



(51) International Patent Classification:

B66B 13/10 (2006.01) *B66B 13/04* (2006.01)
B66B 9/187 (2006.01) *B66B 9/16* (2006.01)
B66B 13/08 (2006.01) *B66B 7/02* (2006.01)

(21) International Application Number:

PCT/US2016/054237

(22) International Filing Date:

28 September 2016 (28.09.2016)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

14/868,295 28 September 2015 (28.09.2015) US

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(81) Designated States (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM,

AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

(54) Title: VERTICALLY AND HORIZONTALLY MOBILE ELEVATOR CABINS

(57) Abstract: An elevator system permitting horizontal movement of a normally vertically moving elevator cabin, the elevator cabin being automatically attached to or detached from an elevator frame and horizontally moved to or from another elevator shaft or other destination. While an elevator cabin is supported on an elevator frame or other surface, various cables, rods, plugs and other equipment are automatically connected to or disconnected from the elevator cabin to enable vertical or horizontal motion of the elevator cabin. Once disconnected from such devices, the elevator cabin can be propelled horizontally out of the elevator frame and elevator shaft, onto other surfaces, such as floors of a building, and move horizontally to another destination. An elevator cabin may also be horizontally moved into an elevator shaft and onto the surface of an elevator frame, and connected to the frame, thus enabling such cabin to then move vertically within an elevator shaft.

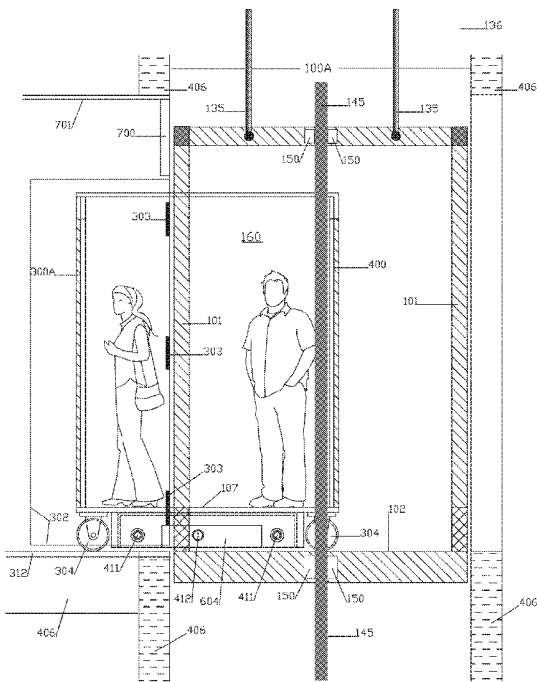


FIG. 7

WO 2017/058954 A1

VERTICALLY AND HORIZONTALLY MOBILE ELEVATOR CABINS**INVENTOR****JUSTIN JACOBS****CROSS-REFERENCE TO RELATED APPLICATIONS**

[0001] This patent application is related to U.S. Patent 8,430,210 B2 and U.S. Patent 8,925,689 B2, which are hereby incorporated herein by reference in their entireties.

FIELD OF INVENTION

[0002] This invention relates generally to any elevator system where one or more elevator cabins are capable of both vertical and horizontal motion.

BACKGROUND

[0003] Conventional elevator cabins are only designed and used to transport passengers vertically up and down in one building. This results in constraints and inefficiencies when passengers in elevator cabins desire, or are required, to travel horizontally as well as vertically. For example, airplane passengers moving vertically in an elevator cabin to or from a parking garage or to or from a passenger arrival floor in one airport terminal building, may desire to move horizontally to a different floor in another distant airport terminal building. Presently, such passengers spend considerable time and effort boarding and leaving elevator cabins with their luggage, as well as walking or obtaining horizontal transportation, such as moving walkways, transit pods, inter-terminal trains/monorails, taxis, or shuttle buses, to go from a desired floor in one airline terminal building to a different desired floor in another terminal building. It would be more efficient and enjoyable if passengers and their luggage could remain in the same vehicle for the entire journey.

[0004] In addition, elevator systems capable of operating multiple elevator cabins in the same elevator shaft can be rendered largely inoperable by mechanical or electrical failures of a single cabin. If one cabin malfunctions or develops limited operational capability it could slow down or halt movement of the other elevator cabins in the same elevator shaft.

Similarly, an elevator cabin may need to be remodeled, refurbished, or repaired over an extended period of time, or many packages in a cabin may need to be loaded or unloaded slowly and carefully from an elevator cabin into a distant room on a certain floor of a tall building.

[0005] Accordingly, there is a need to solve all of the aforementioned problems and limitations, by: 1) making it possible for elevator cabins to easily transfer back and forth between vertical and horizontal motion, and 2) by providing a method to remove an elevator cabin from an elevator frame quickly and efficiently. There is also a need for other uses or applications for elevator cabins that can easily transfer back and forth between vertical and horizontal motion.

SUMMARY

[0006] According to an embodiment of the present invention, there is an elevator system in a structure comprising: at least one vertical elevator shaft and at least one horizontal surface along a horizontal plane of the structure; one or more elevator cabins wherein each cabin is independently moveable with respect to each other cabin vertically through each vertical elevator shaft and horizontally moveable onto each horizontal surface. The at least one vertical elevator shaft comprises at least one vertically moveable elevator frame that is attachable to an elevator cabin; and each cabin is detachable from the at least one elevator frame and capable of horizontal movement on the at least one horizontal surface

[0007] According to an embodiment, each elevator frame is suspended by a plurality of cables and is connected by cables to one or more counterweights. In another embodiment, each cable and each counterweight is located outside a vertical path of movement of each cabin and elevator frame.

[0008] Some embodiments of the present invention describe an elevator system which permits horizontal movement of a normally vertically moving elevator cabin. In one embodiment, an elevator cabin may be automatically attached to or detached from an elevator frame and then horizontally moved to or from another elevator shaft or other destination. While an elevator cabin is supported on an elevator frame or other surface, various cables, rods, plugs and other equipment may be automatically connected to or disconnected from the elevator cabin in order to enable vertical or horizontal motion of the elevator cabin. Once disconnected from all such devices, the elevator cabin can then be propelled horizontally on its own motorized wheels (or by another method) out of the elevator frame and elevator shaft and onto other surfaces, such as the floors of a building, and move horizontally to another destination. Similarly, an elevator cabin may also be horizontally moved into an elevator shaft and onto the surface of an elevator frame on its own motorized wheels (or by another method), and connected to the frame, thus enabling such cabin to then move vertically within an elevator shaft. By these methods it is also possible for an elevator cabin operating vertically in one building/structure to move horizontally to another building/structure and then operate vertically in that building/structure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] Fig. 1 is an illustration of the front view of an elevator shaft that contains three independently and vertically moving elevator frames, each frame containing a horizontally mobile elevator cabin, according to one embodiment of the present invention.

[0010] Fig. 2 is an illustration of three empty elevator frames, their suspension cables, connection points, guides and guide tracks, viewed from an oblique perspective, according to one embodiment of the present invention.

[0011] Fig. 3 is an illustration of the front view of an elevator frame suspended by cables in an elevator shaft, with a horizontally mobile elevator cabin positioned within the elevator frame and supported by the base of the elevator frame, according to one embodiment of the present invention.

[0012] Fig. 4 is an illustration of the top view of an elevator frame suspended by cables in an elevator shaft, with a horizontally mobile elevator cabin positioned within the elevator frame and stabilized by four rods, according to one embodiment of the present invention.

[0013] Fig. 5 is an illustration of the bottom view of an elevator frame suspended by cables in an elevator shaft which shows the positions of the cables, the cabin, and the motorized wheels of a horizontally mobile elevator cabin positioned within the frame, according to one embodiment of the present invention.

[0014] Fig. 6 is an illustration of a side view of an elevator frame suspended by cables in an elevator shaft with a horizontally mobile elevator cabin supported by the base of the elevator frame, and passengers in the cab, some of whom are exiting the cab through its open sliding doors onto the floor of a building, according to one embodiment of the present invention.

[0015] Fig. 7 is an illustration of a side view of a stationary elevator frame suspended by cables in an elevator shaft with a detached horizontally mobile elevator cabin moving out of the frame through open swinging lobby doors and onto the floor of a building, with passengers riding inside of the moving cab, according to one embodiment of the present invention.

[0016] Fig. 8 is an illustration of the rear end view of an elevator frame in an elevator shaft, with a horizontally mobile elevator cabin positioned within the frame and passengers inside the cabin waiting to exit the rear sliding doors of the cabin and walk into the open sliding rear doors of another cabin situated in an adjacent elevator shaft (not shown), according to one embodiment of the present invention.

[0017] Fig. 9 is an illustration of a side view of two stationary elevator frames, each suspended by cables in a different elevator shaft, with horizontally mobile elevator cabins positioned in each elevator frame, and passengers walking from one cabin through open sliding rear doors of one cabin, across a short floor, and through open sliding rear doors of another adjacent elevator cabin, according to one embodiment of the present invention.

