

SLIDE AND PIVOT WINDOW ASSEMBLY

FIELD OF THE INVENTION

[1] The present invention relates generally to a dual moveable window assembly that slides and pivots inward, and more specifically a window assembly installed in a parapet comprising at least two sliding window panels that are pivotally moveable for opening the windows inward toward a user.

BACKGROUND OF INVENTION

[2] Windows are often designed so that they can easily be opened as well as secured in a closed position by a user. Many conventional window structures include sliding panels mounted onto rails in an outer frame. Alternative designs include panels connected at one side of an outer frame for pivotally opening and closing. Other conventional window structures combine the slide and pivot movement features to provide sliding and pivotal window assemblies.

[3] For example, U.S. Patent No. 6,276,092 describes a sliding window assembly with a C-shape support frame and only one vertical support frame for pivotally moving the window open, whereby the intention of this assembly is to overcome disadvantages associated with slidable sashes attached to rails through an arm system. In this regard, the window assembly and other similar commercial window designs address certain disadvantages. However, they require improvement in areas such as user safety, structural integrity and strength.

[4] For example, high rise flats and condominiums are commonplace in many countries such as Singapore. They require windows that are securely affixed into a window parapet to prevent the windows from falling out of their frames. The windows must withstand strong winds and other weather conditions that could otherwise loosen mechanical couplings. For example, in Singapore there have been recorded 50 cases in

2017 of window panels falling from parapets. The Building and Construction Authority (BCA) and the Housing Board (HDB) have been compelled to remind home owners to maintain and/or repair their windows at least once every six months. Mr. Lim Beng Kwee, a director under BCA's Special Functions Group, said falling windows pose a huge danger to the public, "We should all do our part to eliminate this risk. All home owners and tenants should regularly maintain their windows at least once every six months ". Accordingly, the impetus for the safety of window assemblies in Singapore serves to highlight that, like most mechanical structures, windows and their moveable mechanical components are prone to deterioration and the loss of structural integrity resulting in potentially serious safety consequences.

[5] The fall of windows from their frames and/or parapet can be attributed to two main reasons. First, the improper assembly and/or quality of the pivotal mechanisms can cause the window to fall and potentially injure those underneath. Over time mechanical parts can become loose and allow the panel to give way when moving outwardly open. The second reason is related to the sliding movement of a window panel. The sliding mechanisms are often not properly engaged and/or lacking proper safety guides. In either case, the panel can drop out of the supporting outer frame and fall to the ground.

[6] In conjunction with the above issues, another critical issue of conventional window designs is that users may find it difficult to clean, repair and/or maintain the glass panel surface facing outside and external to a building structure. Many take risks to clean the outer window by climbing on to a window edge regardless of the danger of accidentally falling from the window edge or parapet.

[7] In these respects, there is a need to provide a versatile moveable window panel and assembly that conveniently provides a user with dual movement options while also being safe and securely affixed to a parapet in order to overcome, or at least ameliorate, the disadvantages described above. Specifically, the objective of the present invention is to improve safety of window instalments by reducing the incidence of injury from falling

windows. Further, the invention should allow easy access to window panels for cleaning and maintenance.

BRIEF SUMMARY OF THE INVENTION

[8] A primary object of the present invention is to provide a dual moveable window assembly that will overcome or ameliorate the shortcomings of the conventional window assemblies. Accordingly, in one embodiment there is provided a window assembly for installation into a parapet, comprising: a support frame comprising two sliding guide tracks; two window panels each independently slidably mounted on a separate guiding track in the support frame such that each window panel can translate between a first closed position and a second open position and any position therebetween, wherein each window panel comprises a first framework and a second framework, wherein the first framework is configured for positioning within the opening aperture defined by the second framework, wherein the first framework is pivotally attached to the second framework with a pair of friction stays to pivot about a substantially vertical axis such that the first framework can pivot between a closed position and a fully inward open position and any position therebetween; and an interlocking mechanism positioned on the second framework of each window panel for a sealing engagement between each window panel when the two window panels are in a first closed position, wherein the interlocking mechanism comprises L-shaped interlocking members and rubber gasket tubing.

[9] In one embodiment, the fully inward open position of the first framework may be 90° relative to the longitudinal axis of the parapet. In one embodiment, the closed position of the first framework relates to the outer perimeter edges of the first framework being pressed tightly against a rubber tubing secured on the inner face of the second framework.

