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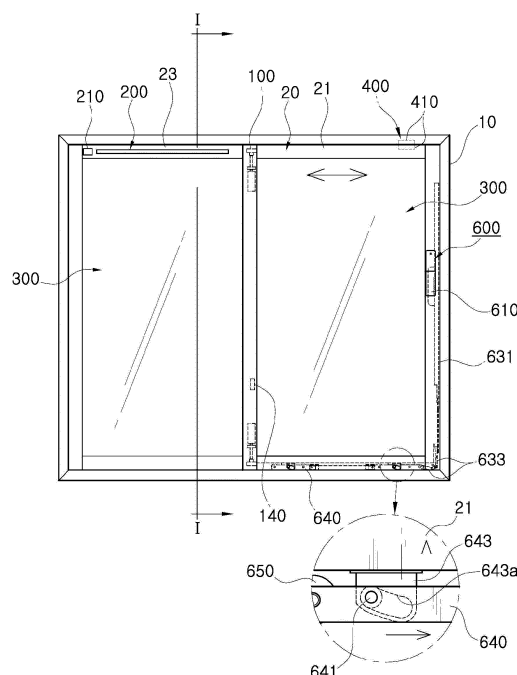
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(54) **LIFTING APPARATUS HAVING AUTOMATIC/MANUAL SWITCHING STRUCTURE, AND SMART WINDOW COMPRISING SAME**

(57) Disclosed is a lifting device having an automatic/manual switching structure and a smart window including the same. The lifting device allows a user to automatically open and close the smart window openable/closable in a lift sliding manner, and may also be switched to a manual mode, allowing the user to manually open and close the smart window. In addition, automatic opening/closing buttons are provided on the surface of a handle driving part, so that the user may open and close the window by simply manipulating the buttons.

[FIG. 2]



Description

[Technical Field]

[0001] The present invention relates to a smart window capable of automatic opening and closing, and more particularly, to a lifting device having an automatic/manual switching structure and a smart window including the same. The lifting device allows a user to automatically open and close the smart window openable/closable in a lift sliding manner, and may also be switched to a manual mode, allowing the user to manually open and close the smart window. In addition, automatic opening/closing buttons are provided on the case of the lifting device, so that the user may open and close the window by simply manipulating the buttons.

[Background Art]

[0002] In general, a window serves as a wall for isolating the room from the outside, and at the same time, the window allows sunlight and fresh outside air to enter the room, thereby enabling indoor lighting and ventilation.

[0003] Windows can be classified into various types according to materials and opening methods. Examples of the opening methods include the tilt-and-turn method, in which a window can be fully opened inward, and the lift sliding method, in which a window is lifted onto a rail and moved by hardware having a lifting function upon opening and closing the window.

[0004] According to the liftslidingmethod, a fixedwindow is provided, and a window disposed on one side of the fixed window is opened or windows disposed on both sides of the fixed window are opened. Such a lift sliding window has been previously filed as KR 10-2006-0025389 A.

[0005] More specifically, the lift sliding window is basically composed of a fixed window installed on a window frame and a window openable and closable while being moved laterally along rails formed on the upper and lower sides of the window frame, and further includes hardware for locking and securing air tightness by vertically or horizontally moving the window.

[0006] According to the lift sliding window having such a configuration, when a handle is turned to open the window, the window is lifted up to a certain height from a rail by operation of hardware including an elevating means, and in this state, the window is horizontally moved, so that the window is quietly and smoothly opened. When the window is closed, the window and the rail closely contact with each other, thereby ensuring air tightness, water tightness, heat insulation, and the like.

[0007] The lift sliding window may be configured so that a window is automatically lifted by operation of an electric actuator. However, in the case of the lift sliding window, there is a problem that the window cannot be lifted when the electric actuator fails.

[0008] Meanwhile, the lift sliding window is generally

applied to a relatively large window such as a living room or balcony window. However, since such a window is large in size, a large amount of force is required when manually opening and closing the window. Accordingly, an automatic opening/closing device capable of automatically opening and closing a window in a sliding manner along a screw shaft rotated by a driving means was disclosed in KR 10-0915952 B1.

[0009] In recent years, in addition to a simple opening/closing function, a window system having functions, such as automatic opening/closing, ventilation, and security, has been proposed for user convenience.

[0010] However, an automatic opening and closing device, a ventilation device, and the like applied to such a window generally operate in a manner that a user directly manipulates a remote control in the vicinity of the room.

[0011] As a result, a user experiences inconvenience in the case that the user wants to check whether a ventilation device is operating or opening/closing of windows while going out, or the user has to close open windows due to sudden rain.

[Disclosure]

[Technical Problem]

[0012] Therefore, the present invention has been made in view of the above problems, and it is one object of the present invention to provide a lifting device having an automatic/manual switching structure and a smart window including the same. The lifting device allows a user to automatically open and close the smart window openable/closable in a lift sliding manner, and may also be switched to a manual mode, allowing the user to manually open and close the smart window. In addition, automatic opening/closing buttons are provided on the surface of a handle driving part, so that the user may open and close the window by simply manipulating the buttons.

[Technical Solution]

[0013] In accordance with one aspect of the present invention, provided is a handle driving part for a lifting device, including a housing installed on a window, wherein the window is any one of at least one pair of windows installed in a window frame and is openable/closable in a sliding manner; a driving motor installed in the housing; a shaft configured to be rotatable in an interlocking manner via gear trains at the rotating shaft of the driving motor; a clutch gear configured to connect the gear trains and the shaft to each other so that the gear trains are engaged with the shaft, wherein the clutch gear is capable of reciprocating in a sliding manner in an axial direction on the identical axis line of the shaft for selective power transmission and is elastically supported at one side by an elastic member; and a cover coupled to the housing, wherein, when the cover is engaged, the clutch gear moves to the other side in an axial direction by pressure

to connect the gear trains and the shaft; and when the cover is detached, the clutch gear moves to one side in an axial direction by the elastic restoring force of the elastic member to block connection between the gear trains and the shaft, and a handle (H) is fitted and coupled at a coaxial position of the shaft so that manual rotation becomes possible.

[0014] In this case, a first spindle may be provided on one axial surface of the clutch gear, wherein the first spindle is coupled to the fitting hole of the shaft so that the first spindle is slidable in an axial direction and is integrally rotated with the shaft; and a second spindle may be provided on the other axial surface of the clutch gear, wherein one end of the second spindle is coupled so as to be idly rotated and the handle (H) is mounted on the other end of the second spindle, wherein the side portion of the other end of the second spindle is slidably coupled to the axial hole of a rotating member rotatably coupled to the housing so that the second spindle is integrally rotated with the rotating member; and a fitting protrusion is provided on the other surface of the clutch gear, wherein, when the cover is detached, the clutch gear moves to one side in an axial direction and the fitting protrusion is fitted and fixed in fitting groove portions provided on the facing surface of the rotating member, so that the first spindle and the second spindle are integrally rotated.

[0015] In addition, the cover may be coupled to the housing so as to be openable/closable in a sliding manner or in a rotating manner around a hinge axis on one side.

[0016] In addition, the handle may be embedded in a seating groove provided in the housing so that the handle is capable of being selectively taken out of the seating groove when the cover is detached.

[0017] In accordance with another aspect of the present invention, provided is a lifting device for lifting a lift sliding window on a rail, including the handle driving part; an operating rod installed so as to be movable up and down by power transmitted through the shaft and the gear modules of the handle driving part; connecting links, which are connected to the operating rod and installed at the lower corner of the window to switch vertical movement to horizontal movement; a slider, which is connected to the connecting links and is slidably installed in the longitudinal direction on the bottom surface of the window, wherein, upon operation of the handle driving part, a guide shaft inside the slider moves along an inclined surface to lift the window on the rail; and a roller rotatably coupled to the lower portion of the slider to be placed on the rail.

[0018] In accordance with another aspect of the present invention, provided is a smart window provided with the lifting device, the smart window including a window frame provided with a rail; a lift sliding window slidably coupled to the rail, wherein, upon opening operation, the lift sliding window is automatically lifted on the rail by action of the lifting device; and an automatic opening/closing device for automatically opening and closing the window, wherein the automatic opening/closing de-

vice is installed in the window so that the outer circumferential surface of the automatic opening/closing device is in contact with one surface of a fixed window to which a driving roller rotated by power transmitted from a driving motor is disposed adjacent.

[0019] In addition, the automatic opening/closing device may be installed in the upper or lower portion, or both upper and lower portions of a meeting stile, in which a pair of windows overlap with each other.

[0020] In addition, the automatic opening/closing device may include an electromagnetic clutch, wherein the electromagnetic clutch is installed on the shaft of the driving motor and selectively blocks power transmitted to the driving roller so as to enable manual operation of opening and closing the window.

[0021] In addition, the smart window may further include a control part, wherein the automatic opening/closing device of the window is selectively controlled by operating the control part using a wireless communication terminal of a user and the control part is responsible for displaying an open/close state of windows on the wireless communication terminal in real time.