[0018] Fig. 10 is an illustration of the side view of two stationary elevator frames, each suspended by cables in a different elevator shaft, with a horizontally mobile elevator cabin, moving on motorized wheels from one elevator frame, across a short floor and onto the base of an adjacent empty elevator frame, according to one embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0019] Embodiments of the present invention are now described with reference to the figures where like reference numbers and letters indicate identical or functionally similar elements. Also, in the specification, the left most digit(s) of each reference number corresponds to the figure in which the reference number is first used. All elements of the present invention may be configured, composed, structured, positioned, and/or operated somewhat differently than as described herein.

[0020] Reference in the specification to “one embodiment” or to “an embodiment” means that a particular feature, structure, or characteristic described in connection with the

embodiments is included in at least one embodiment of the invention. The appearance of the phrase “in one embodiment” in various places in the specification are not necessarily all referring to the same embodiment.

[0021] The language used in the specification has been principally selected for readability and instructional purposes, and may not have been selected to delineate or circumscribe the inventive subject. Accordingly, the disclosure of the present invention is intended to be illustrative, but not limiting, of the scope of the invention, which is set forth in the claims. Persons with ordinary skill in the art would be able to design other embodiments of the present invention without undo effort or experimentation.

[0022] Fig. 1 is an illustration of the front view of three elevator frames **101A**, **101B**, **101C** suspended by suspension cables **135** in an elevator shaft **100**, according to one embodiment of the present invention. Each suspension cable **135** can be connected to a connection point **140** located on each elevator frame **101**. Each connection point **140** can be positioned horizontally (not shown) and vertically away from each other connection point **140** in the elevator shaft **100**. Each suspension cable **135** and each connection point **140** connected to the exterior of each elevator frame **101** can be located outside of the vertical path of each elevator frame **101** as it moves vertically through elevator shaft **100**. Each suspension cable **135** can move up or down a side of elevator shaft **100**, up and over a pulley **120** and down a counterweight channel **130** to the top of a counterweight **115**, where said cable **135** can be connected to said counterweight **115**. Each elevator frame **101** can have two or more guides **150** attached to its sides that can move along vertical guide tracks **145** attached to walls **170** of the elevator shaft **100**. There can be a separate lift motor **155A**, **155B**, or **155C** that moves each elevator frame **101** up or down an elevator shaft **100** by means of a separate lift cable **136** connected to a separate connection point **140** (not shown) on the exterior of the elevator

frame **101** (some can be connected on the rear of each frame) and also connected to a separate lift motor **155** positioned on a lift motor floor **105** of a structure, so that each lift cable **136** and each lift cable connection point **140** can be located outside of the vertical path of each elevator frame **101** as it moves vertically through the elevator shaft **100**. For example, frame **101A** can be attached to lift motor **155A** by lift cable **136A**.

[0023] The base **102** of each elevator frame **101** can support a horizontally mobile elevator cabin **160** which can be firmly connected to each elevator frame **101**. The passengers who are shown as inside each elevator cabin **160** are standing on the top of each elevator cabin floor **107**. When both an elevator frame **101** and an elevator cabin **160** are connected to each other they can also be referred to as an elevator cab **110**. All of the elevator cabs **110** operating in an elevator shaft **100** can be vertically aligned. Each elevator cab **110** suspended in elevator shaft **100** can be capable of moving vertically throughout an elevator shaft **100** independently of all of the other elevator cabs **110**, because all horizontally and vertically separated suspension cables **135**, all lift cables **136**, all horizontally and vertically separated connection points **140**, all guides **150**, and all other elements of the elevator system can be located outside of the path of each elevator cab **110** as it moves vertically through an elevator shaft **100**. On the other hand, most conventional elevator cabs cannot move independently of one another in the same elevator shaft, because most current and conventional elevator cabs are suspended by suspension cables that are connected to the top center of each elevator cab, and this centralized connection place obviously prevents more than one elevator cab from operating in the same elevator shaft.

[0024] Fig. 2 is an illustration of three empty elevator frames **101A**, **101B**, **101C**, their suspension cables **135**, their connection points **140**, some of their guides **150**, and their guide tracks **145**, from a different perspective, according to one embodiment of the present

invention. As shown in Fig. 2 there can be numerous separate connection points **140** that are separated horizontally and vertically from each other, which protrude outwardly from each elevator frame **101**, and away from the vertical path of each elevator frame **101** as it moves through elevator shaft **100**. Also, as shown on Fig. 2, all of said suspension cables **135** and all of said elevator lift cables **136** can be systematically, horizontally and vertically separated from each other. All of the above features enable a plurality of elevator frames **101** to move independently of each other through the same elevator shaft **100** in any direction, either up or down. All of these features can also provide an elevator system for the descriptions and explanations according to embodiments of the current invention.

[0025] Fig. 3 is an illustration of the front view of an elevator frame **101** suspended by cables **135**, all of which cables can be connected to connection points **140**, in an elevator shaft **100**, with a horizontally mobile elevator cabin **160** positioned within an elevator frame **101**, supported by an elevator frame base **102**, and stabilized within the elevator frame **101** by two or more stabilization rods (or other stabilization devices) **306**, according to one embodiment of the present invention. When the elevator frame **101** arrives at a floor of a building/structure, one of two scenarios can happen: 1) the top of an elevator cabin floor **107** (shown as a dashed line) can stop at the level of a building floor **312** (shown here as a dotted line) so that passengers in the elevator cabin **160** can exit through two open cabin sliding doors **300A** (not shown as open) and two open lobby sliding doors **300B** (not shown separately or as open) onto a building floor **312** and waiting passengers can also enter into the elevator cabin **160** through said open sliding doors **300A** and **300B**; or 2) the top of the elevator frame base **102** can stop at the level of a building floor **312** so that telescoping stabilization rods **306** can be automatically withdrawn into the elevator frame **101** (not shown as withdrawn), a pair of swinging lobby doors **302** can fully open on their hinges **303** (not shown as open), and a plurality of motorized wheels **304**, such as four motorized wheels **304**,

(two rear wheels are not shown), positioned under the elevator cabin **160** can propel the horizontally mobile elevator cabin **160** (with or without passengers inside) onto the floor **312** of a building (such passengers can be seen through the windows **301** in the elevator cabin's sliding doors **300A**). The tops of said swinging doors **302** can be shown by the dashed lines **311**, the bottoms of said swinging doors **302** can be shown by dashed lines **314**, each side of said swinging doors **302** can be shown by dashed lines **313**, and the center of said swinging doors **302** can be shown by a dashed line **309**. Each lobby sliding door **300B** can be positioned inside of a swinging door **302**, for example suspended on a track, and can slide to and fro **310** within said swinging doors **302**. As shown, each lobby swinging doors **302** can be attached to a wall **315** of an elevator shaft **100** by hinges **303**. All four sliding doors, **300A** and **300B**, can open or close in unison.

[0026] After all passengers have walked through the open sliding doors **300** in scenario no. 1, all sliding doors **300** can close in unison and the elevator cab **110** can then move vertically up or down in elevator shaft **100** to another destination floor. On the other hand, in scenario no. 2, after four motorized wheels **304** have propelled a horizontally mobile elevator cabin **160** through the open lobby swinging doors **302**, said swinging doors **302** can close in unison. The empty elevator frame **101** can then move up or down to another destination floor, and the horizontally mobile elevator cabin **160** can be propelled on its motorized wheels **304** to another destination on said building floor **312**.

[0027] Fig. 4 is an illustration of the top view of an elevator frame **101** suspended by cables **135**, and guided by guides **150** along guide tracks **145** in an elevator shaft **100A** formed by girders **406**, with a horizontally mobile elevator cabin **160** supported by the base **102** of the elevator frame **101**, and stabilized by four telescoping stabilization rods **306**, according to one embodiment of the present invention. A pair of cabin sliding doors **300A** can be shown as

closed within a cabin wall **410** at the front end of the elevator cabin **160**, and a pair of lobby sliding doors **300B** can be shown as closed within a pair of lobby swinging doors **302**, which can be hung on hinges **303**. At the rear end of the elevator cabin **160** there can be another pair of cabin sliding doors **400** which can be shown as closed within an elevator cabin wall **410** at the rear end of the elevator cabin **160**. Four telescoping stabilization rods **306** can be shown as extended into four sleeves **411** located within the sides of the elevator cabin **160**, by means of motors **402**. Similarly, a telescoping electricity and data plug **403** can be automatically extended into a socket **412** located in a side of the elevator cabin **160** by means of a motor **402**. Inside the elevator cabin **160**, pull down seats **407** can be provided for horizontally moving passengers, building floor destination buttons **408** can be installed within cabin walls **410**, and a ceiling light and video camera **409** can be installed within the cabin **160**.

[0028] Also as shown in Fig. 4, a horizontally mobile elevator cabin **160** can be driven onto the base **102** of an elevator frame **101** by means of the cabin's motorized wheels **304** and positioned in the center of the elevator frame **101** by means of a steering mechanism (not shown) which can steer said motorized wheels **304** as guided by a guiding mechanism, such as a laser beam (not shown). Each elevator frame **101** in an elevator shaft **100A** can be guided vertically along said elevator shaft **100A** by a guiding means **150** moving along a vertical guide track **145** which is positioned along each side of an elevator shaft **100A**. Each elevator shaft **100** in a structure can be constructed of building girders **406** through which each elevator frame **101** and its suspension cables **135** can move. Two or more elevator shafts **100** can be constructed side by side or end to end, **100A**, **100B**, **100C** and **100D**, as shown in Fig. 4.

