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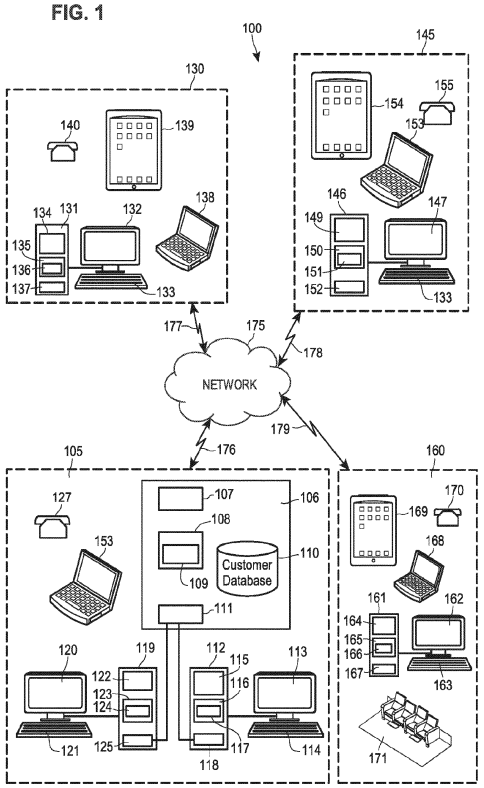
(54) **POWERED CHAIRS FOR PUBLIC VENUES, ASSEMBLIES FOR USE IN POWERED CHAIRS, AND COMPONENTS FOR USE IN ASSEMBLIES FOR USE IN POWERED CHAIRS**

(57) Powered recliner chairs are currently available that operate individually, such that an occupant of the respective chair may reorient the respective chair between an upright orientation and a reclined orientation via a local control. Powered recliner chairs, assemblies for use in the chairs, and components for use in the assemblies are provided. Control systems and methods for operating powered recliner chairs are also provided. Any given chair may be locally and/or remotely controlled.

FIG. 1



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Description

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] The present application claims the benefit of priority under 35 U.S.C. § 119, to U.S. provisional patent applications S/N: 62/143,079, entitled POWERED CHAIRS FOR PUBLIC VENUES, ASSEMBLIES FOR USE IN POWERED CHAIRS, AND COMPONENTS FOR USE IN ASSEMBLIES FOR USE IN POWERED CHAIRS, as filed on April 4, 2015; S/N: 62/149,596, entitled POWERED CHAIRS FOR PUBLIC VENUES, ASSEMBLIES FOR USE IN POWERED CHAIRS, AND COMPONENTS FOR USE IN ASSEMBLIES FOR USE IN POWERED CHAIRS, as filed on April 19, 2015; S/N: 62/159,791, entitled POWERED CHAIRS FOR PUBLIC VENUES, ASSEMBLIES FOR USE IN POWERED CHAIRS, AND COMPONENTS FOR USE IN ASSEMBLIES FOR USE IN POWERED CHAIRS, as filed on May 11, 2015; S/N: 62/159,791, entitled POWERED CHAIRS FOR PUBLIC VENUES, ASSEMBLIES FOR USE IN POWERED CHAIRS, AND COMPONENTS FOR USE IN ASSEMBLIES FOR USE IN POWERED CHAIRS, as filed on May 11, 2015; ; S/N: 62/175,210, entitled POWERED CHAIRS FOR PUBLIC VENUES, ASSEMBLIES FOR USE IN POWERED CHAIRS, AND COMPONENTS FOR USE IN ASSEMBLIES FOR USE IN POWERED CHAIRS, as filed on June 12, 2015; and S/N: 62/206,837, entitled POWERED CHAIRS FOR PUBLIC VENUES, ASSEMBLIES FOR USE IN POWERED CHAIRS, AND COMPONENTS FOR USE IN ASSEMBLIES FOR USE IN POWERED CHAIRS, as filed on August 18, 2015; the disclosures of which are incorporated herein in their entireties by reference.

[0002] The present disclosure relates to commonly assigned provisional patent applications S/N: 61/856,013, entitled TELESCOPIC SEATING SYSTEMS, AND FOLDABLE CHAIRS AND RELATED COMPONENTS FOR USE WITHIN TELESCOPIC SEATING SYSTEMS, filed July 18, 2013; S/N: 61/868,547, entitled TELESCOPIC SEATING SYSTEMS, AND FOLDABLE CHAIRS AND RELATED COMPONENTS FOR USE WITHIN TELESCOPIC SEATING SYSTEMS, filed August 21, 2013; S/N: 61/946,824, entitled ROCKER STYLE CHAIRS, MODULAR COMPONENTS FOR USE WITHIN ROCKER STYLE CHAIRS AND PARTS FOR USE WITHIN THE MODULAR COMPONENTS, filed March 2, 2014; S/N: 62/018,854, entitled BEAM MOUNTED CHAIR ASSEMBLIES, CHAIR ASSEMBLIES FOR USE WITHIN THE BEAM MOUNTED CHAIR ASSEMBLIES, COMPONENTS FOR USE WITHIN THE CHAIR ASSEMBLIES AND PARTS FOR USE WITHIN THE COMPONENTS, as filed on June 30, 2014; U.S. Patent Applications S/N: 14/788,767, entitled BEAM MOUNTED CHAIR ASSEMBLIES, CHAIR ASSEMBLIES FOR USE WITHIN THE BEAM MOUNTED CHAIR ASSEMBLIES, COMPONENTS FOR USE WITHIN THE CHAIR ASSEMBLIES AND PARTS FOR USE WITHIN THE COMPONENTS, as filed on June 30, 2015; S/N: 14/465,791, entitled TELESCOPIC SEATING SYSTEMS, AND FOLDABLE CHAIRS AND RELATED COMPONENTS FOR USE WITHIN TELESCOPIC SEATING SYSTEMS, filed August 11, 2014; and S/N: 14/636,045, entitled ROCKER STYLE CHAIRS, MODULAR COMPONENTS FOR USE WITHIN ROCKER STYLE CHAIRS AND PARTS FOR USE WITHIN THE MODULAR COMPONENTS, filed March 2, 2015, the disclosures of which are incorporated herein in their entireties by reference.

TECHNICAL FEILD

[0003] The present disclosure generally relates to powered chairs. More particularly, the present disclosure relates to locally and/or remotely controlled powered recliner chairs for use within an associated venue.

BACKGROUND

[0004] Powered recliner chairs are currently available that operate individually, such that an occupant of the respective chair may reorient the respective chair between an upright orientation and a reclined orientation via a local control. Similarly, known power-assisted chairs may include a motor-operated lift mechanism for aiding persons that require assistance in entering or exiting the chair. Motor-operated lift mechanisms may be interconnected between a stationary base assembly and a moveable chair frame. Alternatively, some power-assisted chairs include separate linkage mechanisms for permitting the seat occupant to selectively extend and retract a leg rest assembly and/or produce reclining angular movement between an upright first orientation and a reclined second orientation.

[0005] Conventional rocking chairs may include a chair body and a substantially arc-shaped support bracket mounted on a bottom of the chair body. Thus, when a user applies a force on the chair body by his/her own gravity, the support bracket may function as a rocking fulcrum of the chair body so that the rocking chair is rocked forward and backward. However, the user has to exert a force on the chair body so as to rock the rocking chair, so that the user seated on the rocking chair cannot relax himself/herself, thereby easily causing an uncomfortable sensation to the user.

[0006] Power-assisted chairs may be adapted to provide the lift and tilt function in combination with a leg rest and/or reclining function. Chairs which provide such a combination of multi-positional functions generally require use of multiple motors for driving separate linkages, which results in extremely large and expensive chair units. In addition, most power-assisted chairs incorporate a drive mechanism that employs both a power drive function for extending the leg rest, lifting the chair, and reclining the chair, and a power return function for returning the chair to the normal seated position (*e.g.*, an upright orientation).

[0007] An important characteristic of power-assisted chairs is the ability to support heavy loads during the lift and tilt functions. More specifically, power-assisted chairs arc designed to support individuals of a particular weight. Typically, power-assisted chairs that are adapted to support weight above a particular threshold, such as 300 pounds, require multiple motors.

[0008] In any event, known powered chair are, at most, controlled via a local controller.

SUMMARY

[0009] A powered recliner chair system including at least one first powered recliner chair assigned to a first control group. The at least one first powered recliner chair may be assigned to the first control group by at least one of: a first pin and shorting block, a first push button, or a first entry in a memory. The system may also include at least one second powered recliner chair assigned to a second control group. The at least one second powered recliner chair may be assigned to the second control group by at least one of: a second pin and shorting block, a second push button, or a second entry in a memory. The system may further include a first remote control input to reorient the at least one first powered recliner chair to a first orientation. The system may yet further include a second remote control input to reorient the at least one second powered recliner chair to a second orientation. The first orientation is independent of the second orientation. Data representative of the first remote control input and the second remote input may be transmitted via at least one of: a hardwired communication network, or a wireless network connection.

[0010] In another embodiment, a powered recliner chair may include at least one actuator having a first input and a second input. The actuator may be configured to reorient at least a portion of the powered recliner chair between an upright orientation and a reclined orientation in response to the first input. The actuator may be configured to reorient at least the portion of the powered recliner chair between the recline orientation and the upright orientation in response to the second input. The powered recliner chair may also include a control module having a local input, a remote input, a first output, and a second output. The first output may be connected to the first input. The second output may be connected to the second input. The local input may be connected to a chair occupant user interface that may enable a chair occupant to reorient the powered recliner chair while the chair occupant is seated in the chair. The remote input may be connected to a remote user interface that may be physically separate from the powered recliner chair and may enable a remote operator to reorient the powered recliner chair remote from the powered recliner chair.

[0011] In a further embodiment, a method for controlling a plurality of powered recliner chairs may include assigning at least one first powered recliner chair to a first control group, and assigning at least one second powered recliner chair to a second control group. The method may also include causing the at least one first powered recliner chair to reorient to a first orientation in response to a first remote control input. The method may further include causing the at least one second powered recliner chair to reorient to a second orientation in response to a second remote control input. The first orientation may be independent of the second orientation.

[0012] In yet another embodiment, a powered recliner chair system may include at least one of: a channel or an arm box; and at least one of: power wiring or data wiring. The at least one of: the power wiring or the data wiring may be routed through the at least one of: the channel or the arm box from a first powered recliner chair to a second powered recliner chair.

[0013] In yet a further embodiment, a powered recliner chair system may include a smart power supply. The smart power supply automatically may prohibit a second powered recliner chair from starting to reorient at the same time that a first chair starts to reorient.

[0014] Further benefits and advantages of the present invention will become apparent after a careful reading of the detailed description with appropriate reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWING

[0015]

Fig. 1 depicts a high-level block diagram of a computer system for managing powered reclining chairs and venues that include powered reclining chairs;

Figs 2-4 depict perspective views of powered reclining chairs;

Figs. 5A-D depict various powered reclining chair positions;

Fig. 6 depicts an example powered reclining chair with a rocking feature;

Fig. 7 depicts an example powered lifting mechanism for powered reclining chair;

Fig. 8 depicts an example controller assembly for a powered reclining chair;

Figs. 9A-C depict an example controller assembly for a powered reclining chair;

Figs. 10A-C depict an example controller assembly for a powered reclining chair;

Figs. 11A-C depict an example local control for a powered reclining chair;

Figs. 12A-B depict bottom perspective views of an example powered reclining chair;

Figs. 13A-B depict block diagrams for example recliner chair control systems;

Figs. 14A-H and 14J-K depict example recliner chairs and related control components;

Figs. 15A-D depict various views of example reclining chair arm structures;

Figs. 16A-F depict example powered reclining chair electrical interconnections;

Figs. 17A-F depict various views of example powered recliner chair assemblies;

Figs. 18A-H and 18J-L depict various view of electrical power and control assemblies for use in powered recliner chairs; and

Fig. 19 depicts a flow diagram of an example method for controlling a plurality of powered recliner chairs.

DETAILED DESCRIPTION

[0016] Powered recliner chairs, assemblies for use in the powered recliner chairs, and components for use in the assemblies are provided. Related systems and methods may enable remote operation of the powered recliner chairs, thereby, may lower cost of associated routine maintenance and associated venue cleaning.

[0017] For example, a remote master controller may control multiple powered chairs. The master controller may be controlled/operated by venue management to ensure safe and efficient operation of a plurality of powered recliner chairs. A master controller may contain security features such as a key lock, password protection, security handshake access, etc.

[0018] A local master controller may be, for example, located at an end of a row of chairs, within a section of chairs, or in a secured location selected by venue management. A remote master controller may be accessed wirelessly, via a hard wired connection, and/or locally. A master controller may interact with other systems (*e.g.*, emergency systems, food/drink vending operations, venue lighting, maintenance, etc.) to improve venue operations. A master controller may have output(s)/circuit(s) to control chairs via a respective chair circuit. Alternatively, a group of chairs may be mechanically interconnected, such that a single master controller may control a group of chairs.

[0019] Controlling multiple chairs at once may save time in performing venue related tasks, such as cleaning or maintenance that require chairs to be extended and/or retracted. A controller, having multiple output circuits, may allow for pre-select chairs to be extended or retracted in a defined order to facilitate a desired task. For example, cleaning may be facilitated by have every other chair extended and/or retracted to provide an operator better access to an extended recliner chair in narrow rows.

[0020] Alternate patterns of chair positioning may be achieved to aid in different tasks. For example, an entire venue of chairs may automatically reorient at a prescribed time sequence with a single initiation. While a controller may have multiple outputs, any given controller may only have one output circuit and associated chairs may include individual ID's or addresses such that a communication protocol of the controller may allow control of an individual chair and/or banks of chairs.

[0021] Controller output(s) may control chairs wirelessly using available technologies such as Bluetooth ®, and/or the controllers may be hard wired. Controller outputs may drive chair actuator(s) to respective internal stops, which may be settable by time such that chairs may be partially extended and/or retracted. Alternatively, or additionally, a controller may be sequenced to extend/retract chairs such that all chairs in a control group may be fully extended and/or retracted to a position before being extended and/or retracted to a desired position.

[0022] Master controller circuits may control a slave control unit at each powered chair allowing parallel operation of a local user control switch or a master control circuit. Possible scenarios for parallel chair control may include, but are not limited to, an operator control switch and the control circuit that plug into a slave controller, allowing control of a powered chair by the operator or by the master control box, an operator control switch and a control circuit may connect wirelessly to a slave controller, allowing control of a powered chair by the operator or by the master controller. A control circuit connected (wired or wirelessly) to a powered chair switch which may allow parallel operation. A control circuit connected (wired or wirelessly) to a powered chair actuator, which may allow parallel chair operation.

[0023] Power to a powered chair may be extended directly from a transformer to a master controller, and/or slave controller(s) as needed. A slave controller may be powered via respective input circuits or switch circuits as required.

[0024] Lights *(e.g.,* light emitting diodes (LEDs)) may be incorporated into the individual chairs. For example, a light may be incorporated under each chair to illuminate an area of a floor in proximity to the respective chair. The systems and methods of the present disclosure may notify a remote location of activity (*e.g.*, venue cleaning, chair occupancy, chair reorientation, etc.). This lighting may be turned on, for example, during cleaning and/or prior to and/or after a movie to provide entrance and/or exit lighting. Similar to remote chair reorientation, the lighting may be remotely controlled. For example, all powered recliner chairs may automatically return to an upright position (or any other predetermined position) and/or all chair lights may be turned on in an event of an emergency situation in the associated venue. Notably, notification of an emergency situation within a venue may be initiated via a central alarm (*e.g.,* a manually operated fire alarm, a carbon monoxide sensor, a smoke sensor, etc.), a sound detector (*e.g.,* a gunshot detector, a scream detector, etc.), and/or via a personal electronic device (*e.g.,* a mobile telephone, a portable data assistant, a laptop computer, or any other portable electronic device that is communicatively coupled to a venue emergency notification system).

[0025] Sensors (*e.g.,* a proximity sensor, a capacitance sensor, an ultra-sonic sensor, a light sensor, a touch sensor, a proximity switch, a limit switch, an electric current sensor, a pressure sensor, a strain gauge, a microphone, a motion sensor, a temperature sensor, a sonar sensor, etc.) may be incorporated into a respective

chair for safety purposes. For example, a sensor may indicate that reorientation of a chair has been inhibited because an object (e.g., an individual, or an individual's possession) would be in jeopardy of being damaged. A capacitance sensor may be configured such that if an object (*e.g.,* an individual, or an individual's possession) touches, or comes close to a pre-determined, part of a respective chair (*e.g.,* a metallic part of the chair), a capacitance value will change and the object may be detected. The systems and methods of the present disclosure may provide a remote indication of corresponding events.

[0026] Sensors and/or actuators may be incorporated into a chair that record chair reorientations and/or any other events associated with the respective chair. Associated data may be automatically recorded and logged to provide information for use with preventive chair maintenance and/or routine chair maintenance.

[0027] A user interface may be provided that includes, for example, an overhead plan view map of a venue with each chair having alpha-numeric, color, graphical, etc. information related to respective chair status (*e.g.,* need of maintenance, occupied, reclined, malfunction, number of reorientations since last maintenance, number of times occupied, length of time occupied, etc.)

[0028] The remote control system may automatically control other lighting in a venue. The systems and methods of the present disclosure may automatically record cleaning times and dates. For example, positions of each chair may be recording along with a time stamp for each chair orientation and/or chair reorientation. Occupancy sensors may be incorporated into a chair and may be used to record dates and times associated with when the respective chair was occupied. A weight sensor may be included that records a weight of an individual occupying a respective chair.

[0029] Local controls, located on each powered recliner chair, may allow a chair occupant to reposition the powered reclining chair while seated in the respective chair. For example, a first button may be provided to reorient a powered reclining chair from an upright position toward a reclined position. A second button may be provided to reorient the powered reclining chair from a reclined position toward an upright position. Any number of buttons may be provided to reorient individual parts (*e.g.,* a back, a lower lumbar support, a chair seat, an armrest, a foot rest, a calf rest, etc.) of a powered reclining chair independent of any other part. As described in more detail elsewhere herein, a powered reclining chair may be controlled via a cellular phone (*e.g.,* a smartphone) implementing a powered reclining chair application.

[0030] Any given powered reclining chair may include speakers and/or a headphone connector plug. The speakers and/or the headphone connector may be hardwired to a venue sound system and/or may include a wireless connection to a venue sound system. Any given powered reclining chair may include a power and/or data connector, such that an occupant can plug in their cellular telephone and/or portable computer device. Thereby, an occupant may use the forgoing features to order a drink and/or food from a venue delivery. The occupant may be enabled to pay for their drinks and/or food via their own device and/or via an interface attached to the powered reclining chair.

[0031] Turning to Fig. 1, a high-level block diagram of an example computer system 100 for managing powered reclining chairs is depicted. The computer system 100 may include a central venue operations center 105 and a powered reclining chair site 160 (*e.g.,* a movie theater, a sports venue, an auditorium, an arena, a theater, or any other venue) communicatively couple via a communications network 175. The computer system 100 may also include a powered reclining chair technician site 145 and a powered reclining chair supplier site 130. While, for convenience of illustration, only a single central venue operations center 105 is depicted within the computer system 100 of Fig. 1, any number of central venue operations centers 105 may be included within the computer system 100. While, for convenience of illustration, only a single powered reclining chair site 160 is depicted within the computer system 100 of Fig. 1, any number of powered reclining chair sites 160 may be included within the computer system 100. Indeed, the computer system 100 may accommodate thousands of powered reclining chair sites 160. While, for convenience of illustration, only a single powered reclining chair technician site 145 is depicted within the computer system 100 of Fig. 1, any number powered reclining chairs of technician sites 145 may be included within the computer system 100. Any given powered reclining chair technician site 145 may be a mobile site. While, for convenience of illustration, only a single powered reclining chair supplier site 130 is depicted within the computer system 100 of Fig. 1, any number of powered reclining chair supplier sites 130 may be included within the computer system 100.

[0032] The communications network 175, any one of the network adapters 111, 118, 125, 137, 152, 167 and any one of the network connections 176, 177, 178, 179 may include a hardwired section, a fiber-optic section, a coaxial section, a wireless section, any sub-combination thereof or any combination thereof, including for example a wireless LAN, MAN or WAN, WiFi, WiMax, the Internet, a Bluetooth connection, or any combination thereof. Moreover, a central venue operations center 105, a powered reclining chair site 160, a powered reclining chair technician site 145 and/or a powered reclining chair supplier 130 site may be communicatively connected via any suitable communication system, such as via any publicly available or privately owned communication network, including those that use wireless communication structures, such as wireless communication networks, including for example, wireless LANs and WANs, satellite and cellular telephone communication systems, etc.

[0033] Any given central venue operations center 105 may include a mainframe, or central server, system 106, a server terminal 112, a desktop computer 119, a laptop

computer 126 and a telephone 127. While the central venue operations center 105 of Fig. 1 is shown to include only one mainframe, or central server, system 106, only one server terminal 112, only one desktop computer 119, only one laptop computer 126 and only one telephone 127, any given central venue operations center 105 may include any number of mainframe, or central server, systems 106, server terminals 112, desktop terminals 119, laptop computers 126 and telephones 127. Any given telephone 127 may be, for example, a land-line connected telephone, a computer configured with voice over internet protocol (VOIP), or a mobile telephone (*e.g.,* a smartphone). Any given server terminal 112 may include a processor 115, a memory 116 having at least on set of computer-readable instructions stored thereon and associated with managing powered reclining chairs and venue operations 117, a network adapter 118 a display 113 and a keyboard 114. Any given desktop computer 119 may include a processor 122, a memory 123 having at least on set of computer-readable instructions stored thereon and associated with managing powered reclining chairs and venue operations 124, a network adapter 125 a display 120 and a keyboard 121. Any given mainframe, or central server, system 106 may include a processor 107, a memory 108 having at least on set of computer-readable instructions stored thereon and associated with managing powered reclining chairs and venue operations 109, a network adapter 111 and a customer (or client) database 110. The customer (or client) database 110 may store, for example, chair operation data and/or associated venue data, related to operation of the chair (or a group of chairs) within an associated venue. Any given lap top computer 126 may include a processor, a memory having at least on set of computer-readable instructions stored thereon and associated with managing powered reclining chairs and venue operations, a network adapter, a display and a keyboard. Any given telephone 127 may include a processor, a memory having at least on set of computer-readable instructions stored thereon and associated with managing powered reclining chairs and venue operations, a network adapter, a display and a keyboard.

[0034] Any given powered reclining chair supplier 130 may include a desktop computer 131, a lap top computer 138, a tablet computer 139 and a telephone 140. While only one desktop computer 131, only one lap top computer 138, only one tablet computer 139 and only one telephone 140 is depicted in Fig. 1, any number of desktop computers 131, lap top computers 138, tablet computers 139 and/or telephones 140 may be included at any given powered reclining chair supplier 130. Any given telephone 140 may be a land-line connected telephone or a mobile telephone (*e.g.*, smartphone). Any given desktop computer 131 may include a processor 134, a memory 135 having at least on set of computer-readable instructions stored thereon and associated with managing powered reclining chairs and venue operations 136, a network adapter 137 a display 132 and a keyboard 133. Any given lap top computer 138 may include a processor, a memory having at least on set of computer-readable instructions stored thereon and associated with managing powered reclining chairs and venue operations, a network adapter, a display and a keyboard. Any given tablet computer 139 may include a processor, a memory having at least on set of computer-readable instructions stored thereon and associated with managing powered reclining chairs and venue operations, a network adapter, a display and a keyboard. Any given telephone 140 may include a processor, a memory having at least on set of computer-readable instructions stored thereon and associated with managing powered reclining chairs and venue operations, a network adapter, a display and a keyboard.

[0035] Any given powered reclining chair technician site 145 may include a desktop computer 146, a lap top computer 153, a tablet computer 154 and a telephone 155. While only one desktop computer 146, only one lap top computer 153, only one tablet computer 154 and only one telephone 155 is depicted in Fig. 1, any number of desktop computers 146, lap top computers 153, tablet computers 154 and/or telephones 155 may be included at any given powered reclining chair technician site 145. Any given telephone 155 may be a land-line connected telephone or a mobile telephone (*e.g.*, smartphone). Any given desktop computer 146 may include a processor 149, a memory 150 having at least on set of computer-readable instructions stored thereon and associated with managing powered reclining chairs and venue operations 151, a network adapter 152 a display 147 and a keyboard 148. Any given lap top computer 153 may include a processor, a memory having at least on set of computer-readable instructions stored thereon and associated with managing powered reclining chairs and venue operations, a network adapter, a display and a keyboard. Any given tablet computer 154 may include a processor, a memory having at least on set of computer-readable instructions stored thereon and associated with managing powered reclining chairs and venue operations, a network adapter, a display and a keyboard. Any given telephone 155 may include a processor, a memory having at least on set of computer-readable instructions stored thereon and associated with managing powered reclining chairs and venue operations, a network adapter, a display and a keyboard.

[0036] Any given powered reclining chair site 160 may include a desktop computer 161, a lap top computer 168, a tablet computer 169 and a telephone 170. While only one desktop computer 161, only one lap top computer 168, only one tablet computer 169 and only one telephone 170 is depicted in Fig. 1, any number of desktop computers 161, lap top computers 168, tablet computers 169 and/or telephones 170 may be included at any given powered reclining chair site 160. Any given telephone 170 may be a land-line connected telephone or a mobile telephone (*e.g.*, smartphone). Any given desktop computer 161 may include a processor 164, a memory 165

having at least on set of computer-readable instructions stored thereon and associated with managing powered reclining chairs and venue operations 166, a network adapter 167 a display 162 and a keyboard 163. Any given lap top computer 168 may include a processor, a memory having at least on set of computer-readable instructions stored thereon and associated with managing powered reclining chairs and venue operations, a network adapter, a display and a keyboard. Any given tablet computer 169 may include a processor, a memory having at least on set of computer-readable instructions stored thereon and associated with managing powered reclining chairs and venue operations, a network adapter, a display and a keyboard. Any given telephone 170 may include a processor, a memory having at least on set of computer-readable instructions stored thereon and associated with managing powered reclining chairs and venue operations, a network adapter, a display and a keyboard. While not shown in Fig. 1, any given set of powered reclining chairs 171, or individual powered reclining chair, may include a programmable controller (*e.g.,* controller 860, 960a, 960b, 1060a, 1060b of Figs. 8, 9A-B, 10A-B, respectively), a powered reclining chair local control (*e.g.,* local control 270, 370, 470, 870, 970c, 1070c, 1170a-c of Figs. 2, 3, 4, 8, 9c, 10c, 11A-11C, respectively), and/or any number of linear and/or rotary actuators (*e.g.*, actuator 655, 660, 760, 960b, 1060b, 1065b of Figs. 6, 7, 9B, 10B, respectively). Furthermore, while not shown in Fig. 1, any given set of powered reclining chairs 171, or individual powered reclining chair, may include a plurality of sensors (*e.g.*, temperature sensor, pressure sensor, limit switch, motion sensor, strain gauge, position sensor, occupancy sensor, load sensor, etc.).

