

BUILDING LIFT

[0001] The present application claims an earlier priority date of Singapore patent application Number 10201607581Q that was filed on 13 September 2016, and has the
5 title of Wheelchair Lift. All subject matter or content of the earlier priority application is hereby incorporated by reference wherever necessary or appropriate.

[0002] The present application relates to a building lift. The application also relates
10 methods for making, assembling, disassembling, installing, configuring, maintaining, repairing, servicing, or using the building lift. The building lift is also known as a vehicle lift for carrying a vehicle, a wheelchair lift for carrying a wheelchair, an elevator for carrying a passenger or goods, or simply a lift.

[0003] A building lift is a type of vertical transportation device that can move people or
15 goods between floors (i.e. levels, decks) of a building, vessel, or other structure. A building lift is also known as an elevator or lift which is usually powered by motors. A building lift often requires a large area to install, and several traction cables to pull and counterweights to raise a platform. However, a building lift is normally too expensive or structurally demanding to be built for every residential flat of a residential block (i.e.
20 tower block, high-rise, apartment tower, residential tower, apartment block, block of flats). Hence, many occupants of individual residential flats often have to struggle in climbing stairs to access their homes if a building lift does not land on their floors. The climbing of stairs becomes especially strenuous for elderly people, patients or persons with disabilities, if ever possible. Some of these residential flats have higher or lower
25 grounds on a single floor, which are not easily accessible even by wheelchairs.

[0004] The present invention aims to provide a new and useful building lift. The invention also aims to present new and useful methods of making, assembling, disassembling, installing, configuring, maintaining, repairing, servicing, and/or using the
30 building lift. Essential features of the invention are provided by one or more independent claims, whilst advantageous features are presented by their dependent claims respectively.

[0005] According to a first aspect, the present application provides a building lift that comprises a platform for carrying a person or user in a wheelchair; a drive mechanism coupled to the platform for moving the platform; and an anchor further coupled to the drive mechanism for supporting the drive mechanism onto a base or floor of a building.

5 The drive mechanism comprises a rotator for moving the platform laterally, and/or an elevator for moving the platform vertically. The drive mechanism is alternatively known as a main body that keeps mechanical and electronic components of the drive mechanism for moving the platform. Although the rotator and the elevator provide different functions, the rotator and the elevator are optionally integrated together by the
10 same drive mechanism. The rotator or the elevator may move or operate independently from each other or in collaboration. For example, the rotator comprises a turn shaft in a turn motor housing, whilst the turn shaft is driven by a drive motor. In contrast, the elevator includes guide shafts, vertical poles and drive gear assembly so that the platform can be elevated, without being rotated around the anchor. Since rotary
15 movement and linear movement (e.g. vertical elevation) of the platform are optionally independently operated, the building lift is able to raise or lower an object to any desired height, as well as to rotate the object to any preferred angle. The building lift is no longer confined within a vertical well for lifting a passenger or cargo. In contrast, the building lift is capable to shift the passenger or cargo laterally, such as by rotation around the
20 anchor. In other words, the building lift of the present application is versatile to use and simple to construction due to its few components.

[0006] The rotator can comprise a shaft (e.g. turn shaft) and a bearing that are coupled together as a subassembly for providing linear movement along the shaft and rotary
25 movement around the shaft. Since the rotary movement and linear movements are accomplished by the shaft and bearing subassembly, structure of the building lift becomes simple, reliable and cost effective.

[0007] In the building lift, the anchor may comprise a column for locking onto a building.
30 The anchor is able to hold the drive mechanism along its length at multiple supporting locations so that the platform and the drive mechanism become more stable in movement or at rest.

[0008] The platform, the elevator, the rotator, the anchor or a combination of any of these components can comprise one or more ribs for strengthening or preventing bending of these components. For example, the anchor has several ribs extending from a base mounting plate of the anchor and along a longitudinal direction of the anchor.

5 The anchor can thus adopt a hollow cylinder that has a thin wall, requiring less material or having lower weight.

[0009] The building lift may further comprise an extender or linear extender that is coupled to the platform, the drive mechanism, the anchor or a combination of any of these components for extending them linearly. For example, the anchor comprises two concentric and contiguous cylinders extendable along each other as a telescopic motion and the two cylinders have lateral through holes for receiving bolts as stoppers for preventing longitudinal movement of the cylinders. In fact, each of the platform, the drive mechanism or the anchor may be constructed by multiple components that are

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15 telescopically extendable, which allow the building lift to expand its working or movement range.

[0010] Embodiments of the application provide that the building lift has modular structure, whereby the platform, the drive mechanism and the anchor are easily detached or disconnected from each other as modules or subassemblies. A manufacturer, installation contractor or maintenance contractor will be able to dislodge or replace any of these parts or components when modifying or repairing the building lift.

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[0011] According to the application, the drive mechanism optionally comprises one or more range stoppers for defining moving parameters of the platform. The one or more range stoppers define ranges, stages, speed or locus of movement of the building lift. For example, the one or more range stoppers divides a vertical movement into three stages covering a length of 500 millimetre (mm), which consists of a first stage of 15mm

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30 at a speed of 05mm per second, a second stage of 28mm at a speed of 15mm per second and a third stage of 7mm at a speed of 03mm per second. Division or delimitation of the movement offer the flexibility to configure movement of the building lift in order to suit usage preference or performance efficiency. The one or more range stoppers are sometimes defined by algorithm (e.g. computer software) or hardware (e.g.

position switch). The same building lift is optionally configured according to different range stoppers so that a standard building lift may be adapted to different users or building environments to provide customised solutions. In other words, the drive mechanism can be configured to adjust its movement parameters, whether by hardware or software.

[0012] More specifically, the range stopper may comprise a rotary range stopper, a linear range stopper or a combination of both. Again, the range stopper, the rotary range stopper or the linear range stopper may be implemented by computer one or more software packages or hardware components. In practice, if the building lift is installed at a residential unit, linear or vertical range stoppers have to be defined or positioned according to differential height between a floor of the residential unit and a common corridor (also known as passage way or deck) outside the residential unit. The building lift is configured such that the platform is able to lay flat on both the floor of the residential unit and the common corridor. In some other cases, rotary movement of the building lift is required to be customised too, in order to adapt to physical surroundings of the building lift.

[0013] The building lift can further comprise a protector for preventing external intrusion to the building lift. The protector keeps critical components of the building lift from external instruction, impact or disturbance. For example, the protector comprises a panel or box that encloses the drive mechanism so that the drive mechanism is protected from children's mischief. In practice, the protector comprises one or more gasket or seal (e.g. O ring or elastomer) for blocking infiltration of rainwater into the drive mechanism. Embodiments of the application provides a main body as the box which encloses both electronic (e.g. PCB) and mechanical components (e.g. DC motor) of the drive mechanism. The gasket is installed between a cover plate and drawer box of the main body so that the electronic components are ingress resistant, being able to resist rain, mist or snow.

[0014] The protector can also comprise an extended plate or base sheet of the platform so that the platform provides a shield to other components of the building lift when folded onto the drive mechanism in a storage mode. The extended plate covers substantially the drive mechanism, control unit or main body so that vital components

of the building lift are kept away from external disturbance or intrusion, even by rainwater or physical impact of nearby people.

[0015] The building lift may further comprise a detector for detecting obstruction to movement of the platform. The detector monitors or checks ambient environment of the building lift. The detector is optionally a radar detector (e.g. LIDAR sensor) or a proximity sensor similar to that of an autonomous cruise control system. Radar or multi-sensor based detector is able to alert or notify a user of the building lift if danger or hazard exists around the building lift. For example, the detector sends a beep sound to a user of the building lift so that the platform cannot be unfolded, when detecting a child playing under the building lift. The detector is optionally implemented by software or hardware components. For example, the detector

[0016] The detector can comprise a force sensor that measures resistance from an external objection. For example, the force sensor is operable to check resistance force when the platform is stopped by a human leg. The building lift will halt its movement if the resistance force is larger than 7kG (i.e. KG, kg, Kg, kilogram) force or any other predetermined number. Moreover, the detector optionally comprises a camera that captures still images (e.g. snapshot or continuous snapshots) or moving images (e.g. video) around the building lift. A user of building lift is able to activate or launch the building lift when no obstruction is around the building lift.

[0017] The detector further optionally comprises an overweight sensor that monitors load of the platform. The detector is configured to trigger a warning light, an alarm bell or suspend operation of the building lift if the load is more than a predetermined threshold. For example, 180 kG force is a Safe Working Load (SWL) of the building lift. However, the building lift can be configured to operate with a heavier payload. For instance, the threshold of a prototype of the building lift is tested at 225 kG force, which is about 25% more than the SWL recommended. The threshold represents an average person with a wheelchair or a motorised wheelchair. The overweight sensor prevents the building lift to operate beyond its capacity, such as by carrying excess heavy load.

[0018] The building lift may further comprise a local power supply for providing electricity to the drive mechanism. The local power supply sometimes comprises a AC-

DC converter for powering a DC (direct current) motor. The local power supply may further comprise a battery or rechargeable battery that is connectable to the DC motor as a backup power supply. The backup power supply is able to keep electronic components of the drive mechanism on a standby mode or powering the platform in the absence of external power supply. The local power supply may additionally comprise an energy harvester that is operable to harvest renewable energy from ambient environment of the building lift. For example, the energy harvester comprises a solar pane or a wind turbine that is able to convert solar or wind energy to electricity in order to drive the platform.

[0019] Embodiments of the application offer that the drive mechanism comprises a folding mechanism for folding the platform onto the drive mechanism. When folded, the platform and other components of the building lift are packed together, presenting a small thickness or width. Hence, if the anchor is closely mounted near a wall and entrance of a residential unit, the building lift with the folded platform will not obstruct traffic at a corridor outside the residential unit. Particularly, if the platform is folded onto the drive mechanism or the main body, major or critical components of the building lift are effectively shielded by the platform from rainwater or physical impact. Hence, the folding mechanism enables the building lift to have a small footprint and robust structure during storage.

[0020] The folding mechanism is sometimes configured to fold the platform onto the drive mechanism automatically by default (i.e. in the absence of signalling) or extending the platform to a levelled position when triggered. For example, upon entering a residential flat after using the building lift, the building lift is able to complete actions of withdrawing from the residential unit, rotating the platform back at a corridor outside the residential unit, and folding the platform onto the drive mechanism automatically, without user control or intervention. In a storage position or mode, if a user triggers operation (e.g. pressing a button on a remote controller of the building lift), the platform is able to be unfolded, rotated and lowered onto a floor of a residential unit so that a wheelchair user of the residential unit is able to move onto the platform, come out of the residential unit and land onto the corridor outside and next to the residential unit. Once the user moves off the platform, the building lift is able to fold back the platform

and resume the storage position, without creating obstruction to the corridor or passageway.

