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(54) **Title**: BATTERY-POWERED MOTORIZED WINDOW TREATMENT HAVING A SERVICE POSITION

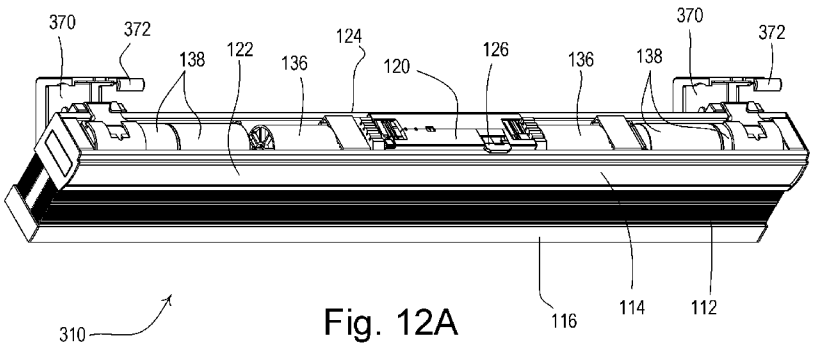

Fig. 12A

(57) **Abstract**: A battery-powered motorized window treatment (310) for covering at least a portion of a window may be adjusted into a service position to allow for access to at least one battery (138) that is powering the motorized window treatment (310). A headrail of the motorized window treatment may be adjusted to the service position to allow for easy replacement of the batteries (138) without unmounting the headrail8114) and without requiring tools. The motorized window treatment (310) may comprise brackets (370) having buttons (372) that may be actuated to release the headrail (114) from a locked position, such that the headrail (114) may be rotated into the service position. The headrail (114) easily rotates through a controlled movement into the service posi - tion, such that a user only needs one free hand available to move the motorized window treatment (310) into the service position and change the batteries (138).

WO 2012/125420 A1

BATTERY-POWERED MOTORIZED WINDOW TREATMENT HAVING A SERVICE POSITION

BACKGROUND OF THE INVENTION

Cross-Reference to Related Applications

[0001] This application is a non-provisional application of commonly-assigned U.S. Provisional Application No. 61/451,960, filed March 11, 2011, and U.S. Provisional Application No. 61/530,799, filed September 2, 2011, and U.S. Provisional Application No. 61/547,319, filed October 14, 2011, all entitled MOTORIZED WINDOW TREATMENT, the entire disclosures of which are hereby incorporated by reference.

Field of the Invention

[0002] The present invention relates to a motorized window treatment, and more specifically, to a battery-powered motorized window blind system having a service position to allow for easy removal and installation of batteries.

Description of the Related Art

[0003] Motorized window treatments typically include a flexible fabric or other means for covering a window in order to block or limit the daylight entering a space and to provide privacy. The motorized window treatments may comprise roller shades, cellular shades, Roman shades, Venentian blinds, and draperies. The motorized window treatments include a motor drive for movement of the fabric in front of the window to control the amount of the window that is covered by the fabric. For example, a motorized roller shade includes a flexible shade fabric wound onto an elongated roller tube with an electronic drive unit installed in the roller tube. The electronic drive unit includes a motor, such as a direct-current (DC) motor, which is operable to rotate the roller tube upon being energized by a DC voltage.

[0004] Prior art electronic drive units are typically powered directly from an AC mains line voltage (e.g., 120 VAC) or from a low-voltage DC voltage (e.g., approximately 24 VDC) provided by an external transformer. Unfortunately, this requires that electrical wires to be run from the power source to the electronic drive unit. Running additional AC main line voltage wiring to the electronic drive unit can be very expensive, due to the cost of the additional electrical wiring as well as the cost of installation. Typically, installing new AC main line voltage wiring requires a licensed electrician to perform the work. In addition, if the pre-existing wiring runs behind a fixed ceiling or wall (e.g., one comprising plaster or expensive hardwood), the electrician may need to breach the ceiling or wall to install the new electrical wiring, which will thus require subsequent repair. In some installations where low Fvoltage (e.g., from a low-voltage DC transformer) is used to the power the electronic drive unit, the electrical wires have been mounted on an external surface of a wall or ceiling between the electronic drive unit and the transformer, which is plugged into an electrical receptacle. However, this sort of installation requires the permanent use of one of the outlets of the electrical receptacle and is aesthetically unpleasing due to the external electrical wires.

[0005] Therefore, some prior art motorized window treatments have been battery powered, such that the motorized window treatments may be installed without requiring any additional wiring. Examples of prior art battery-powered motorized window treatments are described in greater detail in U.S. Patent No. 5,883,480, issued March 16, 1999, entitled WINDOW COVERING WITH HEAD RAIL-MOUNTED ACTUATOR; U.S. Patent No. 5,990,646, issued November 23, 2009, entitled REMOTELY-CONTROLLED BATTERY POWERED-WINDOW COVERING HAVING POWER SAVING RECEIVER; and U.S. Patent No. 7,389,806, issued June 24, 2008, entitled MOTORIZED WINDOW SHADE SYSTEM; the entire disclosures of which are hereby incorporated by reference.

[0006] However, the typical prior art battery-powered motorized window treatments have suffered from poor battery life (such as, one year or less), and have required batteries that are difficult and expensive to replace. Thus, there is a need for a low-cost battery-powered motorized window treatment that has longer battery life and makes battery power practical and convenient for the end user.

SUMMARY OF THE INVENTION

[0007] The present invention provides a low-cost, quiet, battery-powered motorized window treatment for controlling the position of a covering material that is adapted to hang in front of an opening, such as a window. The motorized window treatment is powered by batteries that are not expensive to replace and have a much longer (and more practical) lifetime than the typical prior art battery-powered motorized window treatment (e.g., approximately three years). The batteries are located inside a headrail of the motorized window treatment and thus out of view of a user of the motorized window treatment. The headrail may be adjusted to a service position to provide access to the batteries to allow for easy replacement of the batteries without unmounting the headrail. No tools are required to move the motorized window treatment into the service position, and the headrail easily rotates through a controlled movement into the service position. The user only needs one free hand available to move the motorized window treatment into the service position and change the batteries, such that the other hand may be used to balance the user, for example, by holding onto a ladder.

[0008] According to an embodiment of the present invention, a battery-powered motorized window treatment is adapted to be mounted to a surface for covering at least a portion of a window and may be adjusted into a service position to allow for access to at least one battery that is powering the motorized window treatment. The motorized window treatment comprises a covering material, a motor drive unit adapted to control the covering material between a fully-opened and a fully-closed position, a headrail adapted to be disposed near the top of the opening (such that the covering material descends from the headrail), and at least one mounting bracket for coupling the headrail to the surface. The head rail includes a compartment for receiving the at least one battery for powering the motor drive unit. The mounting bracket remains coupled to the surface and the headrail remains coupled to the mounting bracket when the motorized window treatment is in the service position.

[0009] In addition, a mounting bracket for a motorized window treatment that is adapted to be mounted to a surface and includes a covering material adapted to hang from a headrail to cover at least a portion of a window is also described herein. The mounting bracket comprises a mounting portion adapted to be fastened to the surface, and a rotating portion that is coupled to a topside of the headrail and comprises a clip adapted to be coupled to a bottom side of the headrail. The mounting bracket further comprises an axel for rotatably coupling the rotating

portion to the mounting portion, such that the rotating potion pivots about the axle with respect to the mounting portion. The axle is located below the clip of the rotating portion, such that the center of gravity of the headrail is adapted to cause the headrail to rotate away from the window on its own.

[0010] According to another embodiment of the present invention, a battery-powered motorized window treatment comprises: (1) a covering material for the window; (2) a motor drive unit adapted to control the covering material between a fully-opened and fully-closed position; (3) a head rail from which the covering material descends, for disposition across the top of the window, the head rail including a space for receiving at least one battery for powering the motor drive unit. The head rail has a mechanism for allowing the rail to move outwardly away from the window and tilt downwardly to expose the space to allow the at least one battery to be installed or removed.

[0011] Other features and advantages of the present invention will become apparent from the following description of the invention that refers to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] The invention will now be described in greater detail in the following detailed description with reference to the drawings in which:

[0013] Fig. 1 is a perspective view of a motorized window treatment system having a battery-powered motorized window treatment and a remote control according to a first embodiment of the present invention;

[0014] Fig. 2 is a perspective view of the battery-powered motorized window treatment of Fig. 1 in a full-opened position;

[0015] Fig. 3 is a right side view of the battery-powered motorized window treatment of Fig. 1;

[0016] Fig. 4 is a front view of the battery-powered motorized window treatment of Fig. 1;

[0017] Fig. 5 is a simplified block diagram of a motor drive unit of the motorized window treatment of Fig. 1;

[0018] Fig. 6A is a perspective view of the motorized window treatment of Fig. 1 as the motorized window treatment is being moved to a service position according to a first embodiment of the present invention;

[0019] Fig. 6B is a right side view of the motorized window treatment of Fig. 1 as the motorized window treatment is being moved to the service position according to the first embodiment of the present invention;

[0020] Fig. 7A is a perspective view of the motorized window treatment of Fig. 1 when the motorized window treatment is in the service position according to the first embodiment of the present invention;

[0021] Fig. 7B is a right side view of the motorized window treatment of Fig. 1 when the motorized window treatment is in the service position according to the first embodiment of the present invention;

[0022] Fig. 8 is an enlarged perspective view of one end of the motorized window treatment of Fig. 1 showing how a screw is received in a channel of an endcap of the motorized window treatment;

[0023] Fig. 9 is a perspective view of a motorized window treatment as the motorized window treatment is being moved to a service position according to an alternate embodiment of the present invention;

[0024] Fig. 10 is a perspective view of the motorized window treatment of Fig. 8 when the motorized window treatment is in the service position according to the alternate embodiment of the present invention;

[0025] Figs. 11A is a perspective view of a motorized window treatment having mounting brackets for rotating the motorized window treatment into a service position according to a third embodiment of the present invention;

[0026] Fig. 11B is a right side view of the motorized window treatment of Fig. 11A;

[0027] Fig. 12A is a perspective view of the motorized window treatment of Fig. 11A in the service position according to the third embodiment of the present invention;

[0028] Fig. 12B is a right side view of the motorized window treatment of Fig. 11A in the service position according to the third embodiment of the present invention;

[0029] Fig. 13A is an enlarged perspective view of one of the mounting brackets of the motorized window treatment of Fig. 11A in a locked position;

[0030] Fig. 13B is an enlarged perspective view of the mounting bracket of Fig. 13A in the service position;

[0031] Fig. 14A is a top view of one of the mounting brackets of Fig. 13A in the locked position showing a latch mechanism in greater detail;

[0032] Fig. 14B is a top view of the mounting bracket of Fig. 13A as a release button is being actuated to release mounting bracket from the locked position;

[0033] Figs. 15A and 15B are enlarged perspective views of a mounting bracket for the motorized window treatment of Fig. 11A shown in a locked position and a service position, respectively according to an alternate embodiment of the present invention; and

[0034] Figs. 16A and 16B are left side cross-sectional views of the mounting bracket of Figs. 15A and 15B shown in the locked position and the service position, respectively.

DETAILED DESCRIPTION OF THE INVENTION

[0035] The foregoing summary, as well as the following detailed description of the preferred embodiments, is better understood when read in conjunction with the appended drawings. For the purposes of illustrating the invention, there is shown in the drawings an embodiment that is presently preferred, in which like numerals represent similar parts throughout the several views of the drawings, it being understood, however, that the invention is not limited to the specific methods and instrumentalities disclosed.