[0037] With reference to Fig. 2, a venue 200 may include a plurality of powered recliner chairs 210 supported on a base (*e.g.,* a floor or a structure) 205. The powered recliner chairs 210 may be similar to the powered chairs 171 of Fig. 1. Any given powered recliner chair may include a chair back 215, a lower lumbar support 220, a chair seat 225, a foot-rest 230, and an arm-rest 235. The arm-rest 235 may include a cup-holder 236 and/or a chair controller 270. The chair controller 270 may include, for example, a first button to reorient the respective chair between an upright position (*e.g.*, a chair position as illustrated in Fig. 2) and a reclined position (*e.g.,* a chair position as illustrated in Fig. 3). Alternatively, a chair controller 270 may include a plurality of functions, such as, individual buttons associated with independently controlling a chair back 215, a lower lumbar support 220, a chair seat 225, a foot-rest 230, and/or an arm-rest 235. Additionally, a chair controller 270 may include an audio output connector, a power output connector, lighting, a microphone, a speaker, etc. Alternatively, a chair controller 270 may be similar to a portable computing device (*e.g.,* portable computing device 169 of Fig. 1) that facilitates a plurality of chair controls and/or venue interaction. A chair controller 270 may include a docking station and/or connection for a smartphone.

[0038] An associated powered recliner chair system may include at least one emergency power input selected from a group including: a battery, a capacitor, a photovoltaic cell, an internal combustion engine driven electrical generator, a wind-turbine driven electrical generator, or a hydrogen fuel cell. The at least one emergency power input may be configured to provide electric power to the powered recliner chair in an event of an associated venue power outage.

[0039] Any given powered recliner chair may be a modular assembly having, for example, a single plug in power connection. The powered recliner chair may be fully operable with only the plug in power connection connected to the modular powered recliner chair. All remote control may be communicated to a modular assembly via a wireless communication network.

[0040] Any given reclining chair may be installed such that a surface under the reclining chair is not coplanar with an adjacent walking surface. Examples of such an installation may include: an area directly behind the ottoman raised to make it harder for items to be reoriented (*e.g.*, kicked or pushed) under the reclining chair; an area directly in front of the reclining chair's rear closure panel may be raised to make it harder for items to be moved (*e.g.,* kicked or pushed) under the reclining chair; and an area under the recliner may be sloped to promote movement of items under the reclining chair moving out from under the reclining chair.

[0041] Turning to Fig. 3, a venue 300 may include a plurality of powered recliner chairs 310 supported on a base (*e.g.,* a floor or a structure) 305. The powered recliner chairs 310 may be similar to the powered recliner chairs 210 of Fig. 2. Any given powered recliner chair may include a chair back 315, a lower lumbar support 320, a chair scat 325, a foot-rest 330, and an arm-rest 335. The arm-rest 335 may include a cup-holder 336 and/or a chair controller 370. The chair controller 370 may include, for example, a first button to reorient the respective chair between an upright position (*e.g.*, a chair position as illustrated in Fig. 2) and a reclined position (*e.g.,* a chair position as illustrated in Fig. 3). Alternatively, a chair controller 370 may include a plurality of functions, such as, individual buttons associated with independently controlling a chair back 315, a lower lumbar support 320, a chair seat 325, a foot-rest 330, and/or an arm-rest 335. Additionally, a chair controller 370 may include an audio output connector, a power output connector, lighting, a microphone, a speaker, etc. Alternatively, a chair controller 370 may be similar to a portable computing device (*e.g.*, portable computing device 169 of Fig. 1) that facilitates a plurality of chair controls and/or venue interaction. A chair controller 370 may include a docking station and/or connection for a smartphone.

[0042] With reference to Fig. 4, a venue 400 may include a plurality of powered recliner chairs 410 supported on a base (*e.g.,* a floor or a structure) 405. The powered recliner chairs 410 may be similar to the powered recliner chairs 310 of Fig. 3. Any given powered recliner chair

may include a chair back 415, a lower lumbar support 420, a chair seat 425, a foot-rest 430, and an arm-rest 435. The arm-rest 435 may include a cup-holder 436 and/or a chair controller 470. The chair controller 470 may include, for example, a first button to reorient the respective chair between an upright position (*e.g.*, a chair position as illustrated in Fig. 2) and a reclined position (*e.g.,* a chair position as illustrated in Fig. 3). Alternatively, a chair controller 470 may include a plurality of functions, such as, individual buttons associated with independently controlling a chair back 415, a lower lumbar support 420, a chair seat 425, a foot-rest 430, and/or an arm-rest 435. Additionally, a chair controller 470 may include an audio output connector, a power output connector, lighting, a microphone, a speaker, etc. Alternatively, a chair controller 470 may be similar to a portable computing device (*e.g.*, portable computing device 169 of Fig. 1) that facilitates a plurality of chair controls and/or venue interaction. A chair controller 470 may include a docking station and/or connection for a smartphone. While remote control of reclining chair extend/retract functions may be performed, any given remote control function may similarly be used to control other functions such as massagers, heaters, cooling devices, etc.

[0043] Any given reclining chair system may include blower and/or vacuum features, which may aid in cleaning under reclining chairs. Examples of blower and/or vacuum features may include, but are not limited to: systems located in a reclining chair arm box; systems located in a reclining chair recliner mechanism; systems located in an associated floor area, or rear riser(s).

[0044] Turning to Figs. 5A-5D, powered chairs 500a-d may include a chair back 515a-d, a chair seat 525a-d, a foot-rest 530a-d, and an arm-rest 535a-d. The powered chairs 500a-d may be similar to the powered chairs 171, 210, 310, 410 of Figs. 1-4, respectively. As illustrated in Figs. 5A and 5D, a chair back 515a, 515d, a chair seat 525a, 525d, a foot-rest 530a, 530d, and/or an arm-rest 535a, 535d may be repositioned throughout a plurality of various positions, shown as dashed lines.

[0045] With reference to Fig. 6, a powered reclining/rocking chair 600 may include a support frame 650, a seat frame 625 pivotally mounted on the support frame 650, a rotary actuator 655 mounted between the support frame 650 and the seat frame 625 to drive the seat frame 625 to move relative to the support frame 650, a chair back 615 pivotally mounted on the seat frame 625, a linear actuator 660 mounted between the seat frame 625 and the chair back 615 to drive the chair back 615 to move relative to the seat frame 625, a head support 645 mounted on the chair back 615, two link mechanisms mounted between the chair seat 625 and the chair back 615 to move in concert with the chair back 615, and a foot support 630 mounted between the two link mechanisms to move in concert with the two link mechanisms. The scat frame 625 may have an upper end provided with two opposite pivot cars and a lower end provided with a plurality of castors. The seat frame 625 has a rear end provided with a stop portion.

[0046] The powered reclining/rocking chair may further include two suspension arms each secured on the seat and each pivotally mounted on the support frame, and at least two reinforcing members located between the seat and the two suspension arms respectively to enhance the structural strength of the seat. Each of the two suspension arms extends upwardly from the seat and has an upper end provided with a pivot portion pivotally mounted on a respective one of the pivot ears of the support frame.

[0047] The seat is pivotable relative to the support frame in a pendulum manner. The seat and has an upper portion and a lower portion. The upper portion of the seat has a front end provided with two first through holes and second through holes and a rear end provided with two through bores. The lower portion of the seat has a side provided with a support base.

[0048] The rotary actuator may include a drive member secured on the lower portion of the seat, a rotation member rotatably mounted on the drive member, and a drive lever having a first end pivotally connected with the rotation member to move in concert with the rotation member and a second end pivotally connected with the stop portion of the support frame. The drive member of the rotary actuator is a drive motor to rotate the rotation member. The rotation member of the rotary actuator has a disk shape. The first end of the drive lever is arranged on the rotation member eccentrically and is deviated from a central shaft of the rotation member.

[0049] The two link mechanisms are located at two opposite sides of the seat symmetrically. Each of the two link mechanisms has a mediate portion provided with a first pivot hole pivotally connected with a respective one of the first through holes of the seat and a second pivot hole pivotally connected with a respective one of the second through holes of the seat. Each of the two link mechanisms has a first end provided with a driven portion that is movable in concert with the backrest and a second end provided with a support portion that is movable in concert with the driven portion. The foot support is mounted between the support portions of the two link mechanisms.

[0050] The backrest has a lower end provided with two pivot bores each pivotally connected with a respective one of the through bores of the seat and two push portions each pivotally connected with the driven portion of a respective one of the two link mechanisms. Each of the two pivot bores of the backrest is located above each of the two push portions. The backrest has an upper end provided with two mounting sleeves. The backrest has a side provided with a drive arm which is substantially V-shaped.

[0051] The linear actuator has a first portion pivotally connected with the support base of the seat and a second portion retractably mounted in the first portion and pivotally connected with the drive arm. Preferably, the drive arm has an upper end secured on the backrest and a lower end pivotally connected with the second portion of

the linear actuator. Thus, when the second portion of the linear actuator is moved relative to the first portion of the linear actuator, the drive arm is moved in concert with the second portion of the linear actuator to drive the backrest to pivot relative to the seat.

[0052] The head support may include a resting cushion and two adjusting rods each mounted on a bottom of the resting cushion and each adjustably mounted in a respective one of the mounting sleeves of the backrest.

[0053] In adjustment, when the second portion of the linear actuator is moved toward the first portion of the linear actuator, the drive arm is moved in concert with the second portion of the linear actuator to drive the backrest to pivot downward relative to the seat, so that the pivot bores of the backrest arc pivoted about the through bores of the scat, and the backrest is moved rearward and downward. At the same time, when the backrest is moved relative to the seat, the driven portion of each of the two link mechanisms is pushed by the respective push portion of the backrest to drive each of the two link mechanisms to pivot forward relative to the seat, so that the support portion of each of the two link mechanisms is moved forward and upward, and the foot support is also is moved forward and upward until the foot support is disposed at a horizontal state. In such a manner, the inclined angle of the backrest and the foot support is adjusted by operation of the linear actuator according to the user's requirement so as to provide a comfortable sensation to the user.

[0054] On the contrary, when the second portion of the linear actuator is moved outward relative to the first portion of the linear actuator, the drive arm is moved in concert with the second portion of the linear actuator to drive the backrest to pivot upward relative to the seat, so that the pivot bores of the backrest are pivoted about the through bores of the seat, and the backrest is moved forward and upward. At the same time, when the backrest is moved relative to the seat, the driven portion of each of the two link mechanisms is pulled by the respective push portion of the backrest to drive each of the two link mechanisms to pivot rearward relative to the seat, so that the support portion of each of the two link mechanisms is moved rearward and downward, and the foot support is also is moved rearward and downward so as to fold the foot support.

[0055] In operation, the drive member of the rotary actuator is secured on the lower portion of the seat, the first end of the drive lever is pivotally connected with and arranged on the rotation member eccentrically, and the second end of the drive lever is limited by the stop portion of the support frame, so that when the rotation member is rotated by the drive member, the rotation member is driven by the drive lever to move relative to the support frame, and the drive member is moved by the rotation member to drive the seat to move relative to the support frame. At this time, each of the two suspension arms secured on the seat is pivotally mounted on the support frame, so that the seat is pivoted relative to the support frame by operation of the rotary actuator. In such a manner, the seat is pivoted rightward and leftward so that the seat is pivoted reciprocally relative to the support frame in a pendulum manner.

[0056] The powered reclining/rocking chair further comprises an electrically control device connected with the rotary actuator and the linear actuator to control operation of the rotary actuator and the linear actuator, an overload protection device connected with the electrically control device to shut an electric power to the electrically control device when an overload occurs, and a timer connected with the electrically control device to automatically preset the operation time of the electrically control device. In such a manner, the linear actuator is controlled by the electrically control device to adjust the inclined angle of the backrest and the foot support, and the rotary actuator is controlled by the electrically control device to drive the seat to pivot relative to the support frame in a pendulum manner.

[0057] The resting cushion of the head support may include a main adjusting bracket and a secondary adjusting bracket pivotally mounted on the main adjusting bracket. The main adjusting bracket of the resting cushion is provided with a main toothed portion. The secondary adjusting bracket of the resting cushion is provided with a secondary toothed portion adjustably meshing with the main toothed portion of the main adjusting bracket. Thus, the secondary adjusting bracket of the resting cushion is pivoted relative to the main adjusting bracket of the resting cushion to adjust the inclined angle of the head support. Each of the adjusting rods of the head support is provided with a plurality of adjusting detents adjustably mounted in the respective mounting sleeve of the backrest to adjust the height of the head support.

[0058] Accordingly, the rotary actuator is controlled by the electrically control device to drive the seat to pivot relative to the support frame reciprocally in a pendulum manner so that the scat is pivoted relative to the support frame automatically, and the user needs not to rock the seat manually. In addition, the linear actuator is controlled by the electrically control device to adjust the inclined angle of the backrest and the foot support according to the user's requirement so as to provide a comfortable sensation to the user.

[0059] Turning to Fig. 7, a powered lift chair 700 may include a lift base assembly 750 and a chair support frame 725. The lift base assembly 750 supports the chair 700 in a normal seated position. The lift base assembly 750 lifts the chair 700 to a tilted position that makes it easier for a person to enter or leave the chair 700. Any of a wide variety of chair constructions can be used with the lift base assembly. The chair 700 may include a frame 761, side arms 735, a seat back 730, and a seat portion 725. The seat back 730 may recline in response to pressure from the back of an occupant and the seat portion 725 may move simultaneously with the seat back 730. The chair 700 also may include an extensible leg rest assembly. Additionally, the seat back 730 and/or the seat

portion 725 may include a heat pad and/or a cooling device. The heat pad and/or cooling device may be selectively energized to provide heat and/or cooling to person using the chair.

[0060] An exemplary lift base assembly may include a stationary, rectangular bottom frame member that rests on the floor and a movable, rectangular upper frame member on which the chair is removably but securely attached by suitable fasteners. The bottom frame member may include left and right hand side members, respectively, that are rigid with a front cross member. Side members may have suitable pads that engage the surface of a floor. Upper frame member may include left and right side members that are rigid with a rear cross member. A linear actuator 760 may nest inside of the bottom from member 750, the upper frame member 761, and the chair seat 725.

[0061] Alternatively, a lift mechanism may include a power-assist means, such as an electric motor, a rotary screw shaft, and an internally threaded sleeve or nut. The motor may be selectively operable to rotate the screw shaft in either a first direction or second direction. Both the motor and the screw shaft can arcuately swing up and down in a generally vertical plane about a pivot. The screw shaft extends through and drives the sleeve so that the sleeve moves forwardly or rearwardly along the length of the screw shaft upon rotation of the screw shaft in one of the first and second directions. In the seated or lowered position of the chair, the sleeve may be positioned near the front or outer end of the screw shaft. Lifting of the chair is accomplished by energizing the motor to rotate the screw shaft in a direction that pulls the sleeve toward the motor. To lower the chair, rotation of the screw shaft is reversed, which draws the sleeve away from the motor. An exemplary lift base assembly and lift mechanism are described in more detail in U.S. Pat. No. 5,061,010, assigned to La-Z-Boy Chair Co., which is hereby incorporated by reference in its entirety. Although the above lift base assembly and lift mechanism are described for illustrative purposes, it is to be understood that other suitable lift base assemblies and lift mechanisms may be used with the present invention as it is described below.

[0062] An electrical control system for the motor may include two-prong attachment plug that fits into an electrical receptacle in the general proximity to where the lift base assembly is used for providing electrical current to operate the lift assembly. Alternatively, the attachment plug may be a three-prong grounding plug that fits into a grounding-type receptacle. The plug may include an insulated cable or power cord of suitable length. The electrical control system also may include a transformer, an electrical controller, a control wand, heating pads, cooling device, massage device, a motor actuator, and various male and female socket connectors for connecting the components of the electrical control system as described below.

[0063] The transformer may include a power cord with three current-carrying inductors that terminate in a male socket connector. The male socket mates with a female socket connector so that the transformer is electrically connected to the electrical controller through a power cord. The electrical controller further may include power cords. The power cord may include four current-carrying conductors that terminate in a male socket connector and a female socket connector. The power cord may include eight current-carrying conductors that terminate in a female socket connector. The power cord may include five current-carrying conductors that terminate in a male socket connector. The socket connectors may mate with counterpart socket connectors to electrically connect the electrical controller to the control wand, the heating pads, cooling device, massage device, and the motor actuator.

[0064] The transformer may receive AC power from a standard electrical receptacle via the power cord. The transformer may step down the input power, for example 120 volts of AC, to an output power. For example, the transformer outputs an AC voltage of 12 volts and a constant DC voltage of 27 volts. The transformer may include batteries, such as 9 volt batteries, which may provide backup power to the electrical system in the event of a power failure. The heating pads, cooling devices, and message devices may be powered by the 12 volts AC and the motor actuator may be powered by the 27 volts DC.

[0065] The electrical controller may receive both the 12 volts AC and the 27 volts DC from the transformer. The electrical controller may distribute the power from the transformer to the heating pads, cooling devices, massage device, the motor actuator, and the control wand. The electrical controller may direct the 12 volts AC to the heating pads, cooling device, and/or massage device, and may direct the 27 volts DC to the motor actuator. The control wand may also receive power from the 27 volt DC supply.

[0066] The control wand may include a control cord for receiving power from the electrical controller. The control wand may be mounted to a side arm of the chair or, alternatively, held and operated by a person using the chair. Additionally, the control cord communicates commands from the control wand to the electrical controller. For example, the control wand may include indicator means, such as an LED array, and one or more control switches. The user may control the various operations of the chair with the switches, such as lifting and lowering functions, reclining functions, and "on" or "off" status of the heating pads, cooling devices, message devices, etc. When the user operates the switches to lift the chair, electrical power is supplied to the motor actuator to rotate the screw shaft, rotary actuator, or linear actuator in a direction to cause the chair to lift. When the user operates the switches to lower the chair, electrical power is supplied to the motor actuator to rotate the screw shaft, rotary actuator, or linear actuator in the opposite direction for lowering the chair. The user may view status information for the chair at the indicator means, such as "on" or "off"

status or relative temperature indicators of the heating pads and/or cooling devices.

[0067] The control wand may be powered by the 27 volt DC supply. However, the control wand does not directly switch the current load of the motor actuator. Instead, the control wand switches relays located in the electrical controller in order to control power to the motor actuator. In this manner, the high current draw of the motor actuator does not pass through the control wand. In an alternative embodiment, the indicator means and/or the switches are located directly on the chair rather than on the control wand. For example, the indicator means and switches may be located on a side arm of the chair.

[0068] The motor actuator may receive electrical power from the electrical controller through the electrical connection of the power cord, the male socket connector, and the female socket connector. The motor actuator may provide rotational power to the screw shaft according to the electrical power received from the electrical controller. For example, if the user operates the switches to lift the chair, the motor actuator receives electrical power of a first polarity to rotate the screw shaft in a first direction. If the user operates the switches to lower the chair, the motor actuator receives electrical power of a second polarity to rotate the screw shaft, the rotary actuator, or linear actuator in a second direction.

[0069] The rate at which the motor actuator lifts and lowers the chair may be directly dependent upon the DC voltage received from the transformer through the electrical controller. In the preferred embodiment, the DC voltage is 27 volts. The current drawn by the motor actuator, however, may be proportional to the load upon the chair. If the chair is empty, the motor actuator requires relatively low current. If the chair is loaded with a person, the motor actuator requires higher current. Conventionally, motor actuators receive a particular power input to control the lift and lowering functions. As the load upon the chair increases, the motor actuator draws more current. Because power is a product of voltage and current (P=VI), the voltage of the motor actuator decreases proportionately as current draw increases. As voltage decreases, the lift rate of the chair decreases proportionately. Therefore, it can be seen that the lift and/or lower rates of conventional power-assisted chairs were extremely dependent upon the load on the chair at any particular time.

[0070] In contrast, the transformer of the present invention is operable to output a generally constant DC voltage regardless of the current draw from the motor actuator. One such transformer available is InScat Solutions' AC/DC adaptor, model number 15541 Class II power transformer, which outputs a 12 volt AC supply and a 27 volt DC supply. If the motor actuator draws more current due to a heavier load upon the chair, the transformer adjusts automatically to maintain a generally constant DC voltage output of 27 volts to the motor actuator. The motor actuator receives a constant voltage regardless of the current draw. Therefore, the motor actuator may provide constant rotational power to the screw shaft, rotary actuator, or linear actuator. In this manner, the power-assisted chair of the present invention may provide generally constant lift and lowering rates independent of the load on the chair. Further, the power-assisted chair of the present invention is able to provide constant lift and lowering rates for loads up to 500 hundred pounds with a single motor.

[0071] The required time to complete a full lift or lower cycle is dependent upon the lift or lower rate of the motor, and therefore is further dependent upon the voltage output of the transformer. Because the DC voltage supply of the transformer is generally constant, lift and lower cycles will be consistent regardless of the weight of the person using the chair. For example, slight voltage drops due to extremely heavy loads may cause the lift cycle to have a slightly longer duration, and the lower cycle to have a slightly shorter duration. Although cycle times may vary slightly due to factors such as increased heat due to higher current draw and other process variables, a person using the chair may expect generally uniform lift and lower cycle times.

[0072] Additionally, the electrical control system is operable to selectively control power to the heating pads, cooling devices, and/or massage devices during lift and lower operations of the motor actuator, which allows the transformer to maintain a Class II rating. For example, if the user operates the switches to lift or lower the chair while the heating pads, cooling devices, and/or message devices are "on," the electrical controller may turn off power to the heating pads, cooling devices and/or massage devices. Once the lift or lower operation is complete, the electrical controller will restore power to the heating pads, cooling devices and/or massage devices. In this manner, the electrical controller directs power solely to the motor actuator during lift and lower operations, which allows the motor actuator to receive the maximum power available.

[0073] The electrical control system may include other electrical components, such as a vibratory massage device, an air pillow massage device, or other devices as are known in the art. The additional devices may operate on the 12 volt AC supply in a fashion similar to the heating pads, cooling devices and/or massage devices. Correspondingly, the electrical controller may disable power to the additional devices during motor lift and lower operations.

[0074] An electrical power supply may be configured as "smart" power supply such that, for example, a maximum power, drawn from a power supply, may be automatically limited by controlling a number of recliner chairs that can be operated at any given time. For example, when a power supply is being operated near a maximum limit, recliner chairs, that are connected to the power supply and not yet being operated, are disabled until a power draw from an associated power supply is reduced (*e.g.*, operation of a previously operated recliner chair is ceased). Alternatively, or additionally, operation of a previously operated recliner chair may be automatically sus-

pended if, for example, an occupant of another recliner chair, that is connected to the power supply, initiates return of the chair to an upright position. Accordingly, if an occupant of a recliner chair needs to exit the chair for any reason (*e.g.*, an emergency) that chair will operate and any other chair that is being reclined may cease to operate. Alternatively, or additionally, any given powered recliner chair within a venue, or all powered recliner chairs within the venue, may be configured to automatically move to any predetermined position (*e.g.*, a fully upright position, a fully reclined position, or any position there between) in the event of an emergency. Notably, notification of an emergency situation within a venue may be initiated via a central alarm (*e.g.,* a manually operated fire alarm, a carbon monoxide sensor, a smoke sensor, etc.), a sound detector (*e.g.,* a gunshot detector, a scream detector, etc.), and/or via a personal electronic device (*e.g.,* a mobile telephone, a portable data assistant, a laptop computer, or any other portable electronic device that is communicatively coupled to a venue emergency notification system).

[0075] Similarly, operation of a group of recliner chairs, that are connected to a common power supply, may be automatically staggered such that any given sub-group of recliner chairs may be automatically delayed (*e.g.,* to reduce inrush current - 10mS delay), or operation may be alternated, such that a maximum power limit of the associated power supply is not exceeded. Thereby, a group of recliner chairs, that are connected to a smart power supply, may be automatically controlled to not exceed a power supply maximum.

[0076] A "smart power supply system" may include a power supply (*e.g.*, transformer 1496a, 1496c, 1496d) and a controller (*e.g.*, controller 800, 990a, 990b, 1090a, 1090b), and may include controlling/activating/deactivating any given recliner chair(s) by communicating between chairs, monitoring chair(s) status, (*e.g.*, such things as recline position and travel direction) and may predict/anticipate chair(s) power requirements including accessories such as heat, message, etc. to enable/disable/prioritize recliner chair power consumption. Such a smart power supply system may control inherent power peaks, that may occur during normal operation, or less critical action in a manner to minimize power consumption while optimizing associated recliner chair user experience.

[0077] With reference to Fig. 8, a powered chair control assembly 800 may include a controller (*e.g.,* a programmable logic controller (PLC), an application specific integrated circuit (ASIC), a discrete component electrical circuit, a field-programmable gate array (FPGA), a microcontroller, etc.)/actuator 860, a power connection 866, a power transformer 865, a power connection cable 867, a transformer connection 868, a local controller 870, a local controller cable 873, and a local controller connector 874. The controller/actuator 860 may be either a controller/linear actuator or a controller/rotary actuator. The local controller 870 may be similar to the local controller 270, 370, 470 of Figs. 2-4, respectively. The local controller 870 may include, for example, a chair recline button 871 and a chair upright button 872. Alternatively, the chair controller 870 may include, for example, a first button to move the respective chair between an upright position (*e.g.*, a chair position as illustrated in Fig. 2) and a reclined position (*e.g.,* a chair position as illustrated in Fig. 3). As another alternative, a chair controller 870 may include a plurality of functions, such as, individual buttons associated with independently controlling a chair back 215, a lower lumbar support 220, a chair seat 225, a foot-rest 230, and/or an arm-rest 235. Additionally, a chair controller 870 may include an audio output connector, a power output connector, lighting, a microphone, a speaker, etc. Alternatively, a chair controller 870 may be similar to a portable computing device (*e.g.*, portable computing device 169 of Fig. 1) that facilitates a plurality of chair controls and/or venue interaction. While not shown in Fig. 8, the controller/actuator 860 may also include a battery. While not shown in Fig. 8, the controller/actuator 860 may include a plurality of sensors (*e.g.*, limit switches, proximity sensors, motion sensors, temperature sensors, occupancy sensors, pressure sensors, strain gauges, etc.) and/or lighting (*e.g.,* light emitting diodes). While a control module may be places between a switch and motor/actuator, a "smart switch" may be provided, which may incorporate the function of a control module and switch into one unit; communication lines may then plug directly into the smart switch.

[0078] Turning to Figs. 9A-9C, a powered chair control assembly 900a-c may include a controller (*e.g.,* a programmable logic controller (PLC), an application specific integrated circuit (ASIC), a discrete component electrical circuit, a field-programmable gate array (FPGA), a microcontroller, etc.) 990a, 990b, a local controller 970c, a wireless data receiver 985b, and an actuator 960b. The actuator 960b may be either a linear actuator or a rotary actuator. The local controller 970c may be similar to the local controller 270, 370, 470 of Figs. 2-4, respectively. The local controller 970c may include, for example, a chair back upright button 971 c, a chair back recline button 977c, a chair seat upright button 972c, a chair seat upright button 976c, a chair foot-rest upright button 974c, and/or a chair foot-rest recline button 975c. The chair controller 970c may include, for example, a first button to move the respective chair between an upright position (*e.g.*, a chair position as illustrated in Fig. 2) and a reclined position (*e.g.,* a chair position as illustrated in Fig. 3). Alternatively, a chair controller 970c may include a plurality of functions, such as, individual buttons associated with independently controlling a chair back 215, a lower lumbar support 220, a chair seat 225, a foot-rest 230, and/or an arm-rest 235. Additionally, a chair controller 970c may include an audio output connector, a power output connector, lighting, a microphone, a speaker, etc. Alternatively, a chair controller 970c may be similar to a portable computing device (*e.g.*, portable computing device 169 of Fig. 1) that facilitates a plurality of chair con-

trols and/or venue interaction.

