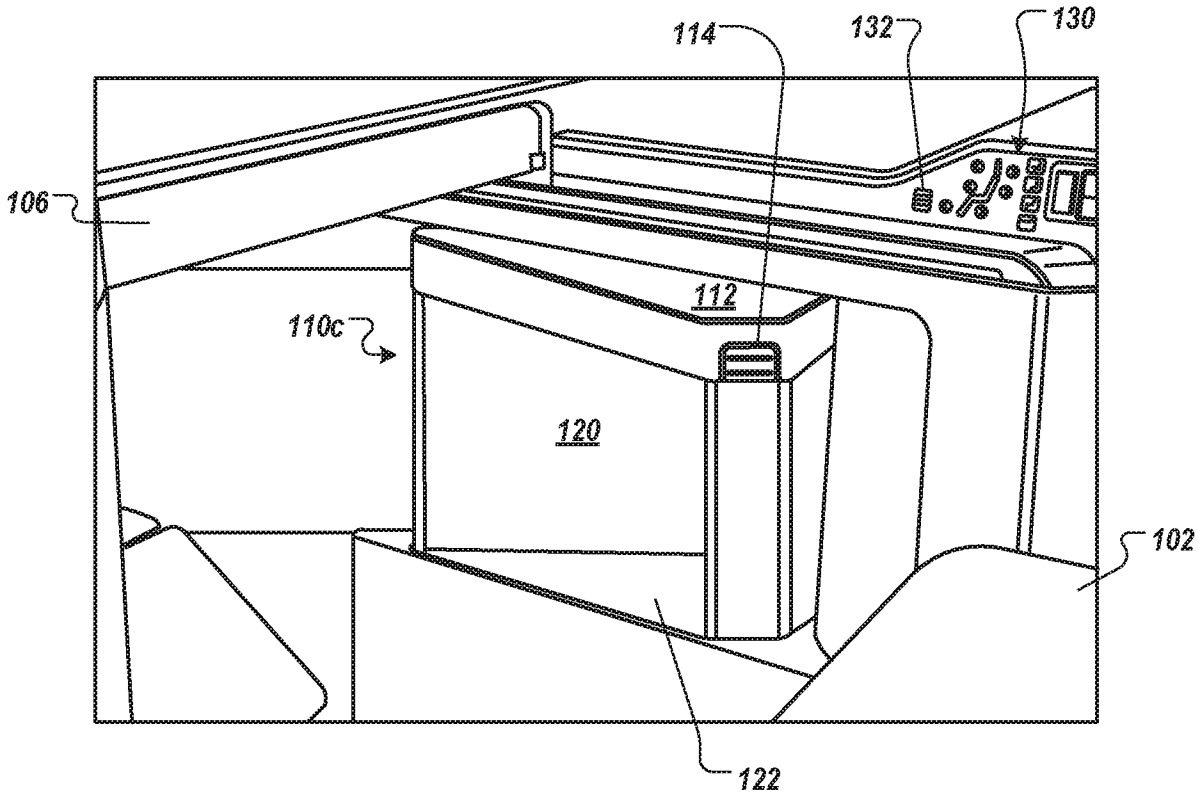


FIG. 1C

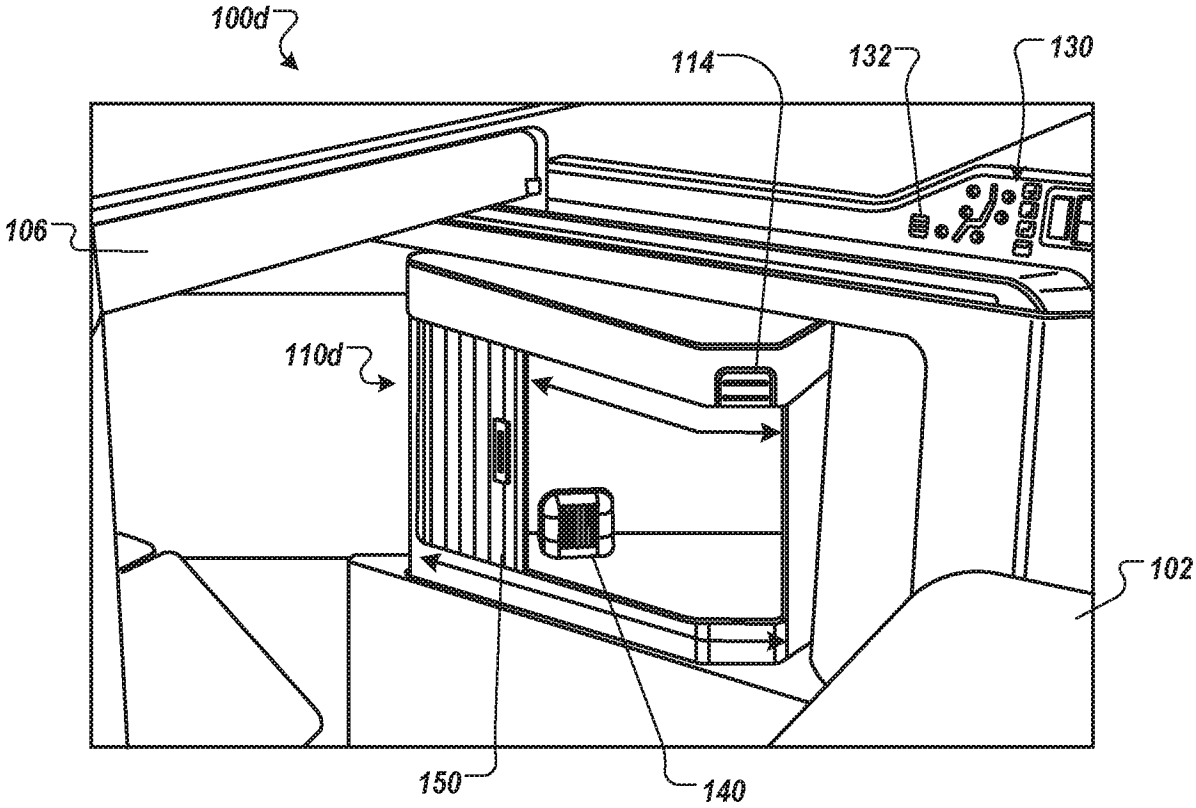