[0036] Fig. 1 is a perspective view of a motorized window treatment system 100 having a battery-powered motorized window treatment 110 mounted in an opening 102, for example, in

front of a window 104 according to an embodiment of the present invention. The battery-powered motorized window treatment 110 comprises a covering material, for example, a cellular shade fabric 112 as shown in Fig. 1. The cellular shade fabric 112 has a top end connected to a headrail 114 (that extends between two mounting plates 115) and a bottom end connected to a weighting element 116. The mounting plates 115 may be connected to the sides of the opening 102 as shown in Fig. 1, such that the cellular shade fabric 112 is able to hang in front of the window 104, and may be adjusted between a fully-open position $P_{FULLY\text{-}OPEN}$ and a fully-closed position $P_{FULLY\text{-}CLOSED}$ to control the amount of daylight entering a room or space. Alternatively, the mounting plates 115 of the battery-powered motorized window treatment 110 could be mounted externally to the opening 102 (e.g., above the opening) with the shade fabric 112 hanging in front of the opening and the window 104. In addition, the battery-powered motorized window treatment 110 could alternatively comprise other types of covering materials, such as, for example, a plurality of horizontally-extending slats (i.e., a Venetian or Persian blind system), pleated blinds, a roller shade fabric, or a Roman shade fabric. The motorized window treatment system 100 comprises an infrared (IR) remote control 118 for controlling the operation of the motorized window treatment 110.

[0037] Fig. 2 is a perspective view and Fig. 3 is a right side view of the battery-powered motorized window treatment 110 with the cellular shade fabric 112 in the fully-open position $P_{FULLY\text{-}OPEN}$. The motorized window treatment 110 comprises a motor drive unit 120 for raising and lowering the weighting element 116 and the cellular shade fabric 112 between the fully-open position $P_{FULLY\text{-}OPEN}$ and the fully-closed position $P_{FULLY\text{-}CLOSED}$. By controlling the amount of the window 104 covered by the cellular shade fabric 112, the motorized window treatment 110 is able to control the amount of daylight entering the room. The headrail 114 of the motorized window treatment 110 comprises an internal side 122 and an opposite external side 124, which faces the window 104 that the shade fabric 112 is covering. The motor drive unit 120 comprises an actuator 126, which is positioned adjacent the internal side 122 of the headrail 114 may may be actuated when a user is configuring the motorized window treatment 110. The actuator 126 may be made of, for example, a clear material, such that the actuator may operate as a light pipe to conduct illumination from inside the motor drive unit 120 to thus be provide feedback to the user of the motorized window treatment 110. In addition, the actuator 126 may also function as an IR-receiving lens for directing IR signals transmitted by the IR remote control 118 to an IR receiver 166 (Fig. 11) inside the motor drive unit 120. The motor drive unit 120 is

operable to determine a target position P_{TARGET} for the weighting element 116 in response to commands included in the IR signals received from the remote control 118 and to subsequently control a present position P_{PRES} of the weighting element to the target position P_{TARGET}. As shown in Fig. 2, a top side 128 of the headrail 114 is open, such that the motor drive unit 120 may be positioned inside the headrail and the actuator 126 may protrude slightly over the internal side 122 of the headrail.

[0038] Fig. 4 is a front view of the battery-powered motorized window treatment 110 with a front portion of the headrail 114 removed to show the motor drive unit 120. The motorized window treatment 110 comprises lift cords 130 that extend from the headrail 114 to the weighting element 116 for allowing the motor drive unit 120 to raise and lower the weighting element. The motor drive unit 120 includes an internal motor 150 (Fig. 11) coupled to drive shafts 132 that extend from the motor on each side of the motor and are each coupled to a respective lift cord spool 134. The lift cords 130 are windingly received around the lift cord spools 134 and are fixedly attached to the weighting element 116, such that the motor drive unit 120 is operable to rotate the drive shafts 132 to raise and lower the weighting element. The motorized window treatment 110 further comprises two constant-force spring assist assemblies 135, which are each coupled to the drive shafts 132 adjacent to one of the two lift cord spools 134. Each of the lift cord spools 134 and the adjacent constant-force spring assist assembly 135 are housed in a respective lift cord spool enclosure 136 as shown in Fig. 4. Alternatively, the motor drive unit 120 could be located at either end of the headrail 114 and the motorized window treatment 110 could comprise a single drive shaft that extends along the length of the headrail and is coupled to both of the lift cord spools 134.

[0039] The battery-powered motorized window treatment 110 also comprises a plurality of batteries 138 (e.g., four D-cell batteries), which are electrically coupled in series. The seris-combination of the batteries 138 is coupled to the motor drive unit 120 for powering the motor drive unit. The batteries 138 are housed inside the headrail 114 and thus out of view of a user of the motorized window treatment 110. Specifically, the batteries 138 are mounted in two battery holders 139 located inside the headrail 114, such that there are two batteries in each battery holder as shown in Fig. 4. According to the embodiments of the present invention, the batteries 138 provide the motorized window treatment 110 with a practical lifetime (e.g., approximately three years), and are typical "off-the-shelf" batteries that are easy and not

expensive to replace. Alternatively, the motor drive unit 120 could comprise more batteries (e.g., six or eight) coupled in series or batteries of a different kind (e.g., AA batteries) coupled in series.

[0040] Fig. 5 is a simplified block diagram of the motor drive unit 120 of the battery-powered motorized window treatment 110. The motor drive unit 120 comprises a controller 152 for controlling the operation of the motor 150, which may comprise, for example, a DC motor. The controller 152 may comprise, for example, a microprocessor, a programmable logic device (PLD), a microcontroller, an application specific integrated circuit (ASIC), a field-programmable gate array (FPGA), or any suitable processing device or control circuit. The controller 152 is coupled to an H-bridge motor drive circuit 154 for driving the motor 150 via a set of drive signals V_{DRIVE} to control the weighting element 116 and the cellular shade fabric 112 between the fully-open position $P_{FULLY\text{-}OPEN}$ and the fully-closed position $P_{FULLY\text{-}CLOSED}$. The controller 152 is operable to rotate the motor 150 at a constant rotational speed by controlling the H-bridge motor drive circuit 154 to supply a pulse-width modulated (PWM) drive signal having a constant duty cycle to the motor. The controller 152 is able to change the rotational speed of the motor 150 by adjusting the duty cycle of the PWM signal applied to the motor and to change the direction of rotation of the motor by changing the polarity of the PWM drive signal applied to the motor.

[0041] The controller 152 receives information regarding the rotational position and direction of rotation of the motor 150 from a rotational position sensor, such as, for example, a transmissive optical sensor circuit 156. The rotational position sensor may also comprise other suitable position sensors, such as, for example, Hall-effect, optical or resistive sensors. The controller 152 is operable to determine a rotational position of the motor 150 in response to the transmissive optical sensor circuit 156, and to use the rotational position of the motor to determine a present position P_{PRES} of the weighting element 116. The controller 152 may comprise an internal non-volatile memory (or alternatively, an external memory coupled to the controller) for storage of the present position P_{PRES} of the shade fabric 112, the fully open position $P_{FULLY\text{-}OPEN}$, and the fully closed position $P_{FULLY\text{-}CLOSED}$. The operation of the H-bridge motor drive circuit 154 and the use of sensor devices to track the direction and speed of the motor drive unit 120 is described in greater detail in commonly-assigned U.S. Patent 5,848,634, issued December 15, 1998, entitled MOTORIZED WINDOW SHADE SYSTEM, and commonly-

assigned U.S. Patent No. 6,497,267, issued December 24, 2002, entitled MOTORIZED WINDOW SHADE WITH ULTRAQUIET MOTOR DRIVE AND ESD PROTECTION, the entire disclosures of which are herein incorporated by reference.

[0042] As previously mentioned, the motor drive unit 120 receives power from the series-coupled batteries 138, which provide a battery voltage V_{BATT}. For example, the batteries 138 may comprise D-cell batteries having rated voltages of approximately 1.5 volts, such that the battery voltage V_{BATT} has a magnitude of approximately 6 volts. The H-bridge motor drive circuit 154 receives the battery voltage V_{BATT} for driving the motor 150. The motor drive unit 120 further comprises a power supply 158 (e.g., a linear regulator) that receives the battery voltage V_{BATT} and generates a DC supply voltage V_{CC} (e.g., approximately 3.3 volts) for powering the controller 152 and other low-voltage circuitry of the motor drive unit.

[0043] The motor drive unit 120 comprises an internal temperature sensor 160 that is located adjacent the internal side 122 of the headrail 114 (i.e., a room-side temperature sensor), and a external temperature sensor 162 that is located adjacent the external side 124 of the headrail (i.e., a window-side temperature sensor). The room-side temperature sensor 160 is operable to measure an interior temperature T_{INT} inside the room in which the motorized window treatment 110 is installed, while the external temperature sensor 162 is operable to measure an exterior temperature T_{EXT} between the headrail 114 and the window 104. The motor drive unit 120 further comprises a photosensor 164, which is located adjacent the external side 124 of the headrail 114, and is directed to measure the amount of sunlight that may be shining on the window 104. Alternatively, the exterior (window-side) temperature sensor 162 may be implemented as a sensor label (external to the headrail 114 of the battery powered motorized window treatment 110) that is operable to be affixed to an inside surface of a window. The sensor label may be coupled to the motor drive unit 120 through low voltage wiring (not shown).

[0044] The controller 152 receives inputs from the internal temperature sensor 160, the external temperature sensor 162, the photosensor 164, and the IR receiver 166. The controller 152 may operate in an eco-mode to control the position of the weighting element 116 and the cellular shade fabric 112 in response to the internal temperature sensor 160, the external temperature sensor 162, and the photosensor 164, so as to provide energy savings. When operating in the eco-mode, the controller 152 adjusts the amount of the window 104 covered by the cellular shade fabric 112 to attempt to save energy, for example, by reducing the amount of

electrical energy consumed by other control systems in the building in which the motorized window treatment 110 is installed. For example, the controller 152 may adjust the present position P_{PRES} of the weighting element 116 to control the amount of daylight entering the room in which the motorized window treatment 110 is installed, such that lighting loads in the room may be turned off or dimmed to thus save energy. In addition, the controller 152 may adjust the present position P_{PRES} of the weighting element 116 to control the heat flow through the window 104 in order to lighten the load on the heating, air-conditioning, and ventilation (HVAC) system in the building in which the motorized window treatment 110 is installed.

[0045] A user of the window treatment system 100 is able to adjust the position of the weighting element 116 and the cellular shade fabric 112 by using the remote control 118 to transmit commands to the motor drive unit 120 via the IR signals. The IR receiver 166 receives the IR signals and provides an IR data control signal $V_{IR\text{-}DATA}$ to the controller 152, such that the controller is operable to receive the commands from the remote control 118. The controller 152 is operable to put the IR receiver 166 to sleep (i.e., disable the IR receiver) and to periodically wake the IR receiver up (i.e., enable the IR receiver) via an IR enable control signal $V_{IR\text{-}EN}$, as will be described in greater detail below. An example of an IR control system is described in greater detail in U.S. Patent No. 6,545,434, issued April 8, 2003, entitled MULTI-SCENE PRESET LIGHTING CONTROLLER, the entire disclosure of which is hereby incorporated by reference. Alternatively, the IR receiver 166 could comprise a radio-frequency (RF) receiver or transceiver for receiving RF signals transmitted by an RF remote control. Examples of RF control systems are described in greater detail in commonly-assigned U.S. Patent Application No. 12/033,223, filed February 19, 2008, entitled COMMUNICATION PROTOCOL FOR A RADIO-FREQUENCY LOAD CONTROL SYSTEM, and U.S. Patent Application No. 13/415,084 filed March 8, 2012, entitled MOTORIZED WINDOW TREATMENT, the entire disclosures of which are hereby incorporated by reference.