[0079] The controller 990a, 990b may include a reclined chair position indicator 997a, 997b and/or an upright chair position indicator 998a, 998b. The controller 990a, 990b may further include a first connector receptacle 991a, a second connector receptacle 992a, a third connector receptacle 993a, a forth connector receptacle 991b, a fifth connector receptacle 992b, a sixth connector receptacle 993b, a seventh connector receptacle 994b, and/or an eighth connector receptacle 995b. The controller 990a, 990b may also include a battery 996b. While not shown in Figs. 9A or 9B, the controller 990a, 990b and/or the actuator 960b may include a plurality of sensors (*e.g.*, limit switches, proximity sensors, motion sensors, temperature sensors, occupancy sensors, pressure sensors, strain gauges, etc.) and/or lighting (*e.g.,* light emitting diodes).

[0080] With reference to Figs. 10A-10C, a powered chair control assembly 1000a-c may include a controller (*e.g.,* a programmable logic controller (PLC), an application specific integrated circuit (ASIC), a discrete component electrical circuit, a field-programmable gate array (FPGA), a micro-controller, etc.) 1090a, 1090b, a local controller 1070c, a wireless data receiver 1085b, a first actuator 1060b, and a second actuator 1065b. The first actuator 1060b and/or the second actuator 1065b may be either a linear actuator or a rotary actuator. The local controller 1070c may be similar to the local controller 270, 370, 470 of Figs. 2-4, respectively. The local controller 1070c may include, for example, a chair back upright button 1071c, a chair back recline button 1078c, a chair seat upright button 1072c, a chair seat upright button 1077c, a chair foot-rest upright button 1073c, a chair foot-rest recline button 1076c, a head-rest upright button 1074c, and/or a head-rest recline button 1075c. The chair controller 1070c may include, for example, a first button to move the respective chair between an upright position (*e.g.,* a chair position as illustrated in Fig. 2) and a reclined position (*e.g.,* a chair position as illustrated in Fig. 3). Alternatively, a chair controller 1070c may include a plurality of functions, such as, individual buttons associated with independently controlling a chair back 215, a lower lumbar support 220, a chair seat 225, a foot-rest 230, and/or an arm-rest 235. Additionally, a chair controller 1070c may include an audio output connector, a power output connector, lighting, a microphone, a speaker, etc. Alternatively, a chair controller 1070c may be similar to a portable computing device (*e.g.,* portable computing device 169 of Fig. 1) that facilitates a plurality of chair controls and/or venue interaction.

[0081] The controller 1090a, 1090b may include a reclined chair position indicator 1097a, 1097b and/or an upright chair position indicator 1098a, 1098b. The controller 1090a, 1090b may further include a first connector receptacle 1091a, a second connector receptacle 1092a, a third connector receptacle 1093a, a forth connector receptacle 1091b, a fifth connector receptacle 1092b, a sixth connector receptacle 1093b, a seventh connector receptacle 1094b, and/or an eighth connector receptacle 1095b. The controller 1090a, 1090b may also include a battery 1096b. While not shown in Figs. 10A or 10B, the controller 1090a, 1090b and/or the actuator 1060b may include a plurality of sensors (*e.g.*, limit switches, proximity sensors, motion sensors, temperature sensors, occupancy sensors, pressure sensors, strain gauges, etc.) and/or lighting (*e.g.,* light emitting diodes).

[0082] Turning to Figs. 11A-11C, a local chair control assembly 1100a-c may include a chair control housing 1170a-c, a chair recline button 1171 a-c, and/or a chair upright button 1172a-c. The local chair control assembly 1100a-c may include, for example, a first button to move the respective chair between an upright position (*e.g.*, a chair position as illustrated in Fig. 2) and a reclined position (*e.g.*, a chair position as illustrated in Fig. 3). Alternatively, a local chair control assembly 1100a-c may include a plurality of functions, such as, individual buttons associated with independently controlling a chair back 215, a lower lumbar support 220, a chair seat 225, a foot-rest 230, and/or an arm-rest 235. Additionally, a local chair control assembly 1100a-c may include an audio output connector, a power output connector, lighting, a microphone, a speaker, etc. Alternatively, a local chair control assembly 1100a-c may be similar to a portable computing device (*e.g.,* portable computing device 169 of Fig. 1) that facilitates a plurality of chair controls and/or venue interaction. The local chair control assembly 1100a-c may be similar to, for example, the local chair control 270, 370, 470.

[0083] With reference to Figs. 12A and 12B, a powered rcclincr chair 1200a, 1200b may include a chair back 1215a, 1215b, a lower lumbar support 1220a, 1220b, a chair seat 1225a, 1225b, a foot-rest 1230a, 1230b, at least one arm-rest 1235a, 1235b (in some embodiments a chair may include two arm-rests that are mirror images of one another), a calf-rest 1240a, 1240b, a support structure 1226a, 1226b, and/or a chair reclining mechanism 1227a, 1227b. The powered recliner chair 1200a, 1200b may be similar to, for example, any one of the powered chairs 171, 200, 300, 400. The powered recliner chair 1200a, 1200b may incorporate any one of the controllers and/or actuators as shown and described with respect to Figs. 6-10. Power and/or data wiring may be routed through cross-channels 1228a. Legs 1229a and the channels 1228a may be mounted to an associated floor and a modular powered recliner chair may subsequently set in place on the legs 1229a and channels 1228a. The legs 1229a may be of pre-determined lengths in proportion to a floor slope such that the chairs set level.

[0084] Turning to Figs. 13A and 13B, block diagrams for example recliner chair control systems 1300a, 1300b are depicted. Fig. 13A depicts a controller 1305a, that may be included in one or more locations per row 1320a, 1325a, per section 1310a, 1315a, and may be set to control all A chair 1335a locations in a respective row 1320a, 1325a and section 1310a, 1315a. Alternatively or additionally, a controller 1305a may be included in one or

more locations per row 1320a, 1325a per section and may be set to control all A and B chair 1335a, 1330a, respectively, locations in that row 1320a, 1325a and section 1310a, 1315a. Any given chair may be, for example, similar to any one of the recliner chairs 210 of Fig. 2, or a group of recliner chairs 210. Control Z 1305a may control all configurations. Various controller 1305a location and control options are depicted in Fig. 13B. The related control may extend and/or retract associated reclining chair mechanism (*e.g.*, chair mechanism 1227a of Fig. 12A). For example, individual chair location control may be provided using an electrical switch (*e.g.*, switch 270 of Fig. 2) per chair. Alternatively or additionally, row 1320a, 1325a control may be provided by way of an assigned master or multiple master controllers 1305a in the row 1320b, 1322b, 1325b. A studio control 1340b may be proved to control of all chairs 1330b, 1335b by a central control 1305a. Alternatively, a studio control 1340b may control any and all locations in all rows 1320b, 1322b, 1325b and sections 1310a, 1315a. Optionally, an end of row controller 1305a A location may control all A locations in the row 1320b, 1322b, 1325b per section 1310b. Yet optionally, a second from end controller 1305a may control all B locations in the row 1320b, 1322b, 1325b per section 1310b. Yet alternatively, one or more A controller 1305a locations may control all other A locations in a row 1320b, 1322b, 1325b per section 1310b. Yet further optionally, one or more B controller 1305a locations may control all other B locations in the row 1320b, 1322b, 1325b per section 1310a, 1315a. Even further, an end of row controller 1305a location may control all locations in the row 1320b, 1322b, 1325b per section 1310a, 1315a.

[0085] A remote controller (*e.g.,* a studio control 1340b) may be communicatively connected to a local control (*e.g.,* an A controller, a B controller, or a controller located within each chair) via a hardwired network and/or a wireless network. A hardwired network and/or a wireless network may be bi-directional (*i.e.,* the remote controller may send data to the A controller, the B controller, or the controller located within each chair, and the A controller, the B controller, or the controller located within each chair may send data to the remote controller). Alternatively, each chair may include a control module (*e.g.*, control module 1490e of Fig. 14E) that is in unidirectional communication with a master controller (*e.g.,* a studio controller, an A controller, or a B controller).

[0086] At least one first powered recliner chair may be assigned to a first control group (*e.g.,* control group A) by at least one of: a first pin and shorting block, a first push button, or a first entry in a memory (*e.g.,* an IP address). At least one second powered recliner chair may be assigned to a second control group (*e.g.,* control group A) by at least one of: a second pin and shorting block, a second push button, or a second entry in a memory. A pin and shorting block may be included within a control module (*e.g.,* control module 1490e of Fig. 14E). A push button may be, for example, part of a chair retract/recline push button assembly (*e.g.*, push button 1171c or push button 1172c of Fig. 11C) or may be a push button incorporated into a control module (*e.g.,* control module 1490e of Fig. 14E). For example, a hole may be provided in a cover of the control module 1490e and a push button may be incorporated on an associated circuit board within the control module 1490e. In any event, each powered recliner chair, within any given venue, may be provided with a unique identification relative to any other chair within the venue. While both control group A and control group B may be located in a common room (*e.g.,* a single theater), control group A may be in a first room (*e.g.,* a first theater) and control group B may be in a second room (*e.g.,* a second theater).

[0087] With reference to Figs. 14A-H, example recliner chairs and related control components 1400a-1400h are depicted. Any given recliner chair 1400a-1400h may be similar to, for example, any one of the recliner chairs from the group of recliner chairs 210 of Fig. 2, or a group 210 of recliner chairs. The recliner chair 1400a may include a reclining control mechanism 1427a, a control module 1490a, and a transformer 1496a having an electrical connector 1491a. The recliner chair 1400b may include a control module 1490b having proximate chair interconnections 1493b, 1495b, a remote control module connection 1492b, and a local control switch connection 1494b. The recliner chair 1400c may include an electric power transformer 1496c, an actuator 1460c, a control module 1490c, a control module/actuator connector 1493c, a transformer/control module connector 1491c, and a local control switch connector 1494c. The recliner chair 1400d may include an electric power transformer 1496d, an actuator 1460d, a control module 1490d, a control module/actuator connector 1493d, a transformer/control module connector 1491d, and a local control switch connector 1494d. The recliner chair 1400e may include a control module 1490e having a battery 1496e, a first actuator connector 1494e, a second actuator connector 1495e, a first proximate chair connector 1493e, and a second proximate chair connector 1491e. The recliner chair 1400f may include a control module 1490f having a battery 1496f, a first actuator connector 1494f, a second actuator connector 1495f, a first proximate chair connector 1493f, and a second proximate chair connector 1491f. The recliner chair 1400g may include a chair frame 1426g, a chair recliner mechanism 1427g, and an actuator 1460g. The recliner chair 1400h may include a chair frame 1426h, a chair recliner mechanism 1427h, and a control module 1490h. As shown in Fig. 14H, the control module 1490h may include a transparent covcr and a light 1499h. The light 1499h may, for example, be illuminated while the associated chair 1400h is in a theater cleaning position. Any given control module 1490a, 1490c, 1490h may be, for example, similar to any one of the control modules 800, 990a, 990b, 1090a, 1090b. Any given actuator 1460a, 1460b, 1460c, 1460d, 1460e, 1460f, 1460g may be, for example, similar to any one of the actuators 660, 665, 760, 860, 960b, 1060b, 1065b.

Any given control module 1490a, 1490c, 1490h may include a chair recline relay output, a chair upright relay output, an emergency relay output, a lighting relay output, a combination thereof, or any sub-combination thereof.

[0088] Any given controller may be configured to control a single chair row, such that all chairs extend and/or retract via a single input. Alternatively or additionally, any given controller may be configured to control a single chair row, such that every other chair extend and/or retract via a single input. Alternatively or additionally, any given controller may be configured to control an entire theater control, such that all chairs in a theater extend and/or retract via a single input. Alternatively or additionally, any given controller may be configured to control an entire theater, such that every other chair extend and/or retract via a single input.

[0089] An associated power supply may be configured to provide daisy chained high voltage power between recliner chairs to facilitate ease of installation. For example, a single chair may be plugged into the high voltage power and then extended to proximate chairs. A chair may have multiple powered outlets, such as an extension cord or power strip that other chairs may be plugged into. This may allow a chair to feed power to other chairs, for example, in a row of chairs, thereby, eliminating multiple and expensive power outlets for each individual chair.

[0090] A mechanical mechanism may be provided in addition to, or in lieu of, the automatic mechanisms (*e.g.,* controller/actuator) to reclining any given chair or a group of chairs via an interlocked mechanical mechanism. For example, a "C" clamp may be include that may be positioned over an arm of a chair and may activate a switch (extend or retract based on clamp position). Thus, a system for applying a force to activate the switch may be provided, such that a reactive force may be contained within the arm that contains the switch. Alternatively, a rod may be provided that may extend between chair arms to activate a switch (extend or retract based on rod position). Thus, a system may be provided for applying a force to activate the switch such that a reactive force is contained within the chair. Such a system may make it unnecessary for the operator to wait while each chair extends/retracts.

[0091] A less sophisticated mechanical system may be provided where a person walks down a row of chairs and applies a mechanical device to extend/retract each chair. Turning to Fig. 14J, a reclining chair 1400j may include a leg rest 1430, a first arm rest 1435j, and a second arm rest 1437j. The second arm rest 1437j may be movable (flip up arm) attached to, for example, the back of the chair. Alternatively, a chair may have a movable arm 1437j attached to an arm box. Attaching the second armrest 1437j to the back may keep the arm rest in line with the back preventing the interference with an adjacent chair occupant.

[0092] Any given reclining chair may include a "pillow top" configured to cover at least a portion of a respective chair (*e.g.,* a foot rest, a leg rest, a chair seat, a chair arm, a chair back, and/or a head rest). A seat and/or back pillow top may be attached to an adjacent seat or back, respectively, thereby, creating a gap filler between the seat and back which may prevent items (*e.g.,* personal items or trash) from falling below the seating surfaces. Alternatively, a gap filler(s) may not be part of a pillow top. A gap filler may be configures as: a gap filler with a temporary or permanent connection between a seat and/or back; a gap filler with a temporary or permanent connection between the chair arm boxes and/or other members; or a gap filler as made from an at least partially permeable member which may be configured to assist in determining which items are allowed to fall thru the chair while other items are limited from falling. An example of items that may be permitted to fall through are popcorn kernels or liquids, while keeping items of such as cell phones, money, etc. from falling below the seating surface. An alternative gap filler example may allow liquids to pass thru, while items such as popcorn kernels, cell phones, etc. are not allowed to fall thru. Any given reclining chair theater system may include passages or openings under the reclining chairs that allow items to move to an area of easier access.

[0093] A pillow top (*e.g.,* a foot rest pillow top, a leg rest pillow top, a chair seat pillow top, a chair arm pillow top, a chair back pillow top, and/or a head rest pillow top) may be removable. Alternatively, or additionally, any/all pillow tops may include a fireproof (or fire resistant) and/or bullet proof material (*e.g.,* carbon fiber composite material, Kevlar, Lexan, grapheme, composite material, wire mesh, anti-ballistic material, etc.). Thus, in emergency circumstances a chair occupant may remove a respective pillow top (or pillow tops) and use the pillow top(s) for personal protection. Notably, notification of an emergency situation within a venue may be initiated via a central alarm (*e.g.,* a manually operated fire alarm, a carbon monoxide sensor, a smoke sensor, etc.), a sound detector (*e.g.,* a gunshot detector, a scream detector, etc.), and/or via a personal electronic device (*e.g.,* a mobile telephone, a portable data assistant, a laptop computer, or any other portable electronic device that is communicatively coupled to a venue emergency notification system).

[0094] In addition to including a fireproof and/or anti-ballistic material as described above, a removable pillow top may include arm sleeves, straps, handholds, etc. such that the removable pillow top is easy for an individual to carry and/or use as a shield. In addition to, or as an alternative to, a removable pillow top a chair seat, a chair back, and/or a chair arm may include fireproof and/or anti-ballistic material fixed to the chair. Accordingly, the chair itself may provide protection from fires and/or bullets.

[0095] As can be seen in Figs. 14A and 14C-14H, an associated recliner chair 1400a, 1400c-1400h may include a back panel 1428a, 1428c-1428h. The back panel 1428a, 1428c-1428h may be removable, or repositionable (*e.g.,* by comparing Figs. 14A and C with Figs.14D-

14H), to provide access under any given recliner chair 1400a, 1400c-1400h. Alternatively, or additionally, a back panel 1428a, 1428c-1428h may be movably attached to a respective recliner chair 1400a, 1400c-1400h, such that the back panel 1428a, 1428c-1428h may be manually/automatically repositioned (*e.g.,* to either a cleaning (access) position or a conceal position), and/or the back panel 1428a, 1428c-1428h may retain the respective position until manually/automatically returned to the other position (*e.g.,* to either a conceal position or a cleaning (access) position).

[0096] Any given back panel 1428a, 1428c-1428h may be configured to move in any direction while remaining attached to an associated reclining chair, and may remain in a position that aids cleaning and access. Additional back panel 1428a, 1428c-1428h movement directions may include: a hinged configuration such that the back panel swings like a door (*e.g.,* full swing or Dutch swing); moves upward; or upward and outward: or folds downward, partially at an angle to the floor, or fully, such that the back panel rests on the floor when in an open position. A recliner chair back panel may include portion(s) made of different materials that may conform or allow relative movement to adjacent surfaces. For example, a recliner chair on a inclined floor may include a back panel, hinged like a door, an having a lower edge made from pliable material (*e.g.,* rubber, thin plastic, composite material, etc.) such that, when the back panel is opened, the lower compliant material allows the back panel to swing open and not interfere with the inclined floor. Alternately, or additionally, back panel hinges may allow movement of an associated back panel such that opening of the back panel is not impeded by the floor or floor obstruction/conditions.

[0097] With reference to Fig. 14K, a reclining chair 1400k may include a chair support frame 1426k, a reclining mechanism 1427k, and an actuator 1460k.

[0098] Turning to Figs. 15A-D, recliner chairs 1500a-d may include an arm box 1535a-d having a cub holder 1536a-d, a top side panel 1541a, a front panel 1543a, a bottom side panel 1542a, a back panel 1544a, an access opening 1539a, support structures 1537b-d, and a wire way passage 1538a-d. An arm box 1535a-d with a wire routing channel(s) 1538a-d may include some or all of the following: assist in passage of wires such as switch controls from inside to outside of the arm box; assist in passage of wires from one side of the arm box to the other side; cross brace 1537b-d; constructed of member which do not provide structure; contain members which provide strain relief; members which are inserted from each side of the arm box and thus forming a wire management path; openings on one or more surfaces to allow additional wires or items to enter the wire management path; openings which have movable members; members positions such that the members limit entry of undesirable items such as fluids; provision for a cover over one or more sides to allow an arm box with such wire management path to be covered so the arm box may be used in situations where access from one or both or no sides is required; and/or isolated path ways. A reclining chair may include wire management features to manage wires between arm boxes and with the recliner mechanism. Any given reclining chair system may include a Smart power system mounted either internal to an arm box or external to the arm box.

[0099] With reference to Figs. 16A-F, a powered reclining chair system 1600a-f may include a series of pluggable electrical interconnections having, for example, electrical conductors (e.g, power and/or data conductors) 1605b, 1605c, 1605e, a first plug 1610b-f, a second plug 1615b, 1615d, 1615f, a flexible conduit 1620b-f, and/or a restraining clamp 1625c-e. Any one of the pluggable electrical interconnections may be, for example, Electri-Pak available from Electri-Cable Assemblies, Shelton, CT. Alternatively, or additionally, a powered reclining chair may include modular wiring system(s) from Electric-Pak or Byrne Electric which allows connection of components (may be UL approved to promote ease of code approval) that may be factory or site installed. Such products may be attached with fasteners or snaps in a fashion that aids assembly, installation or service. Such system(s) may cooperate with the wire management system noted above. Such a system(s) may include low voltage, high voltage or data lines. Such system(s) may cooperate with clean sweep and/or smart power systems described elsewhere herein.

[0100] A host of different circuit board configurations may be employed in any given recliner chair installation. For example, a circuit board may have 2-inputs and 2-outputs. An interconnection may connect in line between a local control switch and a motor (*e.g.,* actuator) and may carry electric current that controls the motor/actuator. Additionally, CAT-5 cables may be included that carry control signals between chairs when a chair is in normal mode. A patron's local control switch actions (extend or retract) may be passed thru our control module thru the CAT-5 cables. When a chair system is put into "clcan/maintcnancc" mode signals may be passed thru the CAT-5 cable to allow a master chair to control other chairs.

[0101] Locations of a circuit board and/or transformer may be attached to a rear chair board. Alternatively, a circuit board and/or transformer may be attached to a rear motor/actuator cross tube. A control circuit may be configured as a serial connection between modules, may be wired in parallel, or wires may be eliminated (or reduced) via wireless communications.

[0102] A high voltage power connection may include a power strip/extension cord plugged into a high voltage feed with a receptacle end mounted on a rear cross tube, or a rear board adjacent to a transformer. A transformer may be plugged into one outlet and proximate chair(s) may be plugged into other outlet(s). This approach may reduce a number of expensive outlets hardwired in an associated building, and may, employ an associated high voltage feed line pre-wired in a chair. A rear chair panel

may be removable to facilitate cleaning and maintenance of a controller, actuator and/or recliner mechanisms.

[0103] Turning to Figs. 17A-F, various views of example powered recliner chair assemblies 1700a-f arc dcpictcd. The powered recliner chair assemblies 1700a-f may be similar to, for example, portions of the powered recliner chair assemblies 210 of Fig. 2. The powered recliner chair assemblies 1700a-f may include a chair seat 1725a-f, a foot rest 1730a-f, a chair arm 1735a-f having a cup holder 1736a-f and a chair controller (not shown in Figs. 17A-F, however, similar to any one of the chair controllers described elsewhere herein), a chair side panel 1726a-f, chair recliner mechanism structure 1727a-f, a power distribution panel 1785a-f, and power and/or control interconnecting cables 1707a-f, 1711a-f, 1715a-f, 1716a-f.

[0104] With references to Figs. 18A-H and 18J-L, various views of electrical power and control assemblies 1800a-h and 1800j-1 for use in powered recliner chairs are depicted. The electrical power and control assemblies 1800a-h and 1800j-1 and/or portions thereof may be similar to, for example, any one of the assemblies depicted in Figs. 8, 9A-C, 10A-C, 14A-H, 14J, 14K, and/or 16A-E. The power and control assemblies 1800a-h and 1800j-1 may include a chair controller 1860a-h and j-1, a power supply 1890a-h and j-1, a junction box/distribution panel 1885a-h and j-1, a support panel 1870a-b having brackets 1871a-b, 1872a-b, a junction box/distribution panel to power supply cable 1805a-h and j-1 having first and second plug ends 1806a-h and j-1 and 1807a-h and j-1, a first chair-to-chair interconnection cable 1810a-h and j-1 having a first plug end 1811a-h and j-1 and a second plug ends 1812a-h and j-1, a chair controller to chair control interconnection cable 1815a-h and j-1 having first plug end 1816a-h and j-1 and a second plug end 1817a-h and j-1, a second chair-to-chair interconnection cable 1825a-h and j-1 having first plug end 1826a-h and j-1 and a second plug end 1827a-h and j-1, and a power supply to actuator/drive motor connecting cable 1830a-h and j-1 having a first plug end 1831 a-h and j-1 and a second plug end 1832a-h and j-1. It should be understood that any one of the interconnecting cables shown in Figs. 17A-F, 18A-H, and 18J-L may be similar to any one of the interconnecting cables of Figs. 16A-E. For example, in lieu of a plug end any given interconnecting cable may have a hardwired (*e.g.*, soldered connection) to a circuit board or terminal end. Any given plug end may be a male or female connection in accordance with National Electric Code Standards.

[0105] As illustrated in Figs. 17A-F, 18A-H, and 18J-L, power and/or control wiring may extend under a chair arm box. Alternatively, or additionally, power and/or control wiring may extend into a slot under chair arm box, and may be secured in position using at least one of: brackets holding modular wiring in advantageous positions to avoid being disturbed during associated venue/chair cleaning; via a power supply (*e.g.,* power supply 1890b) being secured in position; a chair control being secured in position; routing wires through chair structural members (*e.g.,* box beams and/or structural channels); and/or by preventing plugs from being un-plugged via restraining clamps. An electrical power and control assembly 1800a-h and j-1 may be configured such that the panel is pre-assembled with an associated junction box/distribution panel, a power supply, a chair controller, and associated interconnecting cables, such that the electrical power and control assembly may be quickly installed within an associated powered recliner chair without the need for skilled labor. Thereby, powered recliner chair installation time may be reduced and labor costs may be reduced when compared to powered recliner chairs that do not include pre-assembled electrical power and control panels. A chair arm box may be, for example, installed against a riser without a chair back hitting the chair arm or the riser when the recliner chair is reclined.

[0106] As shown in Fig. 18E, any given power or data connector may be held in place via a finger 1886e, or multiple fingers 1886e. Thereby, screws and/or similar fasteners are not required to retain the connectors in place. A bracket 1885f may be mounted on, for example, a rear of each powered recliner chair.

[0107] Turning to Fig. 19, a method for controlling a plurality of powered recliner chairs 1900 may include assigning at least one first powered recliner chair to a first control group (block 1905). The at least one first powered recliner chair may be assigned to the first control group by, for example, at least one of: a first pin and shorting block, a first push button, or a first entry in a memory. The method 1900 may further include assigning at least one second powered recliner chair to a second control group (block 1910). The at least one second powered recliner chair may be assigned to the second control group by, for example, at least one of: a second pin and shorting block, a second push button, or a second entry in a memory. The method may also include causing the at least one first powered recliner chair to reorient to a first orientation in response to a first remote control input (block 1915). The method may yet further include causing the at least one second powered recliner chair to reorient to a second orientation in response to a second remote control input (block 1920). The first orientation may be independent of the second orientation. The first orientation may be a reclined orientation and the first control input is a venue cleaning input. The second orientation may be a reclined orientation and the first control input is a venue cleaning input. The first orientation may be an upright orientation and the first control input is a venue emergency input. The second orientation may be an upright orientation and the first control input is a venue emergency input.

[0108] The method 1900 may further include generating the first control input and the second control input in response to an automatic venue cleaning sequence (block 1925). The method 1900 may also include energizing at least one first light source in response to the

first control input (block 1930). The method 1900 may yet further include energizing at least one second light source in response to the second control signal (block 1935). The method may also include automatically prohibiting a second powered recliner chair from starting to reorient at the same time that a first chair starts to reorient (block 1940).