FIG. 1D

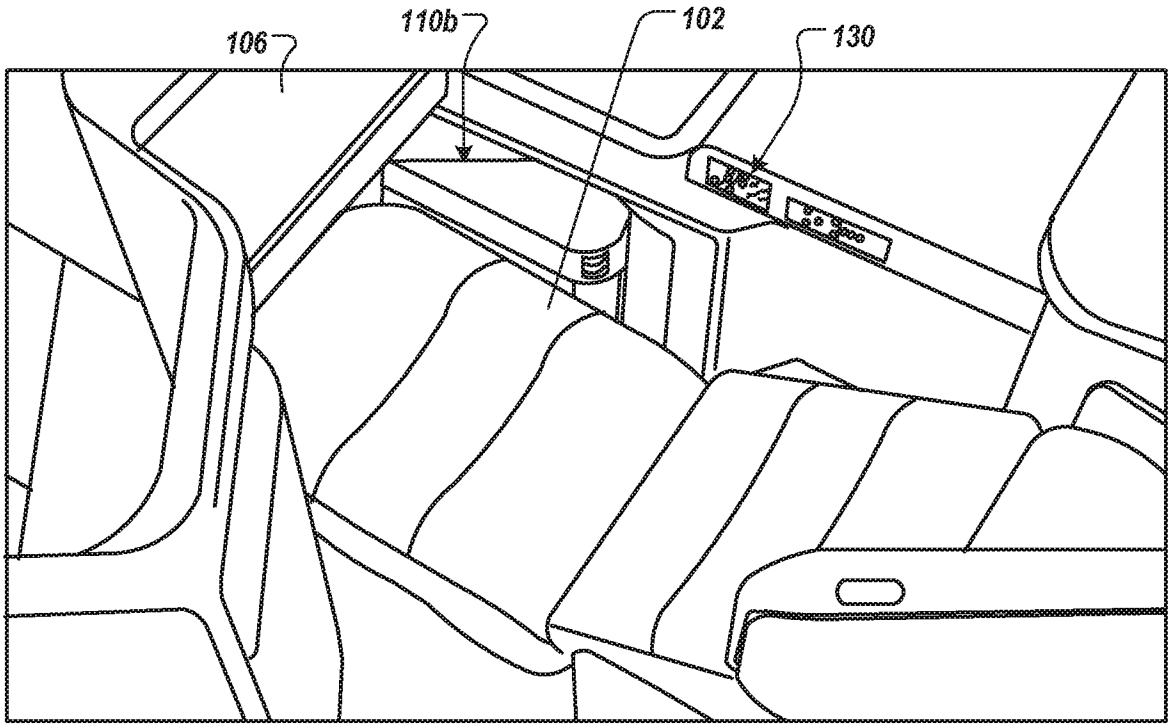


FIG. 1E