[0046] To allow the user to change the batteries 138 when needed, the motorized window treatment 110 is operable to be adjusted to a service position, in which the open top of the headrail 114 is positioned to allow for easy access to the batteries. Fig. 6A is a perspective view and Fig. 6B is a right side view of the motorized window treatment 110 as the motorized window treatment is being moved to the service position according to a first embodiment of the present invention. Fig. 7A is a perspective view and Fig. 7B is a right side view of the motorized

window treatment 110 when the motorized window treatment is in the service position according to the first embodiment of the present invention. The motorized window treatment 110 comprises two endcaps 170 located at each side of the headrail 114. The endcaps 170 each comprise a channel 172, which receives a screw 174 (i.e., a protuberance or pin) that extends through an opening 175 (Fig. 8) in the adjacent mounting bracket 115. Fig. 8 is an enlarged perspective view of one end of the motorized window treatment 110 showing how the screw 174 is received in the channel 172 of the endcap 170. When the motorized window treatment 110 is in a normal position (as shown in Fig. 3), each screw 174 rests in an end 176 of the respective channel 172, such that the headrail 114 is held in position between the mounting brackets 115 and the shade fabric 112 hangs vertically below the headrail.

[0047] When the batteries 138 need to be accessed, the headrail 114 may be lifted up by a user, such that the screws 174 are no longer positioned in the respective ends 176 and may travel through the channels 172 as shown in Fig. 6B. Each screw 172 may then come to rest in an elbow 178 of the respective channel 172 as shown in Fig. 7B, such that the motorized window treatment 110 is in the service position. When in the service position, the headrail 114 is operable to pivot about the screws 174 in the respective elbows 178 to allow the user to access the batteries 138 from the top of the headrail. To remove the headrail 114 from the mounting brackets 115, the user may lift the headrail 114 to move the screws 174 through the respective channels 172 and out of respective channel openings 179.

[0048] Accordingly, the headrail 114 is adapted to be moved down and away from the window 104 and into the service position, so that the headrail may then be tilted to allow the user to access the batteries 138 without the use of tools. Since the headrail 114 is moved horizontally away from the window 104 when in the service position, there is room between the headrail and the window in which the shade fabric 112 may be located when the top of the headrail 114 is rotated towards the user.

[0049] Figs. 9 and 10 are perspective views of a motorized window treatment 210 according to a second embodiment of the present invention. The motorized window treatment 210 of the second embodiment comprises a headrail 214 that may be pulled out in a horizontal direction away from the window 104 and then rotated into a service position to allow access to the batteries 138. The motorized window treatment 210 comprises top mounting brackets 215 located over the top of the headrail 214, and plates 219 that are received in the mounting

brackets. The user is operable to pull the headrail 214 away from the window 104, such that the plates 219 slide through the mounting brackets 215 as shown in Fig. 9. The plates 219 are then able to pivot with respect to the mounting brackets 215, such that the top of the headrail 214 may be rotated towards the user to allow access to the batteries 138 located in the headrail as shown in Fig. 10.

[0050] Figs. 11A is a perspective view and Fig. 11B is a right side view of a motorized window treatment 310 having mounting brackets 370 for rotating the motorized window treatment into a service position according to a third embodiment of the present invention. Fig. 12A is a perspective view and Fig. 12B is a right side view of the motorized window treatment 310 when the motorized window treatment 310 is in the service position according to the third embodiment of the present invention. Each mounting bracket 370 of the motorized window treatment 310 comprises a release button 372, which may be actuated (e.g., pushed) to release the headrail 114 from a locked position (as shown in Figs. 11A and 11B), such that the headrail 114 may be rotated into the service position and the batteries 138 may be accessed (as shown in Figs. 12A and 12B). The release buttons 372 are located above the headrail 114 and protrude slightly over the internal side 122 of the headrail, such that the buttons are partially hidden from view when the motorized window treatment 310 is installed. The release buttons 372 may be labeled with appropriate text (such as "push") to inform the user of the required action to release the motorized window treatment 310 from the locked position. The headrail 114 is flexible enough, such that the buttons 372 of the mounting brackets 370 may be actuated one at a time in order to release the headrail from the locked position. Accordingly, no tools are required to release the motorized window treatment 310 from the locked position to enter the service position. Alternatively, the release buttons 372 may be implemented as pull-tabs or the motorized window treatment 310 could comprise latches that require tools to be unlatched.

[0051] Fig. 13A is an enlarged perspective view of one of the mounting brackets 370 in the locked position. Fig. 13B is an enlarged perspective view of the mounting bracket 370 in the service position. The mounting bracket 370 comprises a fixed mounting portion 374 and a rotating portion 375 that is rotatably coupled to the mounting portion 374 via an axle rod 376. The mounting potion 374 is adapted to be fastened to a vertical surface (e.g., a wall) via screws (not shown) received through mounting holes 378 or to be fastened to a horizontal surface (e.g., a ceiling or the top of an opening) via screws received through mounting holes 379. The rotating

portion 374 is adapted to be connected to the headrail 114 of the motorized window treatment 310 via a lip 380 and a clip 382. Specifically, the internal side 122 of the headrail 114 is adapted to rest on the lip 380 (as shown in Fig. 12A) and the bottom side of the external side 124 of the headrail is adapted to snap into the clip 382. When a user actuates the release button 372, the rotating portion 374 is operable to pivot about the axle rod 376 thus rotating the top of the headrail 114 towards the user into the service position, such that the batteries 138 may be accessed.

[0052] As shown in Fig. 11B, the axle rod 376 about which the rotating portion 374 pivots is located below the headrail 114, such that when the motorized window treatment 310 is released from the locked position, the center of gravity of the headrail causes the top of the headrail to rotate down on its own (i.e., without the need for the user to physically rotate the top of the headrail towards the user) with or without the batteries 138 installed in the headrail. The axle rod 376 is positioned above the weighting element 116 (i.e., behind the cellular shade fabric 112) when the motorized window treatment 310 is in the fully-open position $P_{FULLY\text{-}OPEN}$, such that the mounting brackets 370 cannot be seen by the user.

[0053] Each mounting bracket 370 also comprises a coil spring 384, which is wound around the axle rod 376 and comprises an inside leg 385 that is positioned on the inner side of the rotating portion 375 and an outside leg (not shown) that is positioned on the outer side of the mounting portion 374. The spring 384 operates to provide a controlled movement of the motorized window treatment 310 when the headrail 114 is released from the locked position and the rotating portion 375 rotates about the axle rod 376 into the service position. The spring 384 also limits the distance that the headrail 114 is able to be rotated (e.g., to prevent the batteries 138 from falling out of the headrail). The inside leg 385 contacts the rotating portion 375 and the outside leg contacts the mounting portion 374 to bias the rotating portion towards the mounting portion. The spring 384 is sized such that the headrail 114 rotates down on its own, but does not rotate so far that the batteries 138 are able to fall out of the headrail. Since the user may individually actuate the buttons 372 of the mounting brackets 370 to cause the headrail 114 move into the service position, the user only needs one free hand available to move the motorized window treatment 310 into the service position and change the batteries 138 (i.e., the other hand may be used to balance the user, for example, by holding onto a ladder).

[0054] Each mounting bracket 370 further comprises a latch mechanism 386 coupled to the respective button 372. The latch mechanism 286 locks the rotating portion 375 in the locked position, and releases the rotating portion to allow the headrail 114 to move into the service position in response to an actuation of the release button 372. Fig. 14A is a top view of one of the mounting brackets 370 in the locked position showing the latch mechanism 386 in greater detail. Fig. 14B is a top view of the mounting bracket 370 as the release button 372 is being actuated to release the rotating portion 375 from the locked position. The latch mechanism 386 comprises a notch 388 adapted to contact a locking surface 390 (Fig. 13B) of the rotating portion 375 to hold the rotating portion in the locked position. The latch mechanism 386 further comprises an elongated spring member 392 adapted to push against a wall 394 of the mounting portion 374 to thus keep the notch 388 locked against the locking surface 390. When the release button 372 is pushed in towards the mounting bracket 370, the latch mechanism 386 rotates about a rivet 395, a pin 396 travels through a channel 398 to guide the movement of the latch mechanism, and the spring member 392 flexes against the wall 394. Accordingly, the notch 388 of the latch mechanism 386 no longer contacts the locking surface 390 of the rotating portion 375, such that the rotating portion and the headrail 114 are able to rotate freely about the axle rod 376.

[0055] Figs. 15A and 15B are enlarged perspective views of a mounting bracket 470 for the motorized window treatment 310 according to an alternate embodiment of the present invention. Specifically, the mounting bracket 470 is shown in a locked position in Fig. 15A and in a service position in Fig. 15B. The mounting bracket 470 comprises a release button 472 that may be pushed to release the headrail 114 from the locked position, such that the headrail 114 may be rotated into the service position and the batteries 138 may be accessed. The mounting bracket 470 comprises a fixed mounting portion 474 and a rotating portion 475 that is rotatably coupled to the mounting portion via an axle rod 476. The mounting potion 474 may be mounted to a vertical surface or a horizontal surface via screws (not shown) received through vertical mounting holes 478 or horizontal mounting holes 479, respectively. The rotating portion 474 comprises a lip 480 and a clip 482 for connecting to the headrail 114 of the motorized window treatment 310 in a similar manner as the mounting brackets 370 of the third embodiment. When a user actuates the release button 472, the rotating portion 474 pivots about the axle rod 476 thus rotating the top of the headrail 114 towards the user into the service position, such that the batteries 138 may be accessed.

[0056] The mounting portion 474 comprises two spring arms 484 (one of which is shown in Fig. 15B) that contact the rotating portion 475. Figs. 16A and 16B are left side cross-sectional views of the mounting bracket 470 taken through the center of the left spring arm 484 with the mounting bracket shown in the locked position and the service position, respectively. The spring arms 484 contact cam portions 485 on the rotating portion 475 to provide a controlled movement of the motorized window treatment 310 when the headrail 114 is released from the locked position and the rotating portion rotates about the axle rod 476 into the service position. Alternatively, the rotating portion 475 could comprise one or more spring arms for contacting respective cam portions of the mounting portion 474.

[0057] Referring back to Figs. 15A and 15B, the mounting bracket 470 further comprises a latch mechanism 486 that locks the rotating portion 475 in the locked position, and releases the rotating portion to allow the headrail 114 to move into the service position in response to an actuation of the release button 472. The latch mechanism 486 comprises a notch 488 and an elongated spring member 492 adapted to push against a tab 494 of the mounting portion 474 to hold the notch 488 against a locking surface 490 of the rotating portion 475 to thus hold the rotating portion in the locked position. When the release button 472 is pushed in towards the mounting bracket 470, the latch mechanism 486 rotates and the spring member 492 flexes against the wall 494 until the notch 488 no longer contacts the locking surface 490 of the rotating portion 475 and the rotating portion 475 is able to rotate freely about the axle rod 476.

[0058] While the present invention has been described with reference to the battery-powered motorized window treatment 100 having the cellular shade fabric 112, the concepts of the present invention could be applied to other types of motorized window treatments, such as, for example, Roman shades and Venetian blinds. An example of a Roman shade system is described in greater detail in commonly-assigned U.S. Patent Application No. 12/784,096, filed March 20, 2010, entitled ROMAN SHADE SYSTEM, the entire disclosure of which is hereby incorporated by reference. An example of a Venetian blind system is described in greater detail in commonly-assigned U.S. Provisional Patent Application No. 61/384,005, filed September 17, 2010, entitled MOTORIZED VENETIAN BLIND SYSTEM, the entire disclosure of which is hereby incorporated by reference.