[0109] The method 1900 may be implemented by a processor (*e.g.,* processor 164 of Fig. 1) executing a set of computer-executable instructions (*e.g.,* the set of computer-readable instructions stored memory 165 of Fig. 1). Alternatively, the method 1900 may be implement by dedicated hardware (*e.g.,* one or more discrete component circuits, one or more application specific integrated circuits (ASICs), etc.). Although the method 1900 is described with reference to the flowchart illustrated in Fig. 19, many other methods of implementing the method 1900 may alternatively be used. For example, the order of execution of the blocks illustrated in Fig. 19 may be changed, and/or some of the blocks described may be changed, eliminated, or combined.

[0110] Although exemplary embodiments of the invention have been explained in relation to its preferred embodiment(s) as mentioned above, it is to be understood that many other possible modifications and variations can be made without departing from the scope of the present invention. It is, therefore, contemplated that the appended claim or claims will covcr such modifications and variations that fall within the true scope of the invention.

Aspects

[0111]

1. A powered rcclincr chair system, the system comprising:

at least one first powered rcclincr chair assigned to a first control group, wherein the at least one first powered recliner chair is assigned to the first control group by at least one of: a first pin and shorting block, a first push button, or a first entry in a memory;

at least one second powered recliner chair assigned to a second control group, wherein the at least one second powered recliner chair is assigned to the second control group by at least one of: a second pin and shorting block, a second push button, or a second entry in a memory;

a first remote control input to reorient the at least one first powered recliner chair to a first orientation; and

a second remote control input to reorient the at least one second powered recliner chair to a second orientation, wherein the first orientation is independent of the second orientation, and wherein data representative of the first remote control input and the second remote input is transmitted via at least one of: a hardwired communication network, or a wireless network connection.

2. The system of aspect 1, wherein the first orientation is a reclined orientation and the first control input is a venue cleaning input.

3. The system of aspect 1, wherein the first orientation is an upright orientation and the first control input is a venue emergency input.

4. The system of aspect 1, wherein the first control input and the second control input are generated in accordance with an automatic venue cleaning sequence.

5. The system of aspect 1, further comprising:
a smart power supply, wherein the smart power supply automatically prohibits a second powered recliner chair from starting to reorient at the same time that a first chair starts to reorient.

6. The system of aspect 1, further comprising:
at least one emergency power input selected from a group including: a battery, a capacitor, a photovoltaic cell, an internal combustion engine driven electrical generator, a wind-turbinc driven electrical generator, or a hydrogen fuel cell, wherein the at least one emergency power input is configured to provide electric power to the powered recliner chair in an event of an associated venue power outage.

7. The system of aspect 1, wherein at least one of the at least one first powered recliner chair or the at least one second powered recliner chair is a modular assembly having a plug in power connection, and wherein the powered recliner chair is fully operable with only the plug in power connection connected to the modular powered recliner chair.

8. A powered recliner chair, comprising:

at least one actuator having a first input and a second input, wherein the actuator is configured to reorient at least a portion of the powered recliner chair between an upright orientation and a reclined orientation in response to the first input, and wherein the actuator is configured to reorient at least the portion of the powered recliner chair between the recline orientation and the upright orientation in response to the second input; and

a control module having a local input, a remote input, a first output, and a second output, wherein the first output is connected to the first input, wherein the second output is connected to the second input, wherein the local input is connect-

ed to a chair occupant user interface that enables a chair occupant to reorient the powered recliner chair while the chair occupant is seated in the chair, and wherein the remote input is connected to a remote user interface that is physically separated from the powered recliner chair and enables a remote operator to reorient the powered recliner chair remote from the powered recliner chair.

9. The powered recliner chair of aspect 8, wherein the control module further comprises a third output, wherein the third output is configured to automatically reorient the powered recliner chair to an upright orientation in event of an emergency.

10. The powered recliner chair of aspect 8, further comprising:
a light module, wherein the control module further comprises a fourth output, and wherein the fourth output is configured to activate the light module.

11. The powered recliner chair of aspect8, further comprising:
a master controller located remote from the powered recliner chair and including a fifth output, wherein the control module is mounted to the powered recliner chair and is communicatively coupled to the master controller to receive the fourth output at the remote input.

12. The powered recliner chair of aspect8, further comprising:
at least one safety device, wherein the at least one safety device is configured to detect an object and to prevent reorientation of the powered recliner chair when the object is detected, wherein the at least one safety device is selected from a group including: a proximity sensor, a capacitance sensor, an ultrasonic sensor, a light sensor, a touch sensor, a proximity switch, a limit switch, an electric current sensor, a pressure sensor, a strain gauge, a microphone, a motion sensor, a temperature sensor, or a sonar sensor.

13. The powered recliner chair of aspect8, further comprising:
at least one emergency power input selected from a group including: a battery, a capacitor, a photovoltaic cell, an internal combustion engine driven electrical generator, a wind-turbine driven electrical generator, or a hydrogen fuel cell, wherein the at least one emergency power input is configured to provide electric power to the powered recliner chair in an event of an associated venue power outage.

14. The powered recliner chair of aspect 8, wherein the powered recliner chair is a modular assembly having a plug-in power connection, and wherein the powered recliner chair is fully operable with only the plug-in power connection connected to the modular powered recliner chair.

15. A method for controlling a plurality of powered recliner chairs, the method comprising:

assigning at least one first powered recliner chair to a first control group;
assigning at least one second powered recliner chair to a second control group;
causing the at least one first powered recliner chair to reorient to a first orientation in response to a first remote control input; and
causing the at least one second powered recliner chair to reorient to a second orientation in response to a second remote control input, wherein the first orientation is independent of the second orientation.

16. The method of aspect 15, wherein the first orientation is a reclined orientation and the first control input is a venue cleaning input.

17. The method of aspect 15, wherein the first orientation is an upright orientation and the first control input is a venue emergency input.

18. The method of aspect 15, further comprising:
generating the first control input and the second control input in response to an automatic venue cleaning sequence.

19. The method of aspect 15, further comprising:

energizing at least one first light source in response to the first control input; and
energizing at least one second light source in response to the second control signal.

20. The method of aspect 15, further comprising:
automatically prohibiting a second powered recliner chair from starting to reorient at the same time that a first chair starts to reorient.

21. A powered recliner chair system, comprising:

at least one of: a channel or an arm box; and
at least one of: power wiring or data wiring, wherein the at least one of: the power wiring or the data wiring is routed through the at least one of: the channel or the arm box from a first powered recliner chair to a second powered recliner chair.

23. The powered recliner chair system as in aspect 22, wherein at least one of the first powered recliner

chair or the second powered recliner chair is a modular powered recliner chair.

22. A powered recliner chair system, comprising:
a smart power supply, wherein the smart power supply automatically prohibits a second powered recliner chair from starting to reorient at the same time that a first chair starts to reorient.

Claims

1. A system for controlling a plurality of powered recliner chairs, the system comprising:
a chair controller including a local chair control input and at least one of: a remote chair control input or a chair reorientation safety sensor input, wherein the chair reorientation safety sensor input is representative of whether reorientation of a first powered recliner chair is safe, and wherein, when the remote chair control input is included, reorient the first powered recliner chair, from a chair reclined orientation to a chair upright orientation, in response to the local chair control input irrespective of a state of the remote chair control input, and wherein when the chair reorientation safety sensor input is included, reorient the first powered recliner chair from a first orientation to a second orientation in response to the local chair control input when the chair reorientation safety sensor input is indicative that an individual is not in jeopardy of being damaged due to reorientation of the first powered recliner chair from the first orientation to the second orientation.

2. The system of claim 1, further comprising:
an electric power supply located in the first powered recliner chair, wherein a first set of electrical conductors extends from a first output of the electric power supply to a first electric actuator within the first power recliner chair, and wherein a second set of electrical conductors extends from a second output of the electric power supply to a second electric actuator within a second powered recliner chair.

3. A system as in claim 2, further comprising:
at least one electrical energy storage device, wherein the chair controller is further configured to provide electrical energy from the at least one electrical energy storage device to at least one of: the first electric actuator or the second electric actuator.

4. A system as in claim 1, wherein the chair reorientation safety sensor input is connected to at least one of: a proximity sensor, a capacitance sensor, an ultra-sonic sensor, a light sensor, a touch sensor, a proximity switch, a limit switch, an electric current sensor, a pressure sensor, a strain gauge, a microphone, a motion sensor, a temperature sensor, or a sonar sensor.

5. A system as in claim 1, wherein the remote chair control input is connected to at least one of: a venue emergency system, a venue cleaning system, or a venue ticket system.

6. A method for controlling a plurality of powered recliner chairs, the method comprising:
providing a chair controller including a local chair control input and at least one of: a remote chair control input or a chair reorientation safety sensor input, wherein the chair reorientation safety sensor input is representative of whether reorientation of a first powered recliner chair is safe, wherein, when the remote chair control input is included, reorienting the first powered recliner chair, from a chair reclined orientation to a chair upright orientation, in response to the local chair control input irrespective of a state of the remote chair control input, and wherein, when the chair reorientation safety sensor input is included, reorienting the first powered recliner chair from a first orientation to a second orientation in response to the local chair control input when the chair reorientation safety sensor input is indicative that an individual is not in jeopardy of being damaged due to reorientation of the first powered recliner chair from the first orientation to the second orientation.

7. A method as in claim 6, wherein the chair controller is further configured to inhibit operation of chair accessories and/or reorientation initiation of a second powered recliner chair at a same time as reorientation of the first powered recliner chair is initiated, wherein the chair accessories may include at least one of: a chair heater, a chair massager, a chair cooler, or a chair light source.

8. A method as in claim 6, wherein the remote chair control input is connected to a venue emergency system and the chair controller is further configured for automatically reorienting the first powered recliner chair from a reclined orientation toward an upright orientation in response to the remote chair control input.

9. A method as in claim 6, wherein the remote chair control input is connected to a venue cleaning system and the chair controller is further configured for reorienting the first powered recliner chair from an upright orientation toward a reclined orientation in response to the remote chair control input.

10. A method as in claim 6, further comprising:
providing a concessions ordering and payment device communicatively coupled to the chair controller.

11. A computer-readable medium having computer-

readable instructions stored thereon that, when executed by a processor, cause the processor to control a plurality of powered recliner chairs, the computer-readable instructions comprising:

a local chair control input module that, when executed by the processor, causes the processor to receive a local chair control input;
at least one of: a remote chair control input module that, when executed by the processor, causes the processor to receive a remote chair control input; or a chair reorientation safety sensor input module that, when executed by the processor, causes the processor to receive a chair reorientation safety sensor input, wherein the chair reorientation safety sensor input is representative of whether reorientation of a first powered recliner chair is safe, wherein, when the remote chair control input module is executed, the processor reorients the first powered recliner chair, from a chair reclined orientation to a chair upright orientation, in response to the local chair control input irrespective of a state of the remote chair control input, and wherein, when the chair reorientation safety sensor input module is executed, reorient the first powered recliner chair from a first orientation to a second orientation in response to the local chair control input when the chair reorientation safety sensor input is indicative that an individual is not in jeopardy of being damaged due to reorientation of the first powered recliner chair from the first orientation to the second orientation.

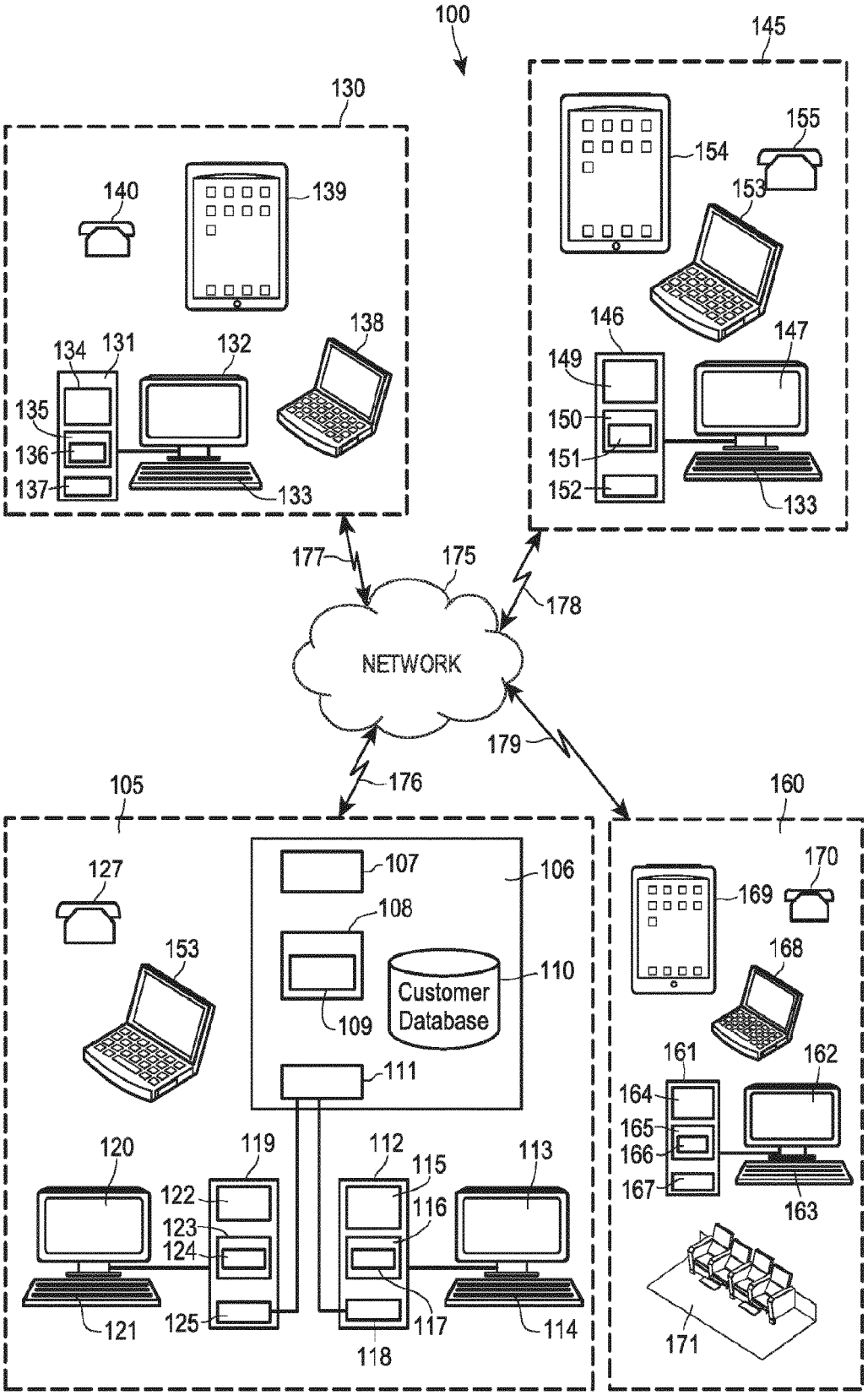
12. A computer-readable medium as in claim 10, further comprising:
a power management module that, when executed by the processor, causes the processor to control at least one of: an electric power supply to the first power recliner chair, or an electric power demand of the first power recliner chair.

13. A computer-readable medium as in claim 10, further comprising:
a venue cleaning module that, when executed by the processor, causes the processor to control a group of powered recliner chairs in response to the remote control input.

14. A computer-readable medium as in claim 10, further comprising:
a venue management module that, when executed by the processor, causes the processor to receive operation data related to the first powered recliner chair.

15. A computer-readable medium as in claim 14, further comprising:
an operation data transmission module that, when executed by the processor, causes the processor to transmit the operation data from the venue to a remote center located geographically separate from the venue.

FIG. 1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NETWORK
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Customer Database
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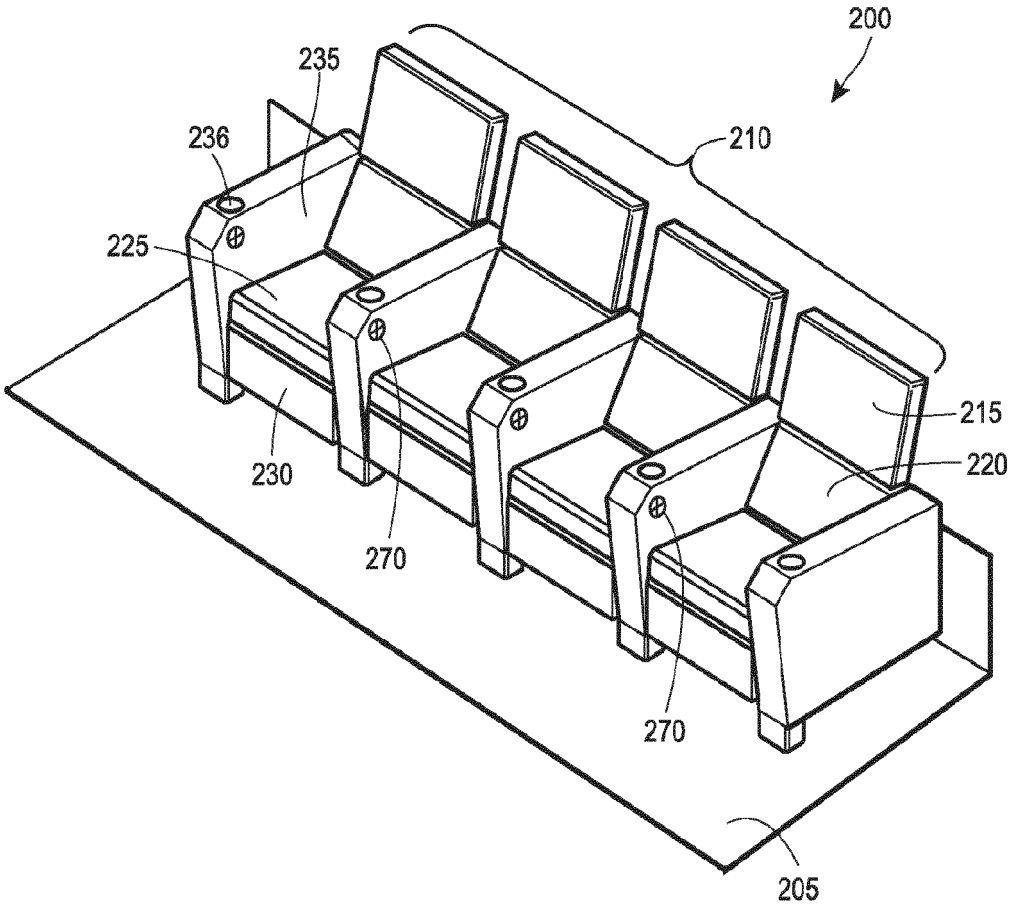

FIG. 2

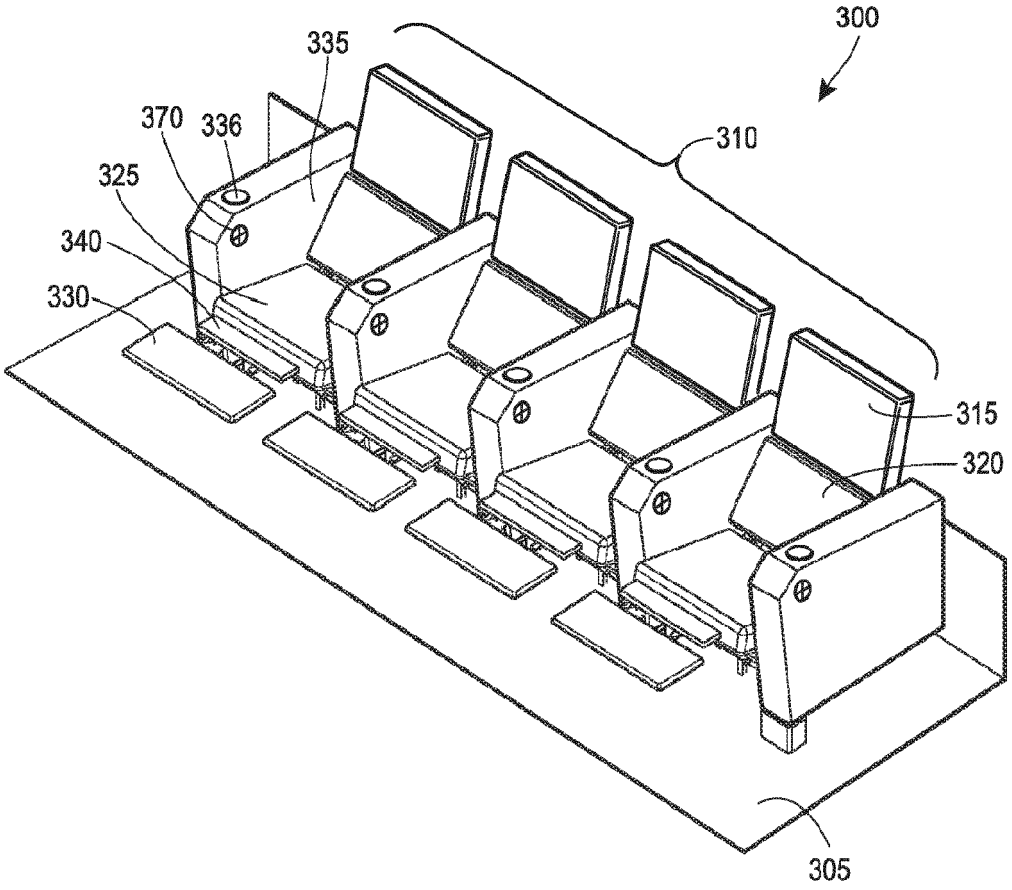

FIG. 3

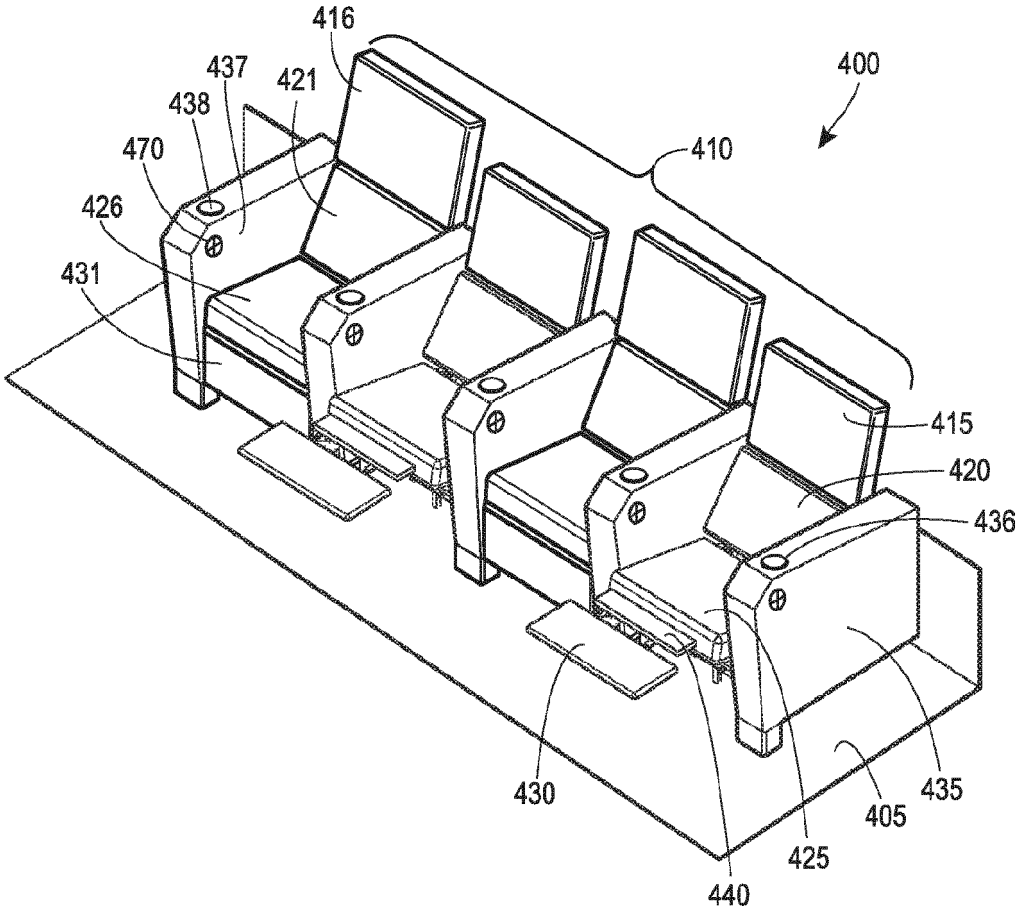
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FIG. 4