[0022] In addition, the smart window may further include a handle driving part provided with left/right/stop buttons (B) for controlling the automatic opening/closing device to automatically open and close the window.

[Advantageous effects]

[0023] As apparent from the foregoing, the present invention advantageously provides a lifting device having an automatic/manual switching structure and a smart window including the same. According to the present invention, the present state of the window provided with various functions can be monitored in real time through the display window of a terminal, and the functions of the window can be individually/integrally controlled regardless of place.

[0024] Particularly, the lifting device and an automatic opening/closing device can be used to automatically open and close the smart window openable/closable in a lift sliding manner, and can also be switched to a manual mode, allowing the user to manually open and close the smart window.

[0025] In addition, left/right/stop buttons are provided on the housing surface of a handle driving part, so that the user can automatically open and close the window by simply manipulating the buttons.

[Description of Drawings]

[0026]

FIG. 1 is a perspective view of the smart window according to the present invention.

FIG. 2 is an elevation view showing the interior side of the smart window according to the present invention.

FIG. 3 is an enlarged view of the main portion of the handle driving part according to the present invention.

FIG. 4 is an exploded perspective view of the handle driving part according to the present invention.

FIG. 5 is a side cross-sectional view showing the internal structure of the handle driving part according to the present invention.

FIG. 6 is an exploded perspective view showing the configuration of the main portion of the handle driving part according to the present invention.

FIGS. 7a, 7b, and 8 include operational state diagrams of the handle driving part according to the present invention.

FIG. 9 is a side cross-sectional view showing the configuration of the automatic opening/closing device according to the present invention.

FIG. 10 is a schematic block diagram of the smart window according to the present invention.

[Best mode]

[0027] Hereinafter, the constructions and functions of preferred embodiments of the present invention will now be described more fully with reference to the accompanying drawings.

[0028] Here, when reference numerals are applied to constituents illustrated in each drawing, it should be noted that like reference numerals indicate like elements throughout the specification.

[0029] FIG. 1 is a perspective view of the smart window according to the present invention, and FIG. 2 is an elevation view showing the interior side of the smart window according to the present invention.

[0030] Referring to FIGS. 1 and 2, a smart window 1 according to a preferred embodiment of the present invention includes a window frame 10, a lift sliding window 21 automatically lifted by action of a lifting device 600, and an automatic opening/closing device 100 for automatically opening and closing the lifted window 21.

[0031] The construction of the window according to the present invention will be described in detail as follows.

[0032] The window frame 10 constitutes a main outer frame of the lift sliding window, and rails (not shown) are provided in the longitudinal direction on the upper and lower surfaces inside the window frame 10 so that at least one pair of windows 20 may be coupled to the window frame 10 so as to be openable/closable in a sliding manner.

[0033] Referring to FIGS. 2 and 3, upon opening/closing operations, the lift sliding window 21 is automatically lifted up to a predetermined height on the rail by the lifting device 600 and then opened or closed in the horizontal direction. A gasket (or a mohair or the like) may be provided in the lower portion of the window 21. Thus, upon closing operation, the gasket closely contacts the inner surface of the window frame 10 to maintain airtightness.

[0034] Specifically, the lifting device 600 may include

a handle driving part 610; an operating rod 631 installed so as to be movable up and down by power transmitted from the handle driving part 610 via gear modules 630 (for example, rack and pinion gears); connecting links 633, which are connected to the operating rod 631 and installed at a lower corner of the window 21 to switch vertical movement to horizontal movement; a slider 640, which is connected to the connecting links 633 and is slidably installed in the longitudinal direction on the bottom surface of the window 21, wherein, upon operation of the handle driving part 610, a sloping guide slot 643a of a lifting block 643 is pushed up and down by a guide shaft 641 provided in the slider 640 to lift the window 21 on the rail; and a roller 650 rotatably coupled to the lower portion of the slider 640 to be placed on the rail.

[0035] Referring to FIG. 4, the handle driving part 610 may include a housing 611 installed on the window 21, wherein the window 21 is any one window of at least one pair of the windows 20 installed in the window frame 10 and is openable/closable in a sliding manner; a driving motor 613 installed in the housing 611; a shaft 617 configured to be rotatable in an interlocking manner via gear trains 615 at the rotating shaft of the driving motor 613; a clutch gear 619 configured to connect the gear trains 615 and the shaft 617 to each other so that the gear trains 615 are engaged with the shaft 617, wherein the clutch gear 619 is capable of reciprocating in a sliding manner in an axial direction on the identical axis line of the shaft 617 for selective power transmission and is elastically supported at one side by an elastic member 618; and a cover 621 coupled to the housing 611.

[0036] In this case, the cover 621 is coupled to the housing 611 so as to be openable/closable in a sliding manner or in a rotating manner around a hinge axis on one side.

[0037] In addition, the handle (H) is embedded in a seating groove 612 provided in the housing 611 so that the handle (H) is capable of being selectively taken out of the seating groove 612 when the cover 621 is detached.

[0038] More specifically, referring to FIGS. 5 and 6, a first spindle 623 is provided on one axial surface of the clutch gear 619, wherein the first spindle 623 is coupled to a fitting hole 617a of the shaft 617 so that the first spindle 623 is slidable in an axial direction and is integrally rotated with the shaft 617. In this case, since the first spindle 623 is formed in a polygonal shape, the first spindle 623 may be integrally rotated with the shaft 617 even when the first spindle 623 is slidably coupled to the fitting hole 617a.

[0039] Referring to FIG. 7a, a second spindle 625 is provided on the other axial surface of the clutch gear 619, wherein one end 625a of the second spindle 625 is coupled so as to be idly rotated and the handle (H) is selectively mounted on the other end 625b of the second spindle 625, wherein the side portion of the other end of the second spindle 625 is slidably coupled to an axial hole 627a of a rotating member 627 rotatably coupled to the

housing 611 so that the second spindle 625 is integrally rotated with the rotating member 627.

[0040] That is, one end 625a of the second spindle 625 is formed in a cylindrical shape and is idly rotated with the clutch gear 619, and the other end 625b of the second spindle 625 is formed in a polygonal shape so that the second spindle 625 is integrally rotated with the rotating member 627 even when the second spindle 625 is slidably coupled to the axial hole 627a.

[0041] In the handle driving part 610 having such a structure, when the cover 621 is engaged, the clutch gear 619 moves to the other side in the axial direction by pressure to connect the gear trains 615 and the shaft 617.

[0042] Referring to FIG. 7b, conversely, when the cover 621 is detached, the clutch gear 619 moves to one side in the axial direction by the elastic restoring force of the elastic member 618 to block connection between the gear trains 615 and the shaft 617.

[0043] That is, a fitting protrusion 619a is provided on the other surface of the clutch gear 619. When the cover 621 is detached, the clutch gear 619 moves to one side in an axial direction by the elastic restoring force of the elastic member 618 and the fitting protrusion 619a is fitted and fixed in fitting groove portions 627b provided on the facing surface of the rotating member 627. Accordingly, the first spindle 623 and the second spindle 625, which were disconnected in an automatic mode, may be connected to each other and integrally rotated in a manual mode.

[0044] Referring to FIG. 8, in a manual mode, the other end 625b of the second spindle 625 is exposed to the outside, and a handle (H) is fitted and coupled to the exposed other end 625b so that manual rotation operation of the shaft 617 becomes possible.

[0045] Referring again to FIGS. 2 and 9, the automatic opening/closing device 100 is installed in the window 21, which is one window of the at least one pair of windows 20, and serves to automatically open and close the window 21 openable/closable in a sliding manner. The automatic opening/closing device 100 may be installed in the upper or lower portion, or both the upper and lower portions of a meeting stile 21a where the pair of windows 20 overlap each other. In the present invention, an example of the automatic opening/closing device 100 installed in the upper or lower portion of the meeting stile 21a is shown and described.

[0046] The automatic opening/closing device 100 may include a driving motor 110 installed in the meeting stile 21a of the window 21 openable/closable in a sliding manner, and a driving roller 120, which is rotated by power transmitted from the driving motor 110 and is responsible for opening and closing the window 21 in a sliding manner, wherein the driving roller 120 is installed such that the outer circumferential surface of the driving roller 120 is in contact with one surface 23a of a fixed window 23 provided adjacent to the window 21.

[0047] In addition, the automatic opening/closing device 100 may further include an electromagnetic clutch

130 for switching the window 21 to be opened or closed manually or automatically. The electromagnetic clutch 130 is installed on a shaft 111 connecting the driving motor 110 and the driving roller 120 and selectively blocks power transmitted to the driving roller 120. Therefore, when power failure or failure of the device occurs, an automatic mode is switched to a manual mode by action of the electromagnetic clutch 130, and thus the window 21 may be manually opened.