[0010] In one embodiment, the window assembly may further comprise a locking device to secure the two panels in a first closed position.

[0011] In one embodiment, in the first closed position, the two window panels are arranged adjacent to one another in a stepped configuration such that there is no opening aperture in the support frame.

[0012] In one embodiment, the second framework may comprise an interlocking side bar with an inner and outer side, and the interlocking mechanism may be positioned on the inner side of the interlocking side bar.

[0013] In one embodiment, the second framework defines an opening aperture with a rubber gasket attached to inner edge of the second framework.

[0014] In one embodiment, the two window panels are each independently slidably mounted via rollers.

[0015] In one embodiment, the first framework may comprise edge protector positioned at one bottom corner.

[0016] In one embodiment, the second framework may comprise safety guides on each corner.

[0017] In one embodiment, the support frame comprises at least four sliding guide spacers.

[0018] In one embodiment, the window assembly may further comprise one or more additional window panel, wherein the one or more additional window panel comprising a first framework and a second framework, wherein the first framework is integrated within the opening aperture defined by the second framework, wherein the first framework is pivotally attached to the second framework with a pair of friction stays to pivot about a substantially vertical axis such that the first framework can pivot between a closed position and a fully inward open position and any position therebetween.

[0019] In one embodiment, the one or more additional window panel may be slidably mounted on the same guiding track as one of the two window panels in the support frame,

and the one or more additional window panel and window panel on the same guiding track comprise an overlapping interlocking mechanism for coordinated slidable movement.

[0020] Further embodiments of the invention will appear as the description proceeds.

[0021] To the accomplishment of the above and related objects, this invention may be embodied in the form illustrated in the accompanying drawings, attention being called to the fact, however, that the drawings are illustrative only, and that changes may be made in the specific construction illustrated and described within the scope of the appended claims.

DEFINITIONS

[0022] The following words and terms used herein shall have the meaning indicated:

[0023] The word “substantially” does not exclude “completely” e.g. a composition which is “substantially free” from Y may be completely free from Y. Where necessary, the word “substantially” may be omitted from the definition of the invention.

[0024] Further, if used and unless otherwise stated, the terms “side”, “top”, “bottom”, “upper,” “lower,” “front,” “back,” “over,” “under,” “inner”, “outer” and similar such terms are not to be construed as limiting the invention to a particular orientation. Instead, these terms are used only on a relative basis. Specifically, in the context of the present invention, these terms are used relative to the installation of the window assembly into the parapet of a building structure with an internal area (enclosed room or space) and external area (outside environment).

[0025] Unless specified otherwise, the terms "comprising" and "comprise", and grammatical variants thereof, are intended to represent "open" or "inclusive" language such that they include recited elements but also permit inclusion of additional, unrecited elements.

[0026] As used herein, the term "about", in the context of concentrations of components of the formulations, typically means +/- 5% of the stated value, more typically +/- 4% of the stated value, more typically +/- 3% of the stated value, more typically, +/- 2% of the stated value, even more typically +/- 1% of the stated value, and even more typically +/- 0.5% of the stated value.

[0027] Throughout this disclosure, certain embodiments may be disclosed in a range format. It should be understood that the description in range format is merely for convenience and brevity and should not be construed as an inflexible limitation on the scope of the disclosed ranges. Accordingly, the description of a range should be considered to have specifically disclosed all the possible sub-ranges as well as individual numerical values within that range. For example, description of a range such as from 1 to 6 should be considered to have specifically disclosed sub-ranges such as from 1 to 3, from 1 to 4, from 1 to 5, from 2 to 4, from 2 to 6, from 3 to 6 etc., as well as individual numbers within that range, for example, 1, 2, 3, 4, 5, and 6. This applies regardless of the breadth of the range.

[0028] The invention illustratively described herein may suitably be practiced in the absence of any element or elements, limitation or limitations, not specifically disclosed herein. Thus, for example, the terms "comprising", "including", "containing", etc. shall be read expansively and without limitation. Additionally, the terms and expressions employed herein have been used as terms of description and not of limitation, and there is no intention in the use of such terms and expressions of excluding any equivalents of the features shown and described or portions thereof, but it is recognized that various modifications are possible within the scope of the invention claimed. Thus, it should be understood that although the present invention has been specifically disclosed by preferred embodiments and optional features, modification and variation of the inventions embodied therein herein disclosed may be resorted to by those skilled in the art, and that such modifications and variations are considered to be within the scope of this invention.