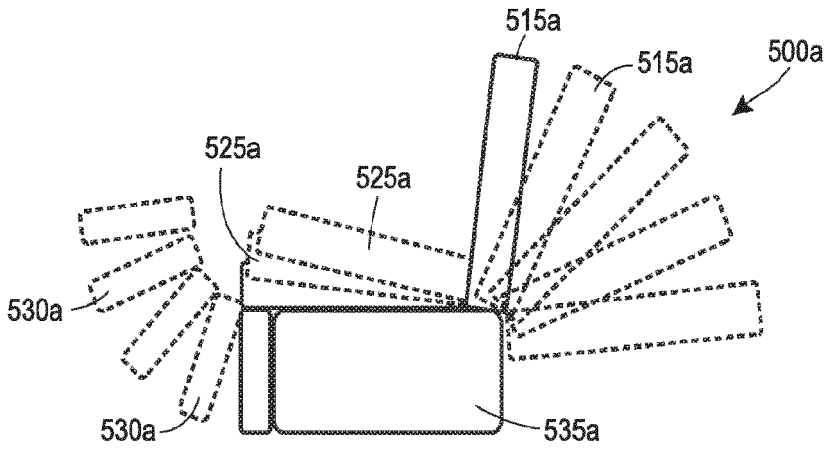

FIG. 5A

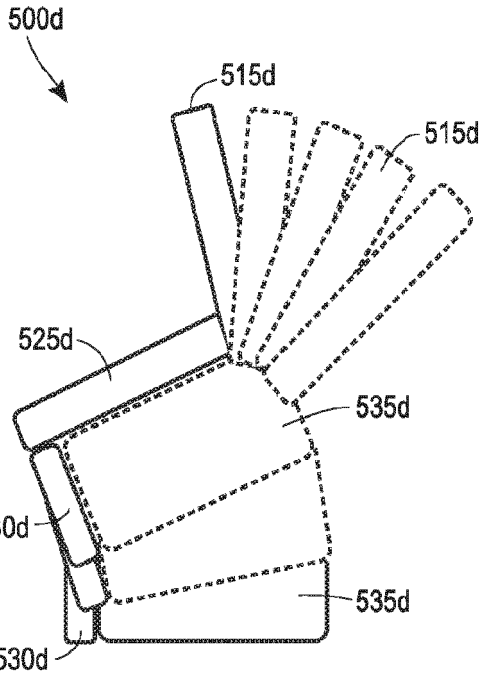

FIG. 5D

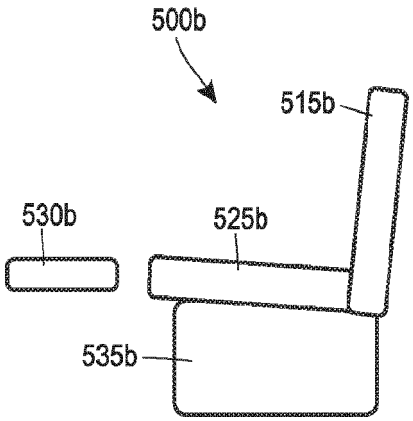

FIG. 5B

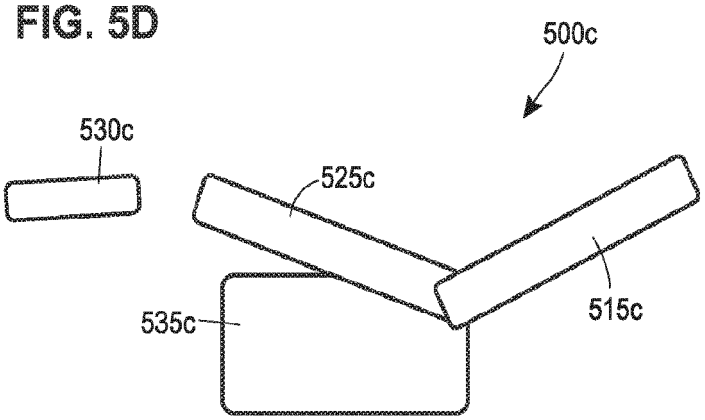

FIG. 5C

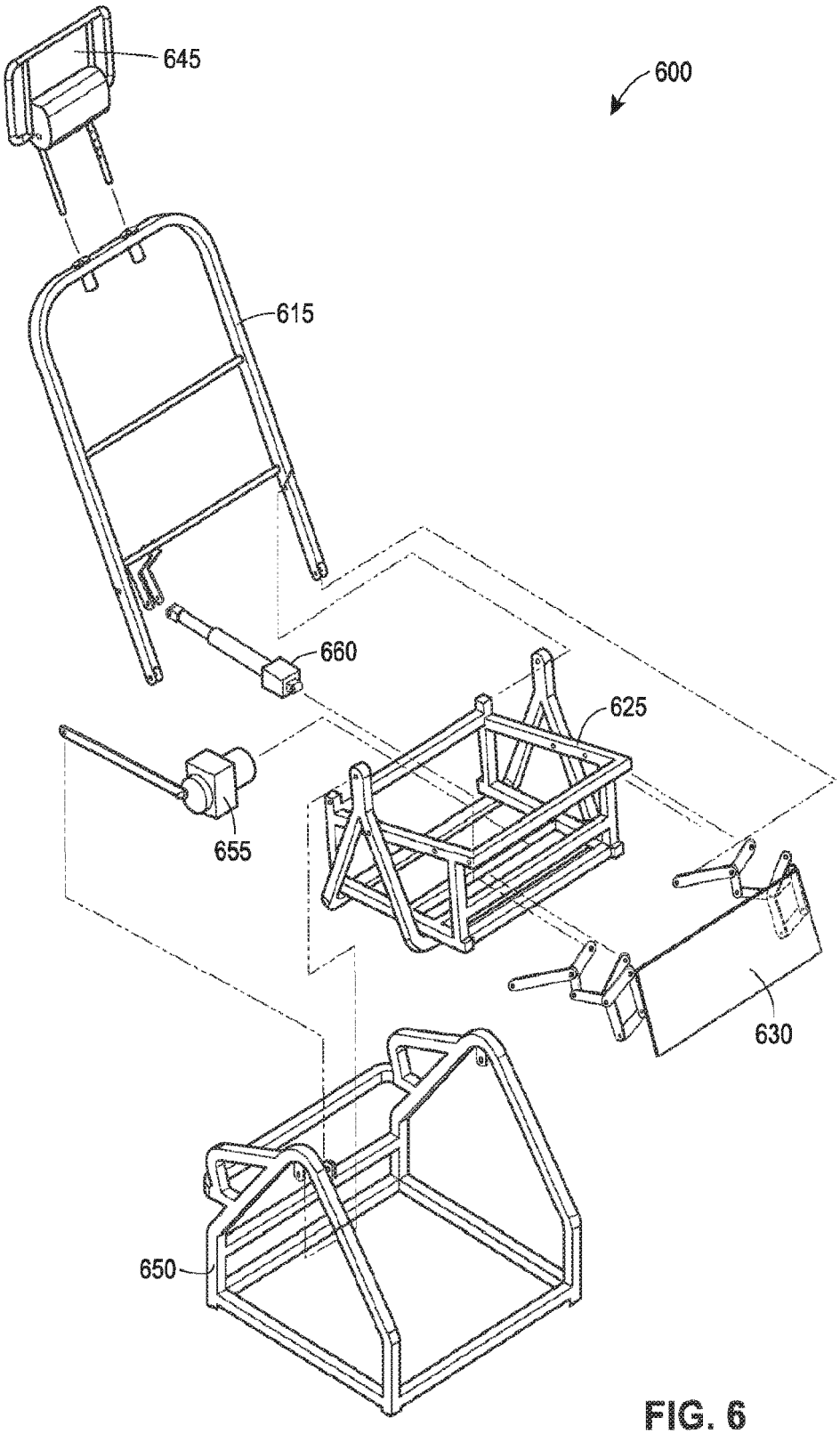

FIG. 6

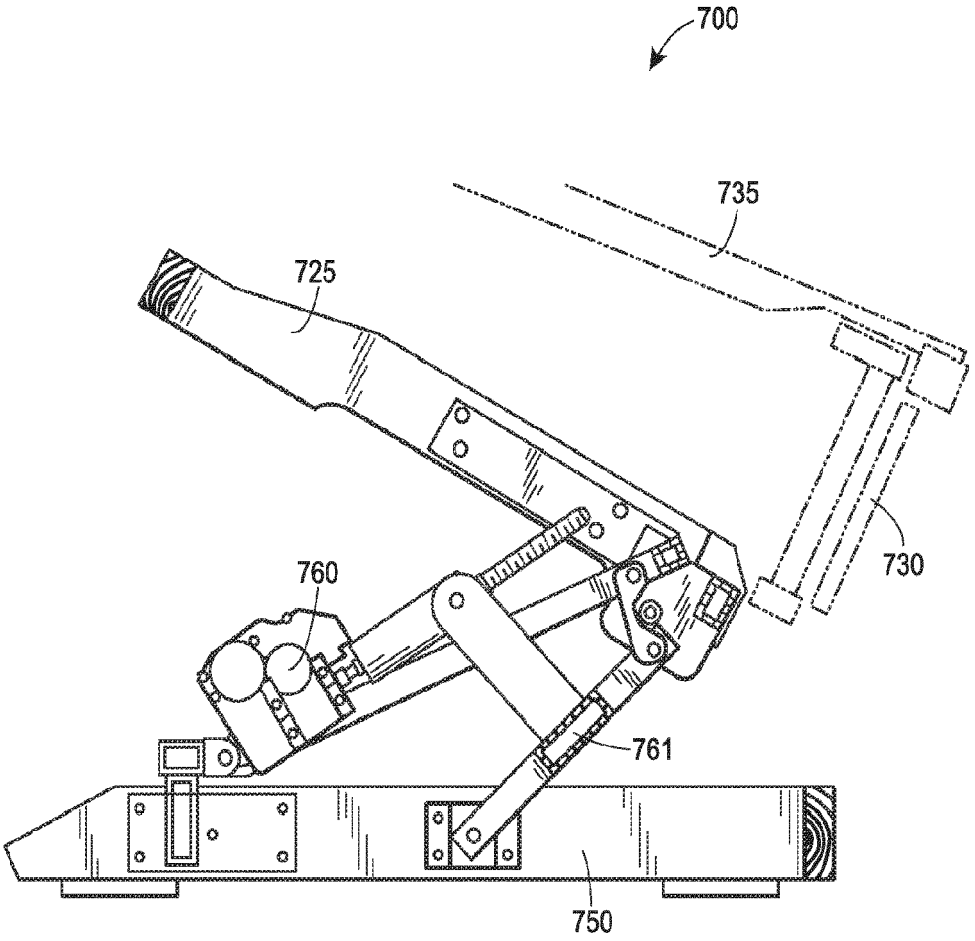

FIG. 7

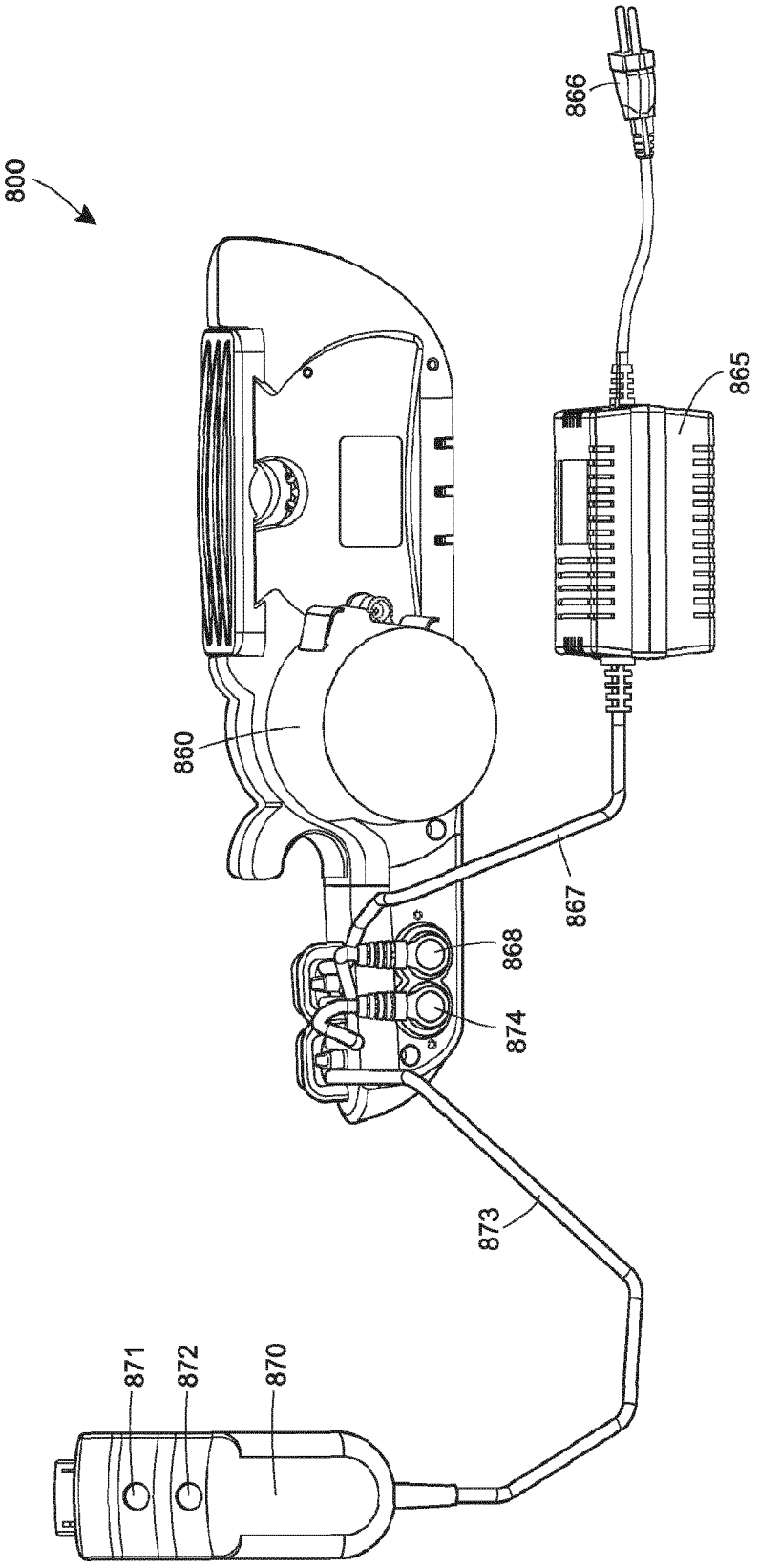

FIG. 8

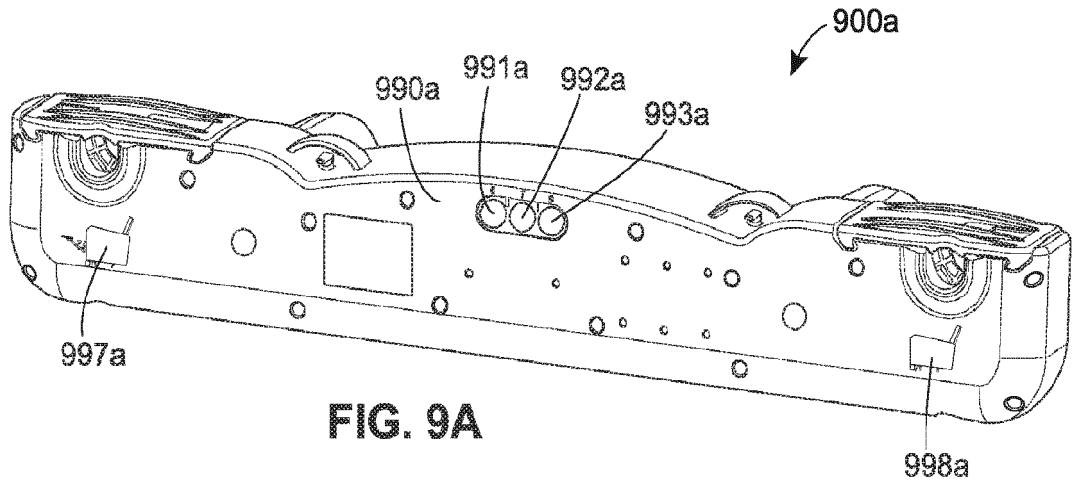

FIG. 9A

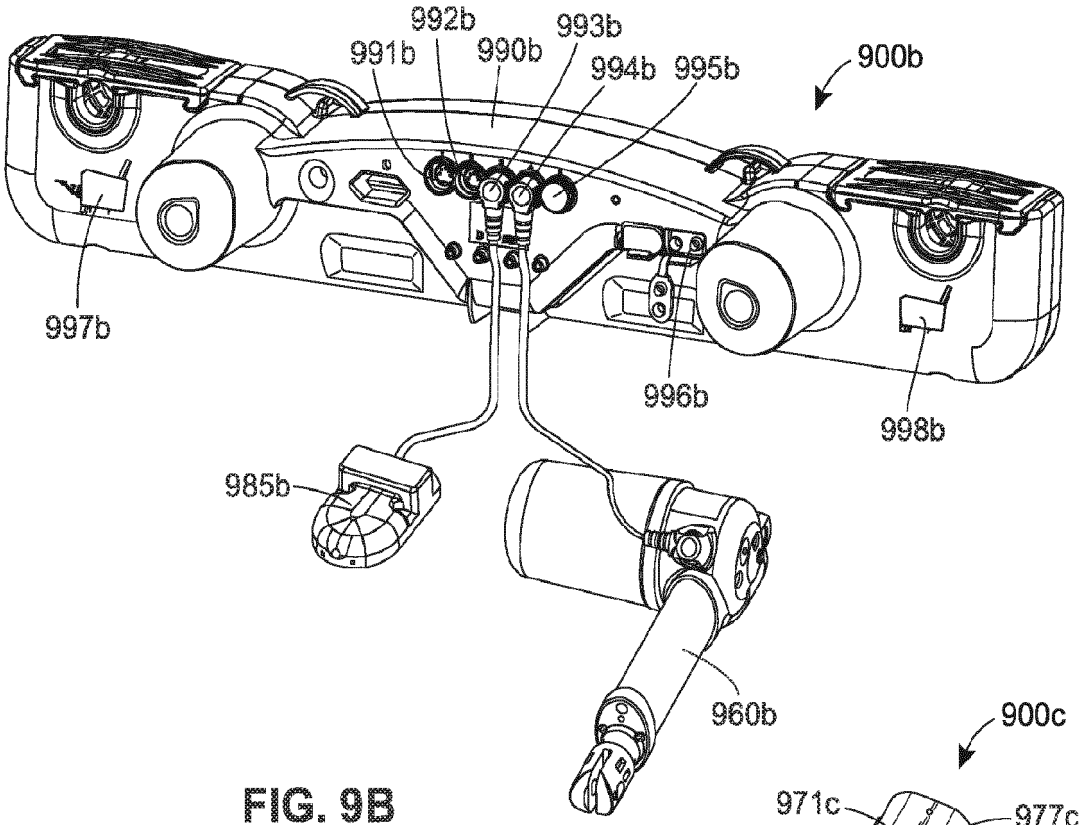

FIG. 9B

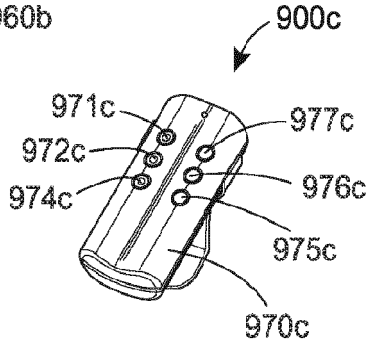

FIG. 9C

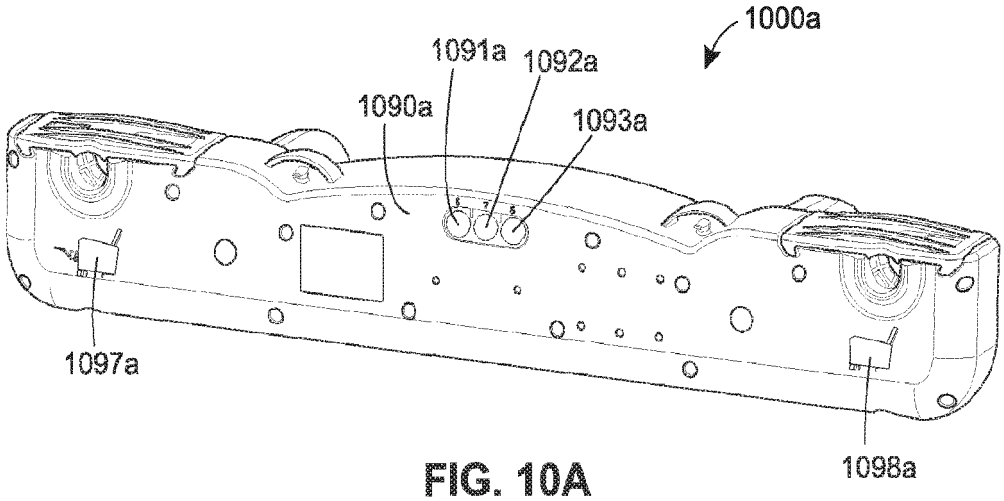

FIG. 10A

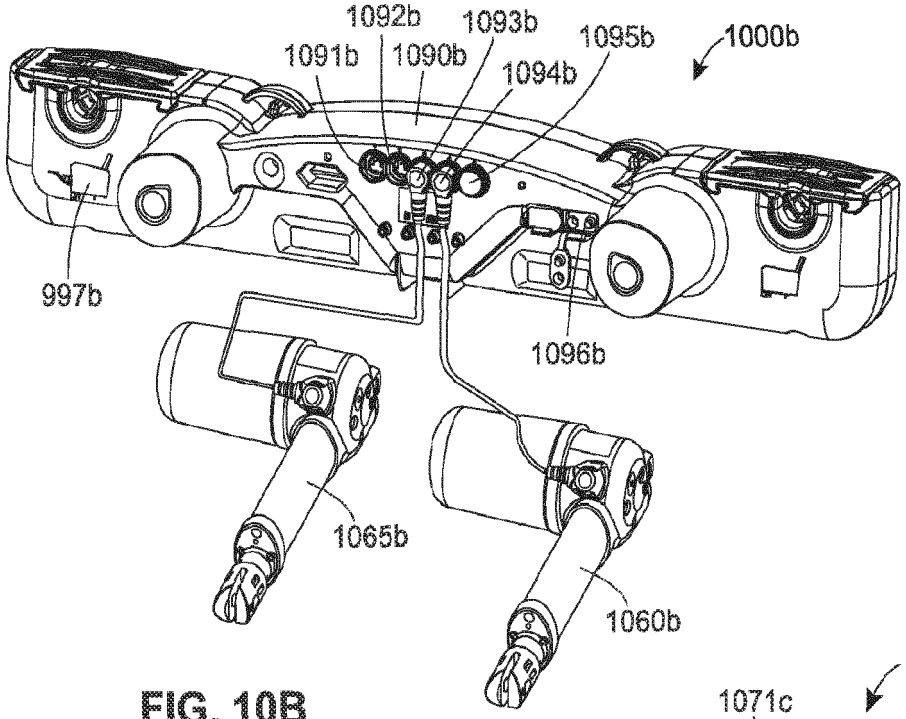

FIG. 10B

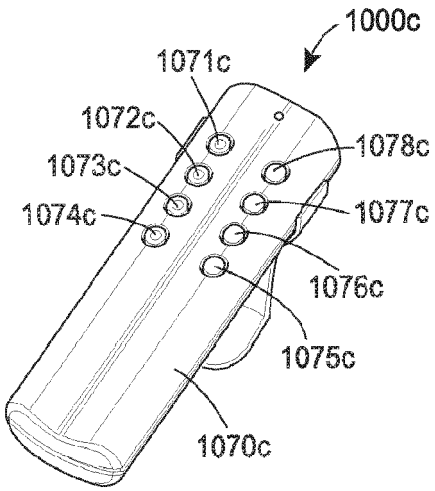

FIG. 10C

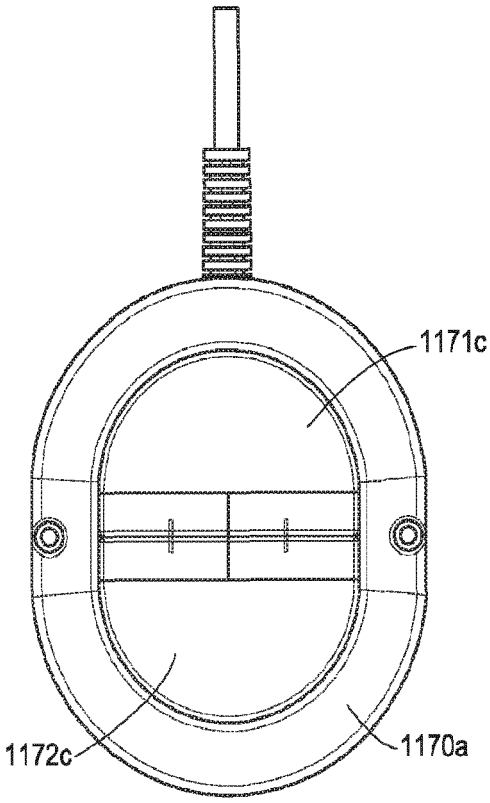

FIG. 11A

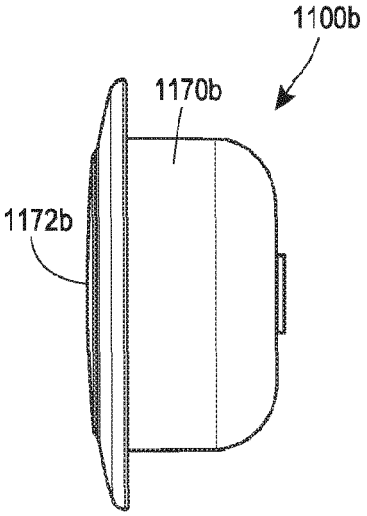

FIG. 11B

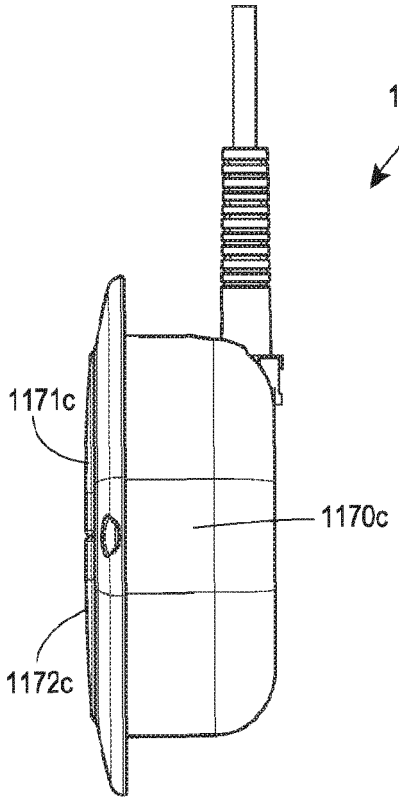

FIG. 11C

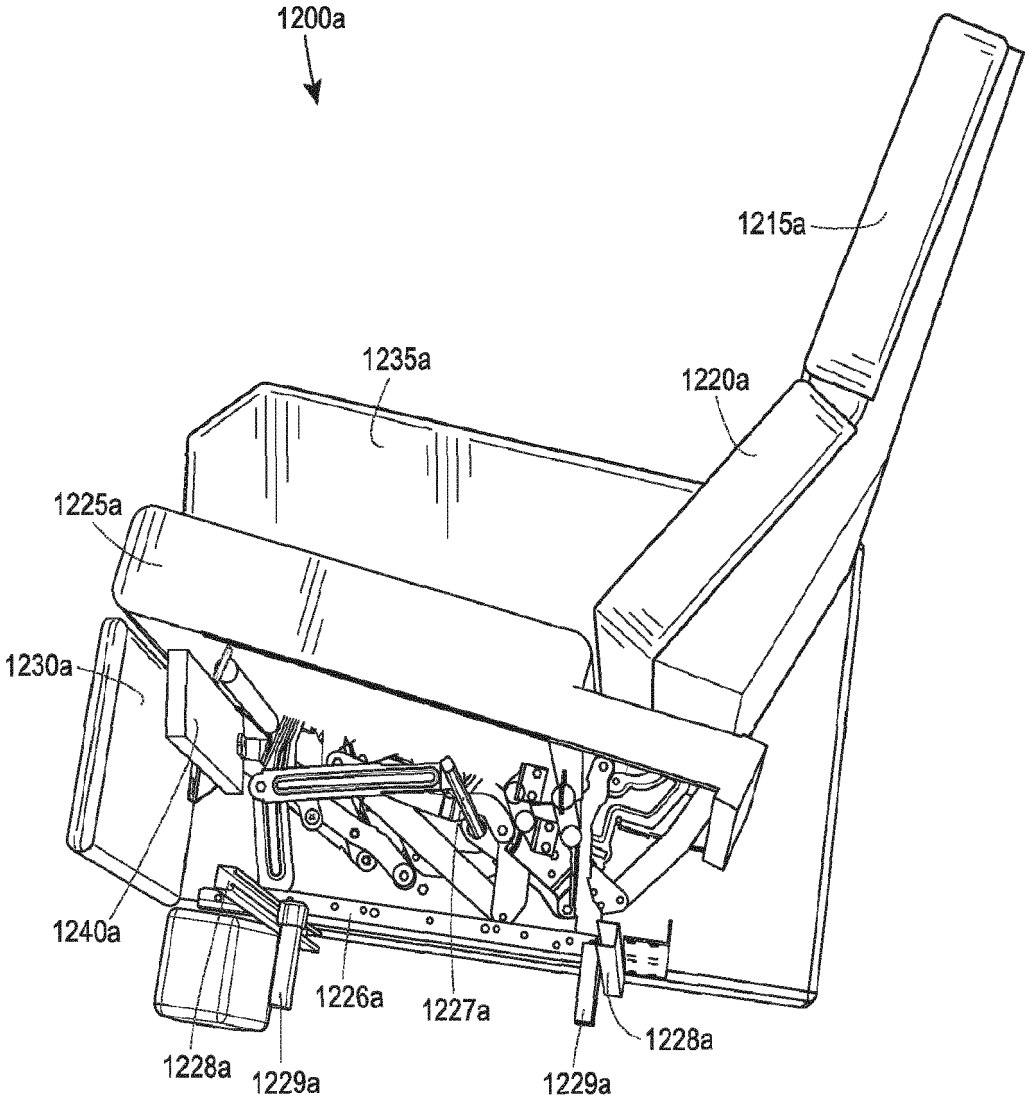
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FIG. 12A