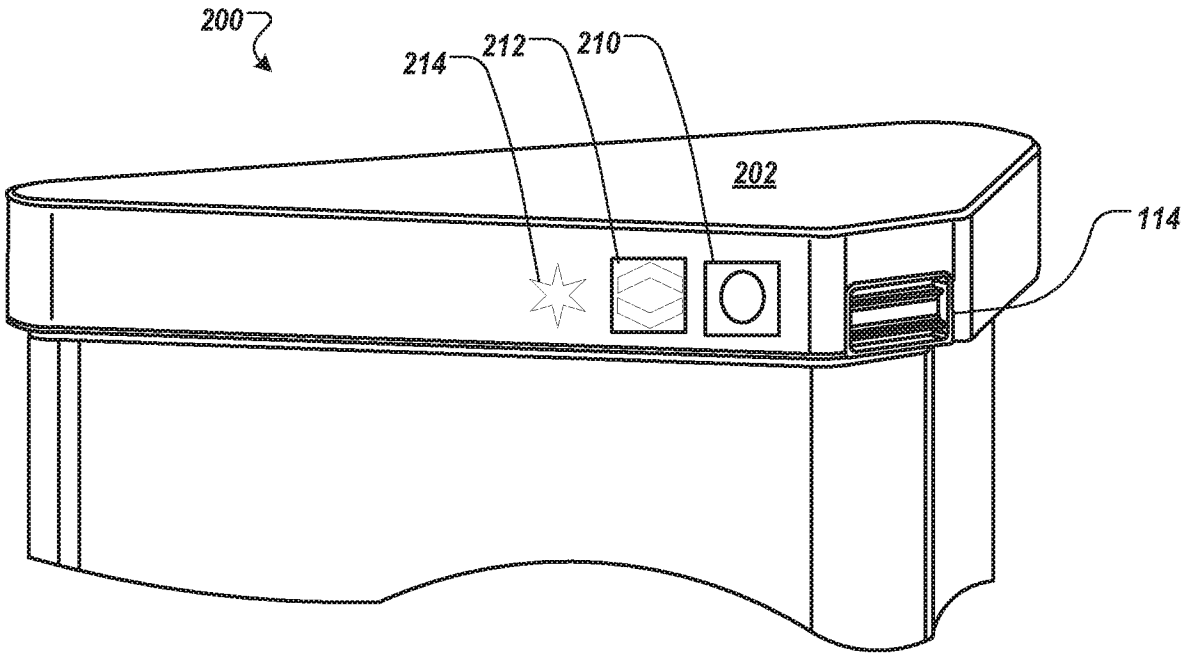
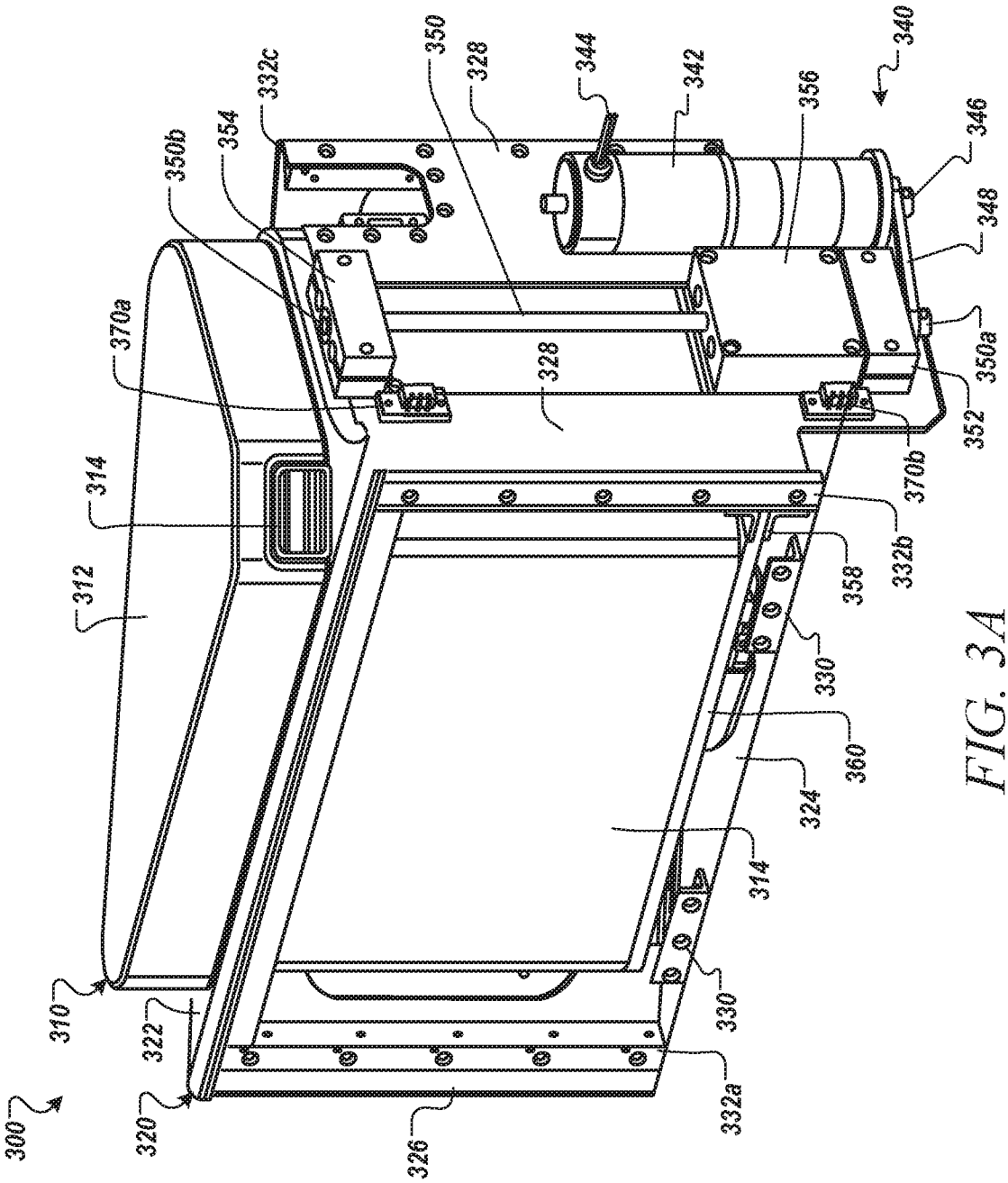