[0059] Although the present invention has been described in relation to particular embodiments thereof, many other variations and modifications and other uses will become

apparent to those skilled in the art. It is preferred, therefore, that the present invention be limited not by the specific disclosure herein, but only by the appended claims.

CLAIMS

What is claimed is:

1. A battery-powered motorized window treatment adapted to be mounted to a surface for covering at least a portion of a window, the motorized window treatment comprising:

a covering material;

a motor drive unit adapted to control the covering material between a fully-opened and a fully-closed position;

a headrail adapted to be disposed near the top of the opening, such that the covering material descends from the headrail, the head rail including a compartment for receiving at least one battery for powering the motor drive unit; and

at least one mounting bracket for coupling the headrail to the surface;

wherein the motorized window treatment is operable to be adjusted into a service position in which access is provided to the at least one battery, the mounting bracket remaining coupled to the surface and the headrail remaining coupled to the mounting bracket when the motorized window treatment is in the service position.

2. The motorized window treatment of claim 1, wherein a topside of the headrail is adapted to be rotated away from the window in the service position.

3. The motorized window treatment of claim 2, wherein the mounting bracket comprises a mounting portion adapted to be fastened to the surface and a rotating portion coupled to the topside of the headrail, the rotating potion adapted to pivot about an axle with respect to the mounting portion to rotate the topside of the headrail away from the window.

4. The motorized window treatment of claim 3, wherein the mounting bracket comprises a latch mechanism for holding the motorized window treatment in a locked position, and a button coupled to the latch mechanism for releasing the motorized window treatment from the locked position and into the service position in response to an actuation of the button.

5. The motorized window treatment of claim 4, wherein the button is positioned above the headrail.

6. The motorized window treatment of claim 4, wherein the button is pushed in towards the headrail to release the motorized window treatment from the locked position.

7. The motorized window treatment of claim 3, wherein the axle is located below the headrail, such that the center of gravity of the headrail causes the headrail to rotate away from the window on its own.

8. The motorized window treatment of claim 7, wherein the mounting bracket further comprises a spring for biasing the rotating portion towards the mounting portion, such that the headrail rotates in a controlled movement when the motorized window treatment is released from the locked position.

9. The motorized window treatment of claim 2, wherein the headrail is adapted to be displaced away from the window and then to be rotated away from the window.

10. The motorized window treatment of claim 9, further comprising:

two mounting brackets coupled to endcaps of the headrail, the endcaps of the headrail comprising channels for receiving pins of the mounting brackets, the headrail adapted to be moved into the service position by causing the pins to travel through the channels.

11. The motorized window treatment of claim 10, wherein the pins are adapted to rest in elbows of the channels when the headrail is in the service position.

12. The motorized window treatment of claim 9, wherein the mounting bracket comprises a plate that slides through the mounting bracket to thus displace the headrail away from the window.

13. The motorized window treatment of claim 12, wherein the plates are adapted to pivot with respect to the mounting brackets to rotate the topside of the headrail away from the window.

14. A mounting bracket for a motorized window treatment adapted to be mounted to a surface, the motorized window treatment comprising a covering material adapted to hang from a headrail to cover at least a portion of a window, the mounting bracket comprising:

a mounting portion adapted to be fastened to the surface;

a rotating portion coupled to a topside of the headrail, the rotating portion comprising a clip adapted to be coupled to a bottom side of the headrail; and

an axel for rotatably coupling the rotating portion to the mounting portion, such that the rotating potion pivots about the axle with respect to the mounting portion;

wherein the axle is located below the clip of the rotating portion, such that the center of gravity of the headrail is adapted to cause the headrail to rotate away from the window on its own.

15. The motorized window treatment of claim 14, further comprising:

a spring for biasing the rotating portion towards the mounting portion, such that the headrail rotates in a controlled movement when the rotating portion is released from the locked position.

16. The motorized window treatment of claim 15, wherein the spring comprises a coil spring wrapped around the axel and contacting the rotating portion and the mounting portion to bias the rotating portion towards the mounting portion.

17. The motorized window treatment of claim 15, wherein the spring comprises at least one spring arm on the mounting portion adapted to contact the rotating portion, such that the headrail rotates in a controlled movement when the rotating portion is released from the locked position.

18. The motorized window treatment of claim 14, further comprising:

a latch mechanism for holding the rotating portion in a locked position; and

a button coupled to the latch mechanism for releasing the rotating portion from the locked position to rotate the headrail into a service position in response to an actuation of the button.

19. The motorized window treatment of claim 18, wherein the button is pushed to release the rotating portion from the locked position.

20. A battery-powered motorized window treatment comprising:

a covering material for the window;

a motor drive unit adapted to control the covering material between a fully-opened and fully-closed position;

a head rail from which the covering material descends, for disposition across the top of the window, the head rail including a space for receiving at least one battery for powering the motor drive unit;

wherein the head rail has a mechanism for allowing the rail to move outwardly away from the window and tilt downwardly to expose the space to allow the at least one battery to be installed or removed.

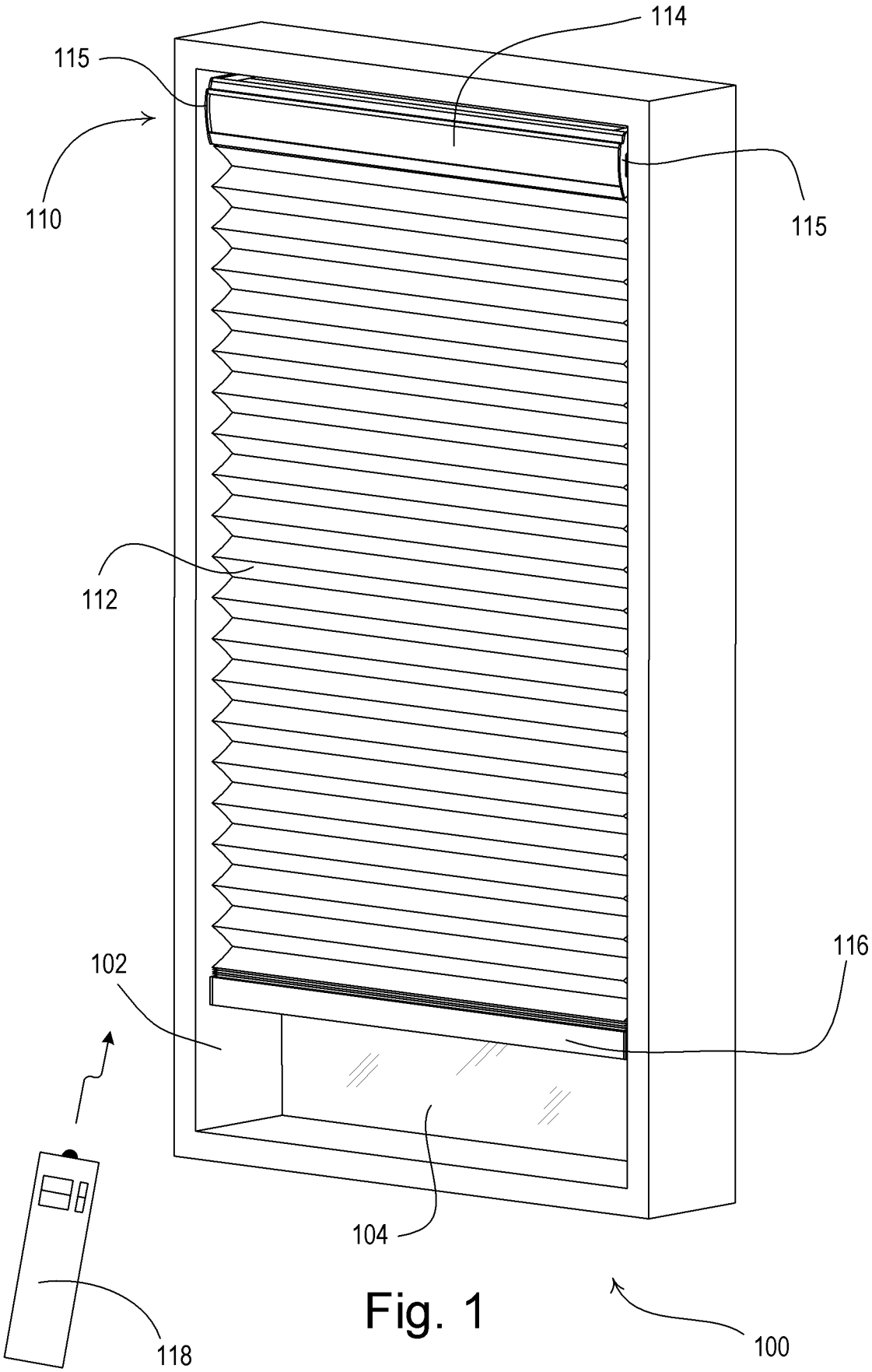

Fig. 1

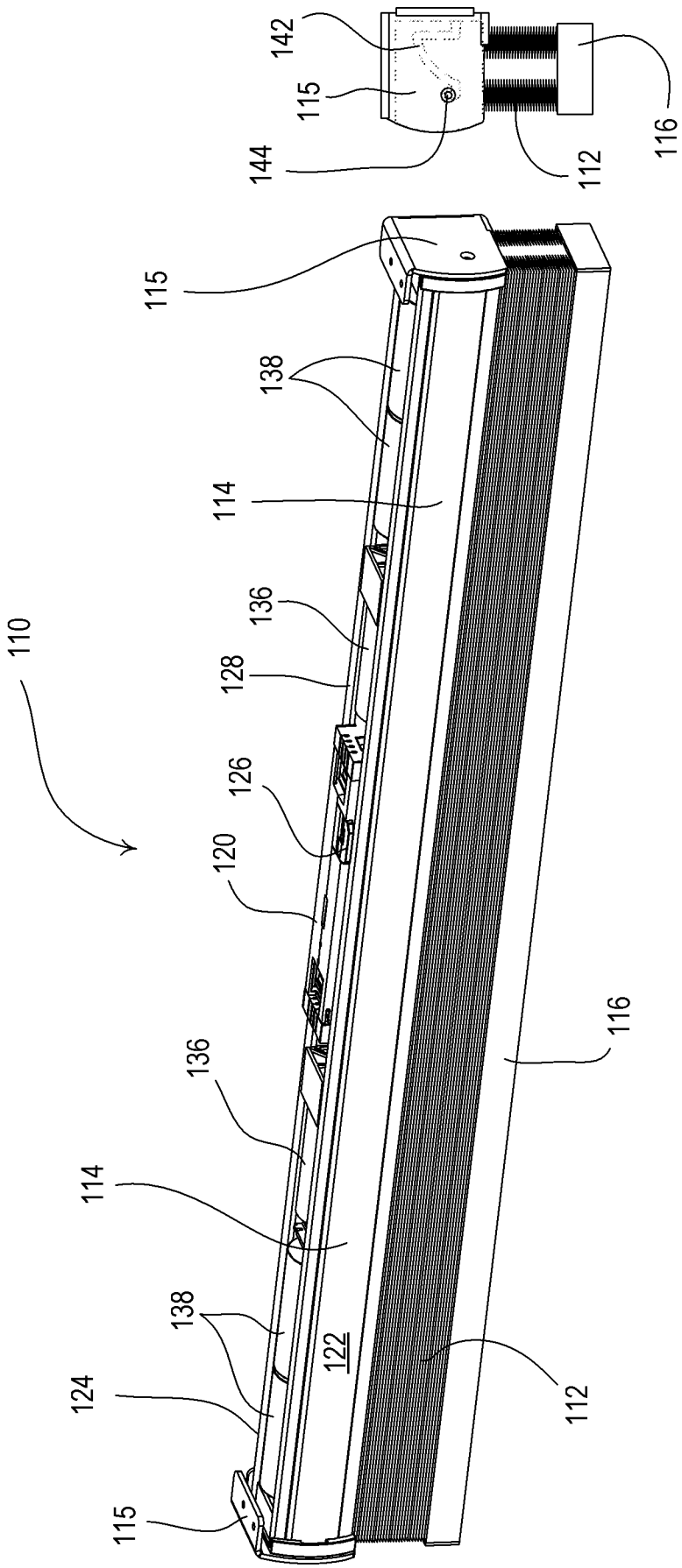
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Fig. 2