[0048] The operation principle of the electromagnetic clutch 130 is described in detail as follows. A first gear 113 integrally coupled to the rotating shaft of the driving motor 110 is provided, and the first gear 113 meshes with a second gear 115 to rotate the shaft 111, thereby driving the driving roller 120. At this time, the second gear 115 is coupled to the shaft 111 so as to idle on the shaft 111. On the identical axis line of the shaft 111, the electromagnetic clutch 130 is coupled to the second gear 115 in parallel. The electromagnetic clutch 130 is integrally coupled with the shaft 111 and is rotated, and an electromagnet (not shown) is provided therein.

[0049] Therefore, when current is applied to the electromagnet of the electromagnetic clutch 130, the second gear 115 provided adjacent to the electromagnetic clutch 130 is integrally rotated with the electromagnetic clutch 130 by magnetic force. Accordingly, the power of the driving motor 110 is transmitted to the driving roller 120, so that the window 21 may be automatically opened and closed.

[0050] Conversely, when the current flowing through the electromagnet is blocked, the electromagnetic clutch 130 and the second gear 115 are separated from each other, and the power of the driving motor 110 transmitted to the driving roller 120 is blocked. Therefore, when power failure occurs or the automatic opening/closing device 100 fails, the window 21 may smoothly be opened and closed in a manual manner.

[0051] In this case, the first gear 113 and the second gear 115 may be spur gears, but it is preferable to use a helical gear so as to reduce noise.

[0052] The driving roller 120 may be made of rubber or urethane to improve adhesion with the window 23 which the outer circumferential surface of the driving roller 120 abuts.

[0053] In addition, a plurality of uneven grooves 121 may be formed on the outer circumferential surface of the driving roller 120 at regular intervals, so that frictional force may be generated when the outer circumferential surface of the driving roller 120 is in contact with the one surface 23a of the window 23.

[0054] In addition, an uneven pad 123 may be provided on the one side 23a of the window which contacts the outer circumferential surface of the driving roller 120 so as to be engaged with the uneven grooves 121, so that a slipping phenomenon may be prevented when the driving roller 120 is initially driven. The uneven pad 123 may be formed on the entire one surface 23a of the window 23 in a direction in which the window 23 is opened or

closed, and may also be formed only in a predetermined section required for initially driving the driving roller 120 in a stopped state.

[0055] When a person or an object passing between a window gap is detected without recognizing the closing operation of the window 21, the automatic opening/closing device 100 may be further provided with a safety sensor 140 to immediately stop operation of the driving motor 110. The safety sensor 140 may be installed on the meeting stile 21a or at the front of the window 21 upon closing of the window 21. In the present invention, an example in which the safety sensor 140 is provided on the meeting stile 21a is described below.

[0056] In addition to the automatic opening/closing device 100, the smart window 1 according to the present invention may be further provided with a natural ventilation part 200, a light adjusting part 300, an opening/closing notification part 400, and a control part 500 (see FIG. 10) for controlling the components 100, 200, 300, 400, and 600.

[0057] The natural ventilation part 200 is provided in the windows 20 to ventilate indoor air. The natural ventilation part 200 is preferably installed in the fixed window 23 which is not opened or closed among the at least one pair of windows 20.

[0058] In this case, the natural ventilation unit 200 may include a carbon dioxide sensor 210 for measuring the concentration of carbon dioxide contained in the indoor air. Accordingly, when the value measured by the carbon dioxide sensor 210 exceeds the reference value, the natural ventilation part 200 may be automatically operated.

[0059] In this case, any one of KR 10-1274838 B1, KR 10-1259671 B1, KR 10-1260564 B1, KR 10-1301811 B1, KR 10-1293852 B1, KR 10-1307645 B1, KR 10-1433437 B1, KR 10-1293846 B1, KR 10-1292365 B1, KR 10-1330447 B1, KR 10-1252906 B1, KR 10-1272994 B1, KR 10-1338547 B1, KR 10-1273019 B1, KR 10-293802 B1, KR 10-1263991 B1, and KR 10-1254413 B1 filed by the present applicants may be applied to the ventilation device for a window used in the natural ventilation part 200. However, the present invention is not limited thereto, and ventilation devices, which are typically used in a window, may be used. A detailed description of the operating principle of the ventilation device for a window is omitted.

[0060] The light adjusting part 300 is installed on a part or all of the glass provided in the windows 20 and serves to convert the light transmittance of the glass into a transparent or opaque state. Typically, the light adjusting part 300 is also referred to as 'magic glass'.

[0061] The magic glass used in the light adjusting part 300 is a laminated glass structure in which an ITO film and a liquid crystal are placed between two sheets of glass and compressed. The light adjusting part 300 may change molecular arrangement between the ITO films by applying a voltage to the magic glass, so that the window may be instantly changed from the opaque state to the transparent state. It is possible to freely change the transparency according to change in voltage.

[0062] In the state wherein no voltage is applied, liquid crystal appearing as a rod-like molecule aligns along the inner wall of a capsule. In this state, light incident on the magic glass is refracted on the surface or inside of the capsule due to the difference in refractive index between a polymer and the liquid crystal and the birefringence of the liquid crystal. As a result, the light does not travel straight and the window appears opaque due to scattering.

[0063] On the contrary, when a voltage is applied, the liquid crystal molecules are arranged in a direction perpendicular to the electrodes because of the property of being parallel to the direction in which the voltage is applied. When the refractive index of the liquid crystal matches the refractive index of the polymer in such an arrangement state, the state becomes the same as without the interface of the capsule, and the light travels straight without scattering. Therefore, the magic glass looks transparent.

[0064] The light adjusting part 300 having such a structure may be applied to the entire windows 20, or the windows 20 may be divided into a plurality of zones along the up/down directions and the left/right directions so that the zones are selectively adjusted to a transparent and opaque state by the light adjusting part 300.

[0065] The opening/closing notification part 400 is provided in the window 1, and includes a detection sensor 410 for detecting, in real time, whether the window 21 is opened or closed.

[0066] In this case, the detection sensor 410 may consist of at least a pair of magnetic sensors for detecting whether the window 21 openable/closable in a sliding manner is opened or closed, wherein the magnetic sensors may be respectively attached to the window frame 10 and the window 21, so that the magnetic sensors are configured to face each other.

[0067] Specifically, the detection sensor 410 is embedded both in the upper portion of the openable/closable window 21 and the window 21 facing surface of the window frame 10 corresponding to the window 21. However, the present invention is not limited to the above-described position, and various positions may be applied without limitation as long as the positions enable easy detection of whether the window 21 is forcibly opened or closed.

[0068] The functions of the components 100, 200, 300, 400, and 600 are individually or integrally controlled by operating the control part 500 using a wireless communication terminal 510 of a user regardless of time and place, and the control part 500 is responsible for displaying the states of the components on the display window of the wireless communication terminal 510 in real time.

[0069] Specifically, wireless communication is used in the control part 500, and wireless communication is performed in such a way that a wireless signal is transmitted to a gateway and then connected to the application of the terminal 510 through the Internet.

[0070] In this case, an RF communication method is

preferably used in wireless communication. However, the present invention is not limited thereto, and ZigBee wireless communication supporting short-range communication may be applied. For reference, ZigBee wireless communication refers to one of the IEEE 802.15.4 standards supporting short-range communication, and is a technology for short-range communication and ubiquitous computing in the range of 10 to 20 m in the field of wireless networking applied to environments such as home and office. In other words, ZigBee relates to a concept of mobile phone or wireless LAN, and the distinctive feature of ZigBee is that it can communicate a small amount of information while minimizing power consumption.

[0071] In the present invention, the RF communication (RF 447 MHz communication method) or the ZigBee wireless communication is exemplified as the wireless communication, but the present invention is not limited thereto. For example, any one of Bluetooth, Z-wave, Wi-Fi, WiBro, and Near Field Communication (NFC) may be selectively used as the wireless communication.

[0072] In addition, the terminal 510 is preferably a smartphone that is portable and on which the corresponding application can be easily installed. In addition to the smartphone, any one of a tablet PC, a mobile phone, a desktop, a laptop, a tab book, and a PDA may also be used.

[0073] When the smart window 1 having such a configuration according to the present invention is used, a user may monitor the current state of the window 1 having various functions, in real time, through the display window of the terminal 510, and individually/integrally control the various functions of the smart window 1 regardless of place.

[0074] In particular, the lifting device 600 may be used to automatically open and close the smart window openable/closable in a lift sliding manner, and the opening/closing method of the window may be switched to a manual mode using the lifting device 600.

[0075] In addition, left/right/stop buttons (B) are provided on the surface of the housing 611 of the handle driving part 610, and a user may control the automatic opening/closing device 100 and the lifting device 600 by simply manipulating the buttons, so that the window 21 may be automatically opened and closed.

[0076] The present invention is described with reference to preferred embodiments. However, the present invention is not limited to the above-described embodiments, and various changes and modifications may be made without departing from the technical spirit of the present invention.