FIG. 2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314
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332a
332b
332c
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350a
350b
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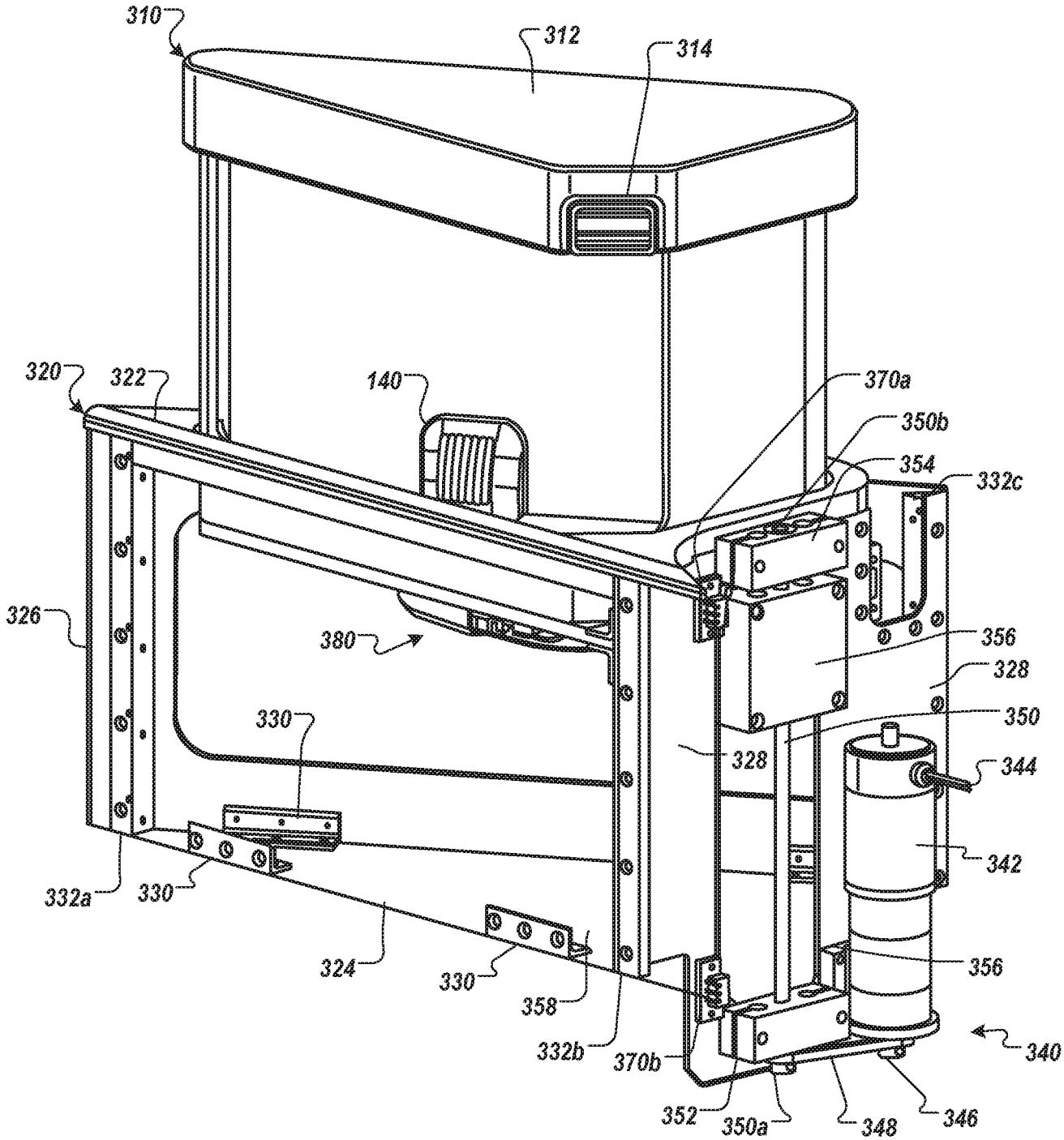
358
360
370a
370b