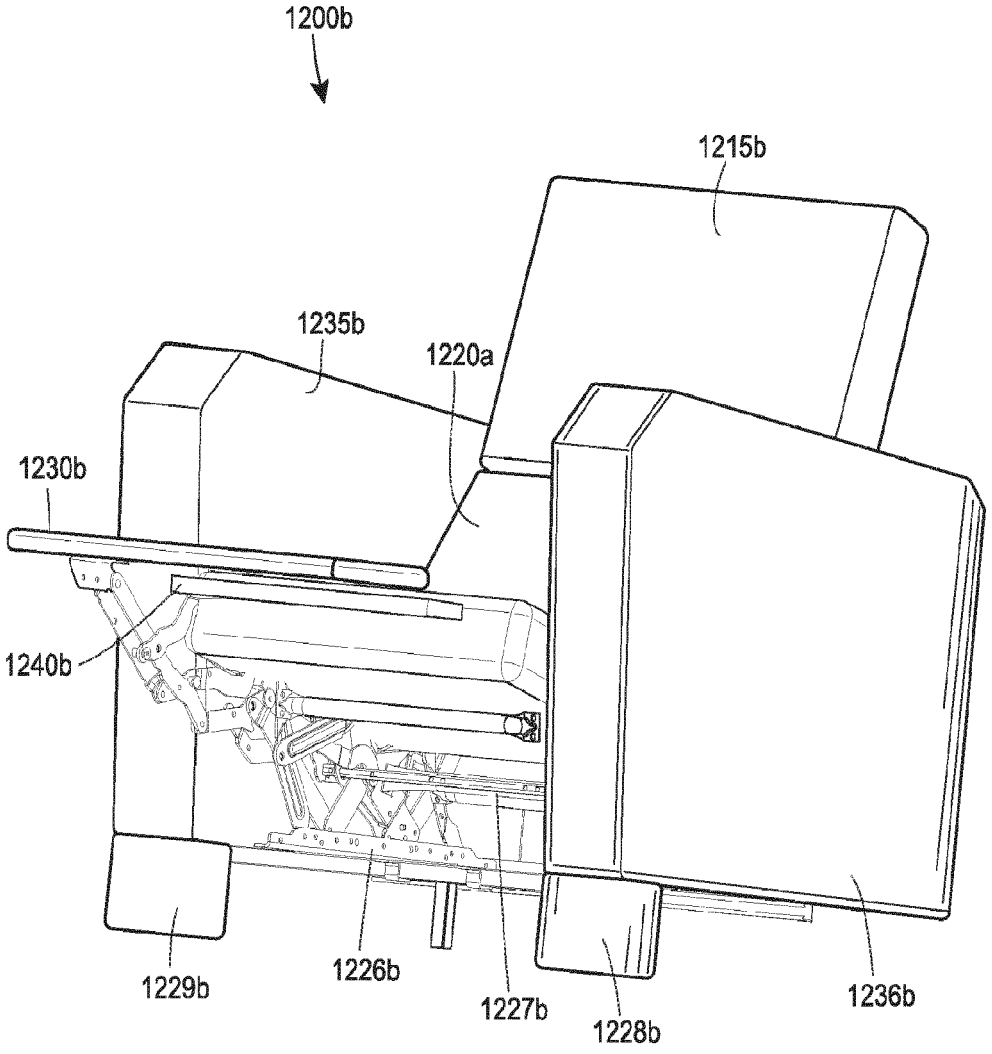
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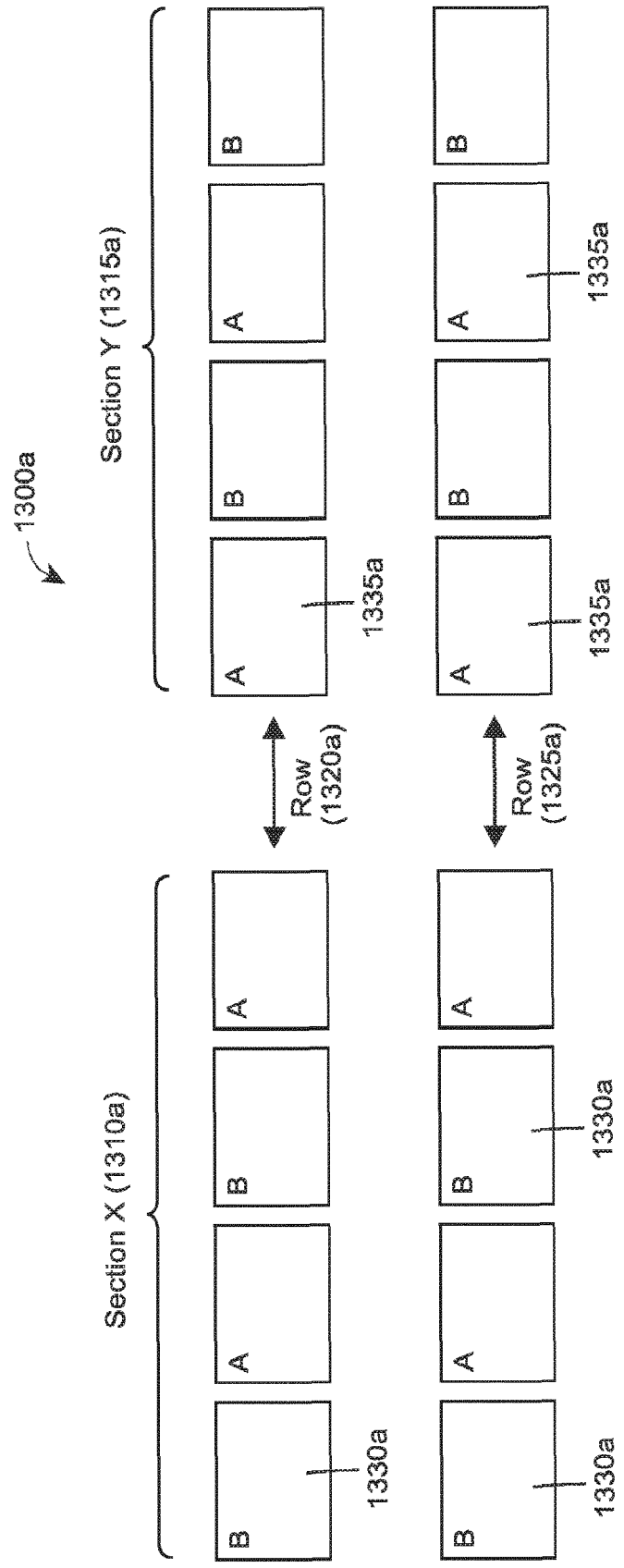
FIG. 12B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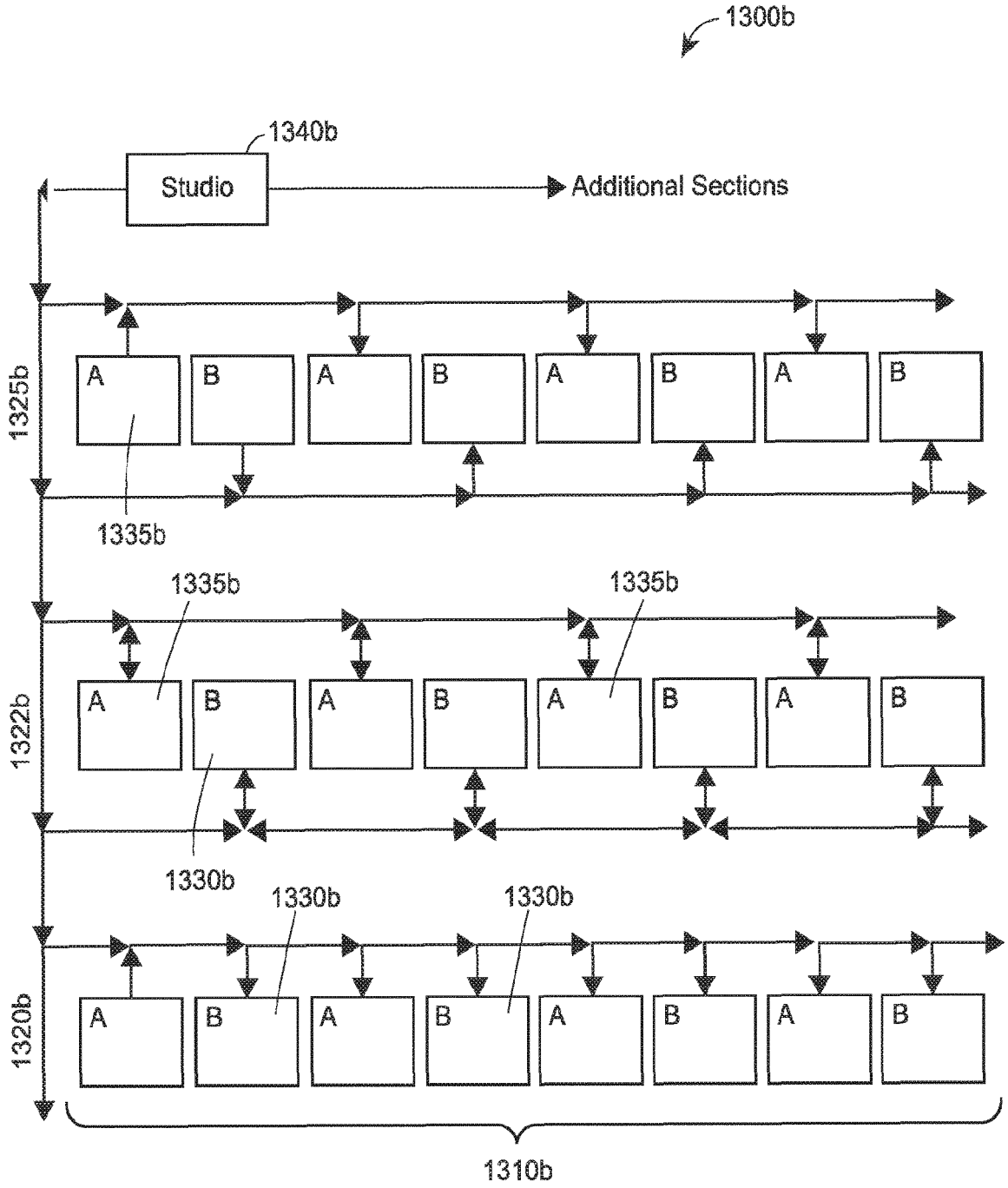
Row (1325a)