[Description of Symbols]

[0077]

1: WINDOW, 10: WINDOW FRAME
20: WINDOW, 21: SLIDING WINDOW

21A: MEETING STILE, 23: FIXED WINDOW
100: AUTOMATIC OPENING/CLOSING DEVICE,
110: DRIVING MOTOR
111: SHAFT, 113: FIRST GEAR
115: SECOND GEAR, 120: DRIVING ROLLER
121: UNEVEN GROOVES, 123: UNEVEN PAD
130: ELECTROMAGNETIC CLUTCH, 140: SAFETY SENSOR
200: NATURAL VENTILATION PART, 210: CARBON DIOXIDE SENSOR
300: LIGHT ADJUSTING PART, 400: OPENING/CLOSING NOTIFICATION PART
410: DETECTION SENSOR, 500: CONTROL PART
510: TERMINAL, 600: LIFTING DEVICE
610: HANDLE DRIVING PART, 611: HOUSING
612: SEATING GROOVE, 613: DRIVING MOTOR
615: GEAR TRAINS, 617: SHAFT
617A: FITTING HOLE, 618: ELASTIC MEMBER
619: CLUTCH GEAR, 619A: FITTING PROTRUSION
621: COVER, 623: FIRST SPINDLE
625: SECOND SPINDLE, 627: ROTATING MEMBER
627A: AXIAL HOLE, 627B: FITTING GROOVE PORTIONS
B: LEFT/RIGHT/STOP BUTTONS, H: HANDLE

Claims

1. A handle driving part for a lifting device, comprising:

a housing 611 installed on a window 21, wherein the window 21 is any one window of at least one pair of windows 20 installed in a window frame 10 and is openable/closable in a sliding manner; a driving motor 613 installed in the housing 611; a shaft 617 configured to be rotatable in an interlocking manner via gear trains 615 at a rotating shaft of the driving motor 613; a clutch gear 619 configured to connect the gear trains 615 and the shaft 617 to each other so that the gear trains 615 are engaged with the shaft 617, wherein the clutch gear 619 is capable of reciprocating in a sliding manner in an axial direction on an identical axis line of the shaft 617 for selective power transmission and is elastically supported at one side by an elastic member 618; and a cover 621 coupled to the housing 611, wherein, when the cover 621 is engaged, the clutch gear 619 moves to the other side in an axial direction by pressure to connect the gear trains 615 and the shaft 617; and when the cover 621 is detached, the clutch gear 619 moves to one side in an axial direction by elastic restoring force of the elastic member 618 to block connection between the gear trains 615

and the shaft 617, and a handle (H) is fitted and coupled at a coaxial position of the shaft 617 so that manual rotation operation becomes possible.

2. The handle driving part according to claim 1, wherein, on one axial surface of the clutch gear 619, a first spindle 623 is provided, wherein the first spindle 623 is coupled to a fitting hole 617a of the shaft 617 so that the first spindle 623 is slidable in an axial direction and is integrally rotated with the shaft 617; and on the other axial surface of the clutch gear 619, a second spindle 625 is provided, wherein one end of the second spindle 625 is coupled so as to be idly rotated and the handle (H) is mounted on the other end of the second spindle 625, wherein a side portion of the other end of the second spindle 625 is slidably coupled to an axial hole 627a of a rotating member 627 rotatably coupled to the housing 611 so that the second spindle 625 is integrally rotated with the rotating member 627; and on the other surface of the clutch gear 619, a fitting protrusion 619a is provided, wherein, when the cover 621 is detached, the clutch gear 619 moves to one side in an axial direction and the fitting protrusion 619a is fitted and fixed in fitting groove portions 627b provided on a facing surface of the rotating member 627, so that the first spindle 623 and the second spindle 625 are integrally rotated.
3. The handle driving part according to claim 1, wherein the cover 621 is coupled to the housing 611 so as to be openable/closable in a sliding manner or in a rotating manner around a hinge axis on one side.
4. The handle driving part according to claim 1, wherein the handle (H) is embedded in a seating groove 612 provided in the housing 611 so that the handle (H) is capable of being selectively taken out of the seating groove 612 when the cover 621 is detached.
5. A lifting device having an automatic/manual switching structure, wherein the lifting device lifts a lift sliding window 21 on a rail comprises:

the handle driving part 610 according to any one of claims 1 to 4;
 an operating rod 631 installed so as to be movable up and down by power transmitted through a shaft 617 and gear modules 630 of the handle driving part 610;
 connecting links 633, which are connected to the operating rod 631 and installed at a lower corner of the window 21 to switch vertical movement to horizontal movement;
 a slider 640, which is connected to the connecting links 633 and is slidably installed in a longitudinal direction on a bottom surface of the win-

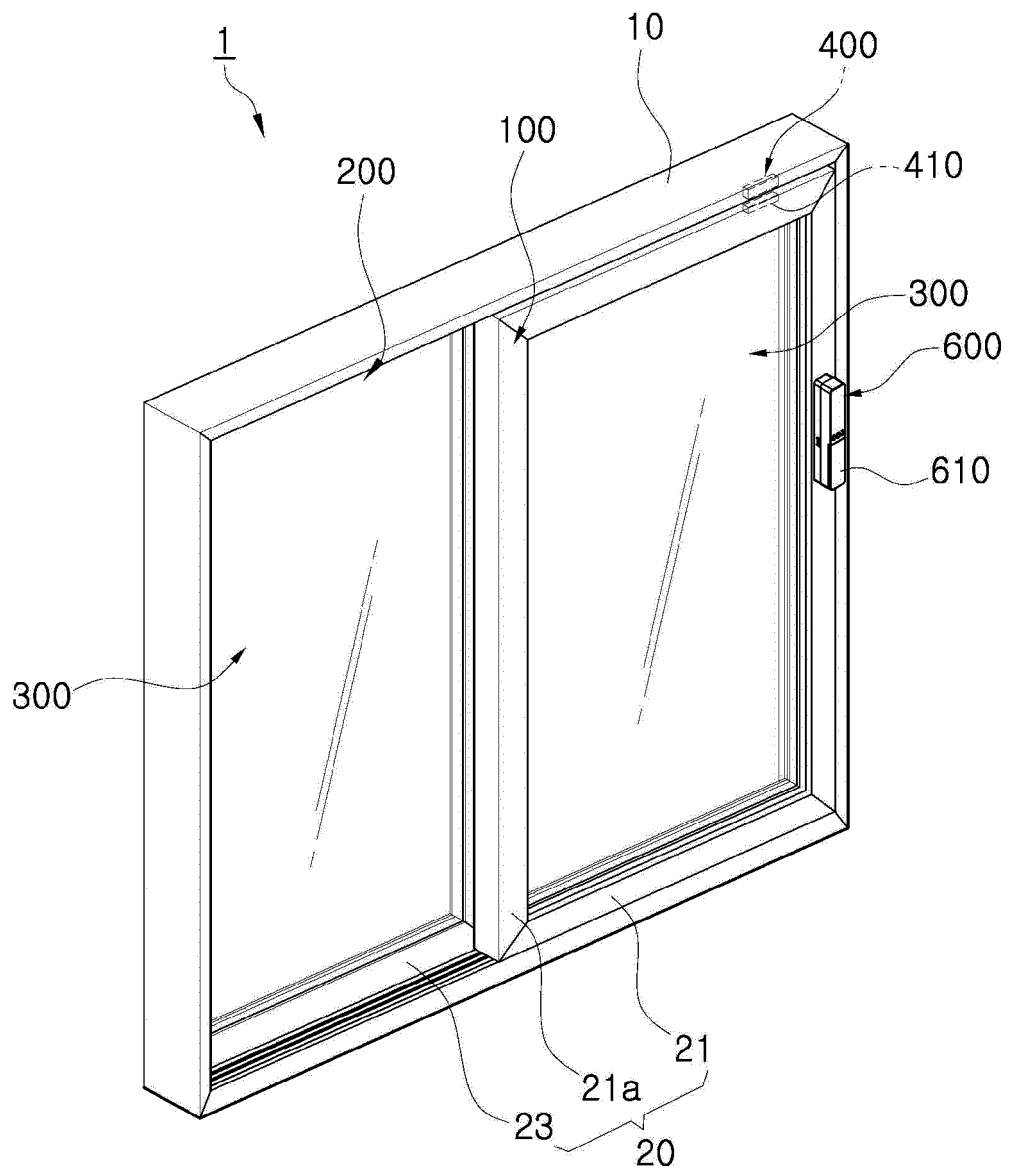
dow 21, wherein, upon operation of the handle driving part 610, a guide shaft 641 inside the slider 640 moves along an inclined surface to lift the window on the rail; and
 a roller 650 rotatably coupled to a lower portion of the slider 640 to be placed on the rail.