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Fig. 3

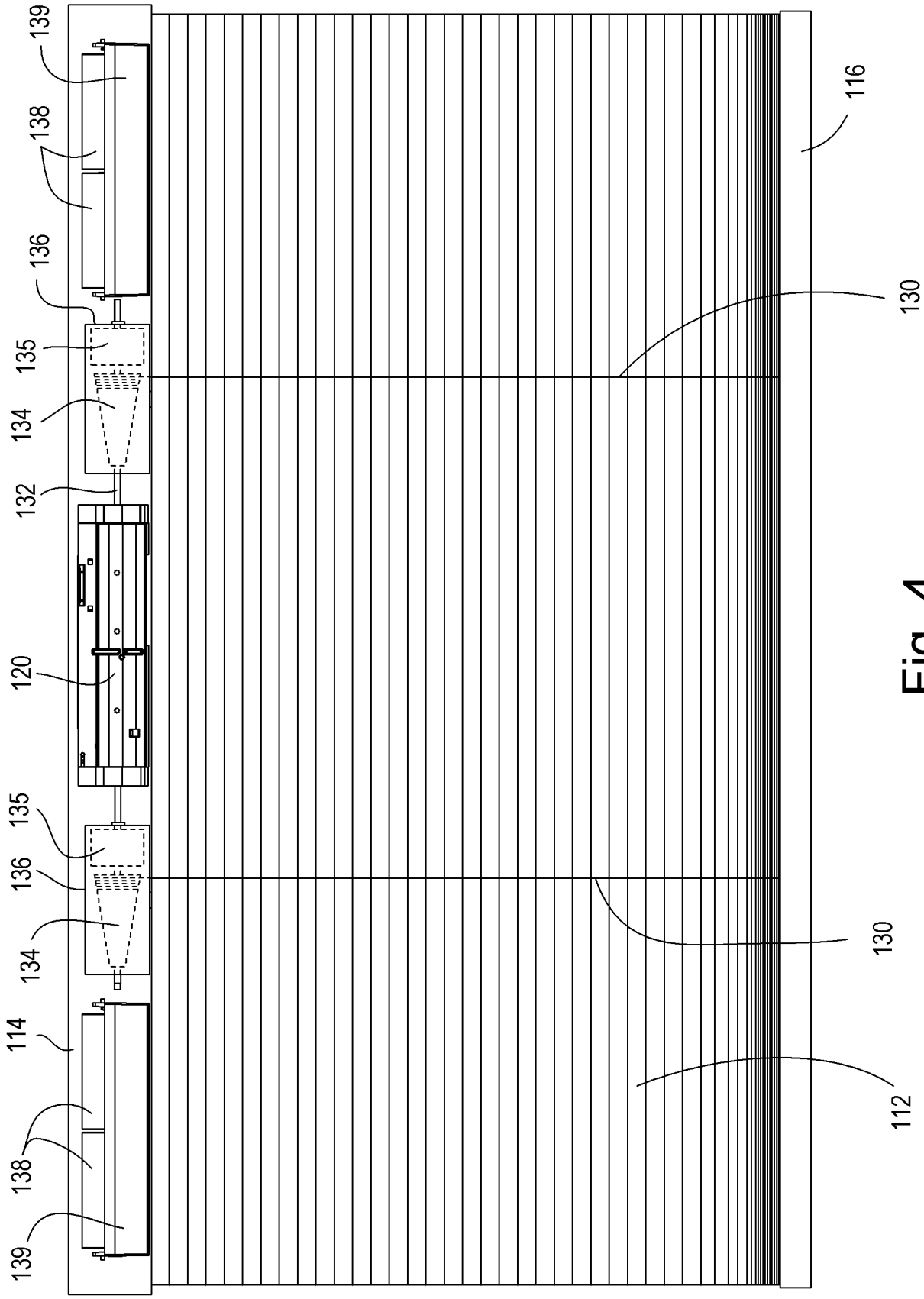
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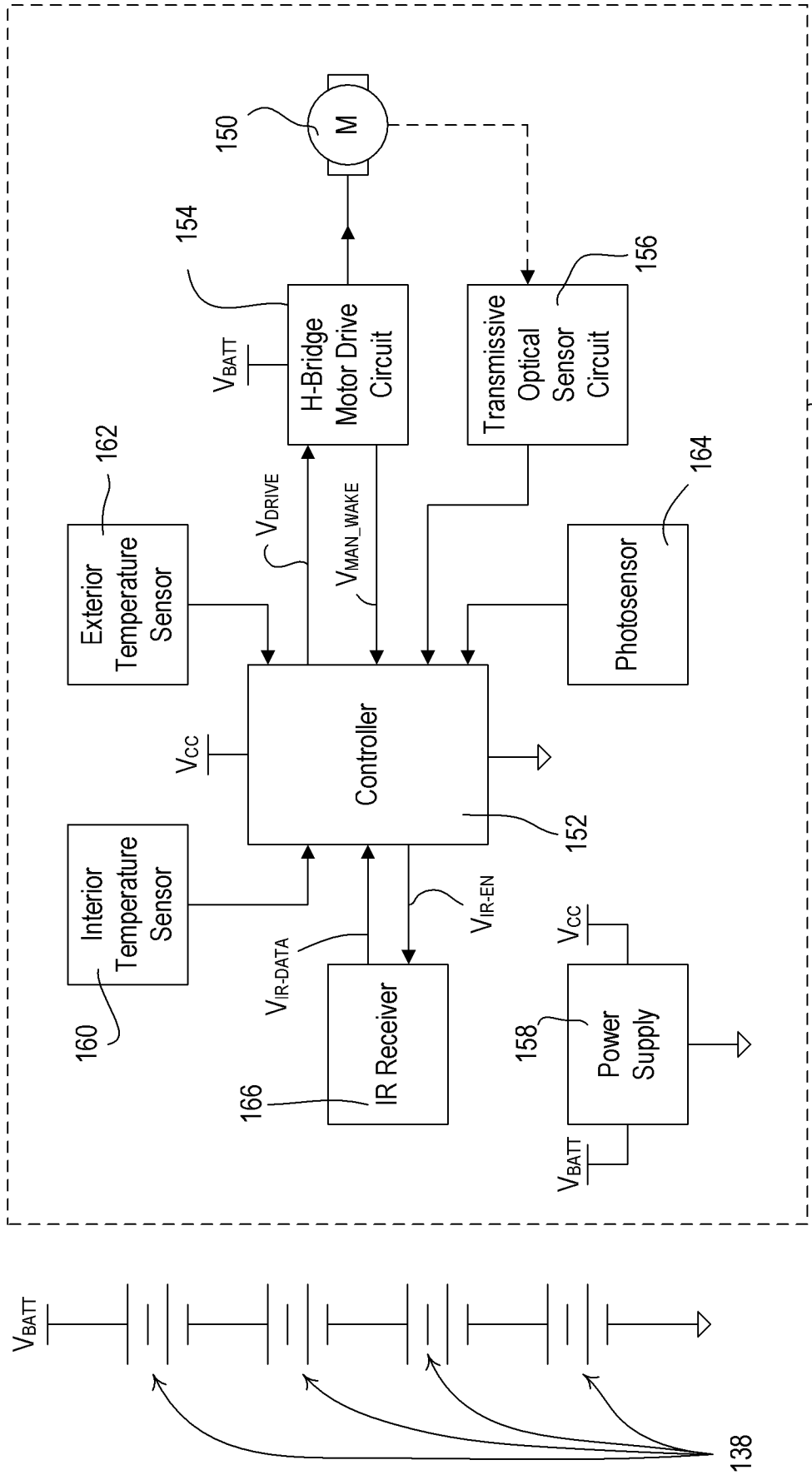
Fig. 4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Photosensor
Controller
V_{CC}
152
Interior Temperature Sensor
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IR Receiver
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Power Supply
V_{CC}
V_{BATT}
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138