[0021] In some instances, the drive mechanism comprises a control unit (e.g. programmable logic controller as PLC) for operating or configuring the building lift. The control unit optionally includes electronic, electric and mechanical components of the building lift, which are interconnected together. For example, the control unit includes a computer that is installed or preloaded with an application software package for operating the building lift. The control unit is possible to control, monitor, examine or diagnose the drive mechanism so that the building lift becomes “intelligent” and user friendly.

[0022] The control unit comprises a communication port for communicating to an external electronic device, such as a mobile phone or a computing server. The communication port comprises a computer networking port, a computer hardware port, a wireless communication port and/or an optical communication port (e.g. for laser communication). For example, the control unit is able to communication to a mobile phone or smartphone for using, configuring or maintaining the building lift. The computer hardware port comprises a serial port (e.g. RS-232), a parallel port (e.g. DB-25, DB25F, “Centronics” 36-pin Amphenol, DC-37), a hot-swappable port, a plug-and-play port (e.g. USB port, FireWire port, a lightning connector port of Apple Inc., Apple 30-pin dock connector port). The communication port facilitates the control unit to exchange information with other electronic devise, or even with a remote computing server. The wireless communication port optionally includes an antenna (e.g. GPS antenna, WiFi antenna) for wireless communication. The antenna is possibly printed or integrated onto a PCB (Printed Circuit Board) of the communication port, detachably plugged into a PCB of the communication port, or soldered with a PCB of the communication port. Possible electronic communication modes that utilise the antenna include NFC (near-field communication), Zigbee (IEEE 802.15.4-based), Wi-Fi (IEEE 802.11 standard), Bluetooth (IEEE 802.15.1) and other wireless communication protocols.

[0023] The communication port, terminal or module may be operable or programmed to communicate with other electronic devices via a communication protocol, which

comprises PARC Universal Packet, Internet protocol suite, AppleTalk, DECnet, IPX/SPX, Open Systems Interconnection (OSI), Systems Network Architecture (SNA), Transmission Control Protocol (TCP), User Datagram Protocol (UDP), Internet Control Message Protocol (ICMP), Hypertext Transfer Protocol (HTTP), Post Office Protocol (POP), File Transfer Protocol (FTP), Internet Message Access Protocol (IMAP), General Inter-ORB Protocol (GIOP), Java remote method invocation (RMI), Distributed Component Object Model (DCOM), Dynamic Data Exchange (DDE) and SOAP (originally Simple Object Access Protocol). The communication protocol includes one or more encryption algorithms, or modulation so that electronic messages, data or signals cannot be intercepted or read by unauthorised parties. The communication terminal or module may communicate with external devices passively, actively or both

[0024] The control unit or drive mechanism optionally comprise an electronic identification for uniquely denoting the building lift. The electronic identification is also known as an identification, a unique identifier, an electronic identity, a machine identifier, a machine-readable identification, an electronic identifier or simply an identifier attached or assigned to the building lift, which is able to uniquely identify or differentiate the building lift from others machines. The identification, the electronic identification, the unique identifier, the machine identifier, the machine-readable identifier, the electronic identifier or the identifier is possible to be static (e.g. permanent assigned to the motorised scooter) or dynamic (e.g. modified or updated according to circumstance or time). The identification code facilitates automatic recognition and/or data capture (AIDC) so that the motorised scooter can be automatically identified, which is also known as "Automatic Identification," "Auto-ID," and "Automatic Data Capture". AIDC Technologies include bar codes, Radio Frequency Identification (RFID), biometrics (e.g. iris and facial recognition system), magnetic stripes, Optical Character Recognition (OCR), smart cards, and voice recognition.

[0025] The identification or electronic identification can have different forms, such as an electronic address, a machine readable number or code, a physical trait or parameter, or a combination of any of these. Examples of the electronic address include a Wi-Fi MAC (Media Access Control) address, an IPv4 (Internet Protocol version 4) address, an IPv6 (Internet Protocol version 6) address, an IMEI (International Mobile Equipment Identity) address, a telephone number, a MSISDN (Mobile Station

Integrated Services Digital Network number), an international mobile subscriber identity (IMSI) number and its related key as stored by a SIM (subscriber identity module or subscriber identification module) card, an Integrated Circuit Card Identifier (ICCID), a Bluetooth address, Ethernet MAC (Media Access Control) address. Examples of the machine-readable number, machine-readable code or machine-readable data includes a serial number, a time stamp, a linear barcode and a matrix (2D) barcode (e.g. Quick Response Code, Data Matrix code).

[0026] In some cases, the drive mechanism or control unit includes a control panel that is connected to the drive mechanism, the control panel having a touchscreen display or button for operating the building lift.

[0027] The drive mechanism may comprise a remote controller for operating the building lift at a distance, whether with wire(s) or cable(s), or wirelessly. In other words, the remote controller is operable to communicate with the building lift or drive mechanism wirelessly. In practice, a user at a residential unit is able to activate the building lift, while sitting inside the residential unit and not seeing the building lift outside an entrance of the residential unit. The build lift, once activated wirelessly, is able to unfold, move into the residential unit and lower its platform onto a floor of the residential unit so that the user is able to roll his wheelchair onto the platform in order to move out of the residential unit. The remote controller provides much convenience because the user does not require an additional person (e.g. carer or nurse) to activate the building lift outside the residential unit on behalf of him. The remote controller may be compact, small or pocketable so that the building lift cannot operated or missed if the user is away from his residential unit or building lift.

[0028] The platform can comprise a levelling tool or levelling mechanism for keeping the platform substantially horizontal when rotating around the anchor. The levelling tool optionally comprises a spirit level, a dumpy level, a digital level, a laser level or a combination of any of these tools. The levelling tool monitors and keeps the platform to be horizontally orientated when unfolded or carrying a load (e.g. a patient in a wheelchair on the platform). The levelling tool is sometimes integrated with the control unit or computer, whether in the form of hardware or software. For example, the levelling tool includes two laser rangefinder, laser distance meter or laser distance

measurers that are installed at opposite ends of the platform in a longitudinal direction of the platform. The levelling tool ensures that the distances of the opposite ends are substantially similar (e.g. difference less than 5mm) when the platform is unfolded or carrying a load. A wheelchair on the levelled platform is unlikely to skid or swing
5 unintentionally, making a user of the building lift feeling safe and secure.

[0029] The building lift may include a safety bar or hand rail that is foldable around a wheelchair on the platform so that a wheelchair passage can hold onto the safety during transition. The hand rail or safety bar may be movably mounted onto the elevator or
10 main box such that the hand rail is able to rotate around its opposite ends or terminals. In an upright or folded position, the hand rail is erected, aligned with a longitudinal direction of the anchor or main box for making the building lift compact in storage. In another unfolded or extended position, the hand rail moves down and surround a passenger on the platform, providing protection and support to the passenger. The
15 hand rail is possible to unfold or fold automatically, activated by detecting existence or absence of the passenger on the platform.

[0030] The platform can include one or more skirts at one or more edges or ends of the platform for preventing a wheelchair on the platform from moving off. For example, the
20 skirt comprises a first leaf (i.e. first flap) and a second leaf (i.e. second flap) that are disposed at longitudinal ends of the platform. Each of the first leaf and the second leaf are movable between a raised position for blocking wheels of the wheelchair and a lowered position for receiving the wheelchair onto the platform. The skirt can additionally include a side skirt or side leaf (i.e. side flap) that is disposed at a lateral end of the platform.
25 The one or more skirts are able to stop a wheelchair from moving off the platform inadvertently, especially when the platform is made slippery by rainwater or ice.

[0031] The platform may further comprise an actuator coupled to the skirt for activating raising or lowering the skirt automatically. For example, the actuator is a lever
30 mechanism that includes a flap and a landing arm that are pivotally connected to a base sheet of the platform. The flap is automatically pressed down if an end (e.g. landing wheel) of the landing arm is pushed against the ground. In contrast, if the platform is raised up, the flap is automatically biased by raising up, stopping a wheelchair on the platform from wheeling off the platform at a longitudinal end near the flap. The lever

mechanism is simple, reliable and made of mainly mechanical components. The actuator may additionally comprise a self-locking mechanism (e.g. driven by a stepper motor or a worm drive) for preventing the one or more stoppers (e.g. flap, first flap, second flap) from being deactivated accidentally.

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[0032] The platform optionally comprises roughened areas on a top side of the platform or base sheet to provide a better grip for the wheelchair on the platform. For example, one of the roughened areas is formed by a grating (e.g. anti-slip steel grating), which is also known as a grid or a mesh. The grating or anti-slip grating is possible to be formed
10 by a perforated sheet metal which is a diamond-shaped serrated perforated sheet metal, a round hole perforated sheet metal or a raised dimple perforated sheet metal.

[0033] The building lift sometimes further comprises a security lock for authorising operation of the building lift. The security lock may be mechanical, electrical, electronic
15 or software application type. For example, a mechanical security lock is fastening device that is released by a physical object (e.g. key). An electronic security lock is possible to be operated by a fingerprint of the user. The security lock is further possibly operated by an application software installed on a smartphone of the user or authorised personnel. The security lock prevents misuse or unauthorised operation of the building
20 lift. For example, an authorised technician is able to communicate with the drive mechanism or control unit in order to configure, repair, fine-tune, customise or upgrade the building lift with proper approval via his smartphone.

[0034] The present application also provides a residential unit that comprises the
25 building lift. The anchor of the building lift fixed to an entrance or near a door of the residential unit, whether inside or outside a door of the residential unit. The building lift is possibly installed outside or inside the residential unit, whilst the building lift is able to rotate its platform for carrying a user out of or into the residential unit. Equipped with the building lift, the residential unit thus becomes more accessible even for people on
30 wheelchair or with disabilities.

[0035] The present application additionally provides a building or a house that comprises the residential unit and the building lift. The residential unit alternatively can become another type of unit (e.g. office unit or warehouse unit) for human occupation

or goods storage. The building lift may be detachable from the residential unit for installation at another residential unit, whether of this building or another building. Multiple units of the building may have the building lifts that are installed respectively. Sometimes, two neighbouring units share the same building lift, which is able to carry
5 a wheelchair into each of the units. The building becomes much liveable or disable-friendly if installed with the building lift(s).