6. A smart window, comprising:

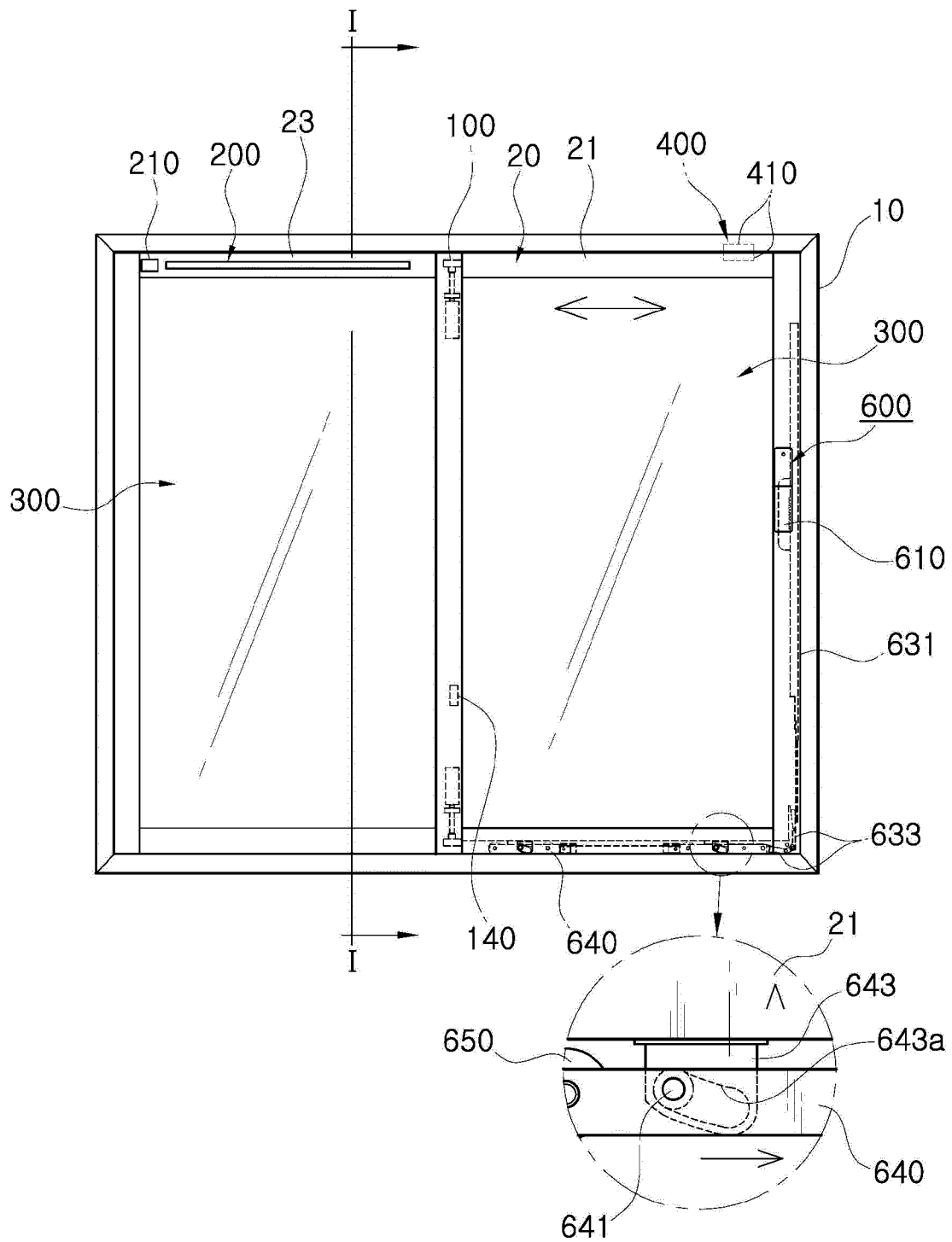
a window frame 10 provided with a rail;
 a lift sliding window 21 slidably coupled to the rail, wherein, upon opening operation, the lift sliding window 21 is automatically lifted on the rail by action of the lifting device 600 of claim 5; and
 an automatic opening/closing device 100 for automatically opening and closing the window 21, wherein the automatic opening/closing device 100 is installed in the window 21 so that an outer circumferential surface of the automatic opening/closing device 100 is in contact with one surface of a fixed window 23 to which a driving roller 120 rotated by power transmitted from a driving motor 110 is disposed adjacent.

7. The smart window according to claim 6, wherein the automatic opening/closing device 100 is installed in an upper or lower portion, or both upper and lower portions of a meeting stile 21a, in which a pair of windows 20 overlap each other.
8. The smart window according to claim 6, wherein the automatic opening/closing device 100 comprises an electromagnetic clutch 130, wherein the electromagnetic clutch 130 is installed on a shaft 111 of the driving motor 110 and selectively blocks power transmitted to the driving roller 120 so as to enable manual operation of opening and closing the window 21.
9. The smart window according to claim 6, further comprising a control part 500, wherein the automatic opening/closing device 100 of the window is selectively controlled by operating the control part 500 using a wireless communication terminal 510 of a user and the control part 500 is responsible for displaying an open/close state of windows 20 on the wireless communication terminal 510 in real time.
10. The smart window according to claim 6, further comprising left/right/stop buttons (B) for controlling the automatic opening/closing device 100 to automatically open and close the window 21 provided in the handle driving part 610.