Fig. 5

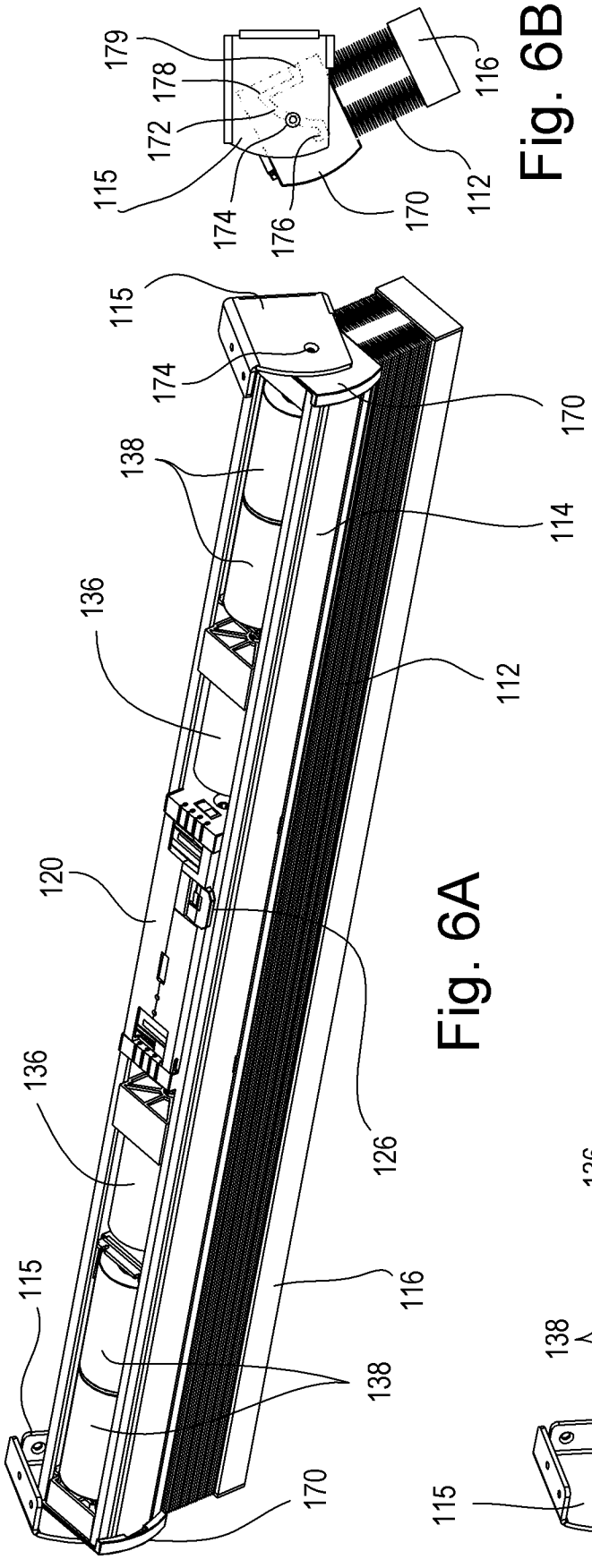

Fig. 6A

Fig. 6B

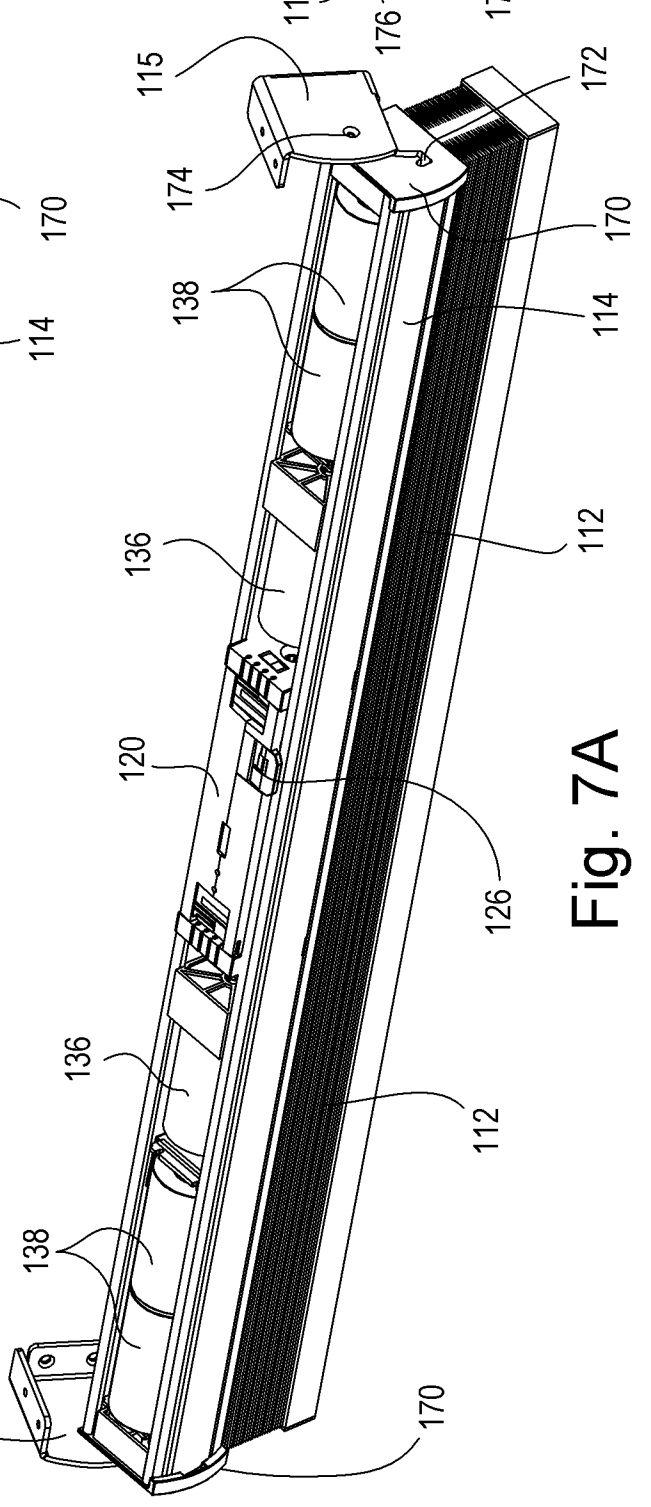

Fig. 7A

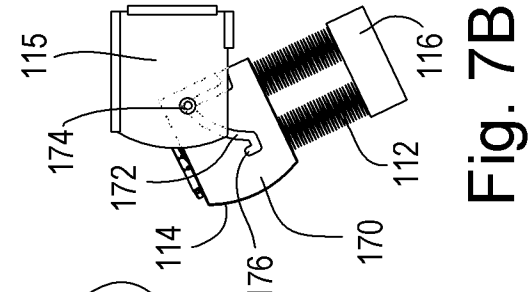

Fig. 7B

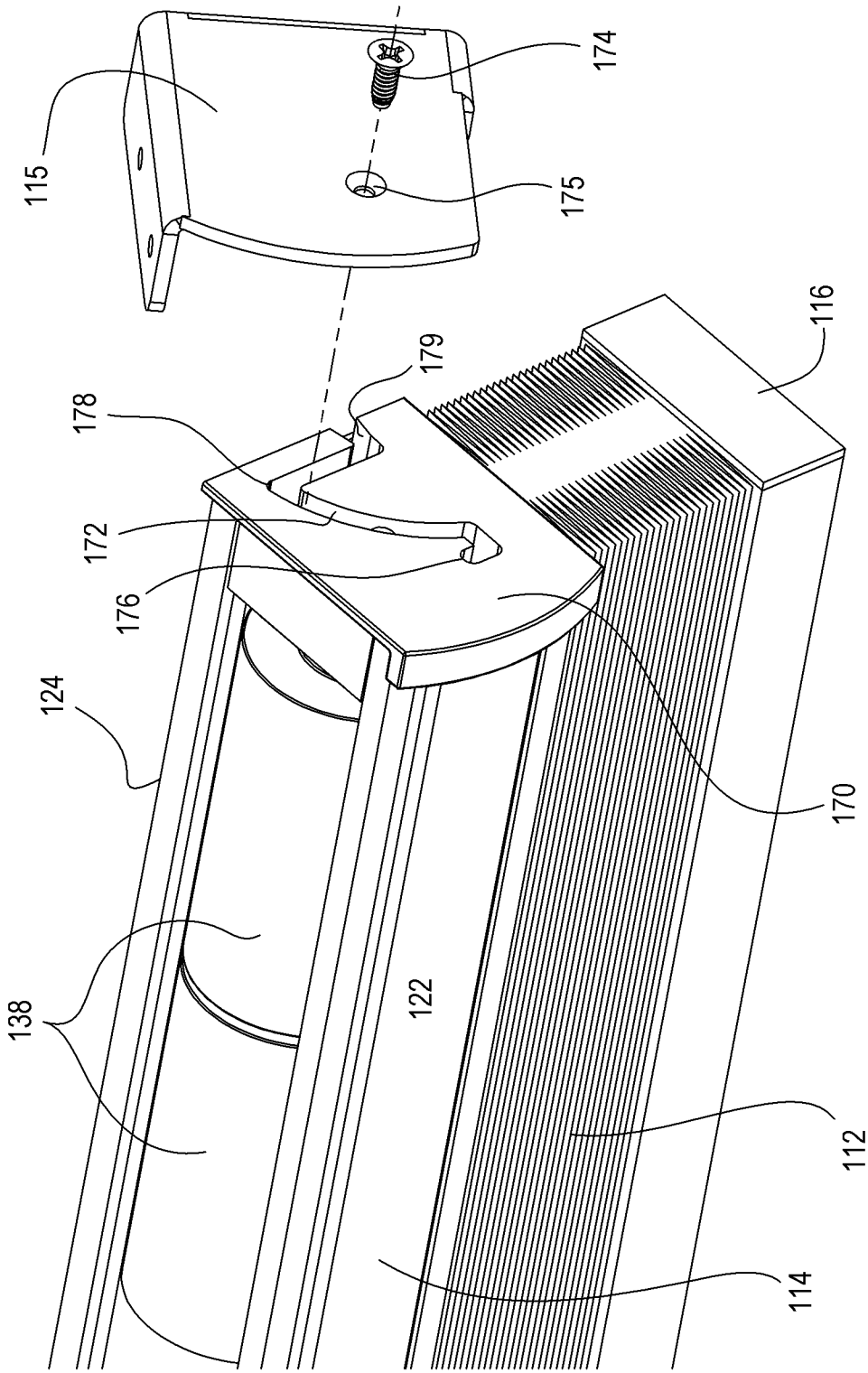

Fig. 8

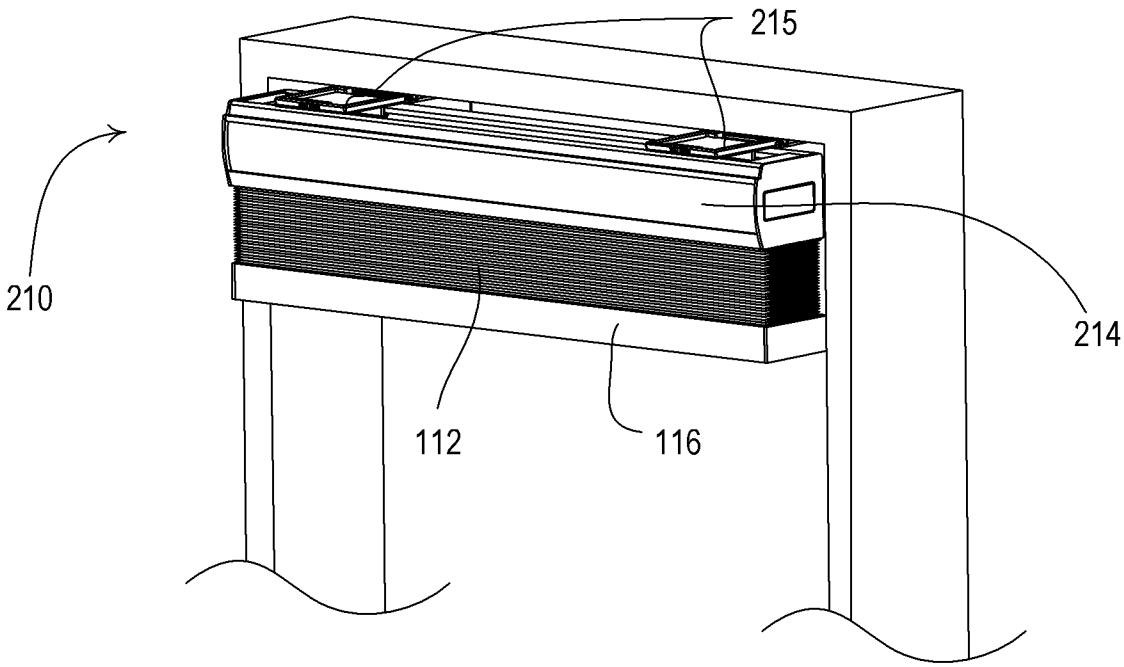

Fig. 9

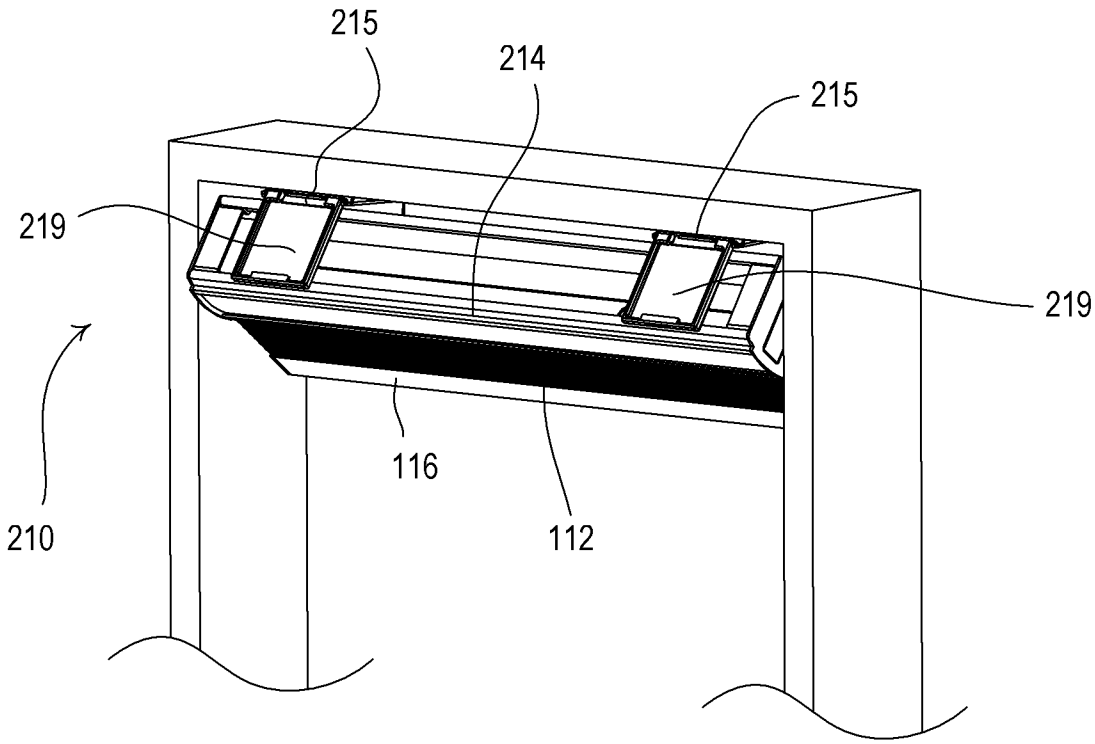

Fig. 10

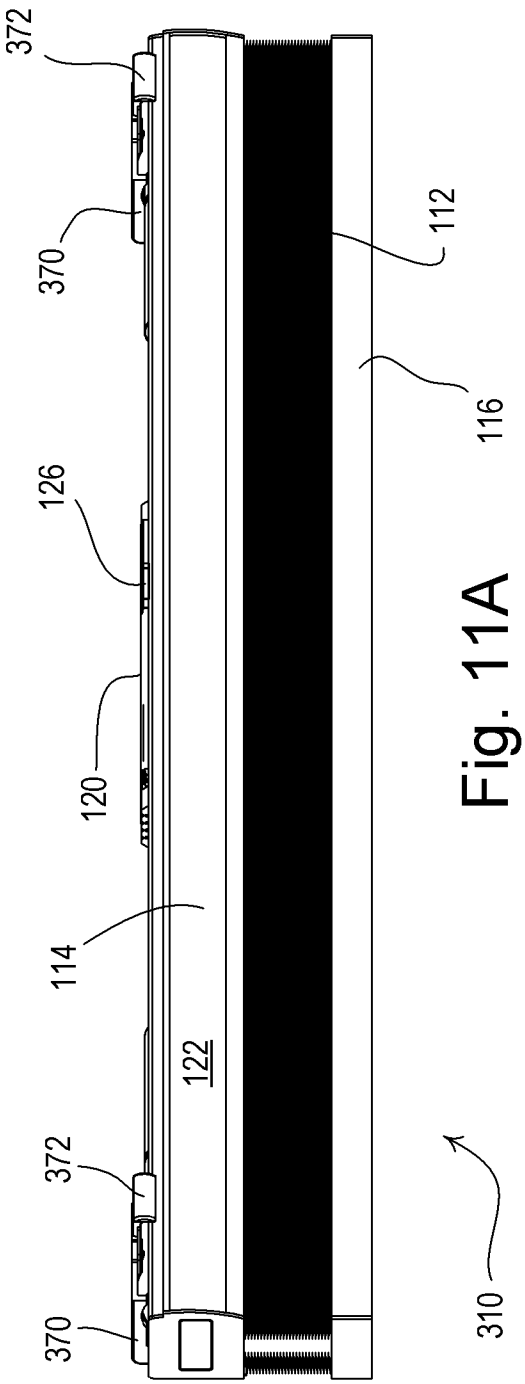

Fig. 11A

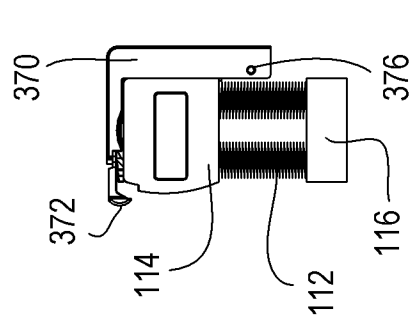

Fig. 11B

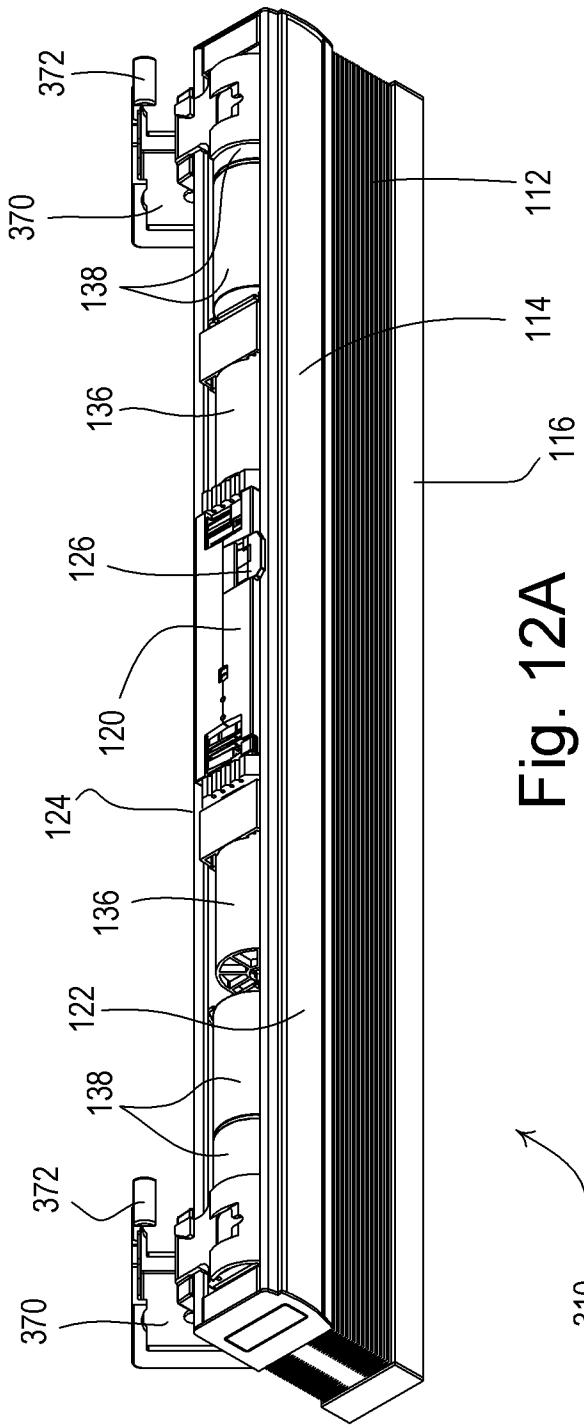

Fig. 12A

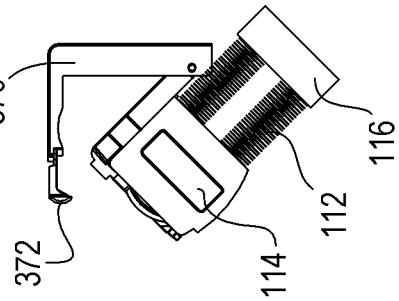

Fig. 12B

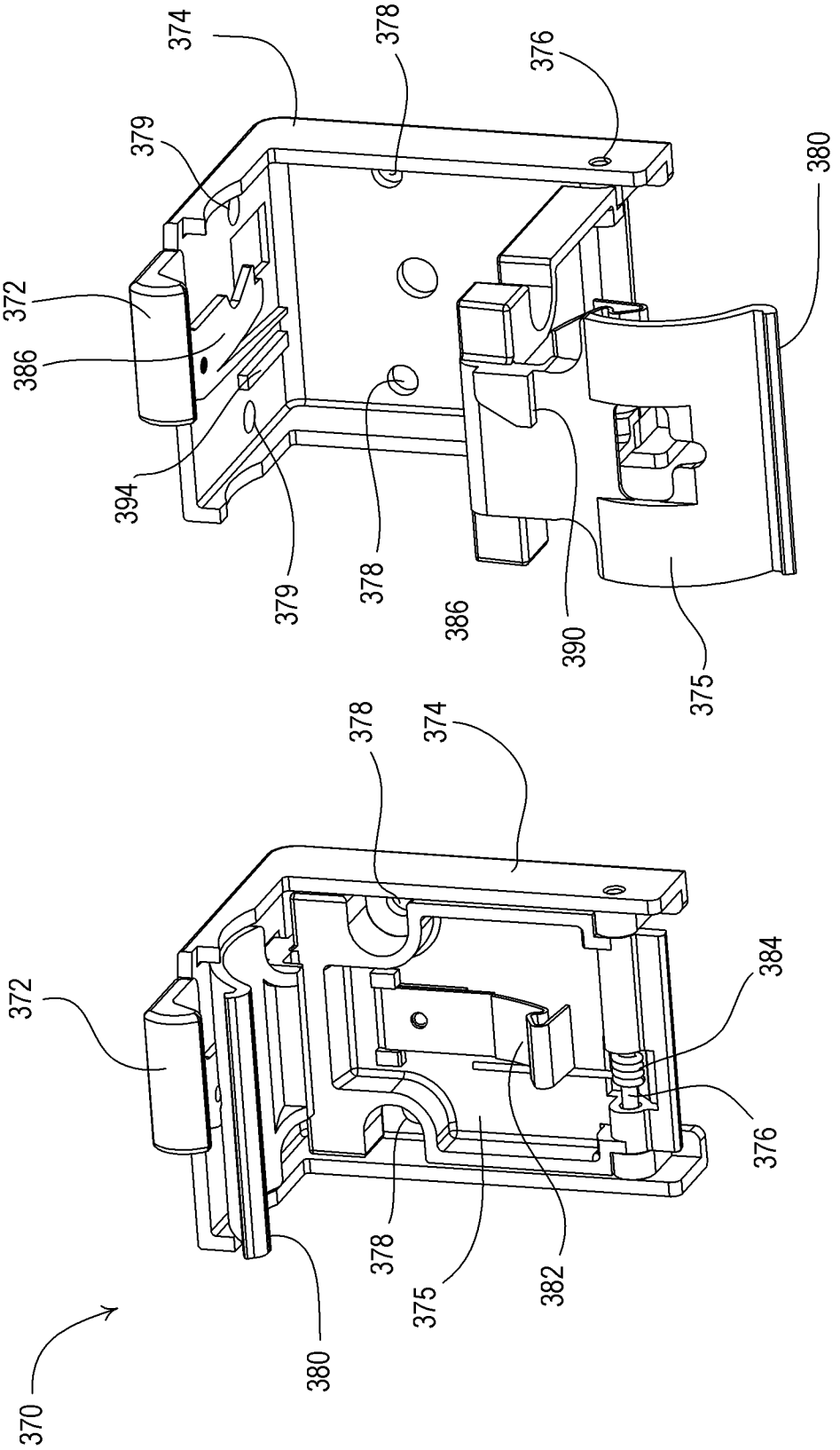

Fig. 13B

Fig. 13A

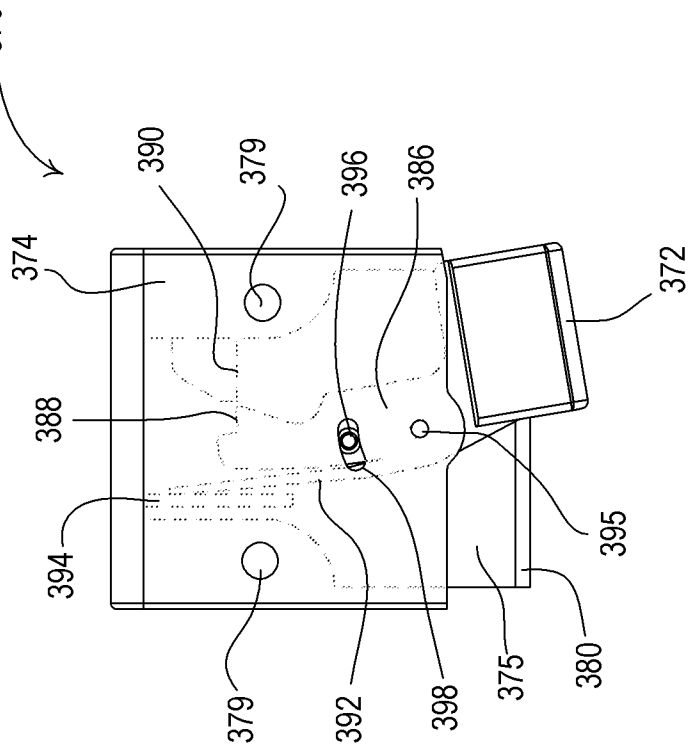

Fig. 14B

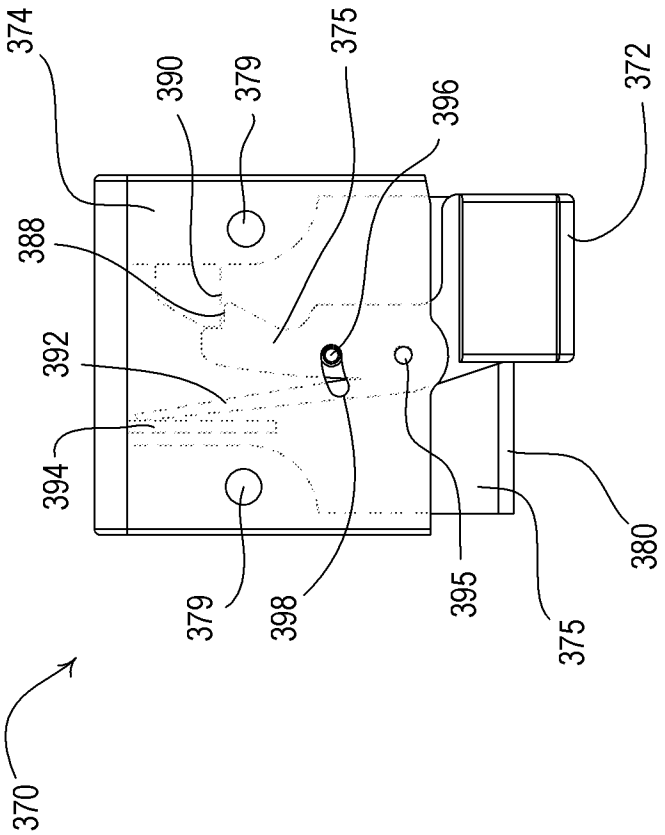