[0036] According to a second aspect, the present application provides a method of installing a building lift. The method comprises a first step of providing a platform, a
10 drive mechanism and an anchor of the building lift; a second step of securing the anchor to a base or floor of building; a third step of mounting the drive mechanism onto the anchor; and a fourth step of joining the platform onto the drive mechanism. Some of these steps may be changed in sequence or combined together. Since components (i.e. the platform, the drive mechanism and the anchor) of the building lift are separated
15 before installation, and installed onsite, the building lift is easily installed onsite, possibly at a residential unit of a user. Users will enjoy freedom of customisation onsite, and efficient repair whenever required, because any faulty component can be easily replaced by carrying a newly brought-in component.

[0037] The method can further comprise a step of configuring the drive mechanism in order to define a movement range of the platform. The step of configuring the drive mechanism or defining a movement range includes a step of defining a rotary range of a rotator of the drive mechanism, defining a vertical range of an elevator of drive mechanism, or defining both the rotary range and vertical range of the drive mechanism.
20 The drive mechanism is able to be configured or adjusted in order to adapt to physical environment or user requirements. For example, two residential units have floors of different heights, as compared to a corridor floor outside the two residential units. Building lifts of the two residential units are adjusted to cause platforms of their building lifts to land squarely on the floors of the residential units, as well as the common corridor
25 of the two residential units.
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[0038] The method may comprise a step of levelling the platform of the building lift, or making the platform horizontal, whether during movement or stationary. Especially, when the platform is rotated, the platform is monitored and adjusted so that the platform

will not be tilted or swanned in motion. The building lift thus provides stable and firm transportation to a user, especially to a frail patient.

[0039] According to a third aspect, the present application provides a method of maintaining or servicing a building lift. The method comprises a first step of examining a platform, a drive mechanism and an anchor of the building lift; a second step of checking the platform; and a third step of adjusting the platform according to predetermined configurations of the platform. Some of these steps may be changed in sequence or combined together. The predetermined configurations include movement ranges of the platform, levelling position of the platform and movement characteristics (e.g. speed, sound and force, safety features) of the platform. The building lift is possible to last for decades if maintained properly according to the method.

[0040] The method can further comprise a step of checking joints of movement of the building lift. The method may further comprise a step of cleaning (e.g. water spraying, air blowing or cloth wiping) the building lift. The method may additionally comprise a step of configuring the drive mechanism (e.g. operation data downloading, electronic circuit testing, battery changing, whether locally or remotely). The method optionally comprises a step of replacing a spoiled or failed component (e.g. PCB) of the building lift. The method enables users of the building lift to enjoy smooth and comfortable operation throughout prolonged period of time, at little cost of using the building lift.

[0041] According to a fourth aspect, the present application provides a method of recycling a building lift for a residential unit. The method comprises a first step of disconnecting a platform, a drive mechanism, and an anchor from a building; a second step of moving the platform, the drive mechanism, and the anchor to another building; a third step of securing the anchor to the other base of building; a fourth step of mounting the drive mechanism onto the anchor; and a fifth step of joining the platform onto the drive mechanism. Some of these steps may be changed in sequence or combined together. The present method enables a used building lift to be refurbished, reused or redeployed after finishing its deployment at a residential unit. Since components (e.g. platform, drive mechanism, anchor) of the building lift can be repaired or replaced, the building lift is able to prolong its operation lift span whenever required or cost effective.

[0042] According to a fifth aspect, the application provides a wheelchair lift or building lift that comprises a platform for carrying a wheelchair; an elevator coupled to the platform for lifting the platform; a rotator further coupled to the platform for moving the platform laterally; and an anchor for securing to a base or floor. The elevator, the rotator or both are coupled to the anchor for moving the platform vertically, laterally or both. The wheelchair lift or building lift is able to provide two or more mutually independent motions, namely linear, rotary or other motions (e.g. spiral). The two or more mutually independent motions may be carried out simultaneous or integrated together, whilst ranges and speeds the respective motions may be individually regulated. Hence, the wheelchair lift or building lift can raise a wheelchair to a desired height according to circumstantial requirements. The wheelchair lift or building lift is further able to rotate the wheelchair around a vertical axis so that the platform or the wheelchair can change their orientations. When the two or more motions combined, the wheelchair lift or building lift is capable to adjust both height and orientation of the platform or the wheelchair flexibly.

[0043] The platform can comprise one or more stoppers for preventing a wheelchair from moving off the platform. The one or more stoppers can be provided at edges of the platform so that the wheelchair is limited within the platform and cannot fall off the wheelchair platform.

[0044] The one or more stoppers may comprise a first leaf and a second leaf that are disposed at opposite ends of the platform. The two leaves are thin plates and hinged to edges of the platform that two leaves offer simple, light-weight and reliable fences, ensuring safety of the wheelchair.

[0045] The platform may further comprise an actuator coupled to the one or more stoppers for flipping the one or more stoppers automatically. The actuator may be hydraulically, pneumatically, mechanically or electrically driven. For example, the actuator comprises a pneumatic pump, one or more pneumatic valve, shafts and/or levers that are joined together for turning the one or more stoppers.

[0046] The actuator can comprise a stepper motor coupled to the one or more stoppers for flipping the one or more stoppers. The stepper motor provides low cost, simple and reliable driving mechanism to shift the one or more stoppers.

5 [0047] The elevator may comprise a DC (Direct Current) motor and a rail for moving the platform along the rail. The DC motor is able to carry heavy weight and provide smooth operation. Accordingly, the wheelchair lift or building lift may offer comfortable experiences to wheelchair occupants when using the wheelchair lift or building lift.

10 [0048] The rotor can comprise a shaft and a bearing that are coupled to each other for supporting rotary movement of the shaft, whilst the shaft is coupled to the platform. The shaft, the bearing or both can be closely fitted together and have large diameters (e.g. 50mm or above) so that the rotor can perform stable and smooth rotary movement, especially when carrying heavy weight (e.g. 200kGf).

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[0049] The anchor may comprise a column or pillar for locking onto a building. The column is compact and sturdy such that the column may hold the wheelchair lift or building lift reliably over a prolonged period of time, even when over prolonged exposure to rain or snow.

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[0050] The platform, the elevator, the rotator, the anchor or a combination of any of these components can comprise one or more ribs for preventing bending of these components. The ribs can be welded to respective components for strengthening respective beams against bending momentum.

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[0051] The elevator may be coupled to the rotator such that the elevator is configured to move laterally together with the platform by the rotator. Hence, the elevator and the rotator may become a single sub-assembly that be installed or unmounted from the column easily. Alternatively, the platform, the elevator and the rotator may be removed
30 from the column or anchor sequentially.

[0052] The platform, the elevator, the rotator, the anchor or a combination of any of these components can comprise a detachable coupling for mounting one or more of

them to another anchor. The detachable coupling allows these parts to be removed apart easily, without dismantle the whole assembly of the wheelchair lift or building lift.

[0053] The platform may comprise roughened areas for preventing unstable moving (e.g. wheel rolling) of the wheelchair on the platform. The roughened areas prevent wheels of the wheelchair from skidding off, making the wheelchair lift or building lift secure and safe. For example, the platform includes a perforated sheet, perforated metal or screen so that wheels of wheelchairs may securely grab a perforated surface. The perforated sheet, perforated metal or screen also facilitates drainage of rainwater, sands, dirt particles, gravels or snowflakes, presenting a clean surface to wheelchairs.

[0054] The wheelchair lift or building lift can further comprise an extender that is coupled to the platform, the elevator, the rotator, the anchor or a combination of any of these components for extending them linearly. The extender facilitates linear extension so that the platform or other parts of the wheelchair lift or building lift can reach distant areas, enabling the wheelchair lift or building lift to operate within wider ranges of areas.

[0055] The wheelchair lift or building lift may further comprise a security lock for authorising operation of the wheelchair lift or building lift. The security lock includes a mechanical, an electrical, an electronic or a computer lock. For example, the security lock includes a biometric reader that recognises authorised personnel of the wheelchair lift or building lift.

[0056] The wheelchair lift or building lift can further comprise a control panel having a touchscreen display for operating the wheelchair lift or building lift. The control panel and the touchscreen facilitates technicians and wheelchair occupants to operate the wheelchair lift or building lift intuitively. For example, the control panel displays icons that guide elderly wheelchair occupants.

[0057] The control panel may further comprise one or more electronic connectors for communicating with external devices via cables or wirelessly. The electronic connectors include computer ports (e.g. USB port), electric connectors (e.g. 4-pin Mini-DIN pinout), cordless and wireless communication ports.

[0058] The control panel can further comprise a monitor filter (e.g. privacy screen protector) so that a child of low height (e.g. less than 1.6 meter) cannot view the control panel easily, thus preventing mischievous damages by children.

5 [0059] The wheelchair lift or building lift may further comprise an electric power source connected to the platform, the elevator, the rotator, the anchor or a combination of any of these components for powering them. The electric power source is typically readily available at residential units, making the wheelchair lift or building lift to be easily adopted.

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[0060] The electric power source can comprise an electric plug, a rechargeable battery, a solar panel, a wind turbine, an electric generator or combination of any of these. Diverse types of electric power source enable the wheelchair lift or building lift to be adopted in wide geographical regions or diverse climate conditions.

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[0061] One or more components of the wheelchair lift or building lift may be ingress resistant. Since the wheelchair lift or building lift may be installed outdoors and exposed to harsh environment, the ingress-proof components allow the wheelchair lift or building lift to be deployed reliably.

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[0062] One or more components of the wheelchair lift or building lift can be foldable. For example, the platform can be folded onto the elevator, the anchor or the rotator so that the platform does not occupy floor area when not in use. Other components of the wheelchair lift or building lift can be folded and further locked onto a wall of the anchor so that the entire wheelchair lift or building lift is compact, providing little hindrance to neighbours of the wheelchair lift or building lift.

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[0063] The wheelchair lift or building lift may be modified or upgraded to shift goods or heavy furniture within narrow space. For example, in industrial estates, heavy goods need to be raised and changed in orientation. The platform may be replaced by folks, prongs, bars or other frames so that the heavy goods are easily captured, moved and re-orientated.

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[0064] The application can further provide a residential unit that comprises the wheelchair lift or building lift. Particularly, the anchor of the wheelchair lift or building lift is fixed to an entrance of the residential unit. A wheelchair-bound resident of the residential unit is thus able to enter or leave the residential unit easily and freely. Less
5 assistance is required from helpers, medical personnel, or family members of the wheelchair bound resident.

[0065] The application may additionally provide a building that comprises the residential unit and the wheelchair lift or building lift. Since the wheelchair lift or building lift may be
10 installed at entrance of any residential unit of the building, the wheelchair lift or building lift provides enhanced freedom to wheelchair bound occupants of the building.