[0029] Fig. 5 is an illustration of the bottom view of an elevator frame **101** suspended by cables **135** and guided by guides **150** along guide tracks **145** in an elevator shaft **100A** formed by girders **406**, with a horizontally mobile elevator cabin **160** supported by the base **102** of an elevator frame **101** and stabilized by four telescoping stabilization rods **306**, according to one embodiment of the present invention. Each motorized wheel **304** of elevator cabin **160** can be connected by an axle **500**, and all motorized wheels **304** can be propelled by one or more propulsion motors **501**. Each motorized wheel **304** can be steerable by means of a steering mechanism (not shown). Each motorized wheel **304** can also be brakable by means of a braking mechanism (not shown). Each horizontally mobile elevator cabin **160** can also be horizontally guidable by means of a guiding mechanism (not shown), such as magnetic guides and metal wires, laser guides, electronic sensors and/or other suitable guiding mechanisms (not shown).

[0030] Fig. 6 is an illustration of the side view of a stationary elevator frame **101**, suspended by cables **135** (two are not shown), and guided by guides **150** along vertical guide tracks **145** in an elevator shaft **100A** formed by girders **406**, in accordance with one embodiment of the current invention. Positioned within elevator frame **101** can be a horizontally mobile elevator cabin **160** with passengers exiting the floor **107** of the cabin **160** onto floor **312** of a building through open sliding doors **300A** and **300B** (not shown as open). The top **161** of elevator cabin **160** is also shown. Open lobby sliding doors **300B** (not shown as open) can be shown within closed lobby swinging doors **302** that are supported by hinges **303**. Closed sliding rear doors **400** can be shown at the rear of elevator cabin **160**. The motorized wheels **304** of elevator cabin **160** can be supported by the base **102** of elevator frame **101**. Elevator cabin **160** can be stabilized by four telescoping stabilization rods **306** (not shown) automatically inserted into four stabilization sleeves **411** (two are not shown) on the sides of the elevator cabin **160**. A telescoping electricity and data plug **403** (not shown) can be automatically

inserted into an electricity and data socket **412** on a side of the elevator cabin **160** in order to provide electricity and data to the cabin **160** while it is moving vertically in an elevator shaft **100A**, and electricity to charge a battery **604** for the horizontally mobile elevator cabin **160**. As shown in Fig. 6 there can be an electricity storage battery **604** attached to the cabin **160** which can be used as energy for motors **501** (not shown) to propel the horizontally mobile elevator cabin **160** when it is detached from the elevator frame **101** and moves horizontally on a surface.

[0031] Fig. 7 is an illustration of the side view of a stationary elevator frame **101**, suspended by cables **135** (two are not shown), and guided by guides **150** along vertical guide tracks **145** in an elevator shaft **100A** formed by girders **406**, all in accordance with one embodiment of the current invention. The top of the base **102** of the elevator frame **101** can be shown at the same level as the floor **312** of a building/structure. Both swinging lobby doors **302** can be swung wide open and can be hanging from their hinges **303**. A pair of cabin front sliding doors **300A** can remain closed and a pair of cabin rear sliding doors **400** can also remain closed. A wall **700** of the elevator lobby and a ceiling **701** above the lobby are shown in Fig. 7. Telescoping stabilization rods **306** (not shown) can have already been automatically withdrawn from stabilization sleeves **411** and into the elevator frame **101** by means of stabilization rod motors **402** (not shown). Similarly a telescoping electricity and data plug **403** (not shown) can have already been automatically withdrawn from an electricity and data socket **412** and into the elevator frame **101** by means of an electricity and data motor **402** (not shown). At this point in time, a horizontally mobile elevator cabin **160** can be propelled out of the elevator frame **101** on its motorized wheels **304** (two are not shown) and onto the surface of the floor **312** of a building or other structure, with or without passengers inside the elevator cabin **160**.

[0032] Once completely outside of the elevator frame **101**, the horizontally mobile elevator cabin **160**, with or without passengers on board, can be propelled by its motorized wheels **304** on any horizontal surface as far as the electric charge in its batteries **604** can last. For example, the elevator cabin **160** can travel to other destinations on the building floor **312**; it can travel across a bridge from one building to another building (not shown); and if a compatible elevator frame **101** in a second building is empty, it can enter through other open lobby swinging doors **302** and move into that second frame **101** (not shown). At this point in time, other telescoping stabilization rods **306** can be automatically inserted into the stabilization sleeves **411** of the elevator cabin **160** (not shown) and another telescoping electricity and data plug **402** can be automatically inserted into an electricity and data socket **412** of the cabin **160** (not shown). Once the other swinging lobby doors **302** (not shown) are closed, this new elevator cab **110** can move vertically again up or down in this new elevator shaft **100B** in the second building (not shown).

[0033] Fig. 8 is an illustration of the rear view of an elevator frame **101A** guided by guides **150** along two vertical guide tracks **145** through an elevator shaft **100A**, in accordance with an embodiment of the current invention. Positioned within elevator frame **101A** can be the rear view of a horizontally mobile elevator cabin **160A**. The cabin's motorized wheels **304** can be supported by the top of the elevator frame's base **102A**, and elevator cabin **160A** can be stabilized by telescoping stabilization rods **306**. Two sliding rear doors **400** can be closed and passengers inside cabin **160A** can be visible from the windows **301** located in the sliding doors **400**. When elevator cab **110A** is moving vertically up or down an elevator shaft **100A**, the two rear sliding doors **400** cannot slide open because they must be locked. When elevator cab **110A** stops at a building floor **312**, one of several scenarios can happen: (1) if the floor **107A** of elevator cabin **160A** stops at the floor **312** of a building (shown by dashed lines), passengers in the stationary elevator cabin **160A** can walk out of the cabin's open front

sliding doors **300A** and **300B** (not shown) onto the surface of floor **312** of a building (not shown). But the rear sliding doors **400** of cabin **160A** must remain closed and locked, unless there is another elevator cabin **160B** (not shown) waiting in a directly adjacent elevator shaft **100B** (not shown) with its floor **107B** also stopped at the same floor level **312** (not shown). If this event occurs, the rear sliding doors **400** of both elevator cabins **160A** and **160B** can automatically unlock and open so that passengers in one stationary elevator cabin **160** can walk across a short floor/connecting platform **800** (not shown) between the two waiting stationary cabins **160** and into the other stationary cabin **160** in accordance with one embodiment of this invention (see Fig. 9 for more detailed descriptions).

[0034] On the other hand, (2) if the top of the base **102A** of elevator frame **101A** stops at the floor **312** of a building, then after elevator cabin **160A** can be automatically detached from elevator frame **101A**, and horizontally mobile elevator cabin **160A** can move out of frame **101A** on its motorized wheels **304**, either: (a) through the open swinging lobby doors **302** and onto the building lobby floor **312** (not shown), or (b) if the base **102B** of another empty elevator frame **101B** is waiting in an adjacent elevator shaft **100B** at the same building floor level **312**, then horizontally mobile elevator cabin **160A** can move out of frame **101A** in shaft **100A** on its motorized wheels **304**, across a short floor/connecting platform **800** (not shown), and into empty elevator frame **101B** waiting in elevator shaft **100B** (not shown), where cabin **160A** can be automatically reattached to frame **101B**. Elevator frame **101B** can then move vertically again up or down elevator shaft **100B** with elevator cabin **160A** on board, in accordance with one embodiment of the present invention (see Fig. 10 for more detailed descriptions).

[0035] Fig. 9 is an illustration of the side view of two stationary elevator frames **101A** and **101B** each suspended by suspension cables **135**, guided by guides **150** along guide tracks **145**

in two adjacent elevator shafts **100A** and **100B**, respectively and separated by a short floor/connecting platform **800** supported by a building girder **406**, in accordance with one embodiment of the current invention. Positioned within elevator frame **101A** can be a horizontally mobile elevator cabin **160A**, and positioned within elevator frame **101B** can be a horizontally mobile elevator cabin **160B**. The rear sliding doors **400A** and **400B** of each elevator cabin **160A** and **160B**, respectively, can be open, so that passengers in stationary cabin **160A** can walk across a cabin floor **107A** in cabin **160A** through open rear sliding doors **400A** and **400B**, across a short floor/connecting platform **800** supported by a girder **406**, and into stationary cabin **160B** without accessing a lobby **900**. Likewise, passengers in stationary cabin **160B** can walk across a cabin floor **107B** in cabin **160B** through open rear sliding doors **400B** and **400A**, across a short floor/connecting platform **800** supported by a girder **406**, and into stationary cabin **160A** without accessing a lobby **900**. Similarly, if rear sliding doors **400B** and **400A** can remain open, if front sliding doors **300A** of elevator cabins **160A** and **160B** can remain open, and if the front lobby sliding doors **300B** of each building lobby **900A** and **900B** can also remain open, then all passengers in each stationary elevator cabin **160A** and **160B** and in each lobby **900A** and **900B** can access each said cabin and each said lobby, as shown on Fig. 9.