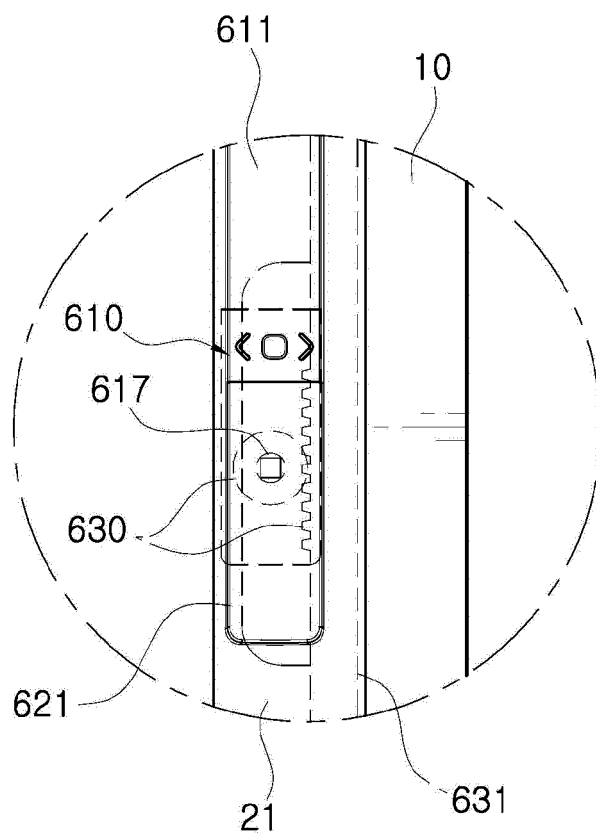
【FIG. 1】



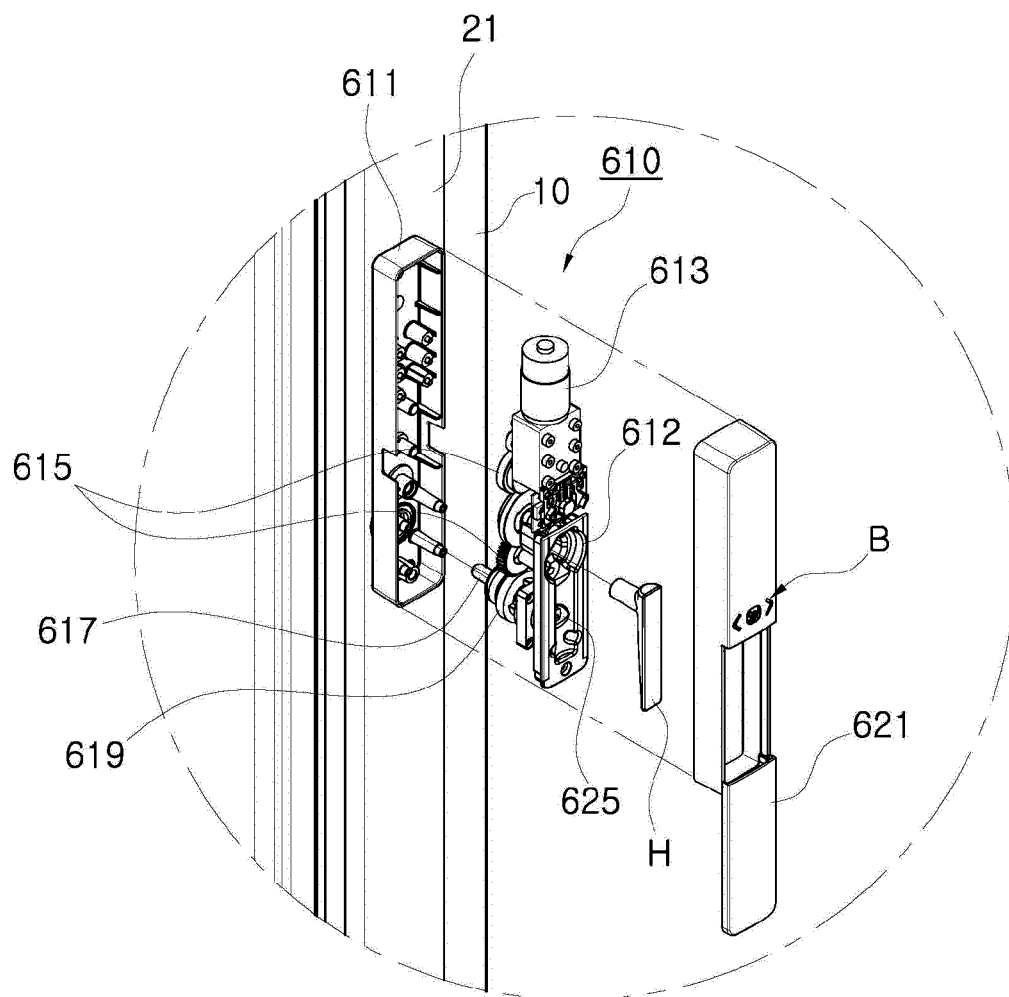
【FIG. 2】



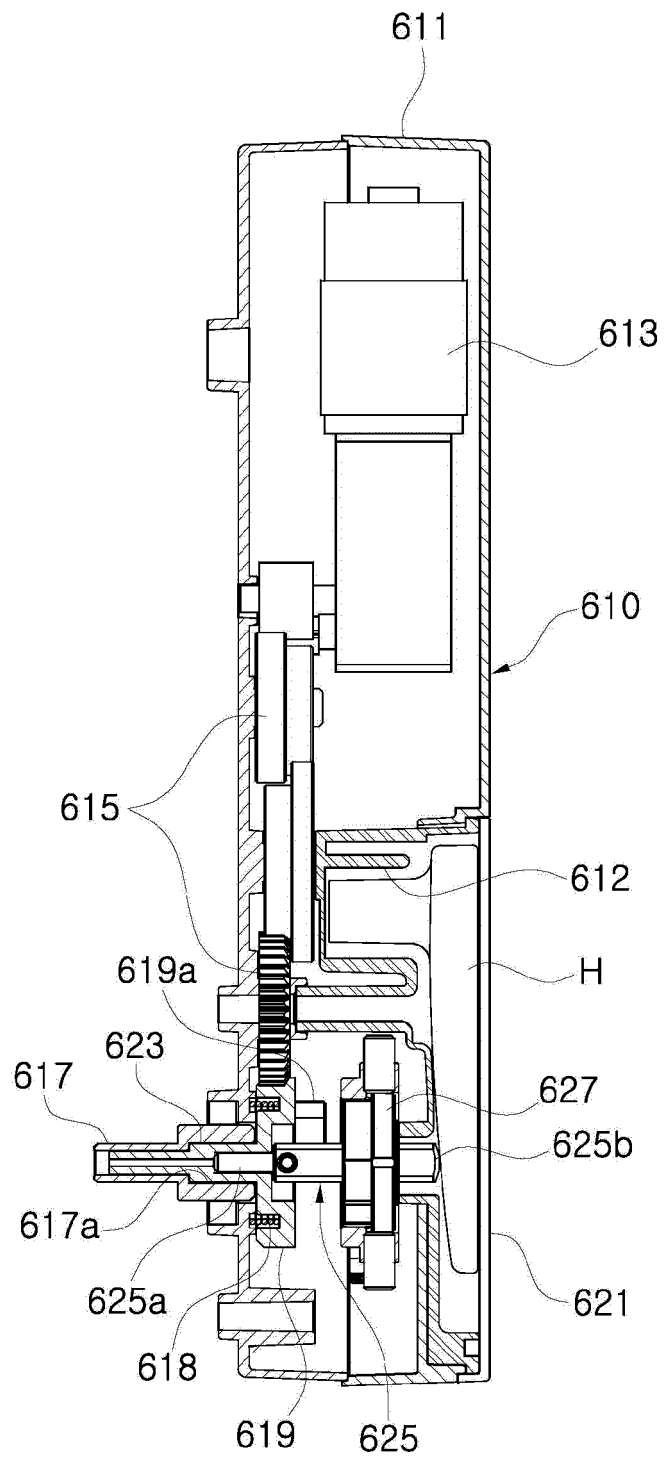
【FIG. 3】



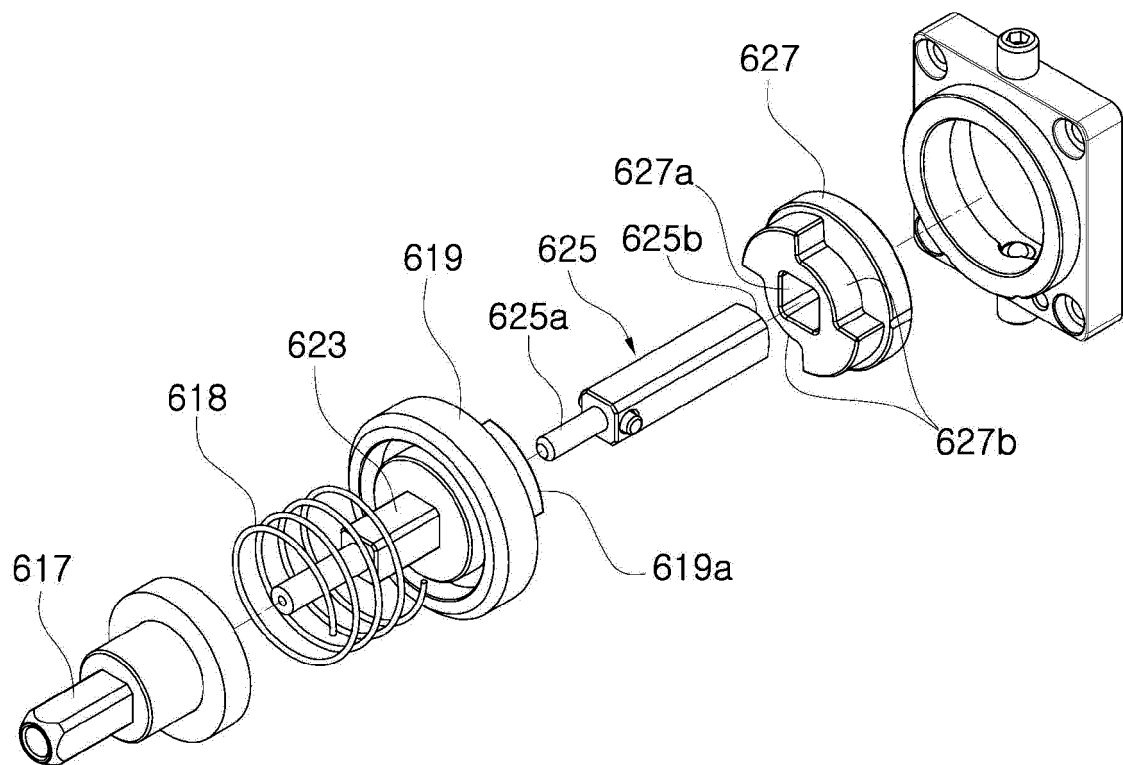
【FIG. 4】



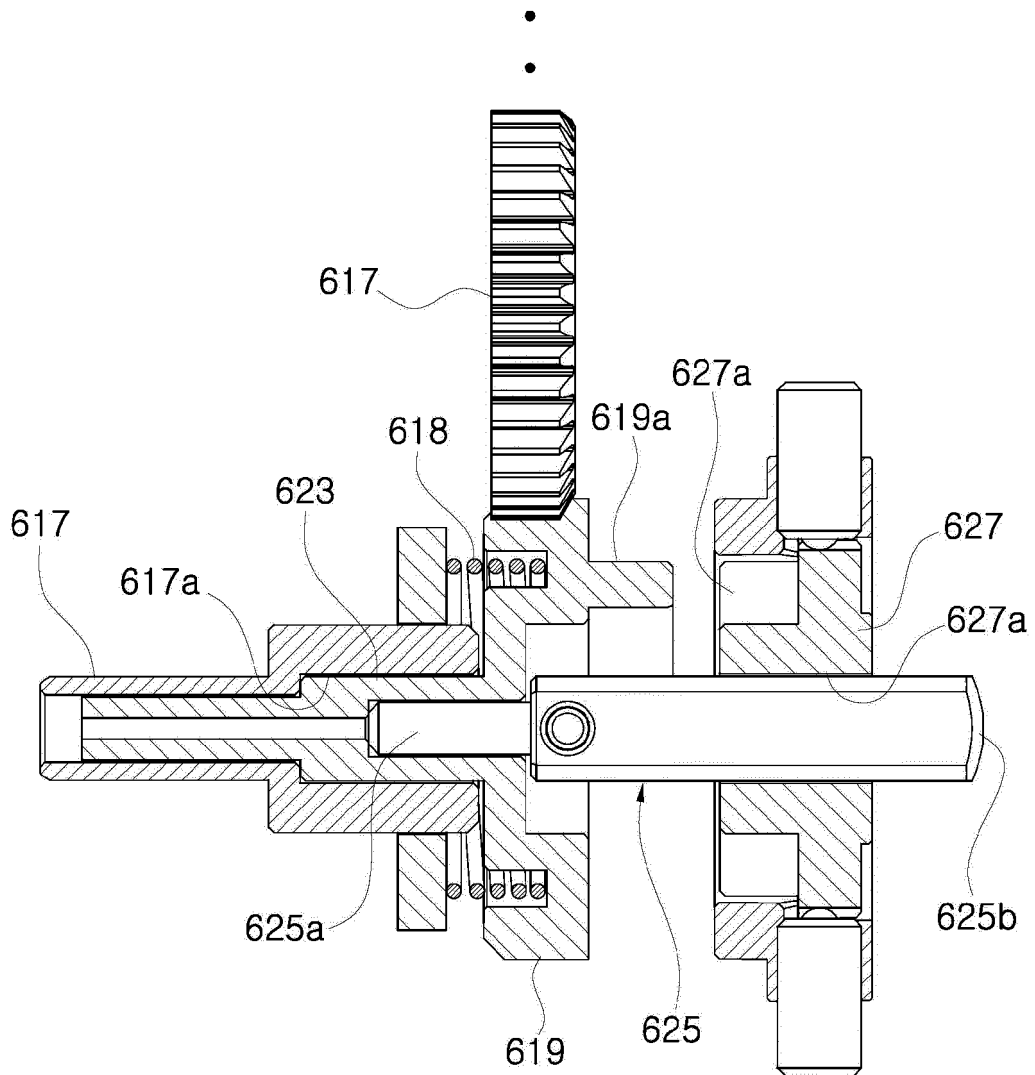
【FIG. 5】



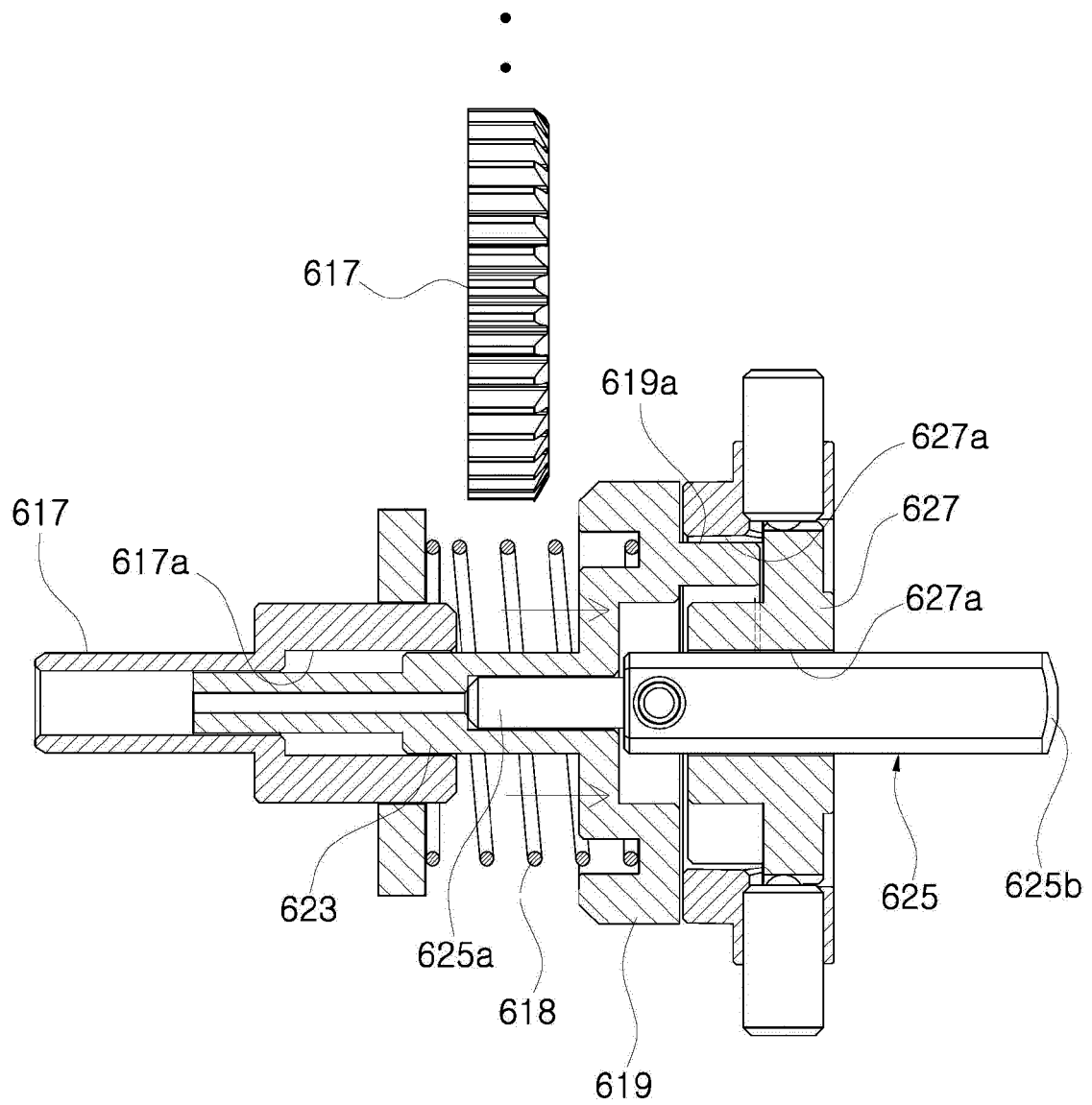
【FIG. 6】



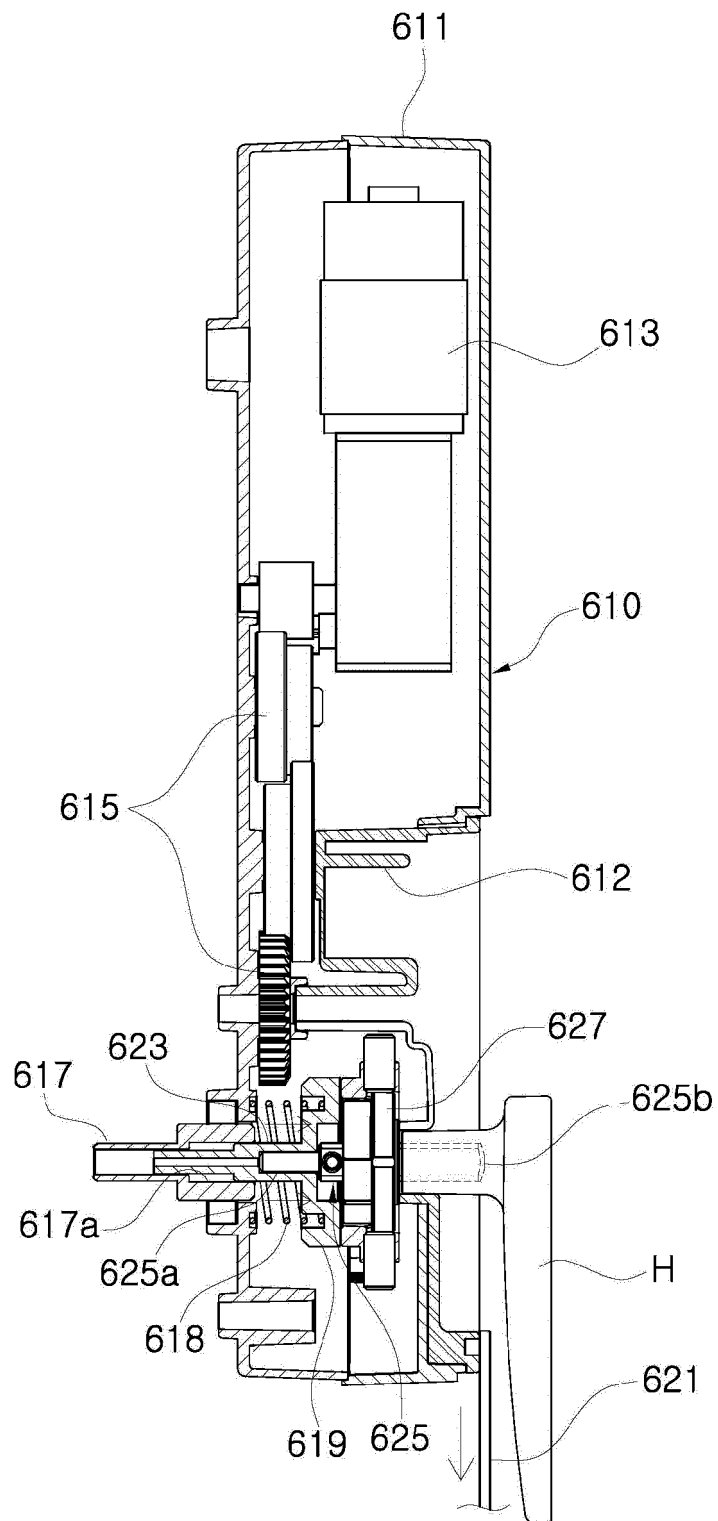
【FIG. 7a】



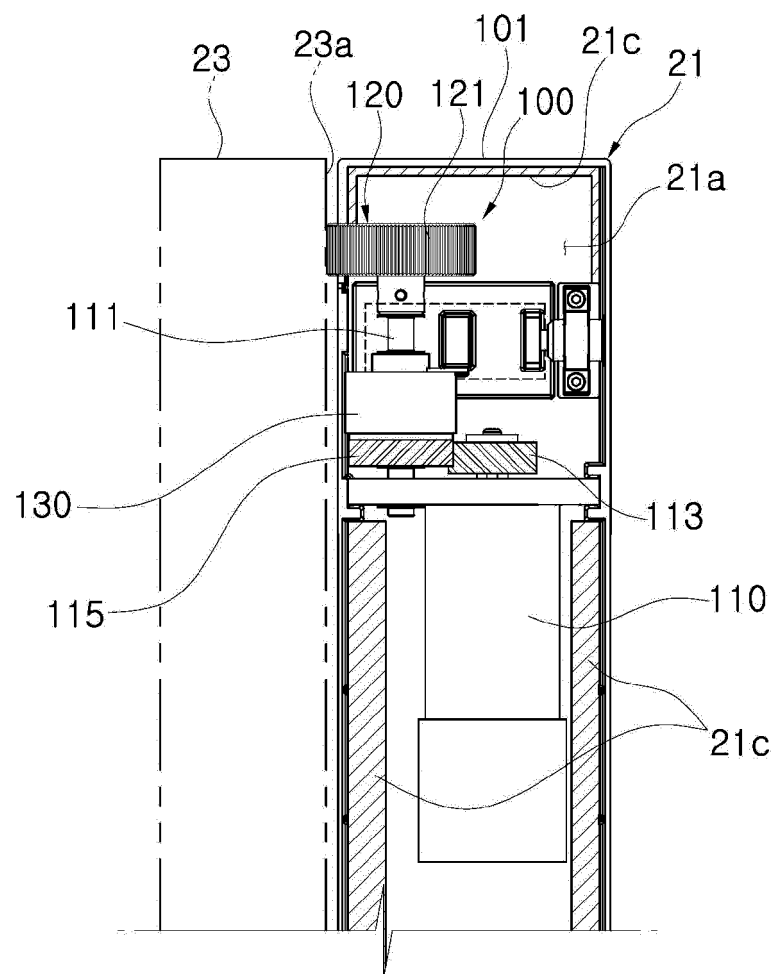
【FIG. 7b】



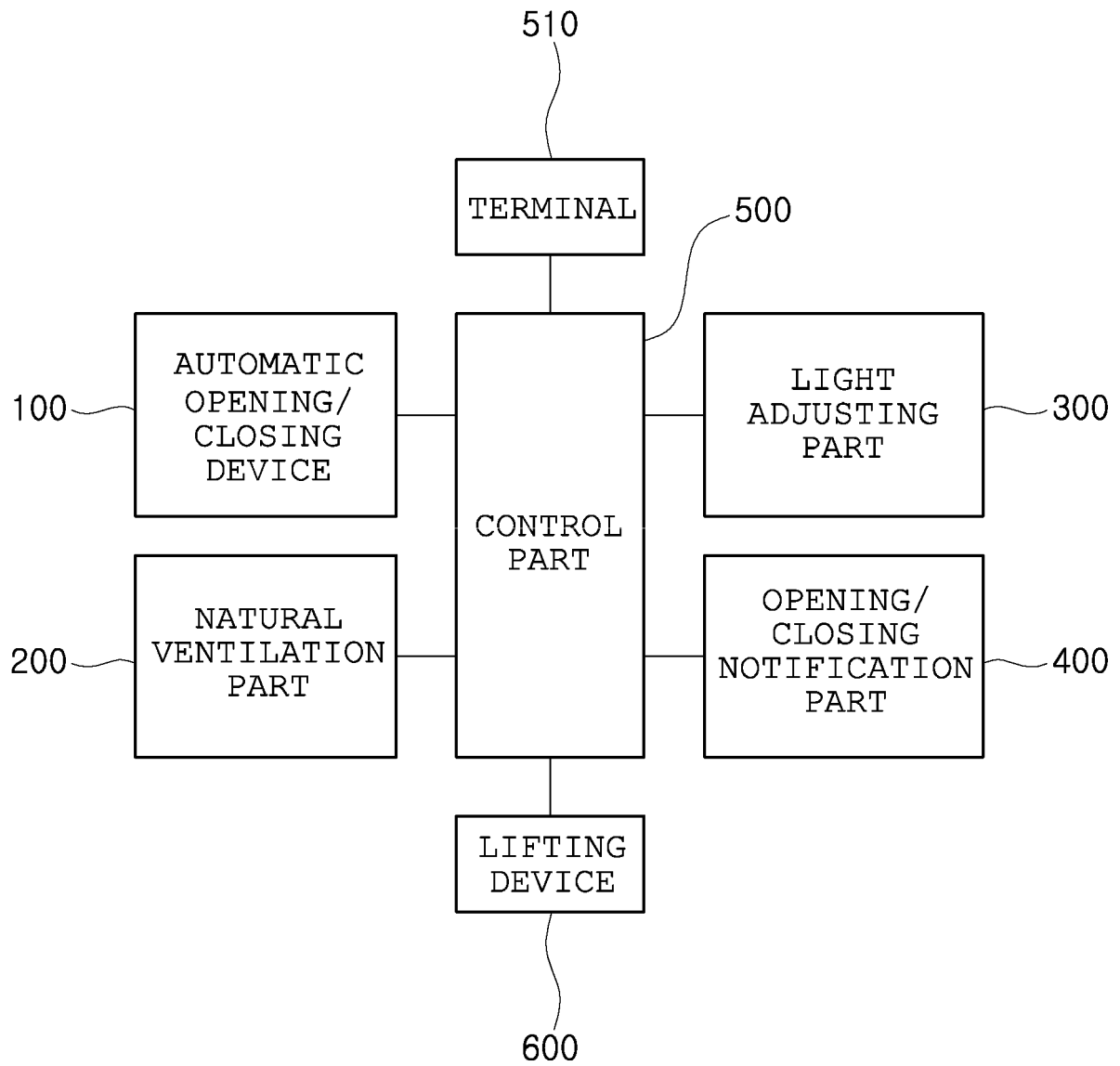
【FIG. 8】



【FIG. 9】



【FIG. 10】



INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2016/009162

A. CLASSIFICATION OF SUBJECT MATTER

E05F 15/632(2014.01)i, E05D 15/06(2006.01)i, E06B 3/46(2006.01)i

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)

E05F 15/632; G08B 17/10; E05D 15/16; E05F 15/70; E05B 65/10; E05B 47/00; E05F 15/10; E06B 7/084; E05F 11/42; E05F 15/665; E05D 15/06; E06B 3/46

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

Korean Utility models and applications for Utility models: IPC as above

Japanese Utility models and applications for Utility models: IPC as above

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