[0066] According to a sixth aspect, the present application provides a method of installing a wheelchair lift or building lift for a residential unit. The method comprises a
15 first step of providing a base near entrance of the residential unit; a second step of mounting an anchor to the base; a third step of attaching a rotator to the anchor; a fourth step of installing an elevator onto the anchor, the rotator or both; and a fifth step of fastening a platform to the elevator, the rotator or both. Some of these steps can be integrated together, separated into multiple actions, or changed in sequence. The
20 method of installing the wheelchair lift or building lift is simple to carry out, allowing most technicians to install the wheelchair lift or building lift intuitively with little training.

[0067] According to a seventh aspect, the present application provides a method of configuring a wheelchair lift or building lift for a residential unit. The method comprises
25 a first step of measuring a height difference between a lower floor and a higher floor; a second step of gauging a lateral distance between the lower floor and the higher floor; a third step of entering parameters into a control panel of the wheelchair lift or building lift according to the height difference, the lateral distance or both. Following the method, the wheelchair lift or building lift is able to adapt to diverse conditions of residential units
30 or flats. The wheelchair lift or building lift becomes flexible to be adopted by wide range of Housing Development Board (HDB) units.

[0068] According to an eighth aspect, the application offers a method of uninstalling a wheelchair lift or building lift for a residential unit. The method comprises a first step of

dislodging a platform, a rotator, an elevator or both from an anchor; and removing the anchor from a base near entrance of the residential unit. The method enables a used wheelchair lift or building lift to be refurbished and/or reinstalled at another location so that usage of the wheelchair lift or building lift is prolonged, providing benefit to more people.

[0069] The accompanying figures (Figs.) illustrate embodiments and serve to explain principles of the disclosed embodiments. It is to be understood, however, that these figures are presented for purposes of illustration only, and not for defining limits of relevant inventions.

Fig. 1 illustrates a right-anchored building lift in a perspective view;
 Fig. 2 illustrates a plan view of the right-anchored building lift;
 Fig. 3 illustrates a front view of the right -anchored building lift;
 Fig. 4 illustrates a side view of the right -anchored building lift;
 Fig. 5 illustrates a rear view of a right-anchored building lift; and
 Fig. 6 illustrates a right-anchored building lift collaborating with an automatic door, a mobile device and a remote server.

[0070] Exemplary, non-limiting embodiments of the present application will now be described with references to the above-mentioned figures.

[0071] Figs. 1 to 6 relate to an embodiment of the present application. In particular, Fig. 1 illustrates a right-anchored building lift 100 in a perspective view. Fig. 2 illustrates a plan view of the right-anchored building lift 100. Fig. 3 illustrates a front view of the right-anchored building lift 100. Fig. 4 illustrates a side view of the right -anchored building lift 100. Fig. 5 illustrates a rear view of a right-anchored building lift 100. Fig. 6 illustrates a right-anchored building lift 100 collaborating with an automatic door, a mobile device and a remote server.

[0072] Particularly, the right-anchored building lift 100 comprises a platform 102, an elevator 104, a rotator 106 and an anchor 108 which is shown in detail in Fig. 4 as seen from a side perspective. The anchor 108 is grounded onto a solid surface. The rotator 106 is vertically rotatable with the anchor 108 at a top portion. The elevator 104 has a main body 134 which is attached to the rotator 106. The platform 102 is pivotally

engaged with the elevator 104 by an arcuate hinge plate assembly 166 actuated by a folding motor 156. The building lift 100 further comprises a protector which has a panel or a box and an extended plate or base sheet 103. The panel or box comprises one or more gaskets or seals. The building lift 100 further comprises a detector. The detector
5 comprises an overweight sensor that monitors load of the platform 102.

[0073] The platform 102 is a rectangular level surface. One side skirt 110 along a first length 112 of the platform 102. A first flap 112 pivotally engaged across the first width 116 of the platform 102. A second flap 118 pivotally engaged across the second width
10 120 of the platform 102. Four landing arms 122 located on the four corners of the rectangular platform 102. The platform 102 further is connected to a levelling tool or a levelling mechanism. The platform 102 is further connected to an actuator coupled to the skirt 110.

[0074] The first flap 114 is engaged along the first length 112 of the platform 102 at the first pivotal point 124. The one landing arm 122 is engaged along the same first length 112 at a second pivotal point 125. The one landing arm 122 is also engaged with the first flap 114 at a third pivotal point 126. A landing wheel 128 is attached at a one end
15 of the landing arm 122. The first pivotal point 124, the second pivotal point 125 and the third pivotal point 126 are similarly positioned on the other three sides of the rectangular platform 102.
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[0075] The centre of the side skirt 110 has an indicator light 130 attached. On the top surface of the platform 102 is a non-slip surface 132 has a rough texture or roughened
25 areas 132 overlaid thereon along the two lengths 112,113.

[0076] The elevator 104 is joined with the platform 102 along the middle section of the second length 113. The elevator 104 has a main body 134, a control panel 136 behind the main body 134, a hand rail 138 installed at the sides of the main body 134 as shown
30 in Fig. 4. There is a plurality of shafts; a drive shaft 140 and two guide shafts 142 that extends from the bottom of the main body 134 to a horizontal metal plate 160 that cooperates with the platform 102 as shown in Fig. 3.

[0077] Fig. 3 shows an interior section of the main body 134 which is a housing or a casing from a front perspective. A drive motor 146 positioned on a left bottom side of the main body 134. On a right interior section of the main body 134, is a vertical pole. The vertical pole extends from the bottom side to the top side of the main body 134.

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[0078] A lower sensor proximity switch 144 is located on a low end of the vertical pole. An upper limit proximity sensor 150 is located on a top end of the vertical pole. A position proximity sensor 152 is interposed between the lower sensor proximity switch 144 and the upper limit proximity sensor 150 on the same vertical pole.

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[0079] A drive assembly 148 is housed in the main body which occupies the entire bottom side. The shafts 140,142 are slidingly, slidably or movably engaged with the main drive assembly 148. The drive assembly 148 communicates with the drive shaft 140 extending and retracting at the centre. The drive assembly 148 also communicates with the two guide shafts 142 positioned on the two sides.

15

[0080] The drive assembly or drive mechanism 148 is coupled to the platform 102 and an anchor 108 coupled to the drive mechanism 148 which is mounted onto a base or floor of a building. The base herein is a solid surface. The drive mechanism 148 comprises a rotator 106 for moving the platform 102 laterally, and/or an elevator 104 for moving the platform 102 vertically. The drive mechanism 148 further comprises one or more range stoppers.

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[0081] On the exterior part of the main body 134 as seen from the rear in Fig. 5 is a folding motor 156 and a turn motor 158.

25

[0082] The folding motor 156 as shown in Fig.3 is juxtaposed to the guide shaft 142. As the shafts 140,142 retract, the folding motor 156 elevates as well but sliding on the side wall of the main body 134.

30

[0083] The folding motor 156 is supported by a metallic vertical pole 164 which is attached to the side wall of the main body 134 as shown in Fig. 3 and 5 and to the platform 102 and the horizontal metal plate 160. Below the folding motor 156 is an arcuate hinge plate assembly 166 as shown in Fig. 4 which communicates with the platform 102. The arcuate hinge plate assembly 166 comprises a hinge plate and an

arcuate hinge plate connected by bolts and nuts. The turn motor 158 as shown in Fig. 5 is housed in the turn motor housing 170 as shown in Fig. 1.

[0084] Behind the main body 134 resides the control panel 136 which comprises a control card 154 as shown in Fig. 5 which are located inside the control panel 136. The control card 154 is located at the rear side as shown in Fig. 5 of the main body 134. The control card 154 is a printed circuit board with an on-board processor has a memory storage with electrical connections to the drive motor 146, the folding motor 156 and the turn motor 158. The control card 154 receives input from the three proximity sensors 144, 150, 152, input buttons located at the top front side of the main body 134. The input buttons comprise a "up" button 174, a "down" button 176 and a "stop" button 178 as shown in Fig. 1. The "up" button 174 and the "down button" 176 are made of translucent coloured plastic allowing light to propagate.

[0085] A power unit (not shown) obtains electrical supply from the utilities typically 110 Volts ac (alternating current) or 220 Volts ac to 240 Volts ac depending on the country's power grid. The electrical supply is then stepped down and converted (ac to dc) to a voltage that is acceptable by the control card 154 located at the control panel 136 typically a 12 Volts dc (direct current). The electric motors use alternating current or direct current for operation depending on the type of application.

[0086] The rotator 106 is connected to the elevator 104 at the turn attachment 172 further comprises an anchor 108, a base mounting plate 109, a turn shaft 168, a turn motor housing 170 and a plurality of turn attachment 172. The base mounting plate 109 is riveted with holes along the periphery. The anchor 108 is welded to the base mounting plate 109 supported by at least three flanges or also known as ribs 107 as shown in Fig. 1. The turn motor housing 170 is positioned at the top end of the anchor 108 with the turn motor 158 located therein. Located above the turn motor housing 170 is the turn shaft 168. The turn shaft 168 is a cylindrical tube that is rotatable about an orifice of the turn motor housing 170. The peripheral wall of the turn shaft 168 has two turn attachments 172 that are joined to the elevator 104.

[0087] The building lift 100 further comprises a protector for preventing external intrusion to the building lift 100. The building lift 100 further comprises a protector which

has a panel or a box and the extended plate or base sheet 103. The panel or box comprises one or more gaskets or seals for blocking infiltration of rainwater into the drive mechanism 148. The base sheet 103 provides a shield to other components of the building lift 100 when folded onto the drive mechanism 148 in a storage mode.

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[0088] The detector is operable to detect obstruction to movement of the platform 102. The detector comprises a force sensor that measures resistance from an external objection. The detector also has an overweight sensor that monitors load of the platform 102.

10

[0089] The platform 102 provides one side skirt 110 at a side (or an edge) thereof for providing a guide for a vehicle specifically a wheelchair and preventing the wheelchair on the platform 102 from slipping off the side. The side skirt 110 is located at the first length 112 and not the second length 113 to enable the platform 102 to be folded towards the main body 134. The levelling tool or levelling mechanism provides a horizontal bearing of the platform 102, which is abler to keep the platform 102 horizontal when rotating around the anchor 108. The platform 102 further comprises the actuator coupled to the skirt 110 for activating raising or lowering the skirt 110 automatically.

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[0090] The first width 116 and the second width 120 of the platform 102 has the first flap 114 and the second flap 118 respectively attached thereon providing a ramp onto the platform 102.