[0036] Fig. 10 is an illustration of the side view of two stationary elevator frames **101A** and **101B**, each suspended by cables **135**, guided by guides **150** along guide tracks **145** in two adjacent elevator shafts **100A** and **100B** formed by girders **406** and separated by a short floor/connecting platform **800** supported by girders **406**, in accordance with one embodiment of the current invention. The base **102A** and **102B** of each elevator frame **101A** and **101B**, respectively, can be level with floor **312** of a building/structure. After horizontally mobile elevator cabin **160A** is automatically detached from elevator frame **101A**, elevator cabin **160A** can be propelled by its motorized wheels **304** through the open area **1000** between

elevator shaft **100A** and elevator shaft **100B**, across a short floor/connecting platform **800** supported by a building girder **406**, and into elevator frame **101B**. At this point in time, horizontally mobile elevator cabin **160A** has two options: (1) it can request that lobby swinging doors **302B** swing wide open so that horizontally mobile cabin **160A** can be propelled on its motorized wheels **304** onto the surface **312** of lobby **900B** and move on its motorized wheels **304** to a new destination; or (2) it can remain in elevator frame **101B**. Once positioned in frame **101B**, elevator cabin **160A** can be automatically reattached to other telescoping stabilization rods **306** (not shown) and to another telescoping electricity and data plug **403** (not shown) by means of motors **402** (not shown). Thereafter, elevator frame **101B** with horizontally mobile elevator cabin **160A** firmly reattached, can move vertically up or down elevator shaft **100B**. In embodiments of the present invention, one or more temporary passageways are provided through one or more elevator shafts, and through one or more stationary elevator frames. Furthermore, each elevator cabin in an elevator shaft can be used as a vertical and/or horizontal carrier of workers and/or materials during construction, remodeling or repair of any floor of such structure.

[0037] Throughout the description and drawings, example embodiments are given with reference to specific configurations. It will be appreciated by those of ordinary skill in the art that the present invention can be embodied in other specific forms. Those of ordinary skill in the art would be able to practice such other embodiments without undue experimentation. The scope of the present invention, for the purpose of the present patent document, is not limited merely to the specific example embodiments or alternatives of the foregoing description.

CLAIMS

What is claimed is:

1. An elevator system in a structure comprising:
 - at least one vertical elevator shaft and at least one horizontal surface along a horizontal plane of said structure;
 - one or more elevator cabins wherein each cabin is independently moveable with respect to each other cabin vertically through the at least one vertical elevator shaft and horizontally into the at least one horizontal surface;
 - at least one vertically moveable elevator frame that is attachable to an elevator cabin, wherein the elevator cabin being detachable from said at least one elevator frame and capable of horizontal movement on the at least one horizontal surface.
2. The elevator system of claim 1, wherein each elevator frame is suspended by a plurality of cables and is connected by cables to one or more counterweights.
3. The elevator systems of claim 2, wherein each cable and each counterweight is located outside a vertical pathway of each cabin and each elevator frame.
4. The elevator system of claim 1, further comprising at least a second elevator frame and at least a second elevator cabin that is attached to and supported by said at least second elevator frame.
5. The elevator system of claim 4, wherein one or more of said elevator cabins and frames are independently moveable with respect to each other cabin and frame vertically through the at least one vertical elevator shaft.

6. The elevator system of claim 4, wherein one or more of said elevator cabins is independently moveable with respect to each other elevator cabin vertically through the each elevator shaft and horizontally onto each horizontal surface.
7. The elevator system of claim 1, further comprising at least a second vertical elevator shaft in the structure having another one or more vertically aligned elevator frames, wherein each cabin is detachable from and attachable to each elevator frame in any vertical elevator shaft and along the at least one horizontal surface.
8. The elevator system of claim 1, wherein each elevator cabin is automatically attached to or automatically detached from the elevator frame.
9. The elevator system of claim 1, wherein each elevator cabin is stabilized by at least a pair of stabilization rods located on the elevator frame or on the cabin.
10. The elevator system of claim 1, wherein each elevator cabin further comprises a plurality of wheels for horizontal movement onto the horizontal surface.
11. The elevator system of claim 10, wherein the plurality of wheels are motorized wheels propelled by one or more propulsion motors.
12. The elevator system of claim 1, wherein each elevator cabin is supported by a supporting surface of the elevator frame.
13. The elevator system of claim 12, wherein the supporting surface of the elevator frame is aligned with the at least one horizontal surface when the cabin is detached from the elevator frame for horizontal movement.

14. The elevator system of claim 1, wherein the horizontal surface is accessible through a pair of swinging doors attached to a wall of the at least one vertical elevator shaft.
15. The elevator system of claim 1, wherein each cabin comprises a front entryway and a rear entryway.
16. The elevator system of claim 1, wherein the horizontal surface is a floor in the structure.
17. The elevator system of claim 1, further comprising a pair of elevator cabin sliding doors located within a front wall of each elevator cabin, and a pair of lobby sliding doors, wherein each lobby sliding door is suspended on a track within a lobby swinging door.
18. The elevator system of claim 1, further comprising a pair of first sliding doors within a front wall of an elevator cabin and a pair of second sliding doors within a rear wall of the same elevator cabin.
19. The elevator system of claim 11, wherein the motorized wheels of the elevator cabin are steerable, brakable, and guidable.
20. The elevator system of claim 11, wherein energy for the one or more motors that propel the wheels of the elevator cabin is supplied by rechargeable batteries transported with the cabin.
21. The elevator system of claim 17, wherein two or more pairs of sliding doors open onto a floor in the structure and are configured for passengers to move through from a stationary elevator cabin.

22. The elevator system of claim 1, wherein each elevator cabin is automatically detachable from an elevator frame and then moveable on motorized wheels onto a horizontal surface.
23. The elevator system of claim 1, wherein each elevator cabin is automatically detachable from an elevator frame and then movable on motorized wheels through open swinging doors and onto a horizontal surface.
24. The elevator system of claim 23, wherein an elevator cabin moves horizontally on a plurality of motorized wheels on a horizontal surface to another structure, moves onto a surface of another stationary elevator frame suspended in another elevator shaft, then automatically attaches to said another stationary elevator frame and is movable up or down in said another elevator shaft.
25. The elevator system of claim 21, further comprising two adjacent elevator shafts and a connecting platform between said adjacent elevator shafts wherein each elevator cabin comprises open rear doors, such that passengers in one adjacent elevator shaft can move across the connecting platform, and into the open rear doors of a stationary adjacent elevator cabin, which adjacent elevator cabin being movable up or down in an elevator shaft.

26. The elevator system of claim 25, wherein

the at least one vertical elevator shaft comprises a pair of sliding doors suspended within a pair of swinging doors which open onto a floor in the structure,

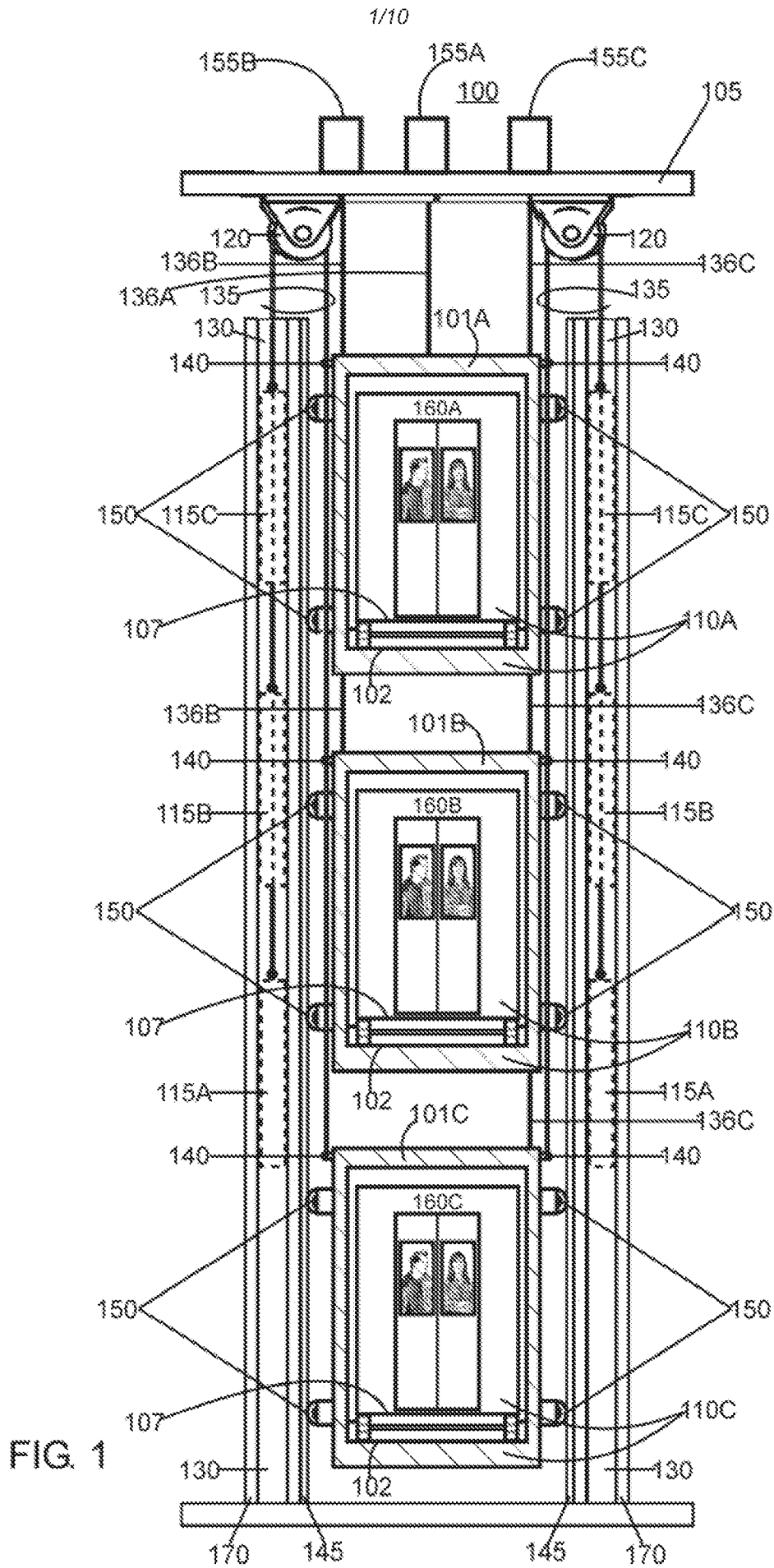
each elevator cabin comprising a pair of sliding doors in a front wall of the elevator cabin suspended in an elevator shaft, and a pair of sliding doors in a rear wall of the elevator cabin,