FIG. 3A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322
140
370a
350b
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332c
326
380
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328
330
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332a
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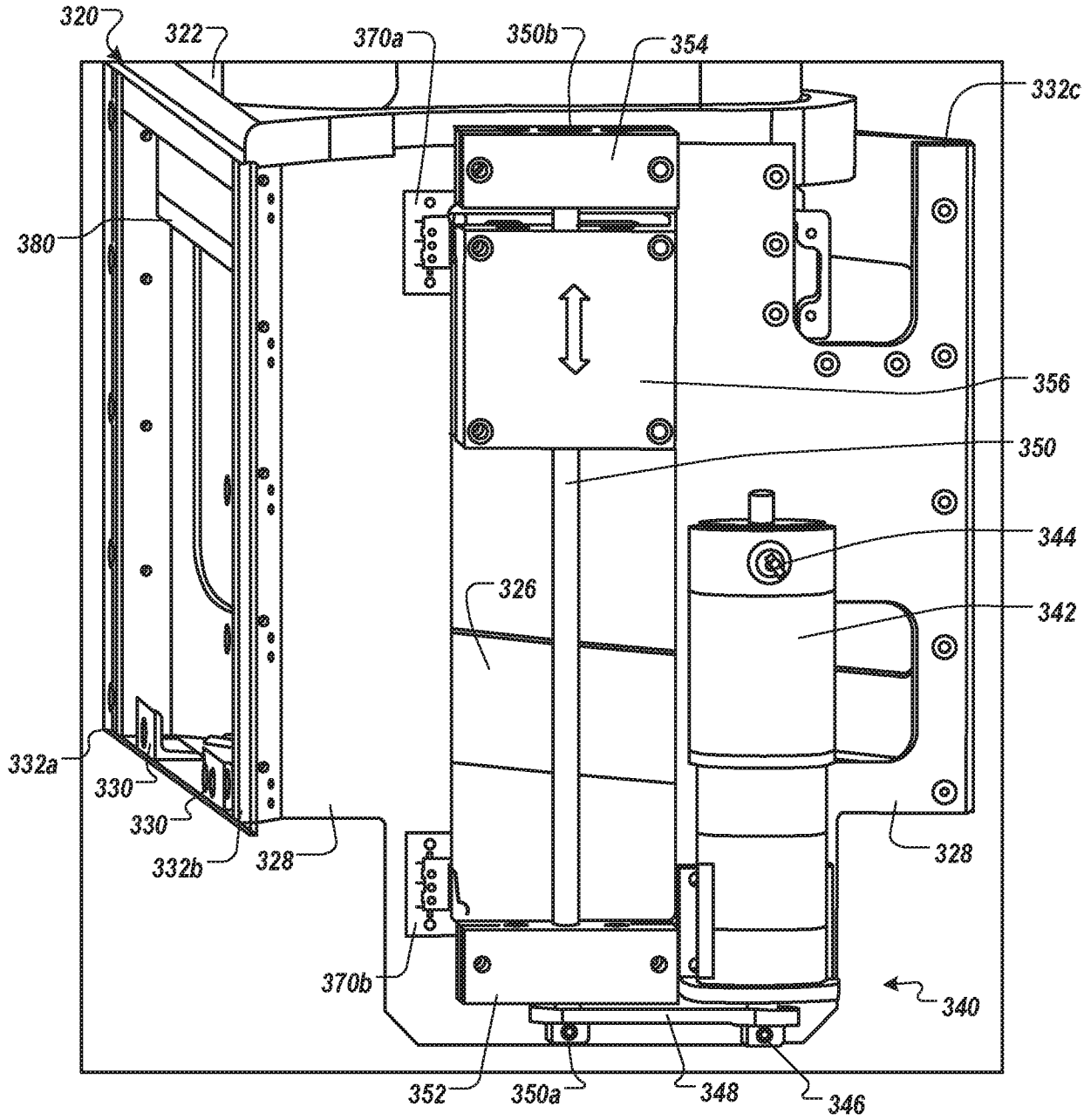
330
358
356
332b
370b
340
352
350a
348
346