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[0091] The landing arms 122 provide a release and retraction of the first flap 114 and the second flap 118. The landing wheel 128 provides a smooth travel on the ground. The applied pressure by the lowering platform 102 towards the ground on the landing arms 122 cause the downward rotational movement of the two flaps 114,118 about the first pivotal point 124 thus lowering the said flaps 114,118. The flaps 114,118 are in a normally upward position when the platform 102 is off-ground. The deployment of the flaps 114,118 is determined by the angle of the landing arms 122. The landing arms 122 cooperate with the flaps 114,118.

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[0092] The indicator light 130 provides a visible flashing warning light to the people in proximity to the building lift 100. The non-slip surface 132 provides a frictional surface

preventing the slipping off of the wheelchair. The “up” button 174 and the “down” button 176 also provides visible flashing light to direct the user 90 to push either buttons 174,176.

- 5 [0093] The elevator 104 provides the control of the platform 102 specifically the position (elevation, depression, rotation) and the orientation (open, close).

[0094] The elevator 104 provides a firm and steady support of the platform 102 at the middle section along the second length 113. The platform 102 is supported off-centre
10 as well at the widths 116,120 depending on the application. The current embodiment enables the platform 102 to be rotated within a smaller area.

[0095] The main body 134 and the control panel 136 provide an external housing (covering) for the electric motor and the electrical components which are within which
15 provides protection from the heat from the sun, water and dust.

[0096] The hand rail 138 provides a hand grip area for a wheelchair user 90 when the building lift 100 is in operation (moving up/down, rotating). The hand rail 138 is manually engaged by the user 90 by holding thereon.

20

[0097] The drive shaft 140 provides the extension and the retraction in a downward and upward movement respectively of the platform 102. The drive shaft 140 is a metal cylindrical tube with a top end connected to the drive motor 146 in the main body 134 and the opposite end joined to the horizontal metal plate 160 which cooperates with the
25 platform 102.

[0098] The guide shaft 142 provides a supported fixed directional (up and down) travel of the platform 102. The guide shaft 142 is a highly polished surface, metal cylindrical tube with a bottom end joined to the horizontal metal plate 160.

30

[0099] The guide shafts 142 and the drive shaft 140 slide up and down from the bottom orifices (not shown) of the main body 134. The guide shafts 142 have vertical paths 162 that extend vertically to the top end of the main body 134 and the control panel 136 as shown by the shaded blocks in Fig. 3.

[0100] In Fig.3, the drive motor 146 is an electric motor that provides the motive force of driving the drive shaft 140 specifically up and down of the main body 134 which in turn moves the platform 102 up and down.

5

[0101] The drive assembly or drive mechanism 148 is coupled to the platform 102 for moving thereof and an anchor 108 coupled to the drive mechanism 148 for supporting the drive mechanism 148 onto a base or floor of a building. The drive mechanism 148 comprises a rotator 106 for moving the platform 102 laterally, and/or an elevator 104 for moving the platform 102 vertically. The drive mechanism 148 further comprises one or more range stoppers for defining moving parameters of the platform 102. The range stopper comprises two rotary range stoppers and twolinear range stoppers. The range stoppers, the rotary range stoppers or the linear range stoppers are controlled by a computer which has one or more software packages or hardware components.

15

[0102] In Fig. 3, the lower sensor proximity switch 144 provides a detection of the drive shaft 140. The presence of the drive shaft 140 indicates that the drive shaft is not fully extended downwards which implies that the platform 102 is not on the ground.

20 [0103] The drive gear assembly 148 provides the interface of the drive motor 146 to the drive shaft 140 comprises gears and components as shown in Fig. 3.

[0104] The folding motor 156 provides motive force of producing a downward push and an upward pull which communicates with the arcuate hinge plate assembly 166 to
25 actuate the platform 102 in an opened state and a closed state respectively.

[0105] The turn motor 158 as shown in Fig. 5 provides the motive force of rotating the platform 102 and the elevator 104 together about the turn shaft 168 as shown in Fig. 1.

30 [0106] The upper limit proximity sensor 150 provides the detection of the position of the drive shaft 140 indicating to the drive motor 146 to stop elevating the platform 102. The position proximity sensor 152 provides the detection of the position of the drive shaft 140 indicating to the drive motor 146 to stop elevating and to perform the next step which is to rotate the elevator 104 together with the platform 102.

[0107] The three proximity sensors 144,150,152 are positioned in a vertical manner along a vertical plane. The positions of the sensors 144,150,152 are adjusted to suit the different height requirements. The height requirements are dictated by the external factors, for example, the height of the step and the height between the ground and the next elevation. Assuming on a level ground, the upper limit proximity sensor 150 and the lower sensor proximity switch 144 will be fixed. Only the position proximity sensor 152 needs to be positioned manually after measuring the height from the ground to the desired elevation or step. For example, if the height is 200 millimetres from the ground to the elevation, the distance between the lower sensor proximity switch 144 and the position proximity sensor is 200 millimetres. The upper limit proximity sensor 150 is changed if a complete retraction of the platform 102 is not required. The lower sensor proximity switch 144 is changed to higher level if the platform 102 is not required to touch the ground.

[0108] The control card 154 provides an on-board processor for the processing of inputs from the input buttons 174,176,178 and the three proximity sensors 144,150,152. The on-board processor processed the inputs and produce a plurality of outputs to control the drive motor 146, the folding motor 156, the turn motor 158 and the indicator lights on the side skirt 110, the “up” button and the “down” button. The on-board processor is a microcontroller with built-in memory storage RAM and ROM (Random Access Memory and Read Only Memory). A set of algorithm is programmed into the ROM for a pre-determined set of instructions specifically pertaining to the control of the motor based on the inputs.

[0109] Alternatively, the input to the control card 154 can be from a remote control 180 as shown in Fig. 1. The remote control 180 provides a communication to the building lift 100. The control card 153 includes a communication module that supports wireless communication protocols, for example, Infrared and Bluetooth. The remote control 180 provides two buttons of operation similar to the buttons 174,176 on the front of the main body 134.

[0110] The anchor 108 has the base mounting plate 109 provides a firm support on the ground. The three flanges at the base mounting plate 109 supporting the anchor 108 provide a strong support of the elevator 104 and the platform 102.

5 [0111] In use, the building lift 100 provides two states of operation, an open position as shown in Fig. 3, 4 and 5 and a close position (not shown).

[0112] In the open position, the platform 102 is unfolded away from the main body 134, is rotated about the turn shaft 168 and is levelled with a lower ground or an elevated
10 ground.

[0113] In the close position, the platform 102 is elevated from the ground, be it on low ground 192 or on elevated ground 194, is rotated about the turn shaft 168 and is folded towards the main body 134.

15 [0114] The building lift 100 provides a method of setting up comprises accessing the site of installation of the building lift 100, measuring the height of the step or the height from the ground to the desired elevation, determining the placement of the position proximity sensor 152, the lower sensor proximity switch 144 and the upper limit
20 proximity sensor 150 based on the measurement, and programming the microcontroller at the control card 154. The programming can be done remotely or on-site by connecting to a mobile computer.

[0115] Alternatively, the control panel provides a tactile display for input as well as
25 output. The output namely a display channel provides a form for the user 90 to fill in the particulars like name, weight, mobile contact number, electronic mail and a personal identification number (PIN). The name provides an identity for personalisation. The mobile contact number and electronic mail provide at least two communication channel to the user 90 for redundancy (if one channel fails, the other channel can still be used)
30 verification and authentication. The PIN provides onsite verification of identity of the user 90 for preventing tampering of the building lift 100 by other unauthorised users.

[0116] The program comprises a plurality of algorithm that can be transferred by a connection port like a USB (universal serial bus) using a thumb drive. Alternatively, the

algorithm transfer can be downloaded from a remote server. Within the control panel 136, there is a communication module that provides a data transfer specifically via the Internet. The communication module provides wired (dial-up phone line, fibre optic, coaxial cable) and wireless connection (2G, 3G, 4G, LTE, Wi-Fi,) to the Internet.

5

[0117] The algorithms can comprise an algorithm for the obtaining of the information of the user 90, an algorithm for the verification and authentication of the user, an algorithm for the deployment of the platform 102 by the press of a button on the remote control 180, an algorithm for the deployment of the platform 102 via a mobile device 184, an
10 algorithm for self-diagnostic, an algorithm for reporting a fault, an algorithm for update of software.

[0118] The building lift 100 provides a method of use using a remote control 180 comprises the following steps.

15

[0119] The building lift 100 is activated via the remote control 180. If the user 90 is on the low ground, the user will push the “up” button 174 on the remote control 180. The platform 102 is unfolded into an open position. The platform 102 is lowered on the low ground 192 with the flaps 114,118 open (flatten). The user 90 with the vehicle
20 (wheelchair) rolls onto the platform 102. The user 90 presses the “up” button on the remote control 180 for a second time. The platform 102 with the user 90 is then elevated. The flaps 114,118 are closed (tilted upwards). The elevator 104 with the platform 102 is rotated to the elevated (high) ground 194. After the user rolled off the platform 102, the building lift 100 senses the user is 90 off and the platform 102 assumes the close
25 position automatically. Alternatively, the user 90 can manually control when to close the platform 102 by pressing the remote control 180.

[0120] Conversely, if the user 90 is on an elevated ground 194, the user 90 will push the “down” button 176. The elevator 104 with the platform 102 rotates to the elevated
30 ground 194. The platform 102 will unfold into an open position with the flaps 114,118 open (flatten). The user 90 rolls onto the platform 102. The building lift 100 senses the user 90 is on the platform 102. The elevator 104 rotates with the platform 102 with the user 90. The platform 102 is lowered to the low ground 192. The user 90 rolls off the platform 102 and the platform 102 assumes the close position automatically.

[0121] In the use of the remote control 180, it is assumed that the elevated ground 194 is already known and the sensors 144,160,152 placed accordingly inside the main body 134. It is also assumed that the elevated ground 194 has no obstruction that hinders the user 90 from rolling off the platform 102.

[0122] Fig. 6 illustrates the use of a mobile device 184 by the user 90 to operate the building lift 100. The building lift 100 provides a method of use using a mobile device 184 comprises the following steps.

[0123] The user 90 initiates a mobile application in the mobile device 184 (mobile phone, electronic tablet). The mobile application will at least contain the function of similar to the remote control 180, "up", "down" and "stop". Additionally, the mobile application has a function to open a door remotely.

[0124] The user 90 opens the door via the mobile device 184. The mobile device 184 communicates with a remote server 186 sending a door request 188. The remote server 186 comprises an Internet Service Provider and at least one cloud server hosting and servicing the door request 188 from the mobile application. The remote server 186 relays the door request 188 to an automatic door unit 182 typically a door closer with a built-in intelligence in a microcontroller and means of communication with the Internet.

[0125] The user 90 activates the building lift 100 by pushing the "up" touch button on the mobile device 184. The "up" request 190 is sent to the remote server 186 and to the building lift 100.