the system comprising

a connecting platform between the at least one elevator shaft and an adjacent elevator shaft, and an adjacent elevator cabin suspended in the adjacent elevator shaft, and a pair of sliding doors suspended within a pair of swinging doors of the adjacent elevator shaft which open onto another floor of the structure;

such that passengers on the floor move through the pair of swinging doors and pair of sliding doors of the at least one vertical elevator shaft, through the pair of sliding doors in the front wall of a stationary elevator cabin in the shaft, across the stationary elevator cabin, through the pair of sliding doors in the rear wall of the stationary elevator cab, across the connecting platform, through the pair of sliding doors in the rear wall of the adjacent elevator cabin in the adjacent elevator shaft, across the adjacent elevator cabin, through the pair of sliding doors in the front wall of the adjacent elevator cabin, through the pair of sliding doors and pair of swinging doors of the adjacent elevator shaft, and onto the another floor.

27. The elevator system of claim 20, wherein an elevator cabin is detached from a stationary elevator frame suspended by cables in an elevator shaft, then said elevator cabin is movable on a plurality of motorized wheels across a surface of the elevator frame, across a connecting floor and onto a surface of an adjacent stationary elevator frame suspended by cables in a different elevator shaft, wherein said elevator cabin is reattached to said adjacent elevator frame and then is movable up or down in said different elevator shaft.
28. The elevator system of claim 26, wherein a temporary passageway is provided through one or more elevator shafts, and through one or more stationary elevator frames.
29. The elevator system of claim 23, wherein each elevator cabin in an elevator shaft can be used as a vertical and/or horizontal carrier of workers and/or materials during construction, remodeling or repair of any floor of such structure.
30. The elevator system of claim 1, wherein the two or more elevator cabins operate independently of each other elevator cabin in the same vertical elevator shaft due to all cables and a plurality of connection points being located outside the vertical path of movement of each elevator cabin, as each elevator cabin moves vertically through the vertical elevator shaft.