FIG. 3B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322
370a
350b
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332c
380
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332b
328
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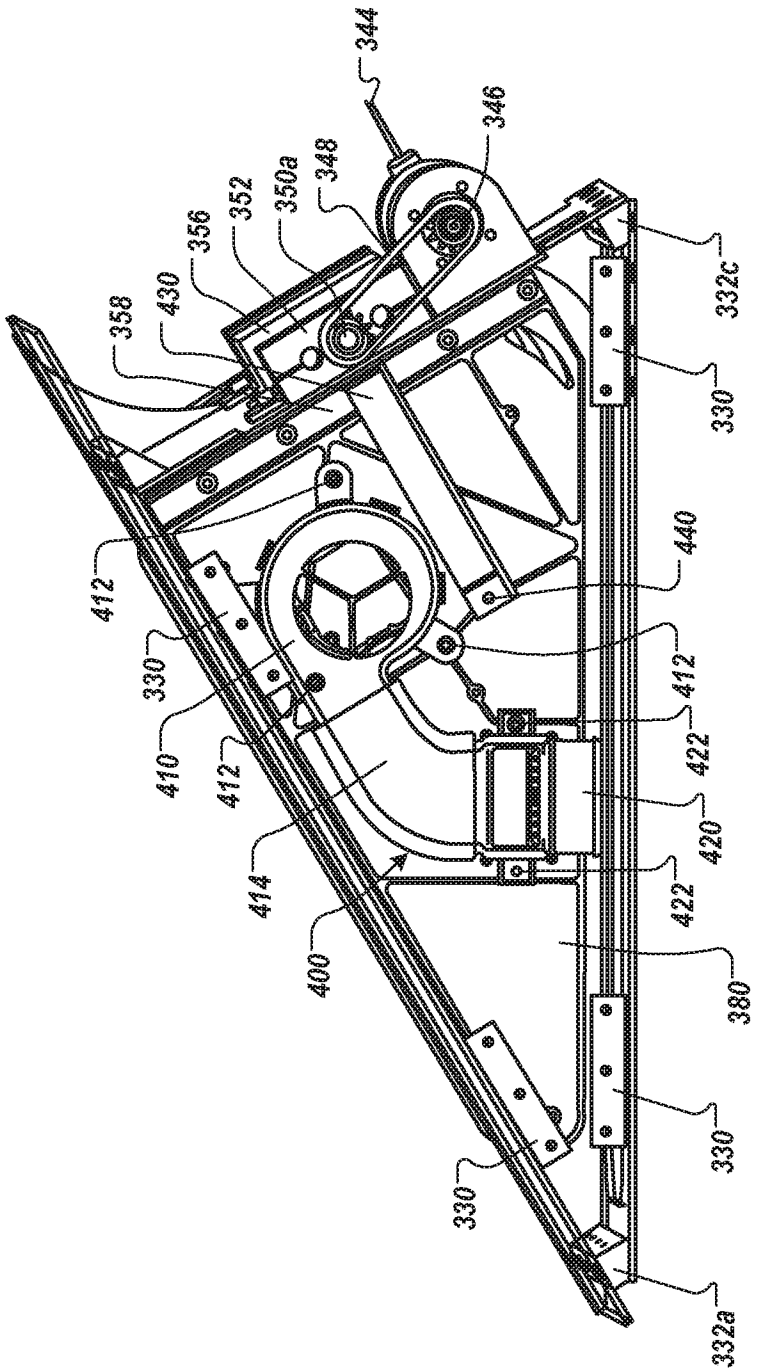
370b
340
352
350a
348
346

FIG. 3C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348
350a
352
356
430
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332c
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440
412
330
412
410
422
412
420
414
422
400
380
330
330
332a