[0126] The platform 102 is unfolded from the main body 134 and lowered to the low ground 192 with the flaps 114,118 open (flatten). The user 90 with the vehicle (wheelchair) rolls onto the platform 102 and press the "up" touch button sending a second "up" request 190 again.

[0127] The platform 102 elevates to the pre-determined elevation (height) and rotates about the turn shaft 168 to the elevated ground 194. The flaps 114,118 are tilted upwards during the movement.

[0128] The platform 102 lowers to the elevated ground 194 and lowered the flaps 114,118 allowing the user 90 to roll off the platform 102.

- 5 [0129] The user 90 can then use the mobile device 184 to control the building lift 100 to assume the close position by pressing another push button.

[0130] During the movement of the platform 102, audible alarm is sounded from a speaker (not shown) at the main body 134 together with the flashing lights on the "up" button 174, the "down" button 176 and the indicator light 130 on the side skirt 110.

10

[0131] It is to be emphasised that the user 90 has the option to select auto closing of the platform 102 or manual operation through the remote control 180 or the mobile device 184.

15

[0132] Alternatively, the building lift 100 provides motion sensors to detect oncoming passer-by so as to halt the operation. Providing at least one camera positioned at strategic location to detect tampering and misuse by capturing live video footage to gather visual evidence. The camera can also be used to detect obstacles by analysing the video footage. The camera can be further used to guide the platform 102 to the elevated ground by controlling the turn motor 158 (yaw) and the drive motor 146 (elevation). Additionally, a microphone is added to capture audio signals.

20

[0133] In the application, unless specified otherwise, the terms "comprising", "comprise", and grammatical variants thereof, intended to represent "open" or "inclusive" language such that they include recited elements but also permit inclusion of additional, non-explicitly recited elements.

25

[0134] As used herein, the term "about", in the context of concentrations of components of the formulations, typically means +/- 5% of the stated value, more typically +/- 4% of the stated value, more typically +/- 3% of the stated value, more typically, +/- 2% of the stated value, even more typically +/- 1% of the stated value, and even more typically +/- 0.5% of the stated value.

30

[0135] Throughout this disclosure, certain embodiments may be disclosed in a range format. The description in range format is merely for convenience and brevity and should not be construed as an inflexible limitation on the scope of the disclosed ranges. Accordingly, the description of a range should be considered to have specifically disclosed all the possible sub-ranges as well as individual numerical values within that range. For example, description of a range such as from 1 to 6 should be considered to have specifically disclosed sub-ranges such as from 1 to 3, from 1 to 4, from 1 to 5, from 2 to 4, from 2 to 6, from 3 to 6 etc., as well as individual numbers within that range, for example, 1, 2, 3, 4, 5, and 6. This applies regardless of the breadth of the range.

[0136] It will be apparent that various other modifications and adaptations of the application will be apparent to the person skilled in the art after reading the foregoing disclosure without departing from the spirit and scope of the application and it is intended that all such modifications and adaptations come within the scope of the appended claims.

Reference Numerals

	90	user
	100	building lift
5	102	platform
	103	base sheet
	104	elevator
	106	rotator
	107	rib or flange
10	108	anchor
	109	base mounting plate
	110	side skirt
	112	first length
	113	second length
15	114	first flap
	116	first width
	118	second flap
	120	second width
	122	landing arm
20	124	first pivotal point
	125	second pivotal point
	126	third pivotal point
	128	landing wheel
	130	indicator light
25	132	non-slip surface
	134	main body
	136	control panel
	138	hand rail
	140	drive shaft
30	142	guide shaft
	144	lower sensor proximity switch
	146	drive motor
	148	drive assembly or drive mechanism
	150	upper limit proximity sensor

	152	position proximity sensor
	154	control card
	156	folding motor
	158	turn motor
5	160	horizontal metal plate
	162	vertical paths
	164	vertical pole
	166	arcuate hinge plate assembly
	168	turn shaft
10	170	turn motor housing
	172	turn attachment
	174	up button
	176	down button
	178	stop button
15	180	remote control
	182	automatic door
	184	mobile device
	186	remote server
	188	door request
20	190	“up” request
	192	low ground
	194	elevated ground

Claims

1. A building lift comprising:
 - ❖ a platform for carrying a person in a wheelchair;
 - ❖ a drive mechanism coupled to the platform for moving the platform;
 - ❖ an anchor further coupled to the drive mechanism for supporting the drive mechanism onto a building;
 - ❖ a detector for detecting obstruction to movement of the platform; and
 - ❖ an electronic identification for identifying the building lift automatically;wherein the drive mechanism comprises a rotator for moving the platform laterally, and an elevator for moving the platform vertically.
2. The building lift of claim 1, wherein the drive mechanism comprises a folding mechanism for folding the platform onto the drive mechanism.
3. The building lift of claim 1 or 2, wherein the drive mechanism comprises a control unit for operating the building lift.
4. The building lift of the any of the preceding claims, wherein the drive mechanism further comprises a remote controller for operating the building lift at a distance.
5. The building lift of the any of the preceding claims further comprising a safety bar that is foldable around a wheelchair on the platform.
6. The building lift of any of the preceding claims, wherein the platform has a skirt near an edge of the platform for preventing a wheelchair on the platform from moving off.
7. The building lift of any of the preceding claims, wherein the drive mechanism comprises a security lock for authorising operation of the building lift.

8. The building lift of any of the preceding claims, wherein the anchor comprises a base mounting plate for securing the anchor to a floor of the building.
- 5 9. The building lift of any of the preceding claims, wherein the platform comprises a non-slip surface for preventing freewheeling of the wheelchair on the platform.
- 10 10. The building lift of any of the preceding claims, wherein the detector comprises a force sensor for halting movement of the building lift if detecting a resistance force larger than a predetermined threshold substantially.
- 15 11. The building lift of claim 10, wherein the force sensor is configured to halt the movement of the building lift if detecting the resistance force larger than 7kG substantially.
- 20 12. The building lift of any of the preceding claims, wherein the detector comprises at least one proximity sensor for operating the building lift according to field measurement or microcontroller programming.
- 25 13. The building lift of any of the preceding claims, wherein the driver mechanism further comprises a rotary range stopper and a linear range stopper for adjusting mutually independent movement parameters of the platform in order to adapt to different users or building environments
- 30 14. A residential unit comprising:
the building lift of any of the preceding claims;
wherein the anchor is fixed near an entrance of the residential unit for fetching a wheelchair into the residential unit.
15. The residential unit of claim 14 further comprising a communication device for communicating with the building lift automatically.

16. The residential unit of claim 14 or 15 further comprising
a domestic power supply that is connected to the building lift for powering the
building lift by an electrical grid.
- 5 17. A building comprising:
the residential unit of any of the preceding claims 14 to 16; and
the building lift of any of the preceding claims 1 to 13.
- 10 18. The building of claim 17 further comprising
a corridor for installing the building lift of any of the preceding claims 1 to 13.
- 15 19. A method of installing a building lift, the method comprising
- providing a platform, a drive mechanism and an anchor of the building lift;
 - securing the anchor to a building;
 - mounting the drive mechanism onto the anchor;
 - joining the platform onto the drive mechanism;
 - installing a detector for detecting obstruction to movement of the platform;
and
 - giving an electronic identification to the building lift for identifying the
building lift automatically;
 - configuring a rotary range stopper and a linear range stopper of the drive
mechanism in order to adjust mutually independent rotary and linear
movement ranges of the platform in order to adapt to different users or
building environments.
- 20
- 25 20. The method of claim 19 further comprising
levelling the platform of the building lift.

21. A method of maintaining a building lift, the method comprising
- examining a platform, a drive mechanism or an anchor of the building lift;
 - measuring existing configuration of the platform;
 - 5 ➤ adjusting the platform according to predetermined configuration of the platform;
 - defining mutually independent rotary and linear movement parameters of the platform in order to adapt to different users or building environments;
 - configuring a detector of the building lift for detecting obstruction to
 - 10 movement of the platform; and
 - giving an electronic identification to the building lift for identifying the building lift automatically.
22. The method of claim 21 further comprising
- 15 cleaning at least one component of the building lift.
23. The method of claim 21 or 22 further comprising configuring the drive mechanism.
- 20 24. A method of recycling a building lift for a residential unit comprising:
- disconnecting a platform, a drive mechanism, and an anchor from a building;
 - moving the platform, the drive mechanism, and the anchor to another building;
 - 25 ➤ securing the anchor to the other building;
 - mounting the drive mechanism onto the anchor;
 - joining the platform onto the drive mechanism;
 - configuring mutually independent rotary and linear movement parameters of the platform in order to adapt to different users or building environments;
 - 30 ➤ configuring a detector of the building lift for detecting obstruction to movement of the platform; and
 - giving an electronic identification to the building lift for identifying the building lift automatically.