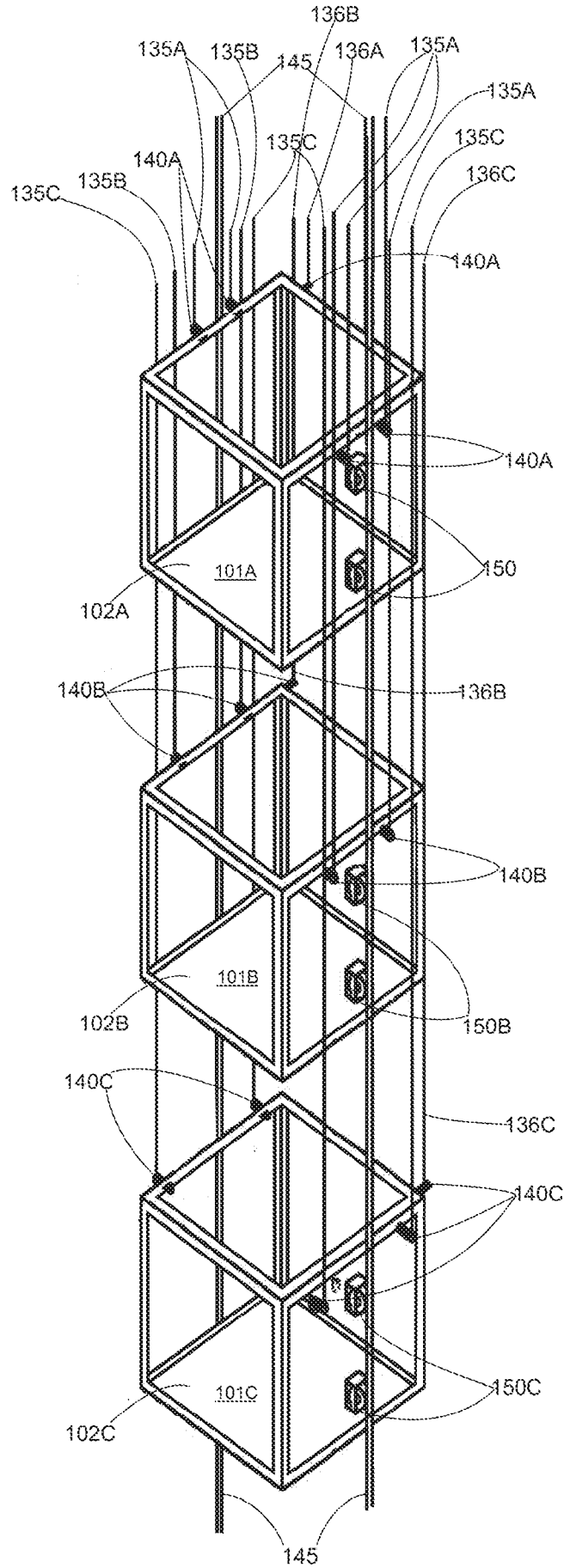


FIG. 2

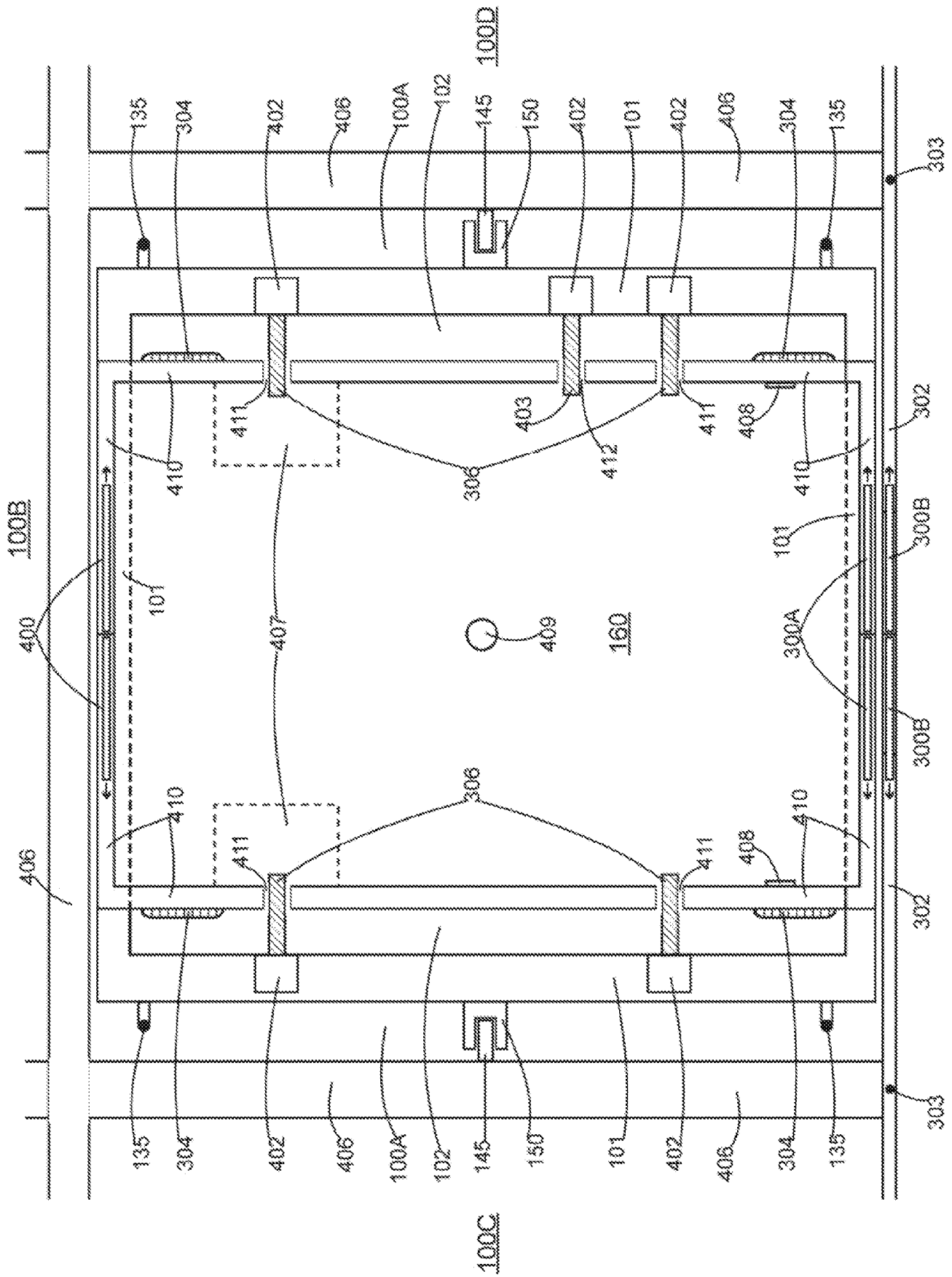


FIG. 4

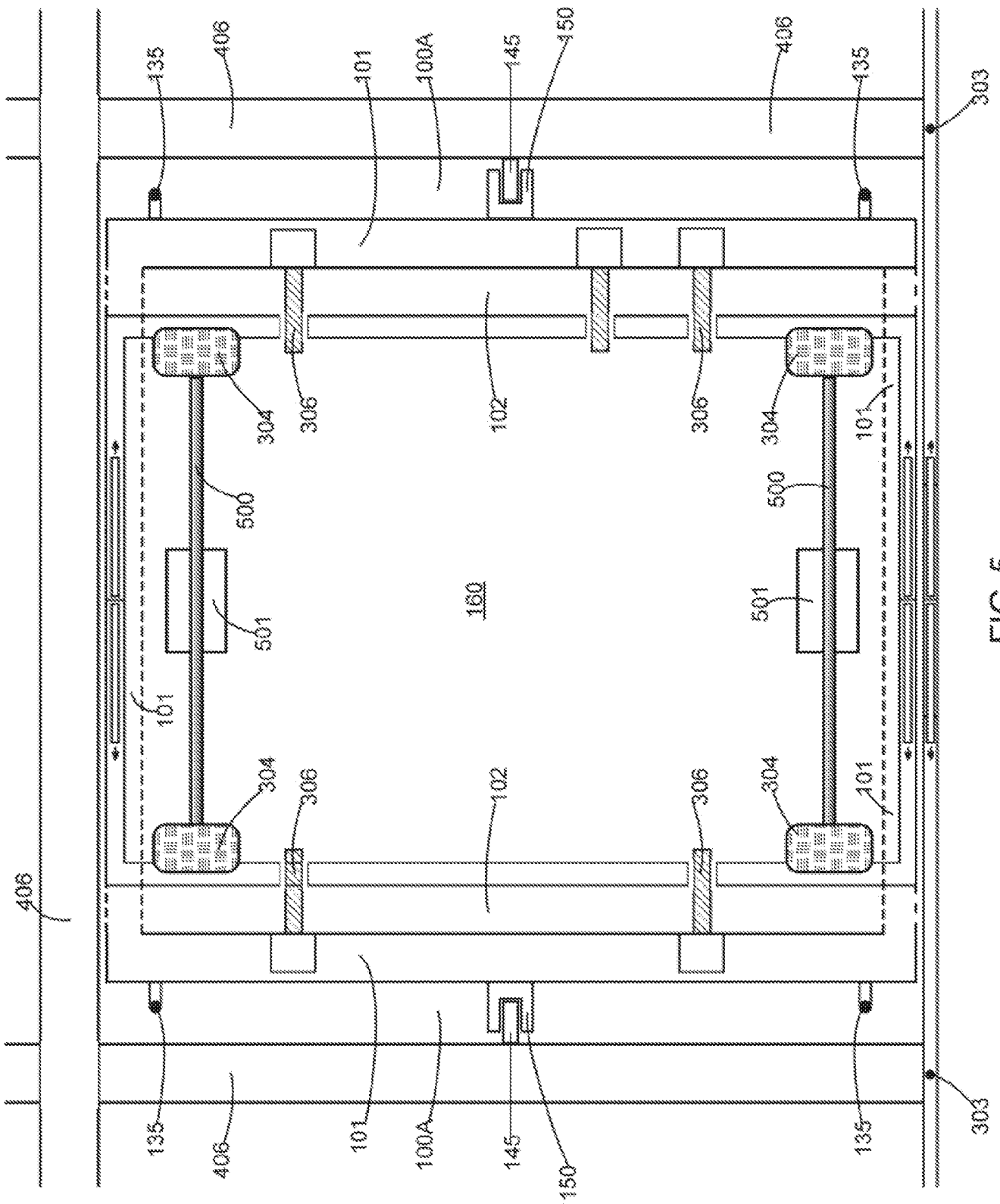


FIG. 5

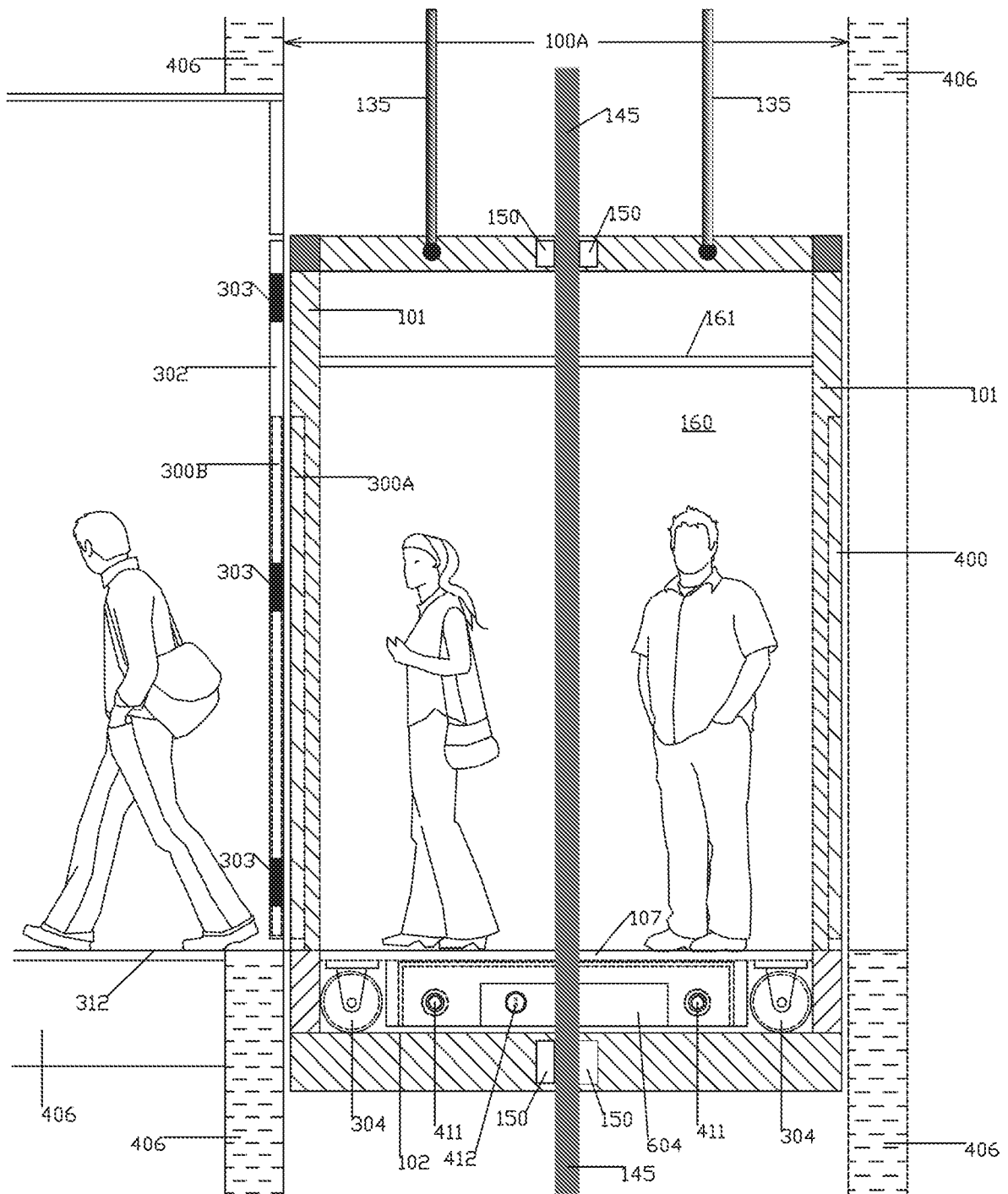


FIG. 6

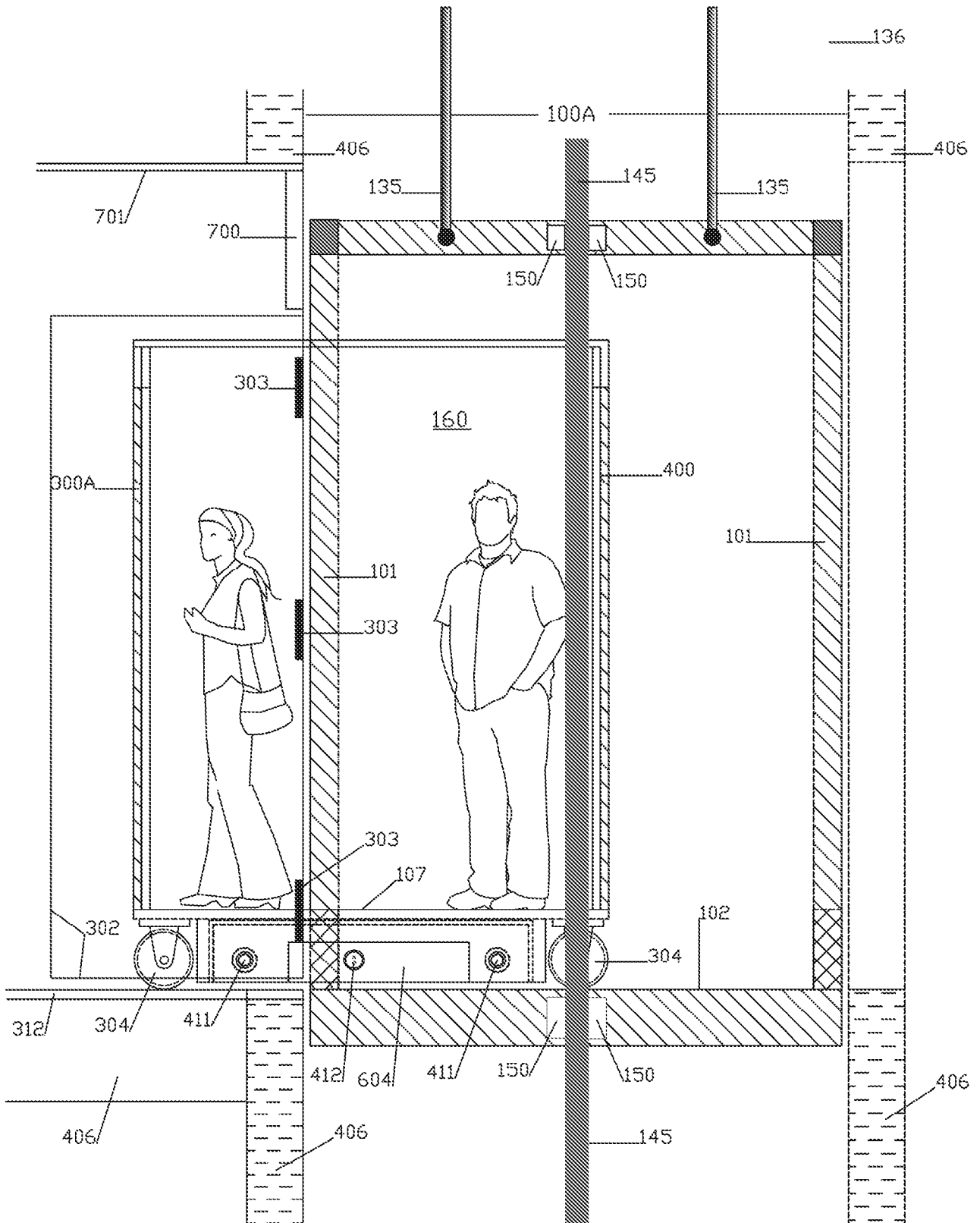


FIG. 7

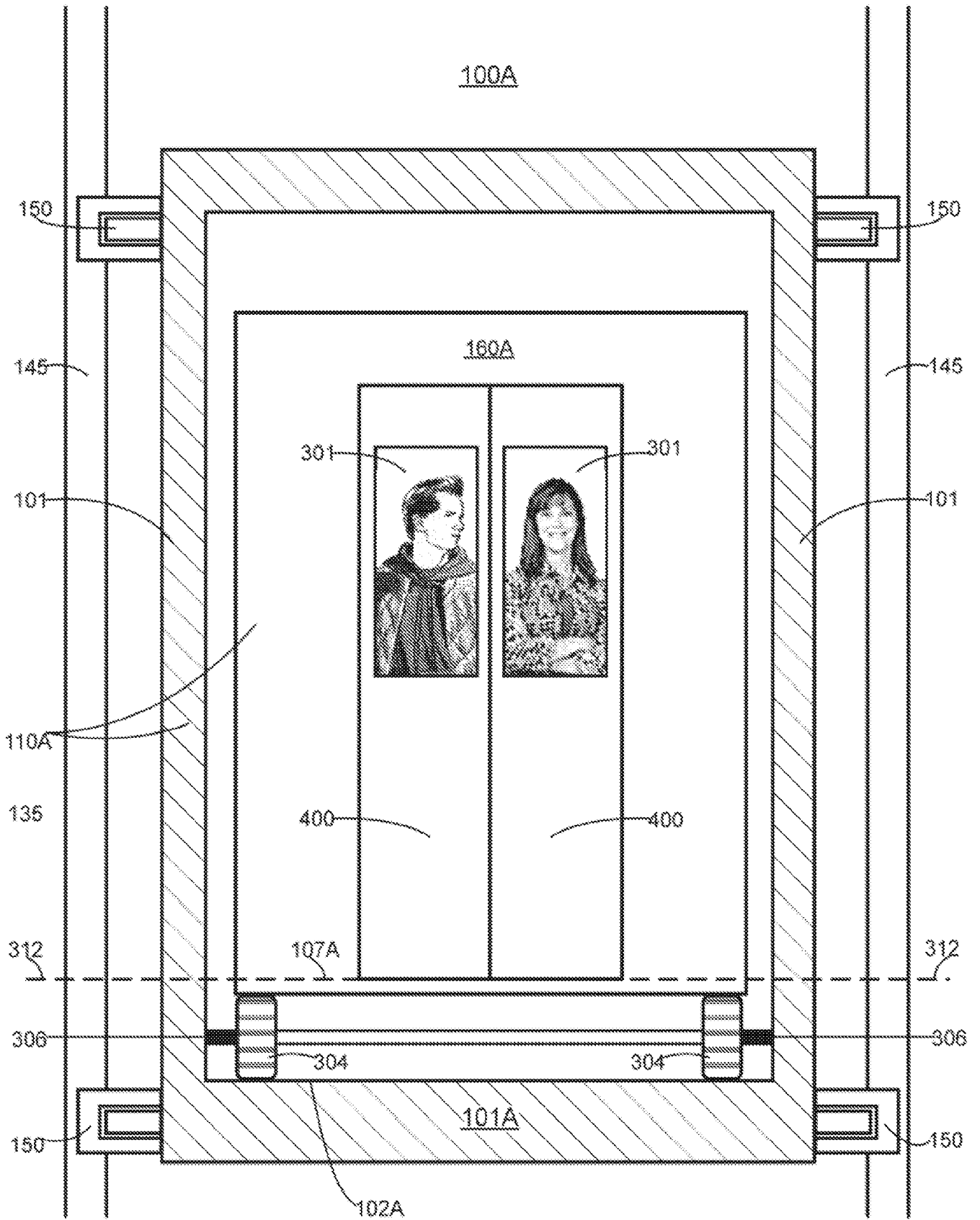


FIG. 8

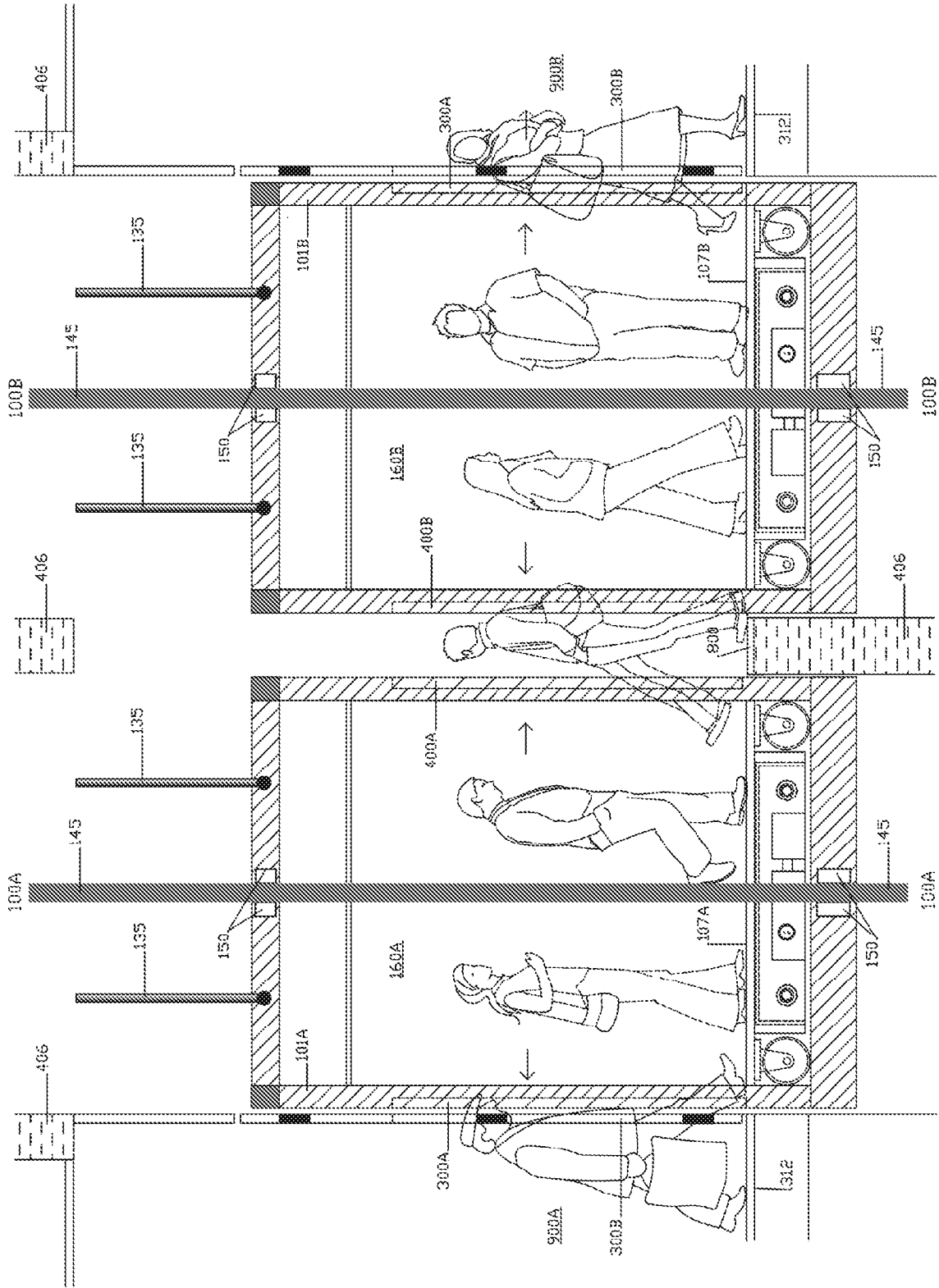


FIG. 9

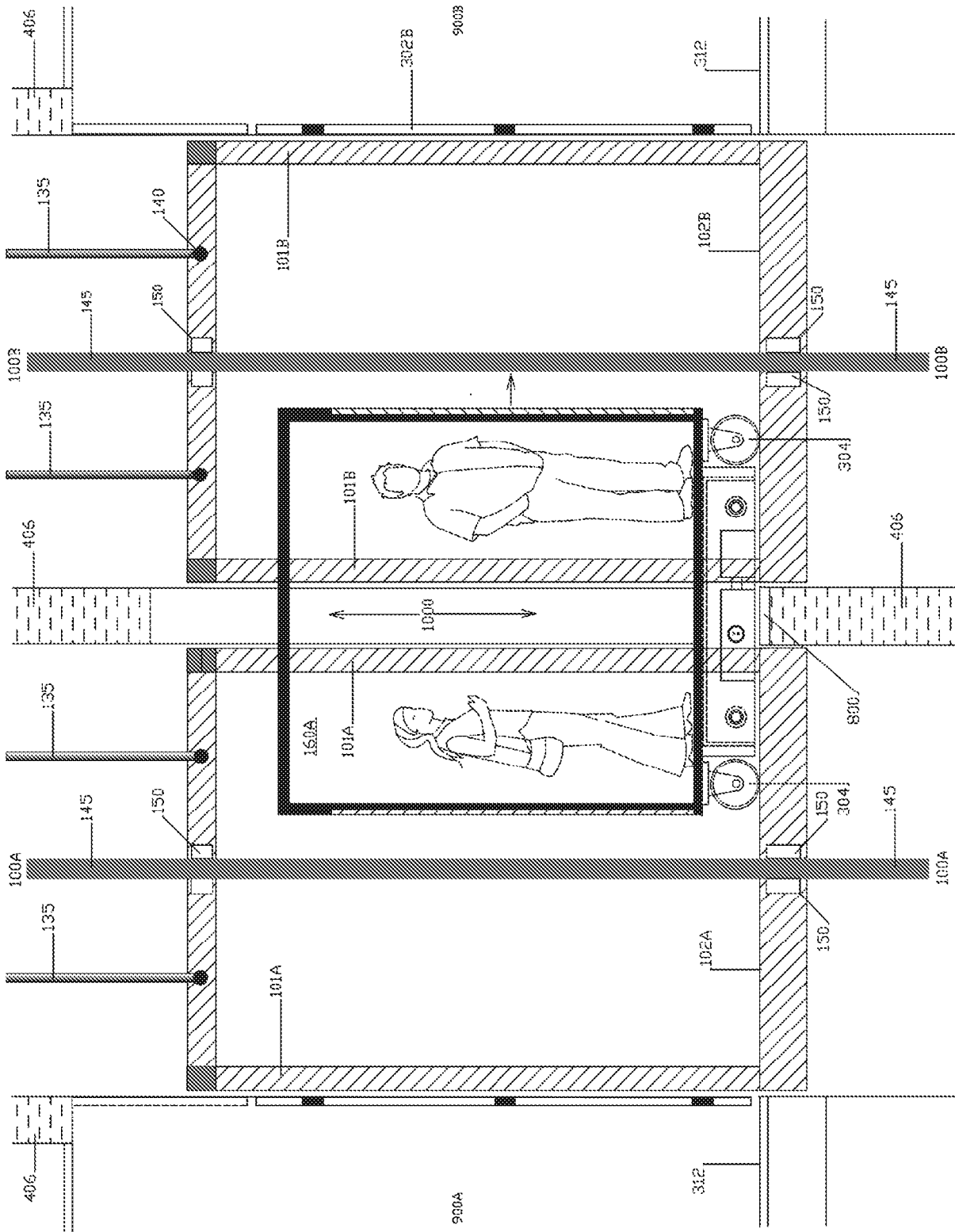


FIG. 10

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US16/54237

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - B66B 13/10, 9/187, 13/08, 13/04, 9/16, 7/02 (2016.01)

CPC - B66B 13/10, 9/187, 13/08, 13/04, 9/16, 7/068

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC(8): B66B 9/00, 9/16, 9/187, 7/02, 7/06, 13/04, 13/06, 13/08, 13/10 (2016.01)

CPC: B66B 9/00, 9/16, 9/187, 7/02, 7/06, 7/068, 13/04, 13/06, 13/08, 13/10

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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