FIG. 4

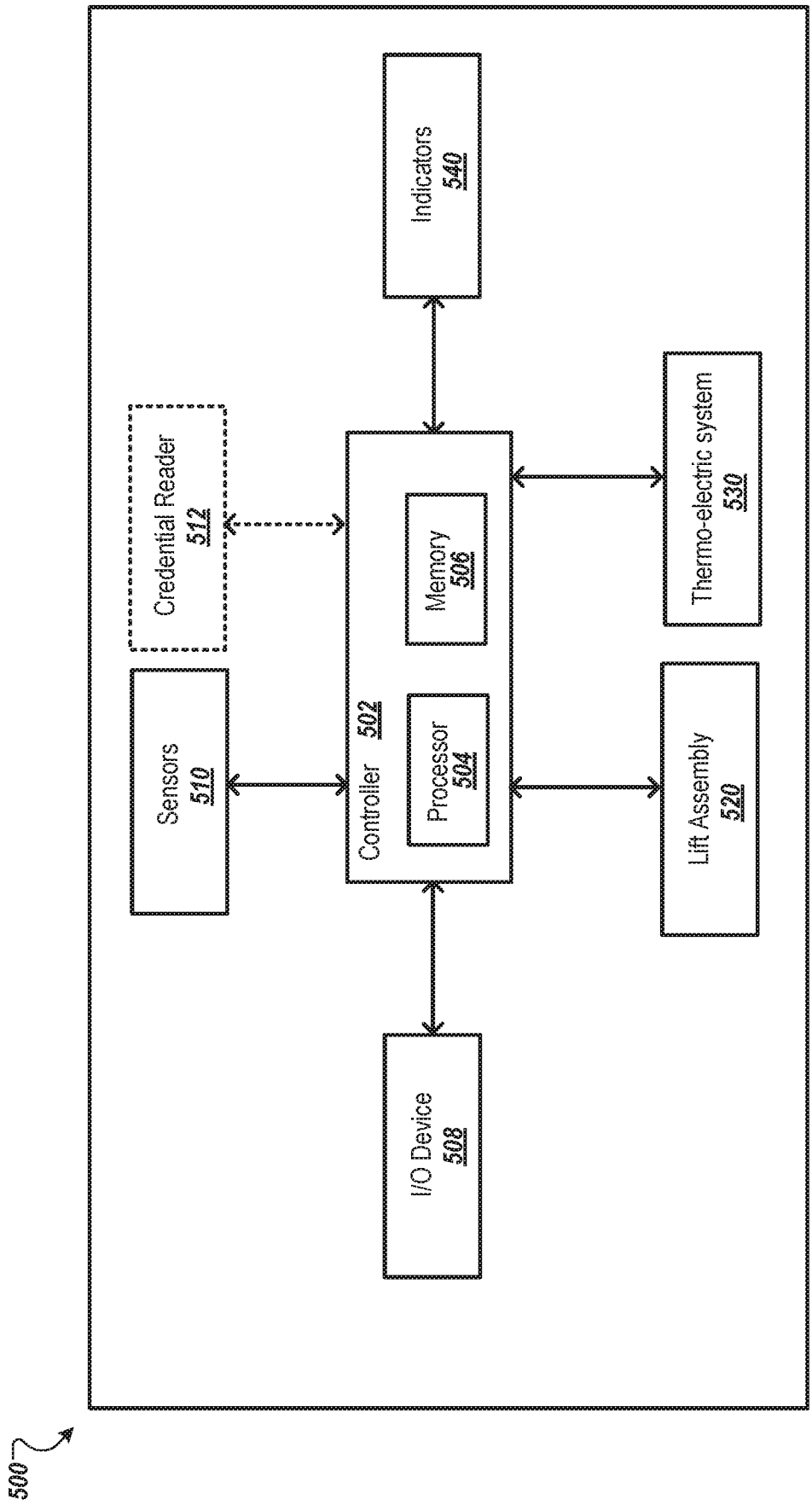
500
Indicators
540
Credential Reader
512
Memory
506
Thermo-electric system
530
Sensors
510
Controller
502
Processor
504
Lift Assembly
520
I/O Device
508