FIG. 13A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1310b

FIG. 13B

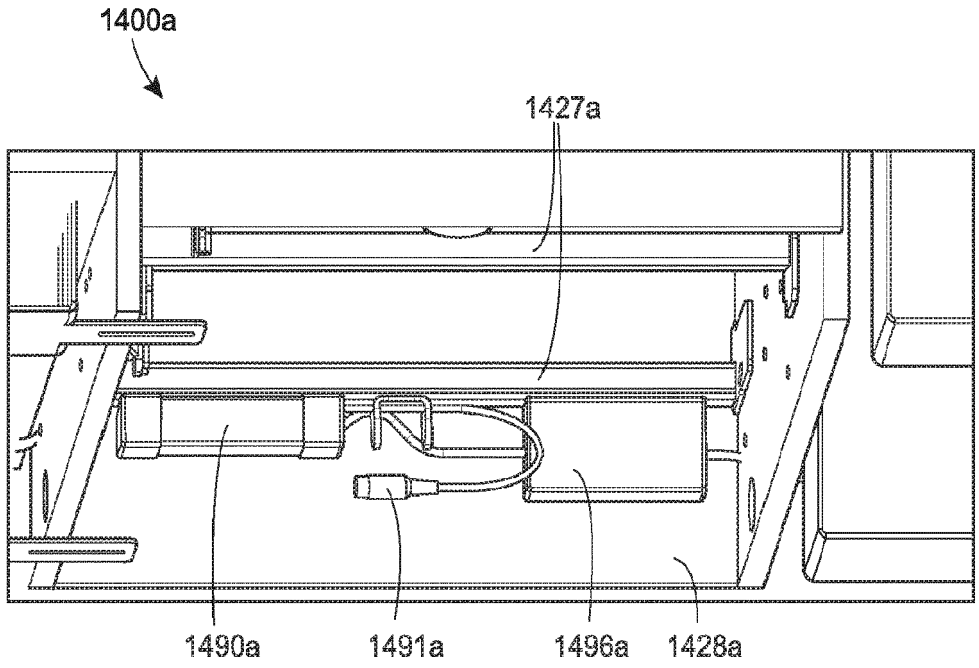

FIG. 14A

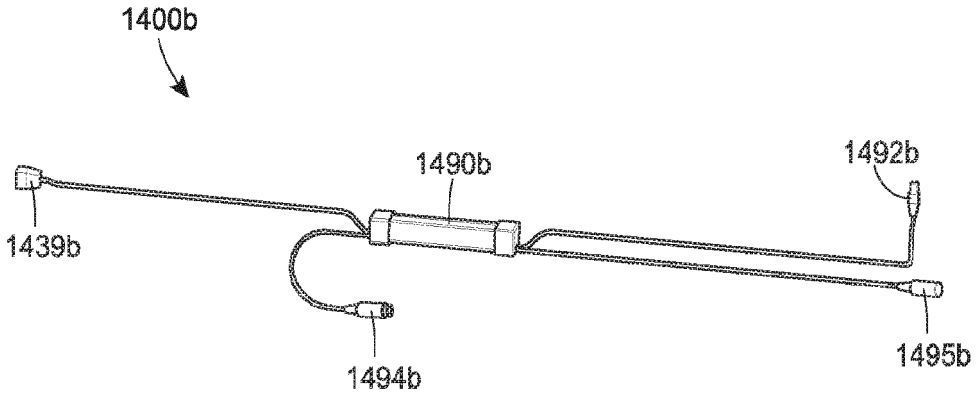

FIG. 14B

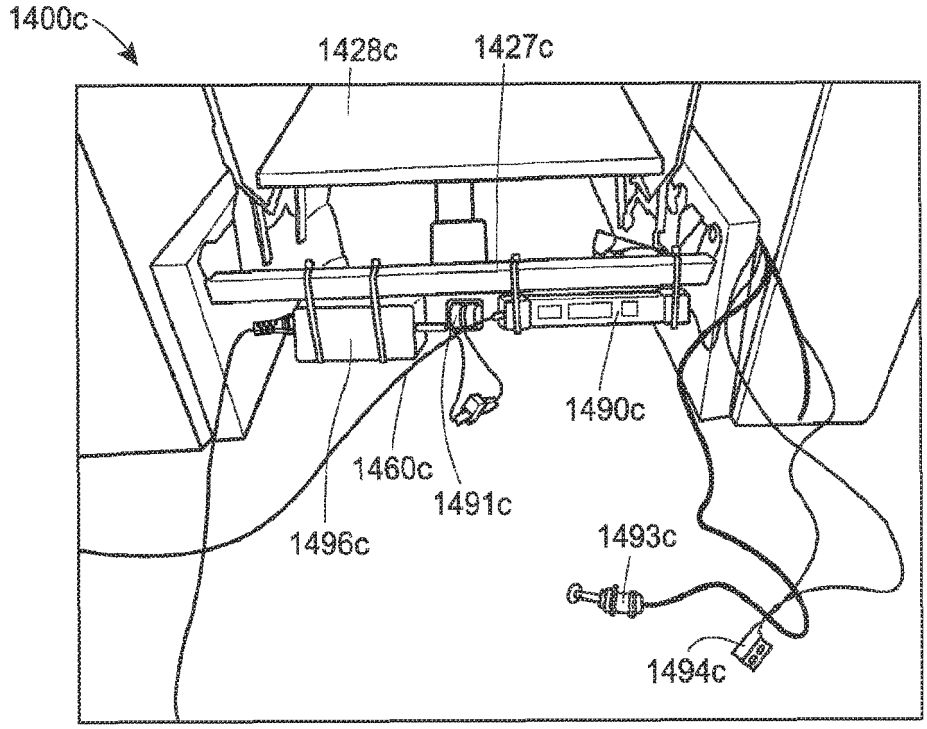

FIG. 14C

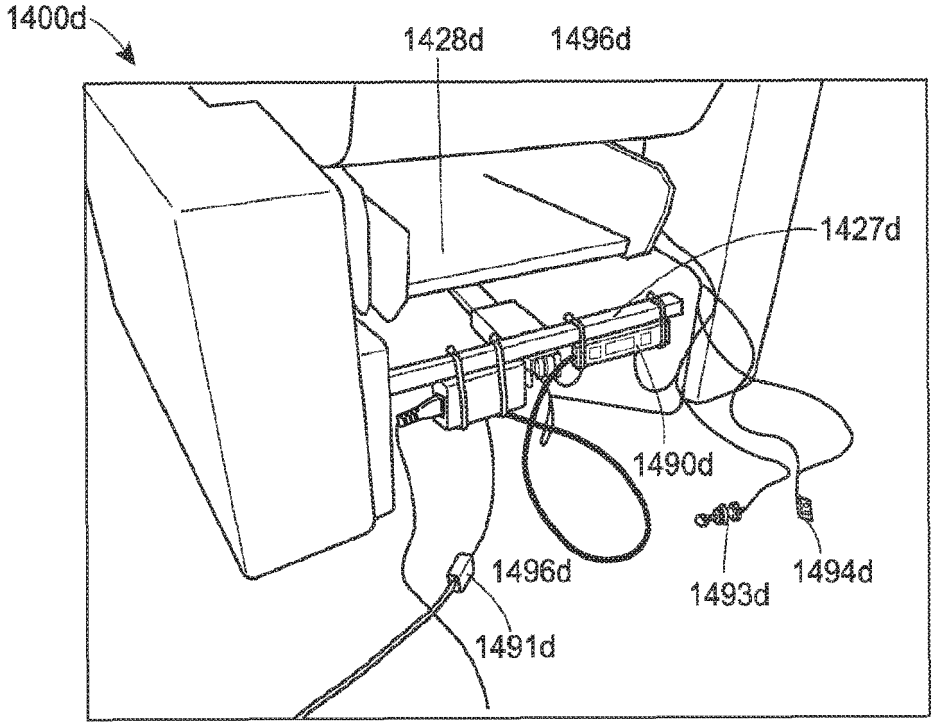

FIG. 14D

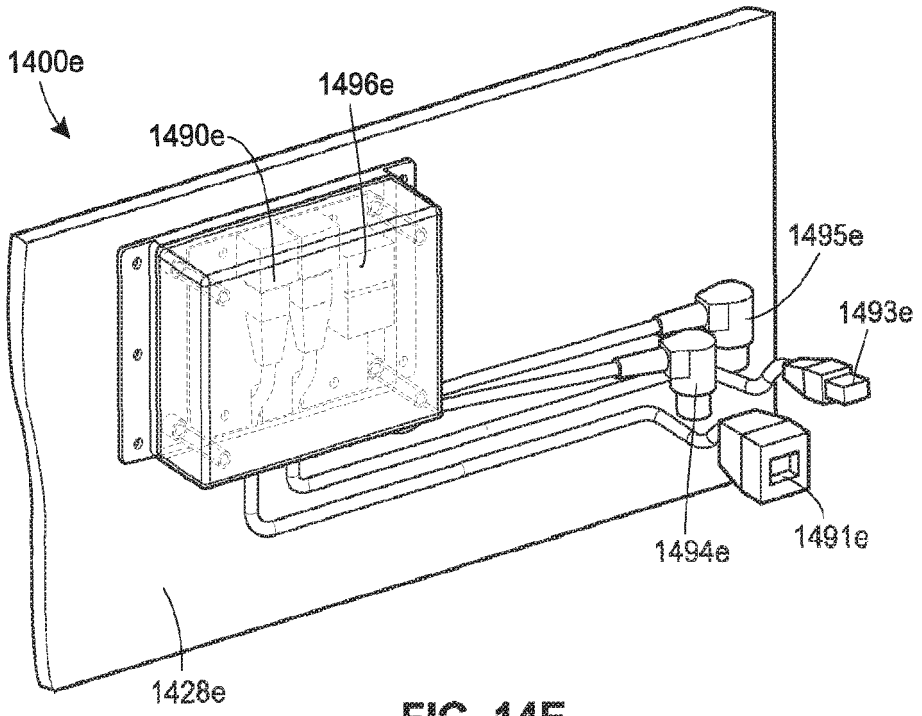

FIG. 14E

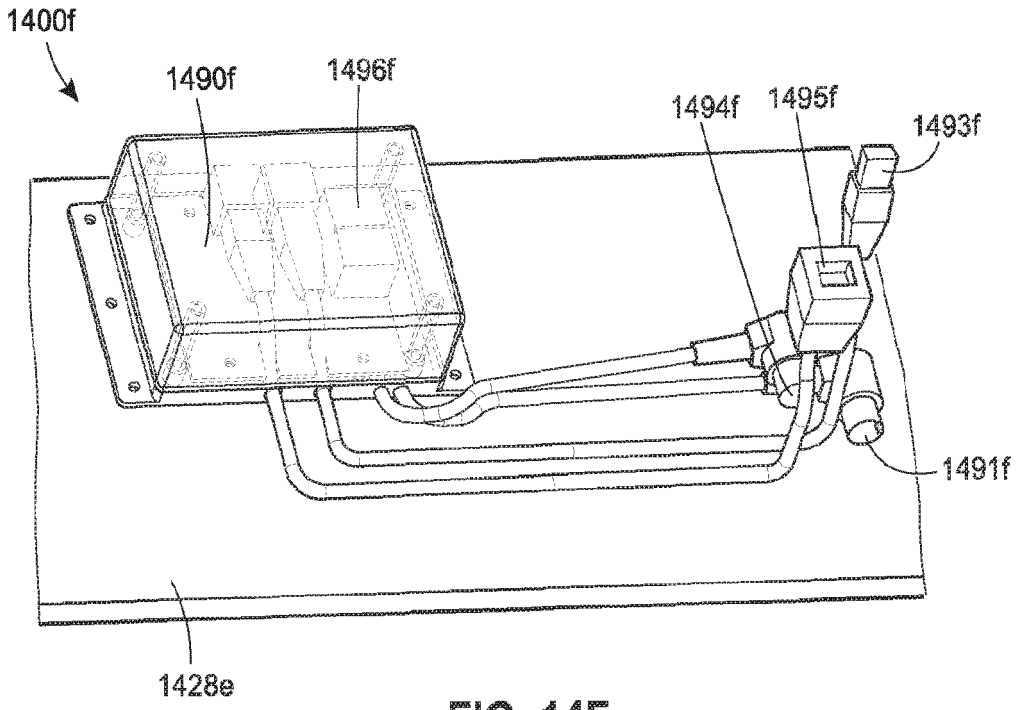

FIG. 14F

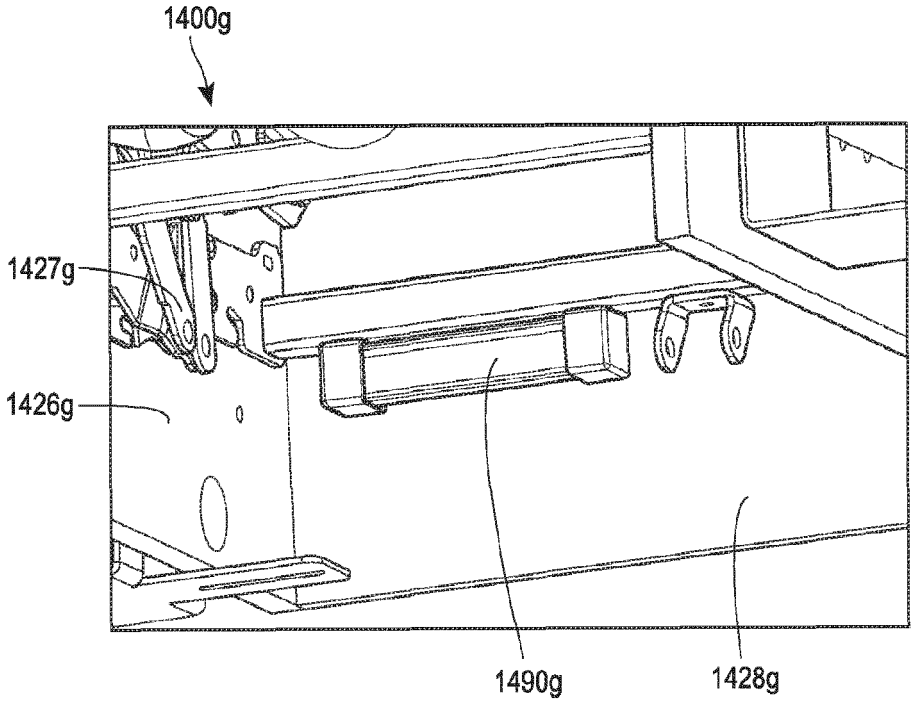

FIG. 14G

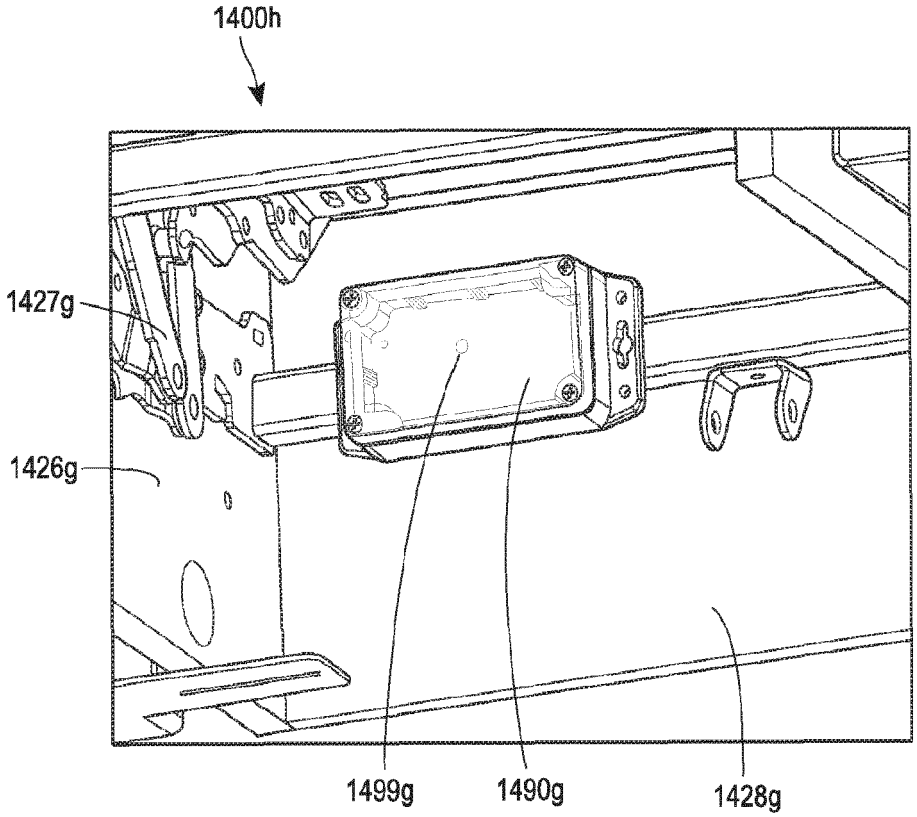

FIG. 14H

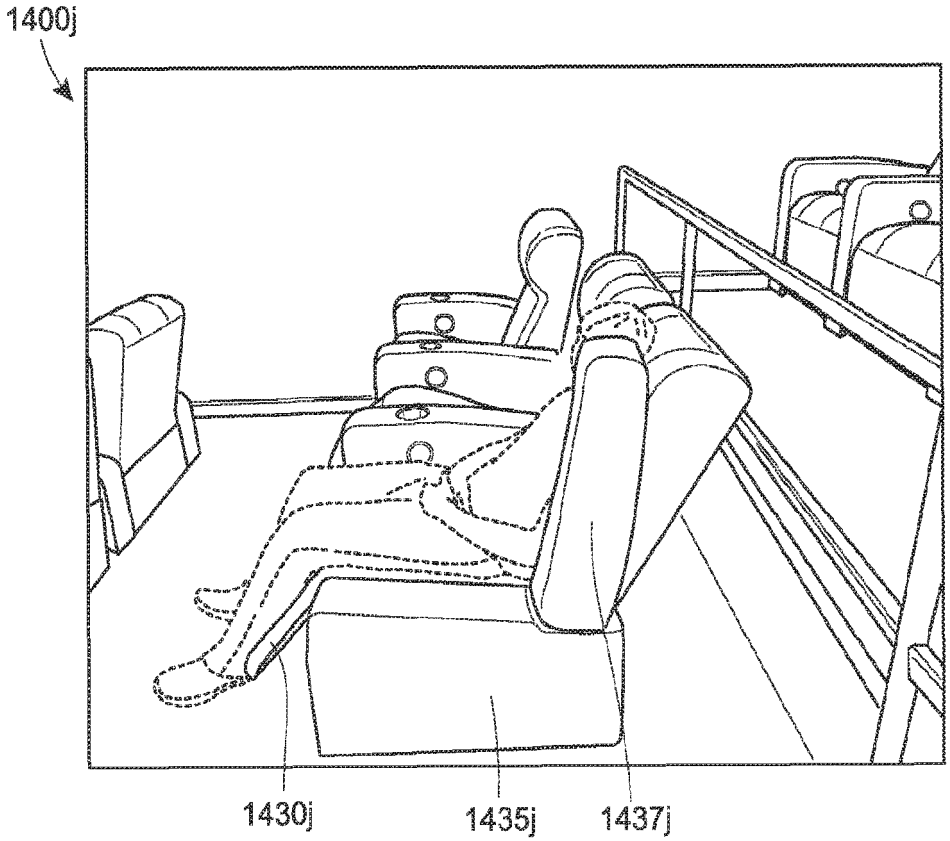

FIG. 14J

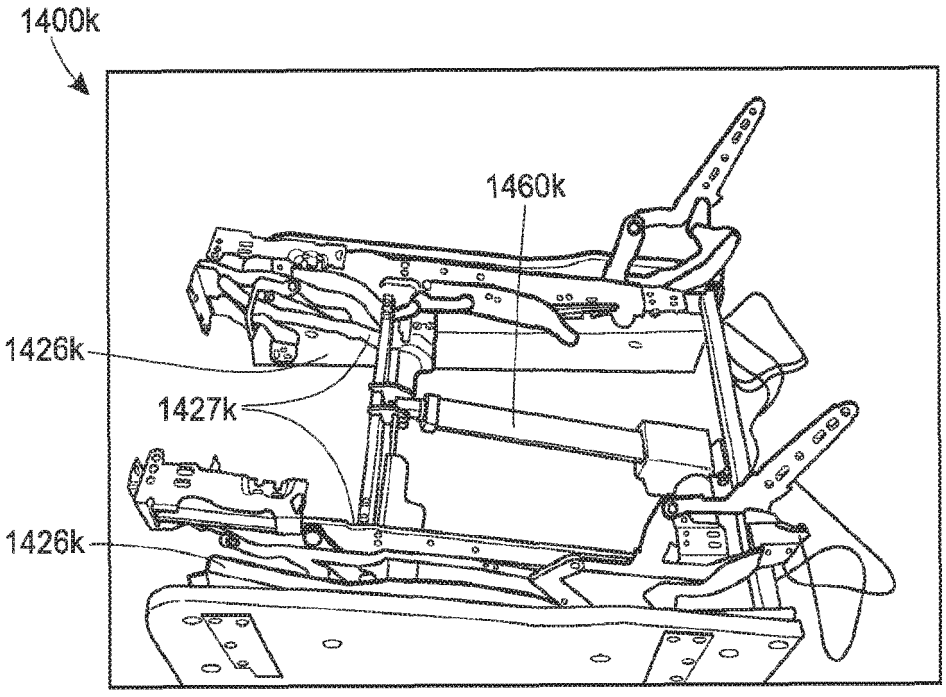

FIG. 14K

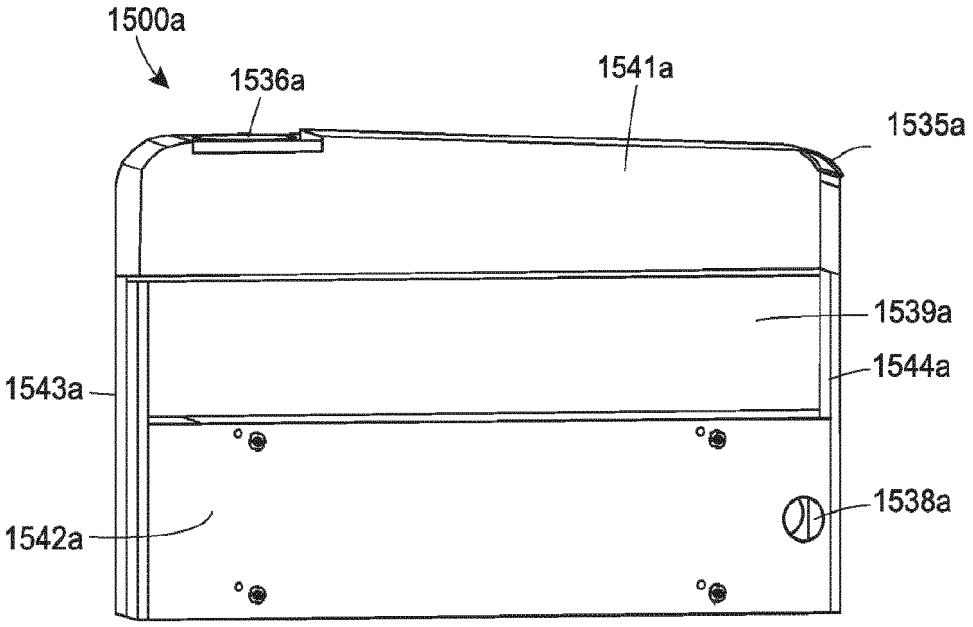

FIG. 15A

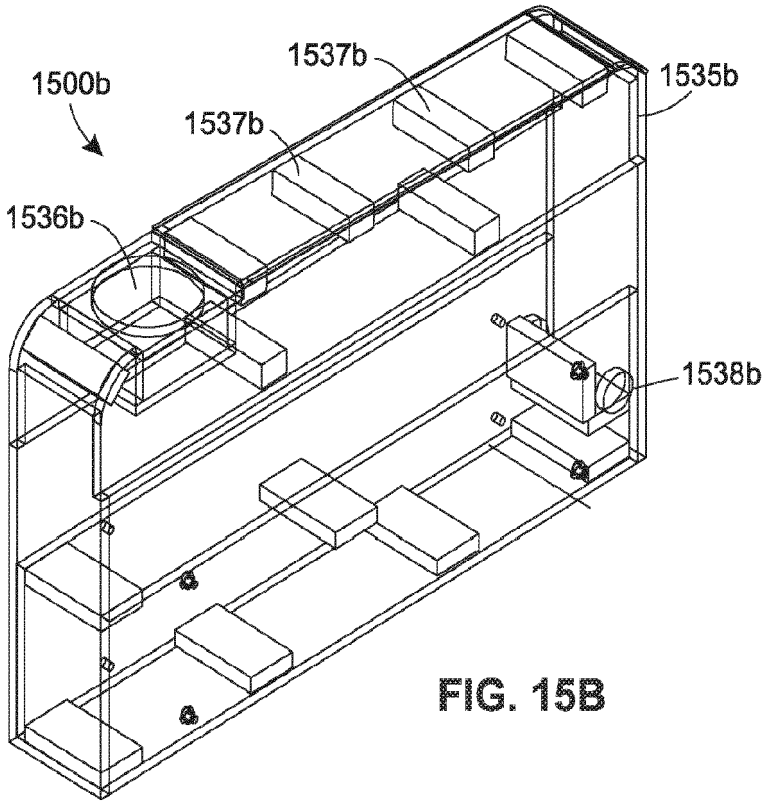

FIG. 15B

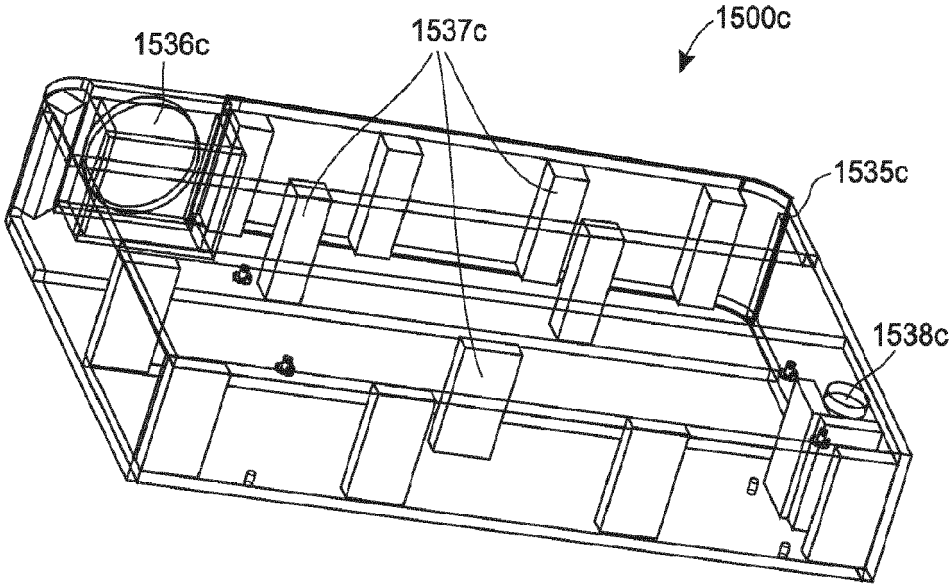

FIG. 15C

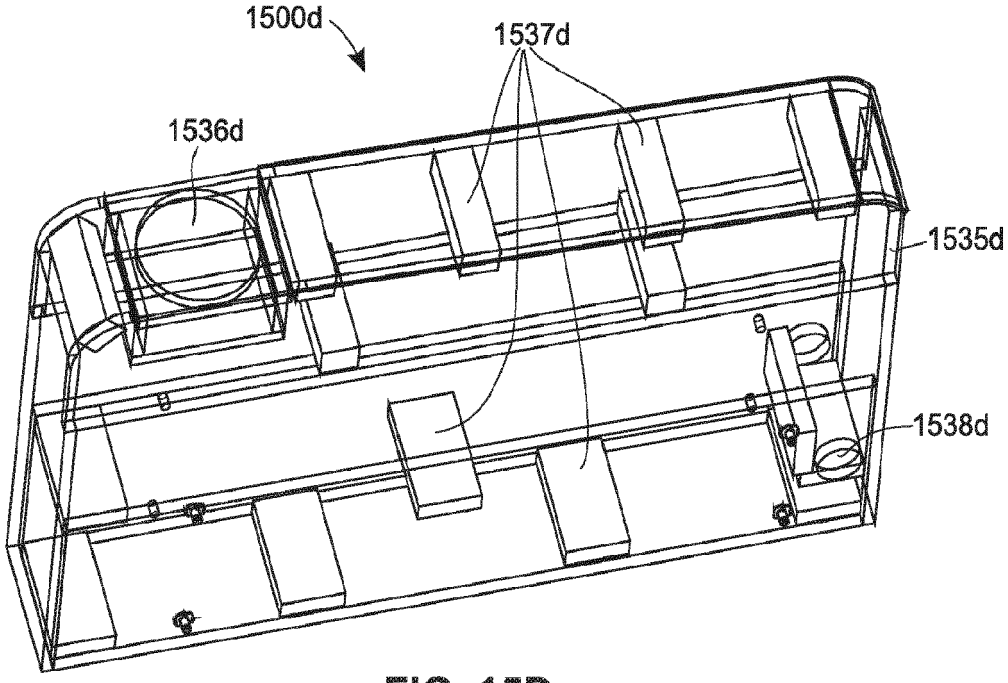

FIG. 15D

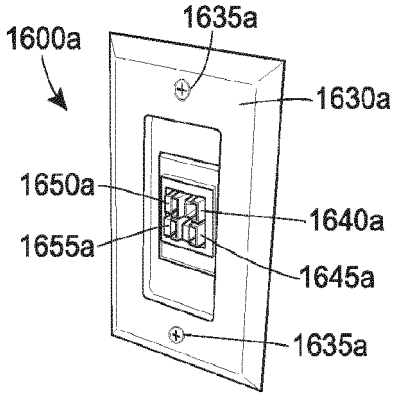

FIG. 16A

FIG. 16B

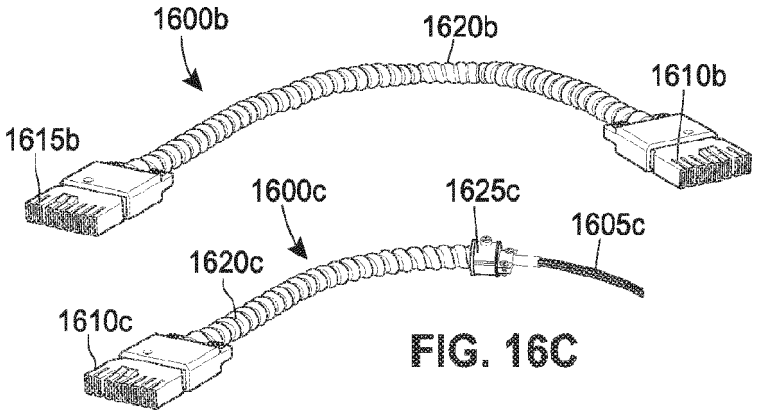

FIG. 16C

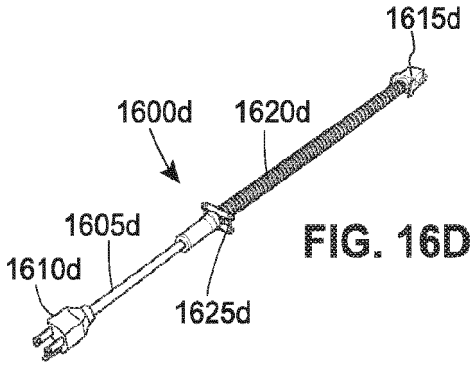

FIG. 16D

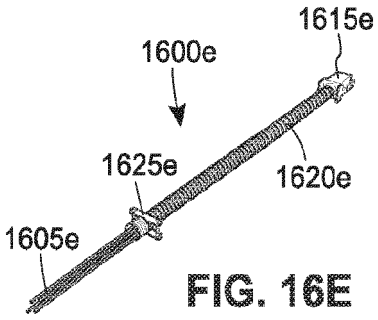

FIG. 16E

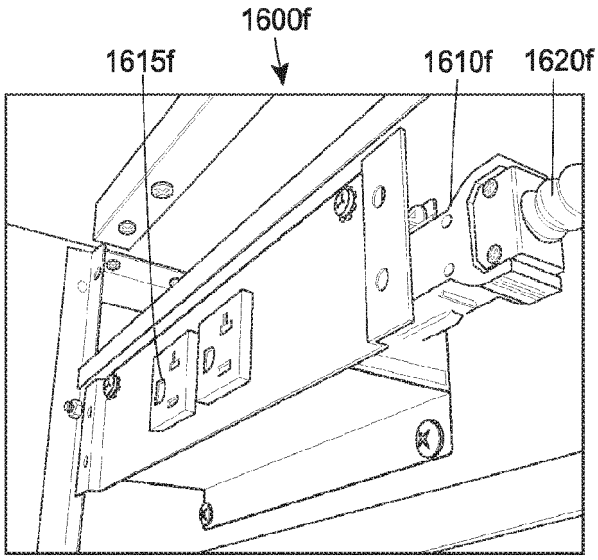

FIG. 16F

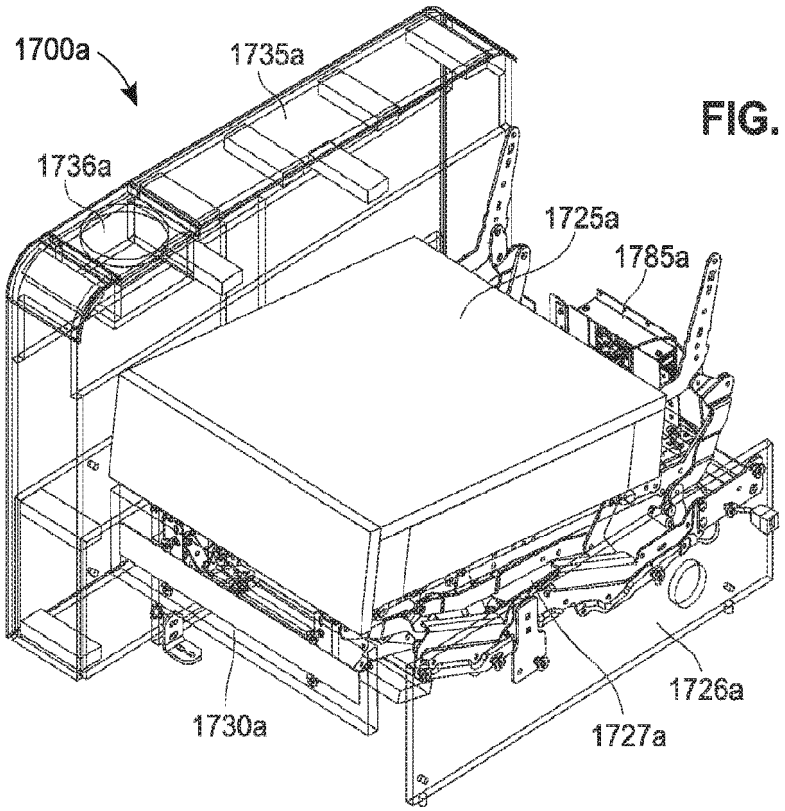

FIG. 17A

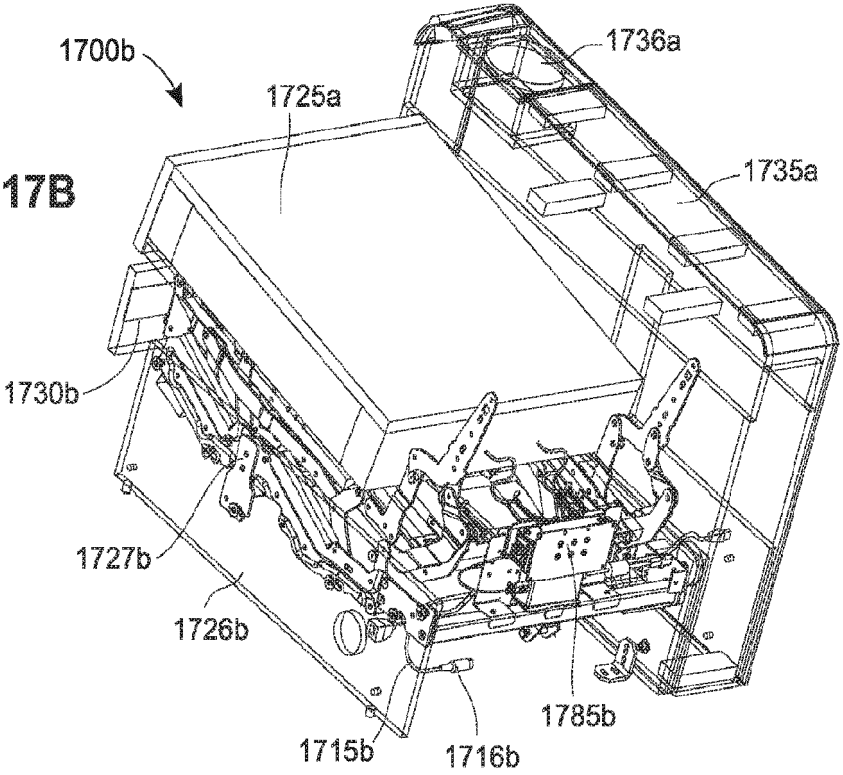

FIG. 17B

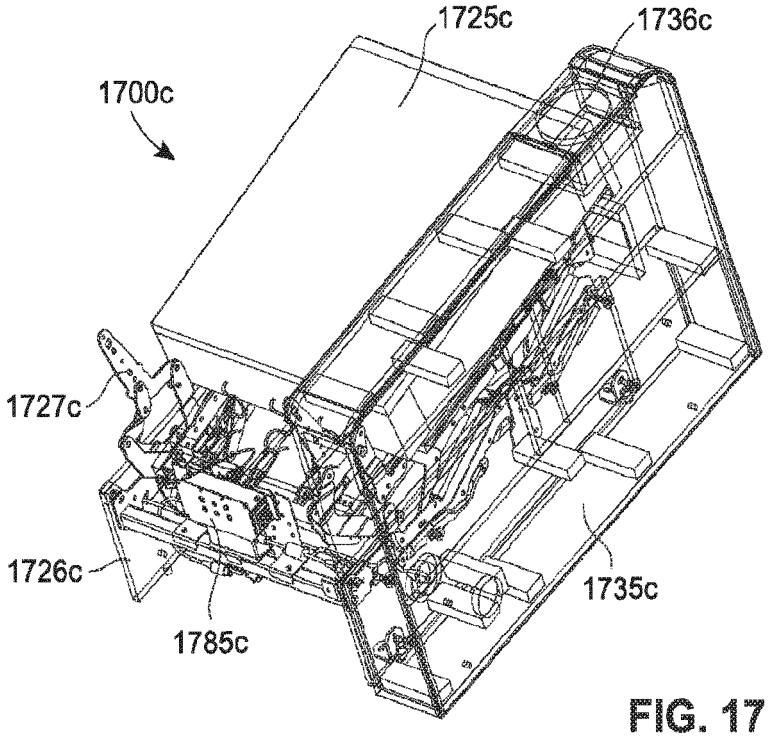

FIG. 17C

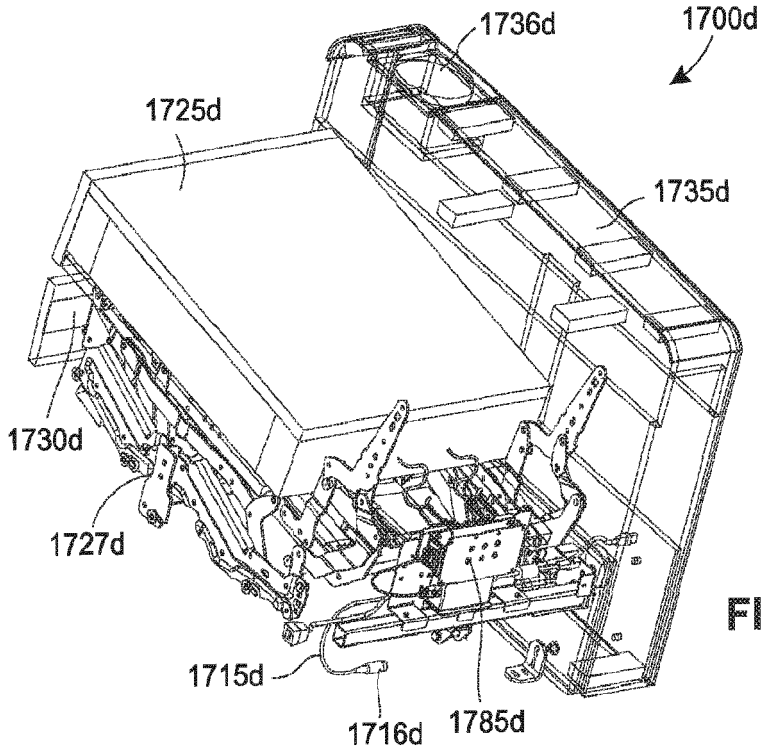

FIG. 17D

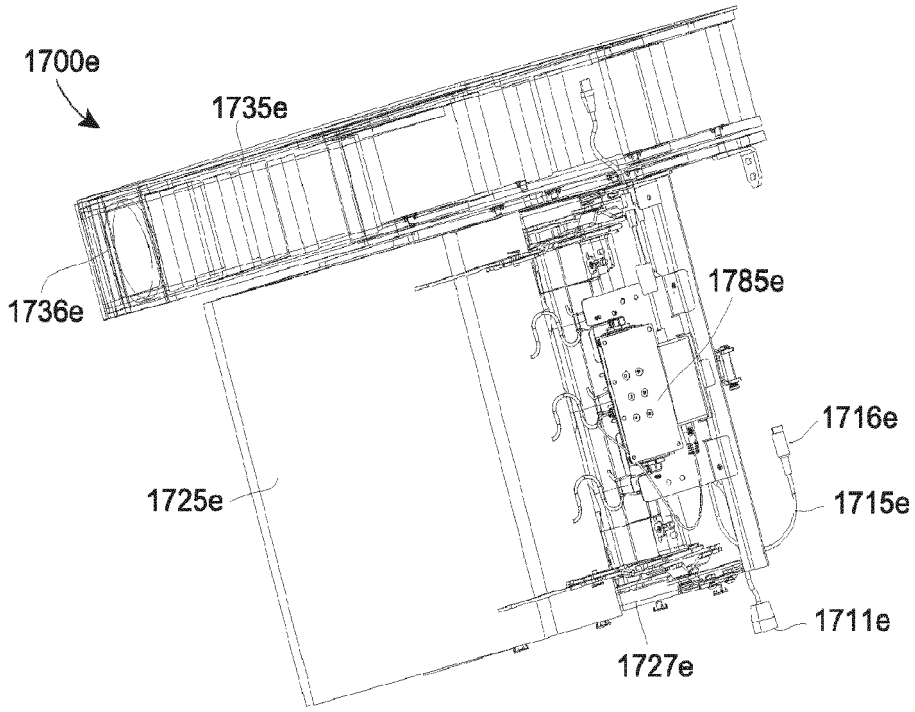

FIG. 17E

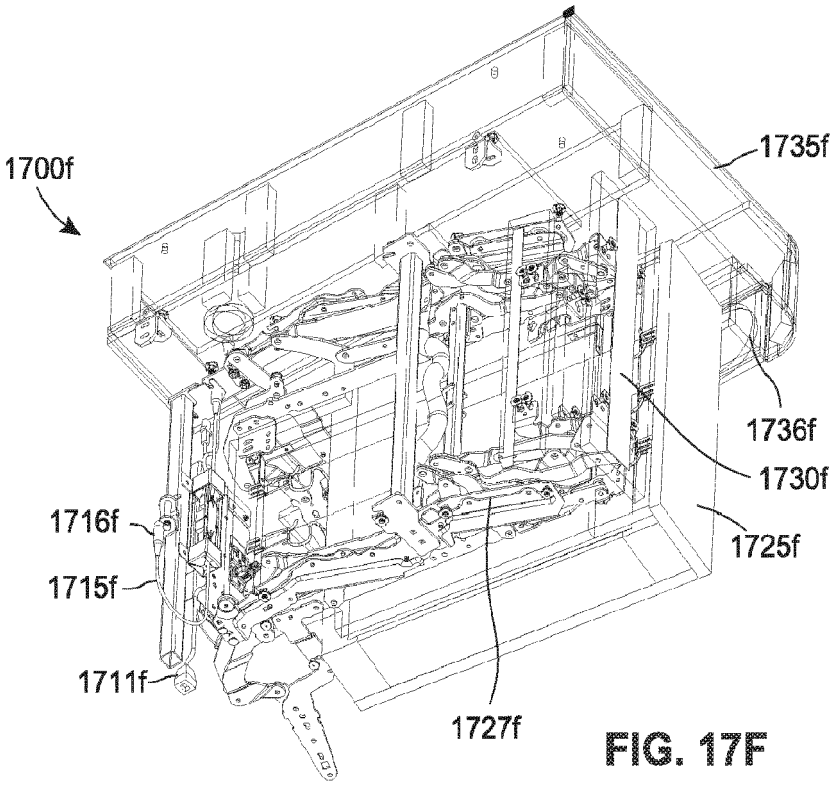

FIG. 17F

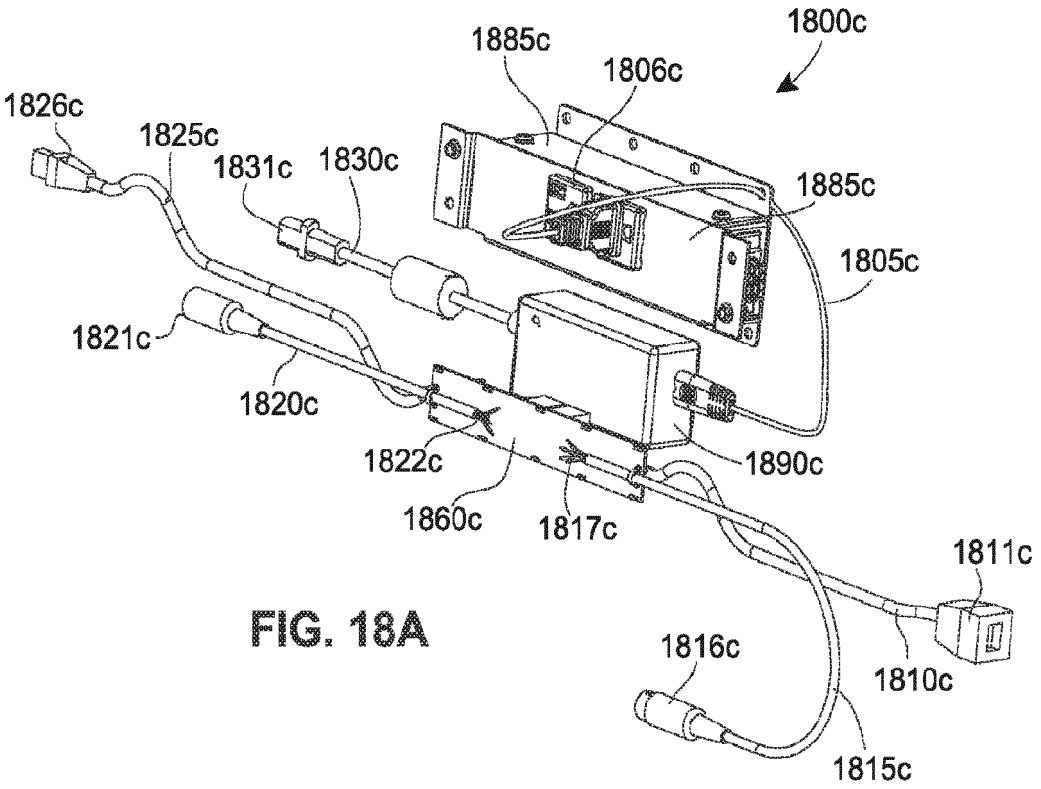

FIG. 18A

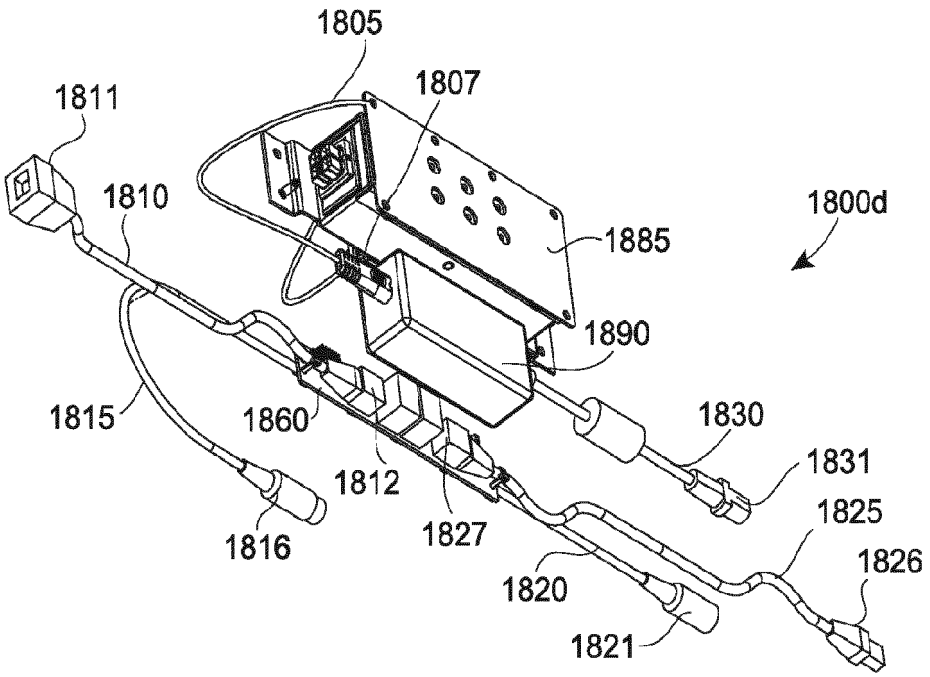

FIG. 18B

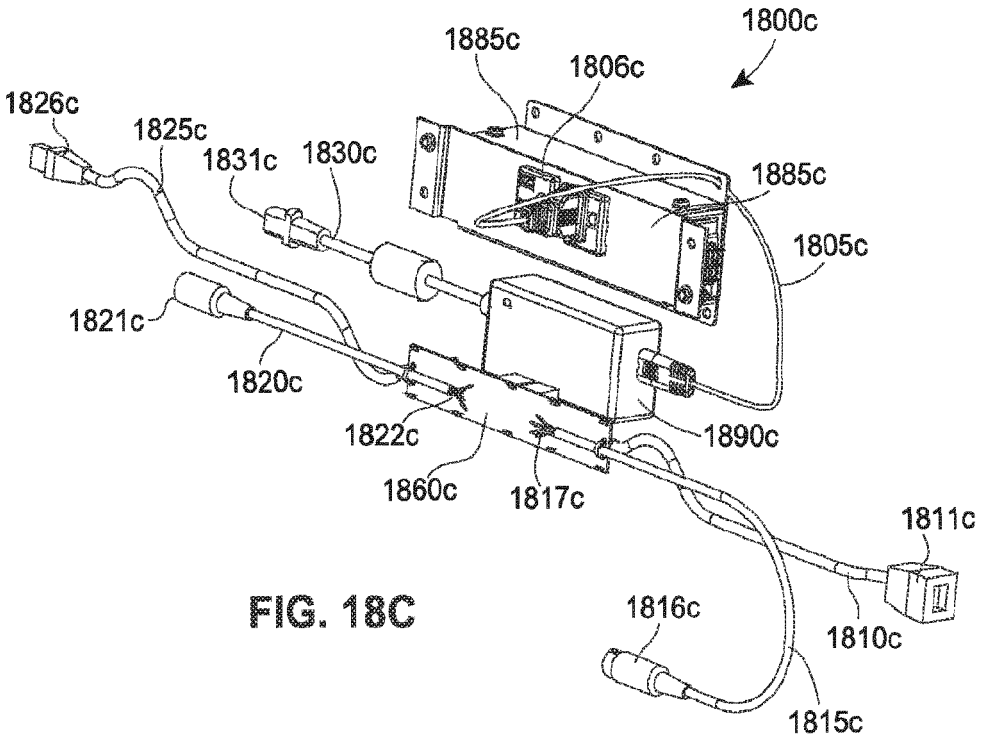

FIG. 18C

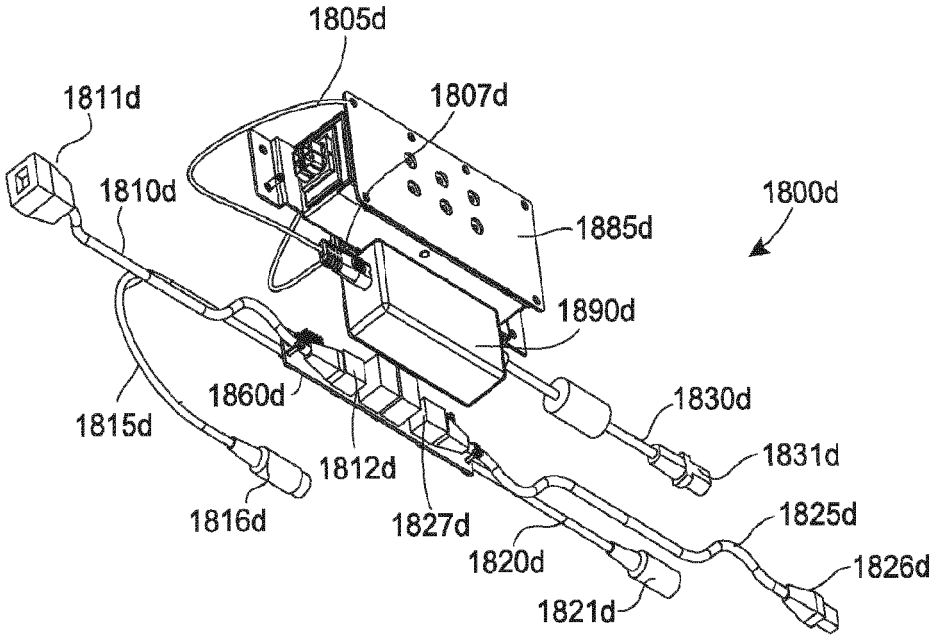

FIG. 18D