NUMERICAL REFERENCE FEATURES

[0029] The following numerical index is provided for ease in cross-referencing between the structural features illustrated in the figures and the accompanying description provided herein.

100	–	Complete two panel window assembly
110	–	First framework
110a	–	Outer portion of a first framework
110b	–	Inner portion of a first framework
111	–	Glazing unit
112	–	Friction Stay Arm (Pivoting mechanism)
113	–	Tapping screw
114	–	Rubber pad
115	–	First side frame bar
116	–	First top frame bar
117	–	First bottom frame bar
118	–	Pull flush handle
119	–	Spring-loaded roller catcher set
120	–	Second framework
120a	–	Inner surface of a second framework
120b	–	Outer surface of a second framework
121	–	Locking unit
122	–	Sliding mechanism
122a	–	Sliding mechanism housing
123	–	Second top frame bar
124	–	Second bottom frame bar
125	–	Interlocking side frame bar
126	–	Outer side frame bar
127	–	Interlocking mechanism
127a	–	L-shaped interlocking members
127b	–	Interlocking rubber gasket

128a –	Top safety guide
128b –	Bottom safety guide
129 –	Rubber gasket
130 –	Supporting frame
131 –	Sliding guide spacers
1 3 2 –	S c r e w s
133 –	Supporting top frame bar
134 –	Supporting bottom frame bar
134a –	Bottom sill bar
134b –	Bottom mounting bar
135 –	Supporting side frame bar
136 –	Supporting frame opening aperture
137 –	Bottom roller guide tracks
138 –	Top alignment guide tracks
139 –	Overlapping mechanism
140 –	Safety Edge Protector

BRIEF DESCRIPTION OF THE DRAWINGS

[0030] Various other objects, features and attendant advantages of the present invention will become fully appreciated as the same becomes better understood when considered in conjunction with the accompanying drawings, in which like reference characters designate the same or similar parts throughout the several views, and wherein:

[0031] FIG. 1 depicts a complete window assembly comprising two window panels indicating its orientation in respect to an internal and external enclosed area (i.e. room) for installation into a parapet as well as specific mechanisms of its sliding and pivoting movement.

[0032] FIG. 2 is an exploded view of the window assembly of FIG. 1 that shows the constructions of the three frames along with their positioning in relation to one another with the dotted lines (---).

[0033] FIG. 3 depicts a single window panel opening inward via the pivoting mechanism of a pair of friction stay arms attaching the first and second frames.

[0034] FIG. 4 depicts a friction stay arm with four arm components and a guide for attaching the first and second frames to one another.

[0035] FIG. 5A is a perspective view of the completed supporting frame comprising two guide tracks, for installation into a parapet.

[0036] FIG. 5B is a front two-dimensional view of the completed supporting frame with dotted lines (---) indicating the connecting screws between the bars.

[0037] FIG. 5C depicts cross-sectional profiles of the bottom, top and side bars of the supporting frame.

[0038] FIG. 5D depicts cross-sectional profiles of a supporting top frame bar with three top alignment guide tracks, supporting bottom frame bar with three guide tracks with a bottom mounting bar and bottom sill bar, and a supporting side frame bar.

[0039] FIG. 6A is a front view of the completed second framework of two window panels interlocked at their inner side bars in a closed position.

[0040] FIG. 6B is a perspective view of the completed second framework of two window panels interlocked at their inner side bars.

[0041] FIG. 6C is a cross-sectional view of the second framework and two window panels.

[0042] FIG. 7A depicts the sliding movement of a two-window panel assembly in relation to one another and the supporting frame.

[0043] FIG. 7B depicts the pivoting movement of the first frame in relation to the second frame.

[0044] FIG. 7C depicts the arrangement of three, four, five and six window panels relative to one another using the interlocking mechanism between window panels on separate guide tracks and the overlapping mechanism for window panels on the same guide tracks.

[0045] FIG. 7D depicts the interlocking/overlapping mechanism of the two window panels.

[0046] FIG. 7E also depicts the interlocking/overlapping mechanism of the two window panels.