FIG. 5

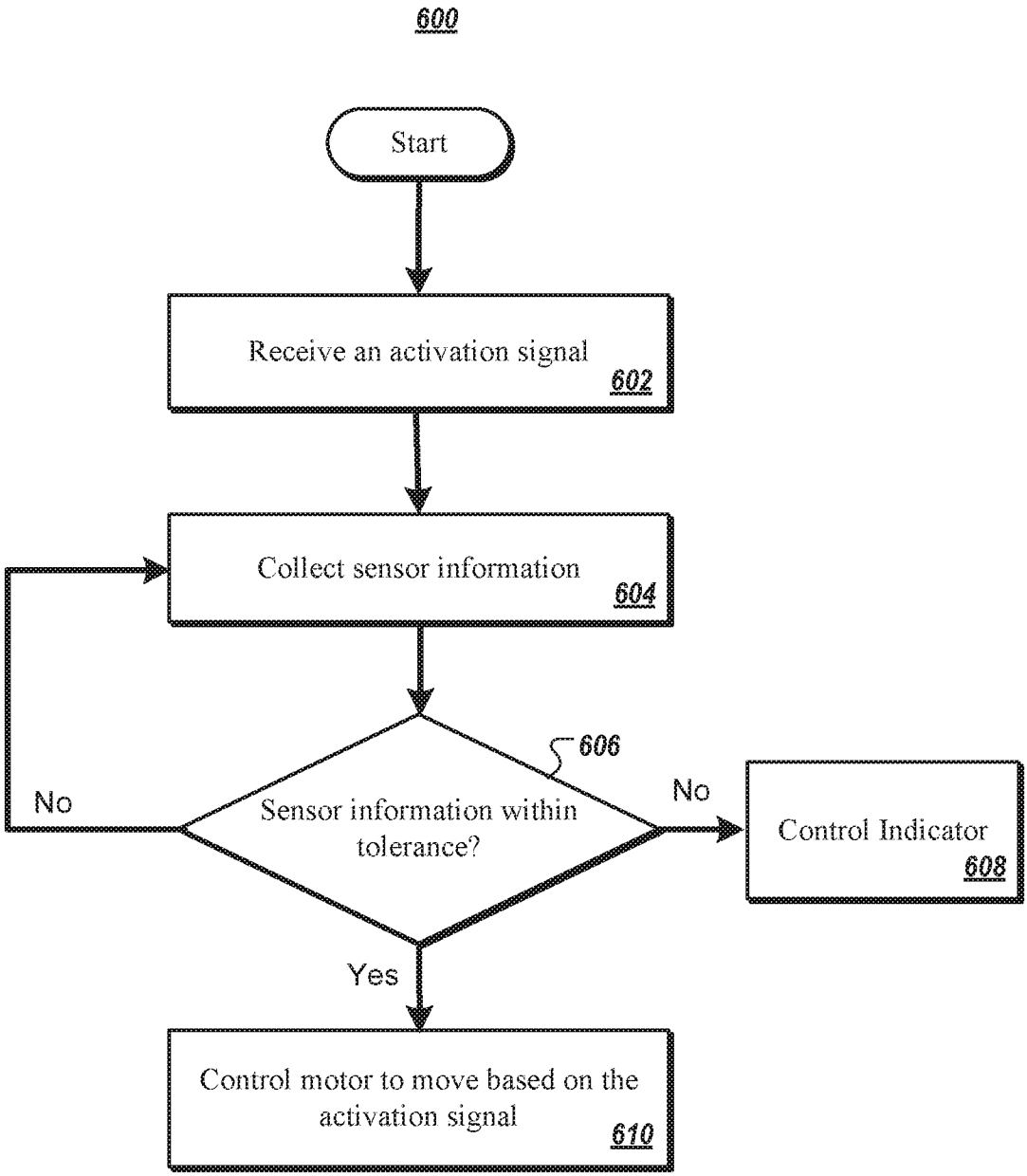
600
Start
Receive an activation signal
602
Collect sensor information
604
606
Sensor information within tolerance?
No
No
Control Indicator
608
Yes
Control motor to move based on the activation signal
610

FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2017/026018

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - B64D 11/00; B64D 11/06 (2017.01)
CPC - B64D 11/003; B64D 11/00; B64D 11/06 (2017.05)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
See Search History document

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC - 244/118.5; 244/118.6; 297/188.08; 312/242; 312/245; 312/246; 312/247; 312/270.1; 312/319.8 (keyword delimited)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2013/0247590 A1 (B/E AEROSPACE, INC.) 26 September 2013 (26.09.2013) entire document	1-20
Y	US 2013/0241246 A1 (B/E AEROSPACE, INC.) 19 September 2013 (19.09.2013) entire document	1-20
Y	US 2008/0071398 A1 (KNELLER et al) 20 March 2008 (20.03.2008) entire document	5, 9, 15, 19
A	US 5,567,028 A (LUTOVSKY et al) 22 October 1996 (22.10.1996) entire document	1-20
A	US 2004/0245897 A1 (STEPHAN et al) 09 December 2004 (09.12.2004) entire document	1-20

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
06 June 2017	19 JUN 2017
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, VA 22313-1450 Facsimile No. 571-273-8300	Authorized officer Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774