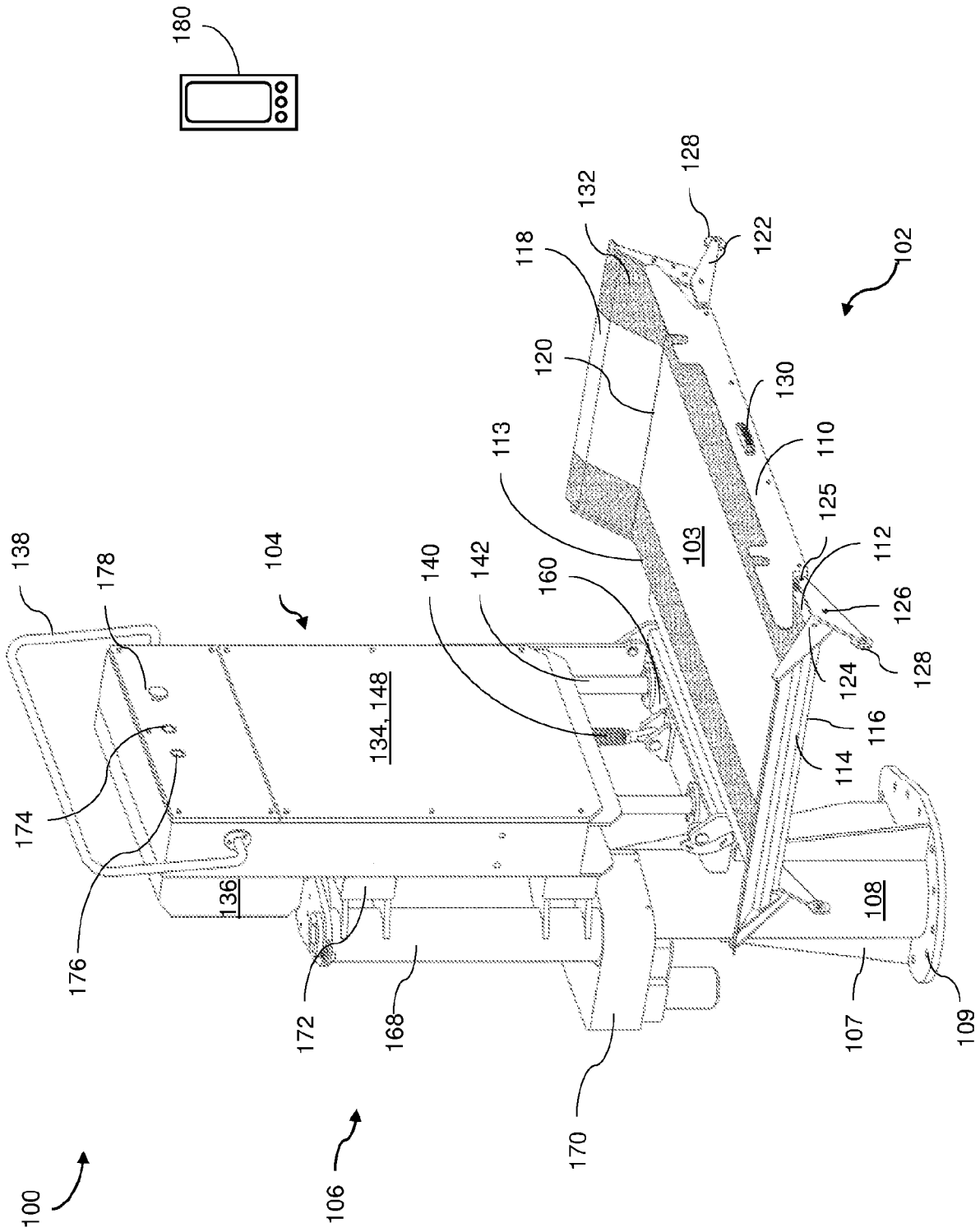


Fig. 1

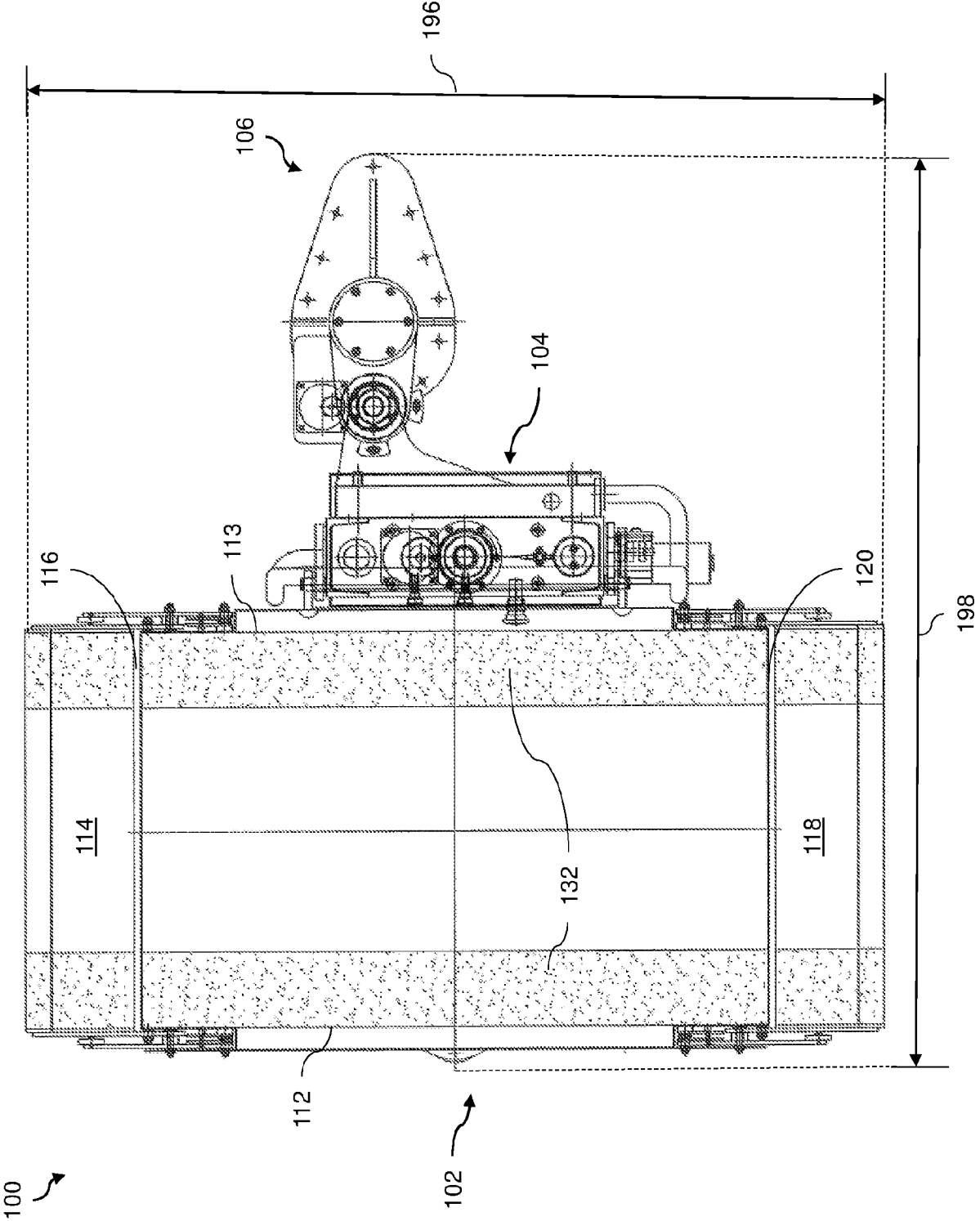


Fig. 2

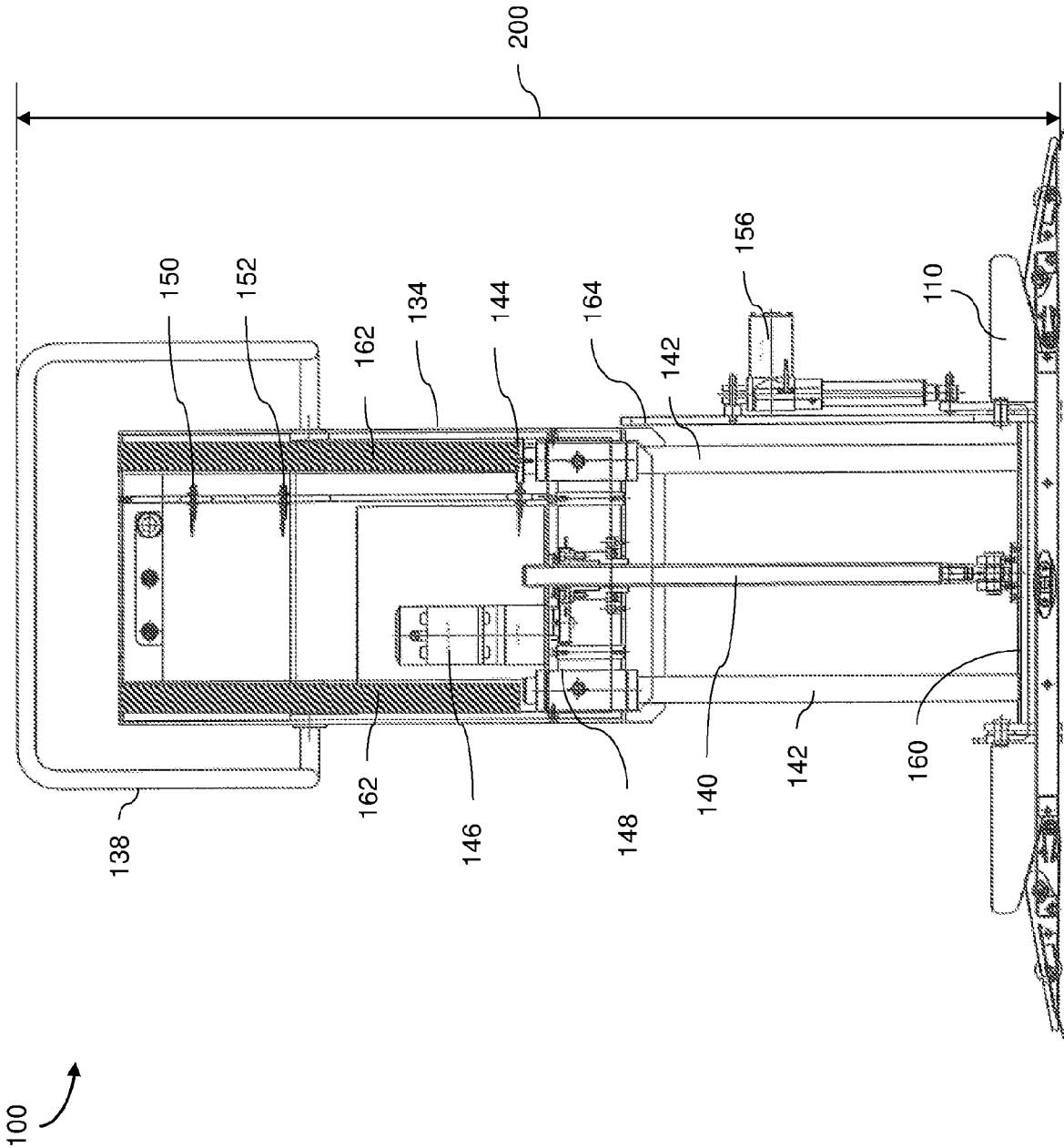


Fig. 3