Fig. 14A

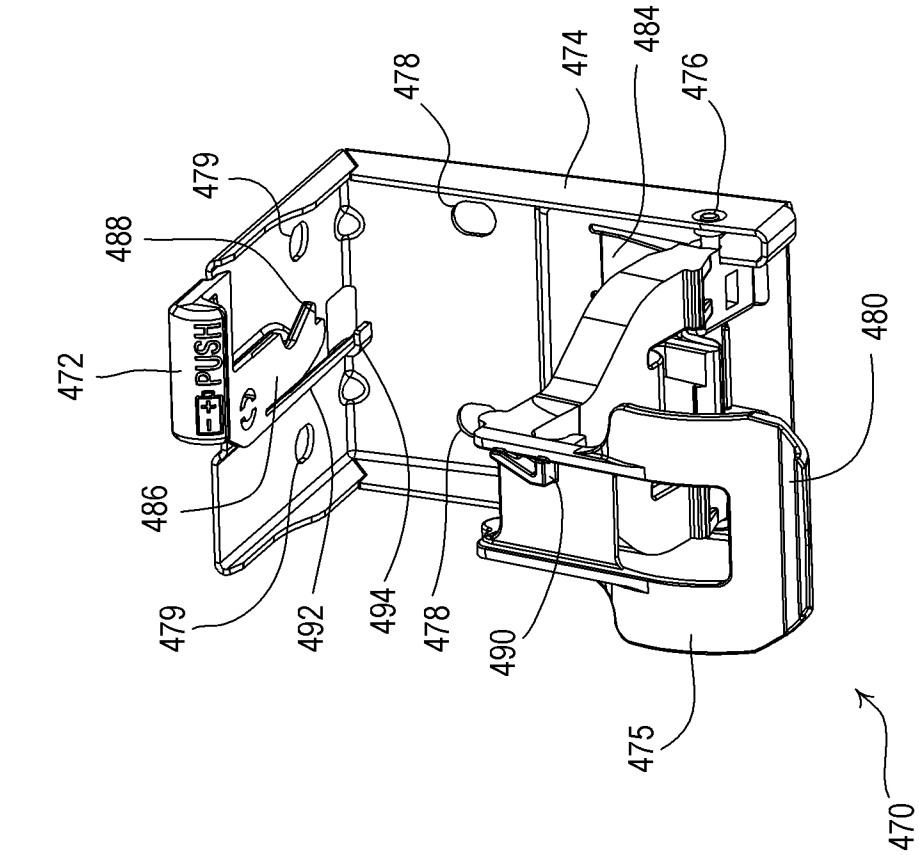

Fig. 15B

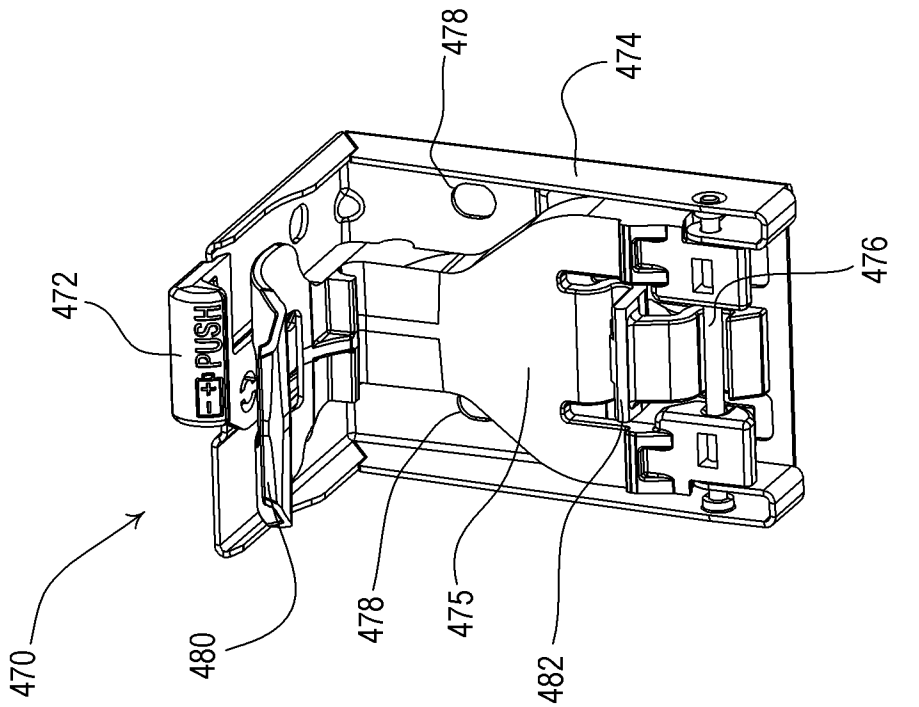

Fig. 15A

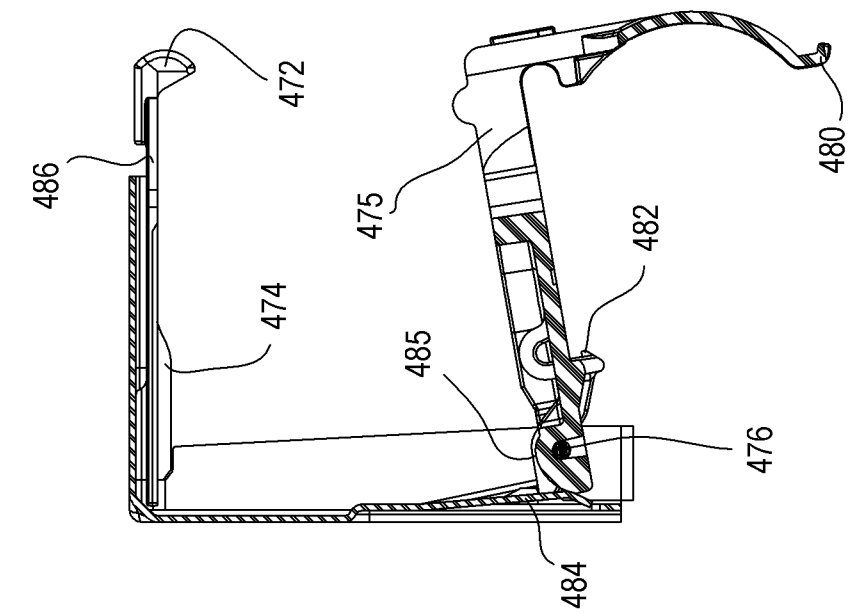

Fig. 16B

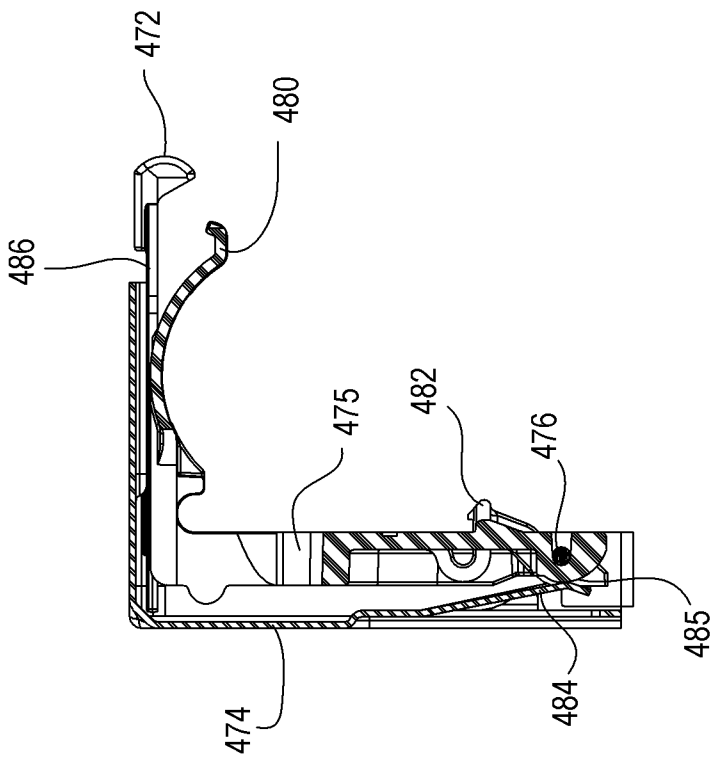

Fig. 16A

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/028329

A. CLASSIFICATION OF SUBJECT MATTER
INV. E06B9/323
ADD.

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)
E06B

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 97/18501 A1 (HARMONIC DESIGN INC [US]) 22 May 1997 (1997-05-22)	1-3,9, 12,13
A	page 28, line 11 - line 15 page 31, line 25 - line 30; figures 8,11	20
Y	US 2 802 523 A (ANDERLE JOSEPH A) 13 August 1957 (1957-08-13)	1-3,9, 12,13
A	column 3, line 35 - line 52; figures 1-6 mounting bracket (31)	4-8,10, 11,20
A	US 3 169 006 A (LORENTZEN HANS K ET AL) 9 February 1965 (1965-02-09) column 4, line 10 - column 5, line 27; figures 1-8	14-19
A	US 2007/089841 A1 (ROSSATO ALEJANDRO M [US] ET AL) 26 April 2007 (2007-04-26) abstract; figures 1-6	14-19

☐ 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	Date of mailing of the international search report
24 May 2012	06/06/2012

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Koulo, G

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2012/028329

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