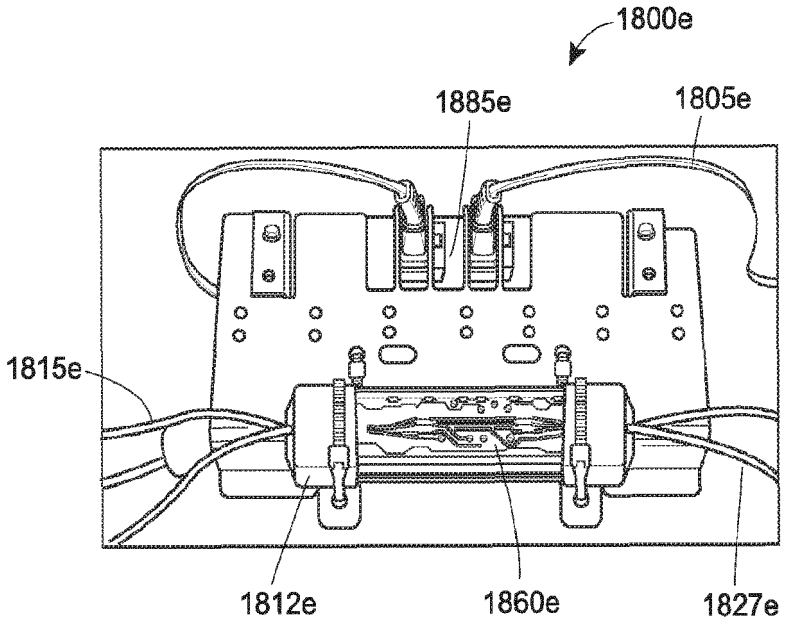

FIG. 18E

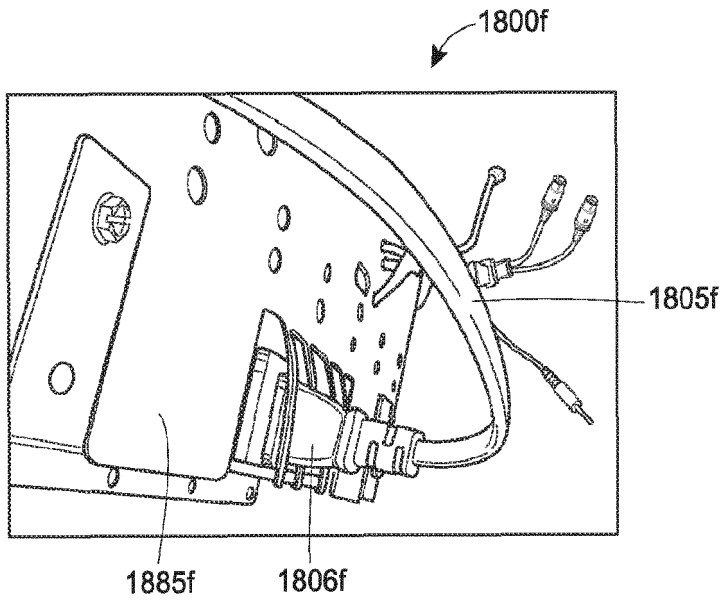

FIG. 18F

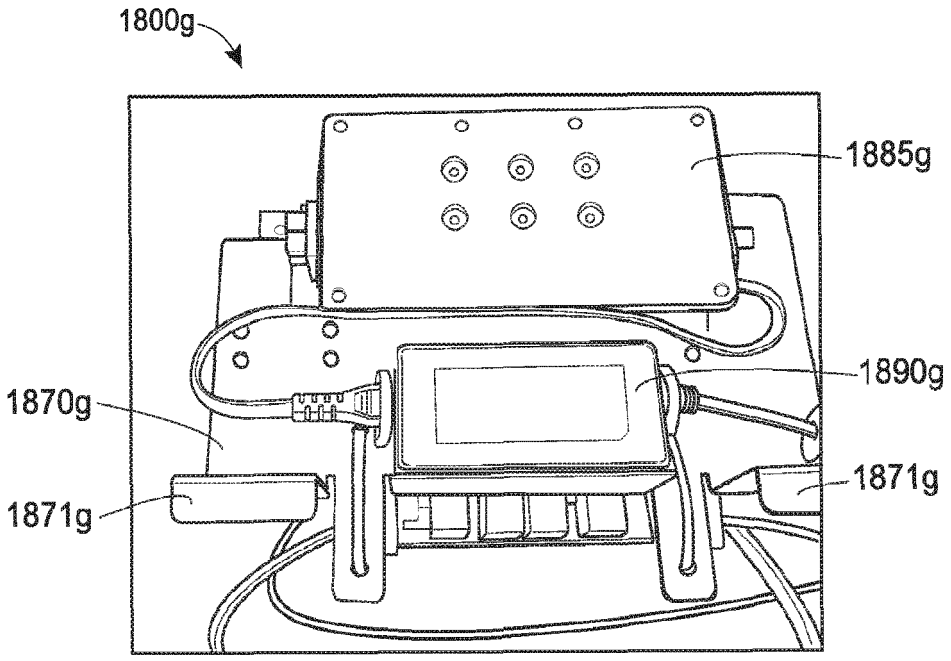

FIG. 18G

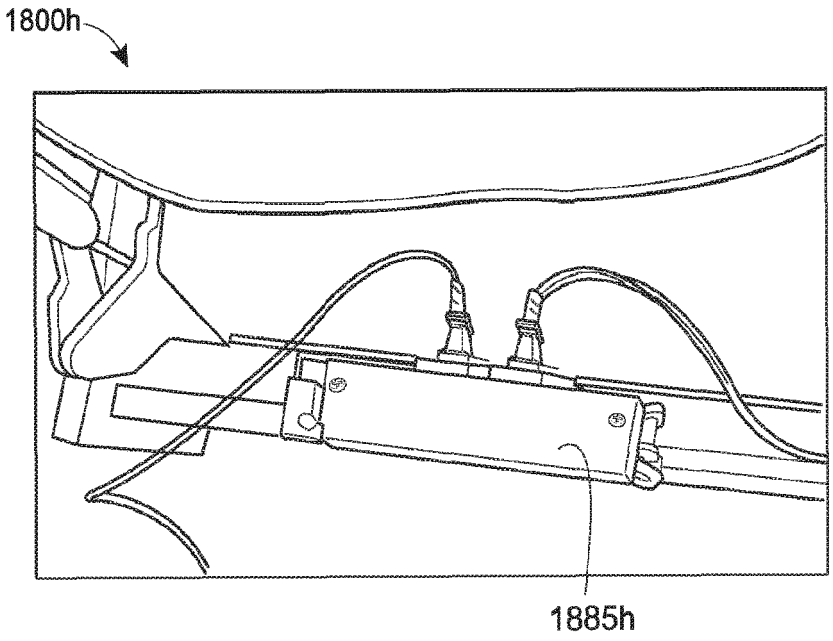

FIG. 18H

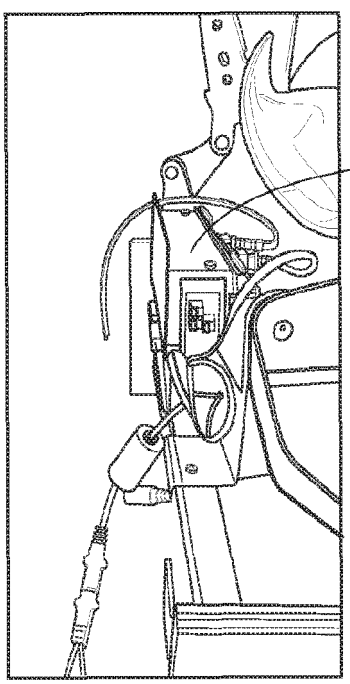

FIG. 18J

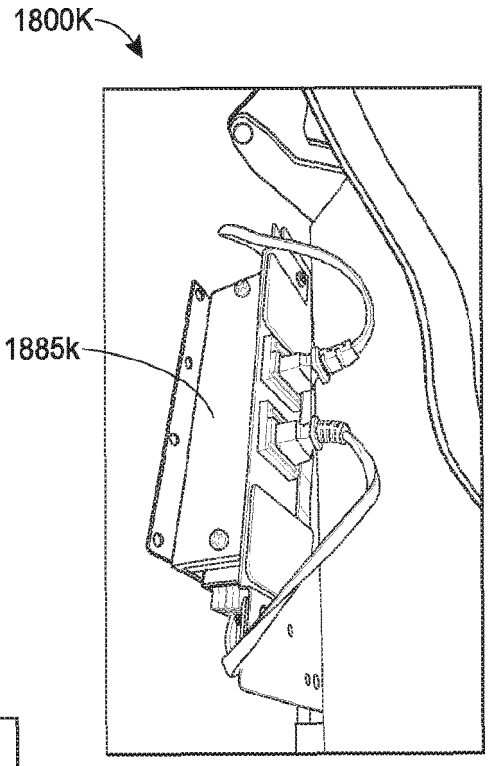

FIG. 18K

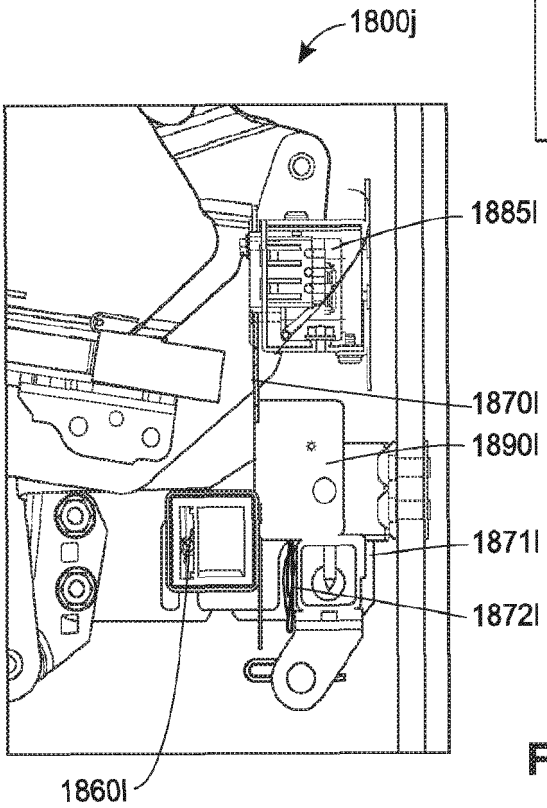

FIG. 18L

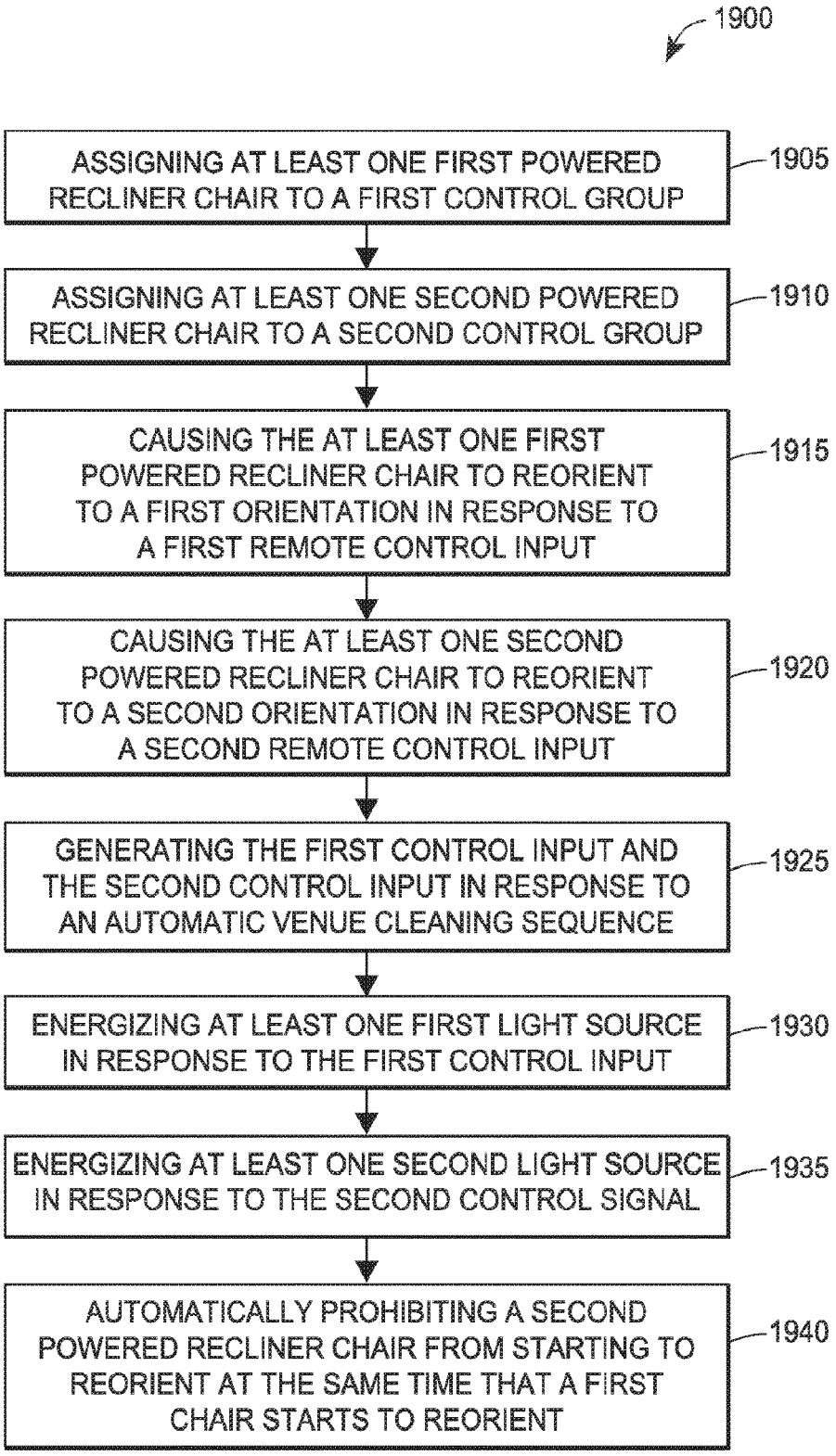
1900
ASSIGNING AT LEAST ONE FIRST POWERED RECLINER CHAIR TO A FIRST CONTROL GROUP
1905
ASSIGNING AT LEAST ONE SECOND POWERED RECLINER CHAIR TO A SECOND CONTROL GROUP
1910
CAUSING THE AT LEAST ONE FIRST POWERED RECLINER CHAIR TO REORIENT TO A FIRST ORIENTATION IN RESPONSE TO A FIRST REMOTE CONTROL INPUT
1915
CAUSING THE AT LEAST ONE SECOND POWERED RECLINER CHAIR TO REORIENT TO A SECOND ORIENTATION IN RESPONSE TO A SECOND REMOTE CONTROL INPUT
1920
GENERATING THE FIRST CONTROL INPUT AND THE SECOND CONTROL INPUT IN RESPONSE TO AN AUTOMATIC VENUE CLEANING SEQUENCE
1925
ENERGIZING AT LEAST ONE FIRST LIGHT SOURCE IN RESPONSE TO THE FIRST CONTROL INPUT
1930
ENERGIZING AT LEAST ONE SECOND LIGHT SOURCE IN RESPONSE TO THE SECOND CONTROL SIGNAL
1935
AUTOMATICALLY PROHIBITING A SECOND POWERED RECLINER CHAIR FROM STARTING TO REORIENT AT THE SAME TIME THAT A FIRST CHAIR STARTS TO REORIENT
1940

FIG. 19

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EUROPEAN SEARCH REPORT

Application Number
EP 20 20 4455

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A47C
G05B
A63J

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	13 November 2020	Lehe, Jörn

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