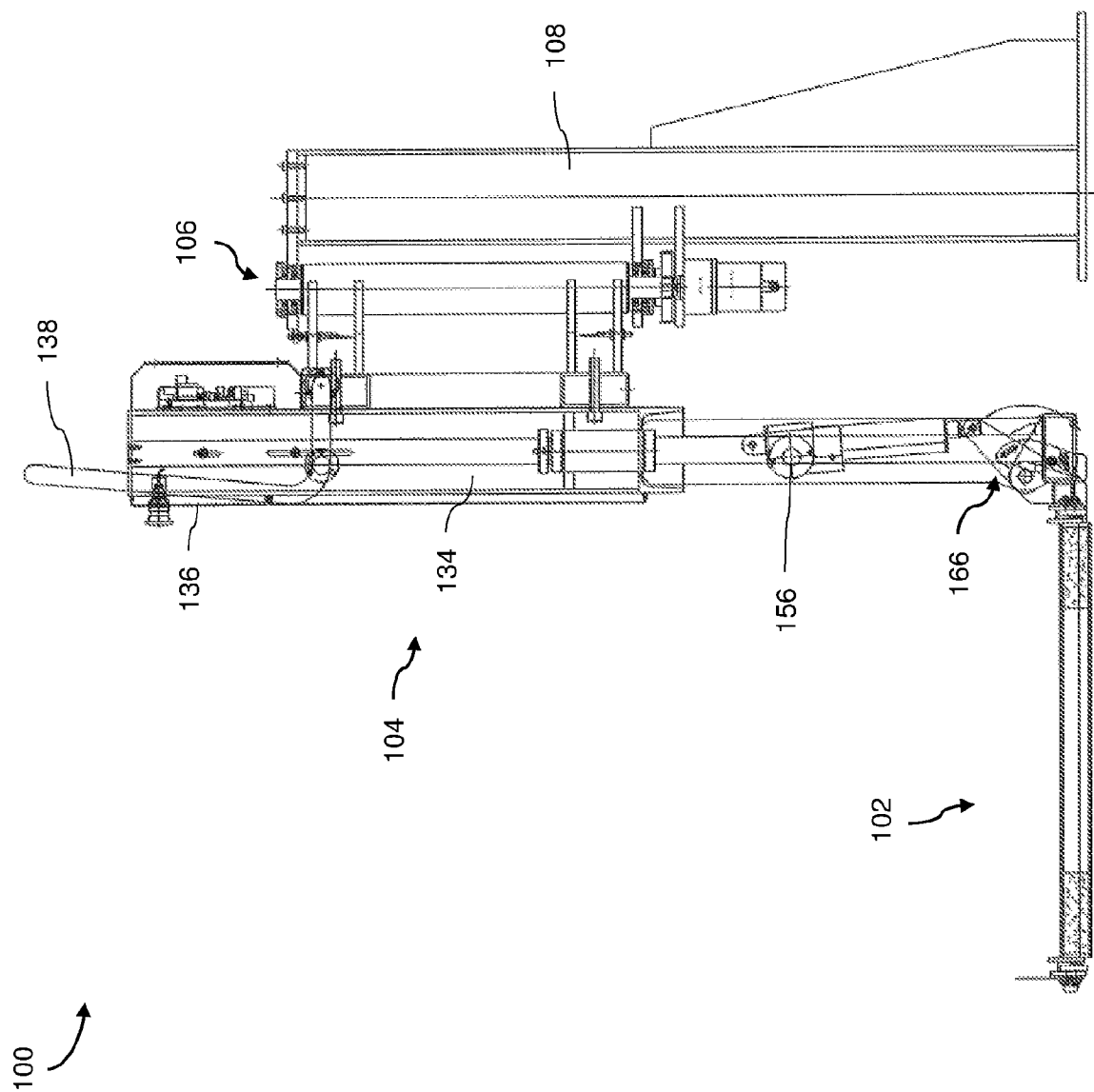


Fig. 4

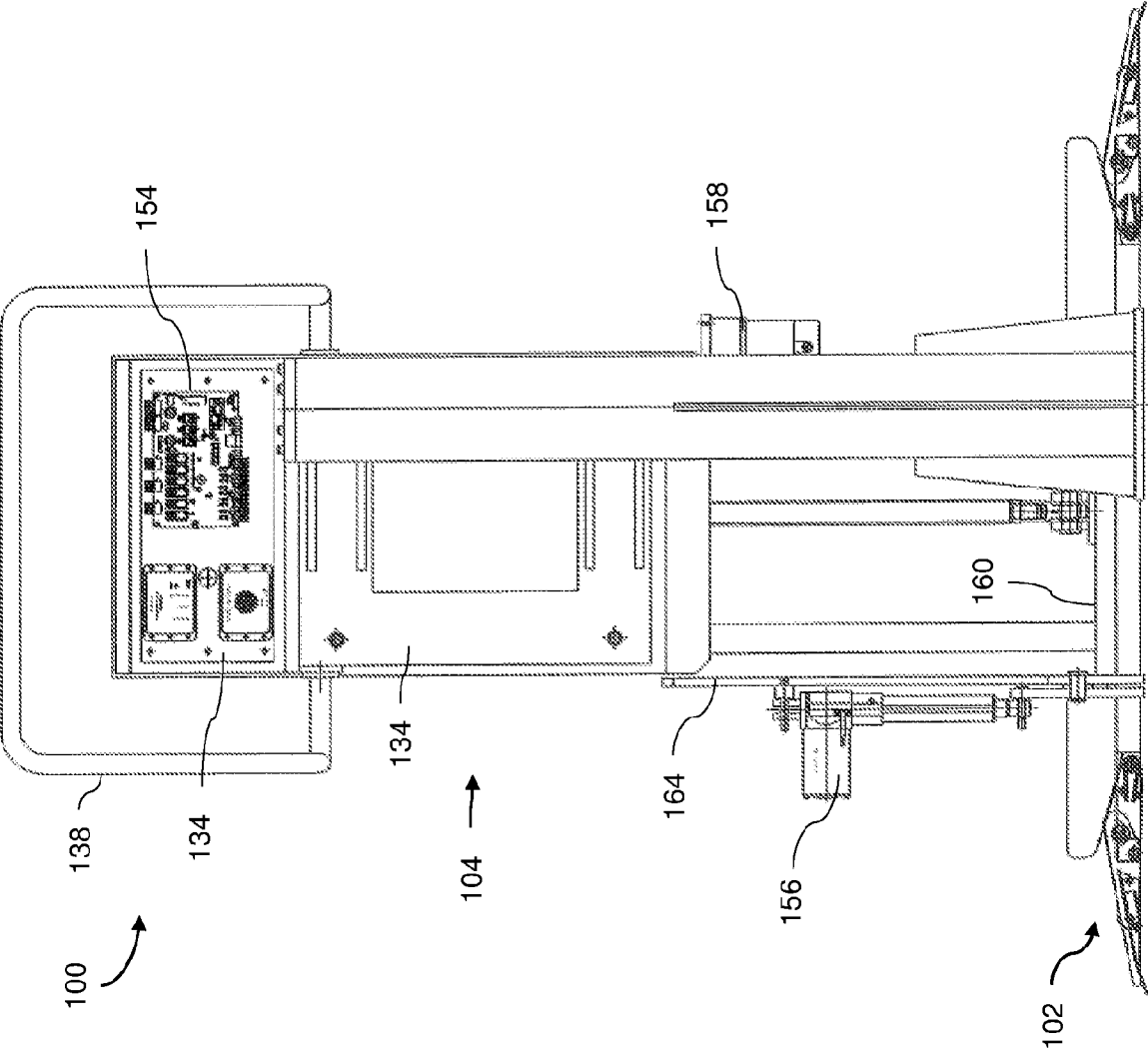


Fig. 5

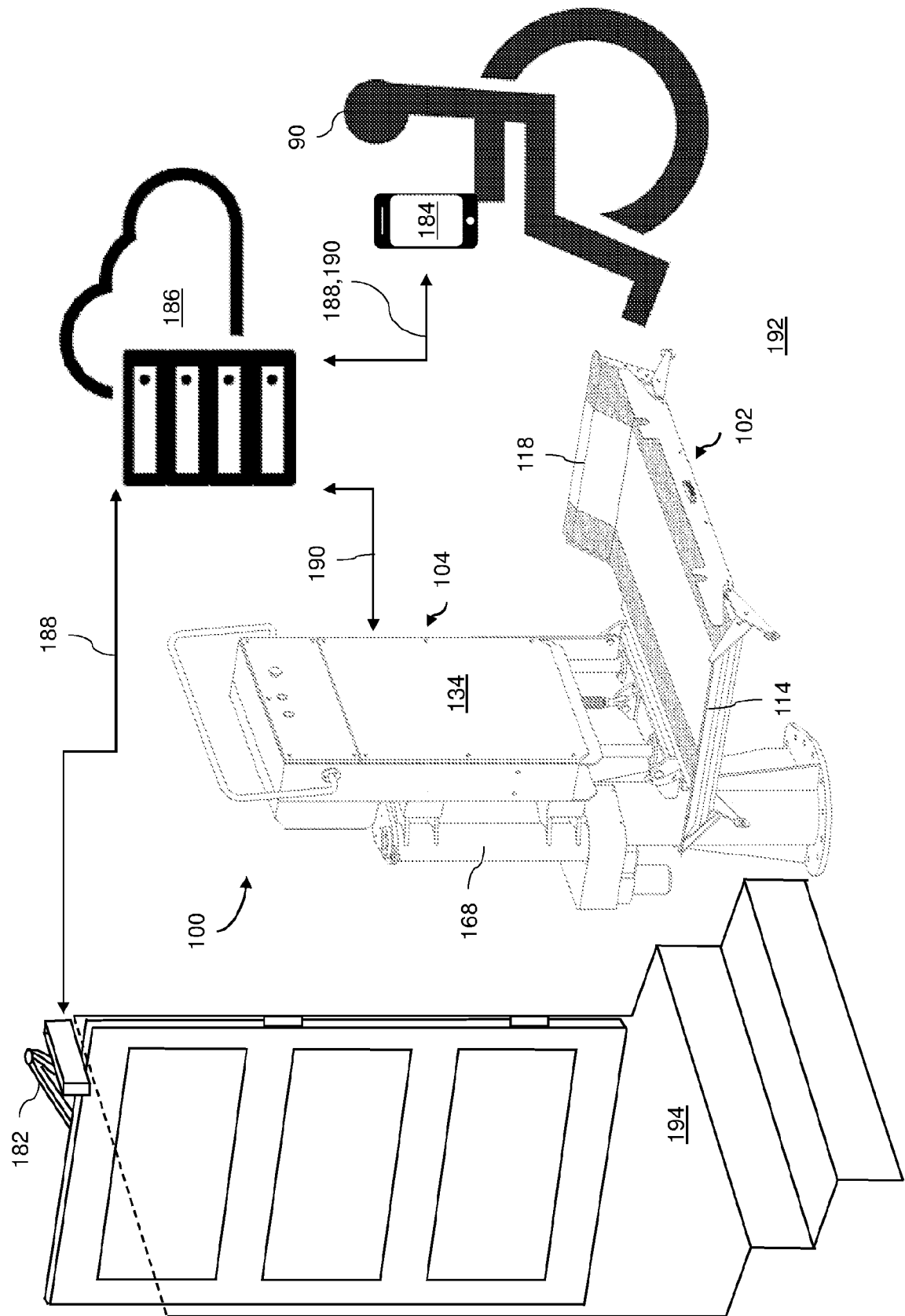


Fig. 6