PatSeer (US, EP, WO, JP, DE, GB, CN, FR, KR, ES, AU, IN, CA, Other Countries (INPADOC), RU, AT, CH, TH, BR, PH); EBSCO; IEEE/IEEExplore; Google/Google Scholar; Keywords: elevator, lift, cabin, car, wheel, motor, door, swing, sliding, sway, surface, horizontal, vertical, cables, motor, decouple, detach, floor, independent

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	EP 0814049 A1 (OTIS ELEVATOR COMPANY) 29 December 1997; figures 2, 8; column 1, lines 49-55; column 3, lines 21-30; column 9, lines 28-37; column 10, lines 45-58; column 11, lines 30-48; claims 19, 27.	1, 4-7, 10, 12-13, 16 ----- 2-3, 8-9, 11, 14-15, 18-20, 22, 27, 30 ----- 23-24, 29
Y	US 2015/0075916 A1 (SMART LIFTS, LLC) 19 March 2015; paragraph [0005]; claim 18.	2-3, 30
Y --- A	US 2011/0042168 A1 (GRUNDMANN, S.) 24 February 2011; paragraph [0063].	8, 22 ----- 17, 21, 23-26, 28-29
Y	EP 0367621 A1 (OTIS ELEVATOR COMPANY) 09 May 1990; abstract; column 3, lines 34-45.	9
Y --- A	US 2003/0132039 A1 (GAFFNEY, T. et al.) 17 July 2003; figure 1; paragraph [0013].	11, 19-20, 22, 27 ----- 23-24, 20
Y --- A	JP 2014-009099 A (MITSUBISHI ELECTRIC CORP) 20 January 2014; see machine translation.	14 ----- 17, 21, 23-26, 28-29
Y	CA 1265069 A (GOMEZ, S.) 30 January 1990; page 1, 1st paragraph.	15, 18

Further documents are listed in the continuation of Box C.

See patent family annex.

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

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Date of the actual completion of the international search

28 November 2016

Date of mailing of the international search report

19 DEC 2016

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US16/54237

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 2719650 A1 (MITSUBISHI ELECTRIC CORPORATION) 16 April 2014; figure 1; paragraph [0014].	20, 27
A	US 2014/0034426 A1 (NOVAK, Y.) 06 February 2014; entire document.	1-30