eKOMPASS (KIPO internal) & Keywords: lifting, handle drive part, drive motor, shaft, gear train, clutch gear, cover, elastic member, spindle, operating rod, connecting link, slider, roller, automatic opening/closing device

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	KR 20-0196516 Y1 (KIM, Jong Hoon) 15 September 2000 See abstract, pages 3-4 and figures 1, 3, 5a, 5b.	1,3,4
Y		5-10
A		2
Y	KR 10-2010-0034376 A (RO, Soung Hoan et al.) 01 April 2010 See abstract, paragraphs [0007]-[0014] and figure 1.	5-10
Y	JP 2000-310068 A (NISHIMURA, Koki et al.) 07 November 2000 See abstract, paragraphs [0023]-[0027], [0030], claims 1, 3 and figures 1-3.	6-10
Y	KR 20-2010-0013043 U (CHA, Bong Sang et al.) 31 December 2010 See abstract, paragraph [0045] and claim 2.	9
A	KR 10-2006-0025389 A (HANWHA GENERAL CHEMICAL CO., LTD.) 21 March 2006 See abstract, paragraphs [0031]-[0034] and figure 2.	1-10

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

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

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

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

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search

25 NOVEMBER 2016 (25.11.2016)

Date of mailing of the international search report

25 NOVEMBER 2016 (25.11.2016)

Name and mailing address of the ISA/KR


 Korean Intellectual Property Office
 Government Complex-Daejeon, 189 Seonsa-ro, Daejeon 302-701,
 Republic of Korea

Facsimile No. 82-42-472-7140

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2016/009162

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

- Group 1 (claims 1-4): a handle operation part for a lifting device
 Group 2 (claim 5): a lifting device comprising any one of handle operation part of claims 1-4
 Group 3 (claims 6-10): a smart window comprising the lifting device in claim 5

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☒ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

Form PCT/ISA/210 (continuation of first sheet (2)) (January 2015)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/KR2016/009162

Patent document cited in search report	Publication date	Patent family member	Publication date
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KR 20-2010-0013043 U	31/12/2010	NONE	
KR 10-2006-0025389 A	21/03/2006	KR 10-0585457 B1	07/06/2006

Form PCT/ISA/210 (patent family annex) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

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