[0047] FIG. 7F depicts a sliding guide spacer and a top and bottom safety guide for controlling the sliding movement of window panels via rollers, whereby 'X' indicates the distance control for redundant movement between the guide tracks and rollers of the window panels and alignment guide tracks and sliding guide spacer.

[0048] FIG. 8A is a perspective view of a completed first framework with a glass panel.

[0049] FIG. 8B depicts a single window panel with a safety edge protector.

[0050] FIG. 9A depicts a completed two-window panel assembly installed in a parapet, whereby the second framework is slid in a closed positioned and the first framework is in a closed position in alignment with the second framework.

[0051] FIG. 9B depicts a completed window assembly of FIG. 9A with one of the panel's second framework slid into an open position and one of the panel's first framework pivotally opened inward, toward the user and internal area.

DETAILED DESCRIPTION OF THE INVENTION

[0052] While the invention is described for use as a window assembly in a parapet, it is understood that the invention is not so limited and can be applied to other structures that can utilize slide and pivot opening/closing. Other applications include, for example, using the assembly in a door frame, partition, storage cabinet, closet, pantry, etc. Similarly, the window assembly can be modified using techniques that are common in the art.

[0053] The window assembly described herein includes window panels that are independently moveable by both sliding and pivoting, while being safely and securely affixed within a conventional parapet. This “two in one” moveable window panel overcomes limitations of conventional windows and window assemblies. The assembly conveniently provides the user with a choice of how the windows are opened (i.e. by sliding open or pulling/pivoting inward). It improves safety of the window assembly by preventing the window panels from falling out of the parapet. Further, it allows a user to more easily clean both sides of the window pane.

[0054] As will be readily appreciated, the window assembly can be adapted for use in conventional parapets found in common building structures or conversely a conventional parapet can be adapted for installation of the window assembly. In particular, the window assembly is well suited for use in parapets within commercial buildings, non-commercial buildings and high-rise apartment buildings such as condominiums or homes.

[0055] In one embodiment, the window assembly can include at least two window panels. However, in yet another embodiment, the window assembly can include one or more additional window panels, such that the window assembly can include three, four, five or six window panels. The number of window panels used will depend upon the desired application and function as well as structural factors to consider such as the parapet size and support frame, all of which will be readily appreciated by those skilled in the art based upon the following disclosure and accompanying figures.

Sliding Assembly

[0056] According to one embodiment, there is provided a sliding window assembly comprising a support frame for at least two window panels to be slidably and securely mounted upon, whereby each window panel comprises a first and second framework with the first framework being pivotally mounted within the second framework. In this regard, each window panel is slidably mounted in the support frame via a sliding mechanism such

that it can translate between a closed first position and an open second position, and any position there between. The closed first position refers to a situation whereby the window panels cover the entire opening aperture of the support frame and parapet to obstruct access to the other side of the window assembly, as illustrated by FIG. 9A. The second open position refers to the window panel being moved to the opposite side of the support frame and parapet relative to when in a first closed position, this resulting in an opening through the support frame to the other side of the window assembly, as illustrated by FIG. 9B.

[0057] As indicated above, each window panel is configured to slide across an opening aperture defined by the support frame and restrict access to the opposing side via the opening aperture. The opening aperture being formed as at least two of the window panels are translated from a first closed position to the second open position so as to allow air to flow through the opening aperture. It will be understood that the size and shape of the opening aperture varies continuously as the window panels slide within the support frame.

[0058] The sliding mechanism is configured such that it can be driven to translate laterally within the support frame in a substantially horizontal direction (i.e. from side to side). In this regard, the window panel can be slidably mounted on a sliding guide track rail. The window panel can be mounted on a sliding guide track or rail via at least two rollable members (e.g. wheels). For the window panels to slide in a horizontal direction the sliding guide track or rail is arranged to extend along an interior part of the bottom frame bar of the support frame.

Pivoting Assembly

[0059] In addition, the first framework of each window panel can be pivotally mounted within the sliding second framework of the window panel such that the first framework pivots about a substantially vertical axis between a closed position and a fully open position and any position therebetween. In this regard, the fully open position of the first

framework is configured to allow access to an interior region of the window assembly and/or the opening aperture defined by the second framework. It is of note that for opening the first framework the user pivotally moves (i.e. pulls) the first framework inward, that is towards the internal area of the secure environment (i.e. room) the parapet is positioned. This is in contrast to the first framework being pivotally moved outward to the external environment and away from the user. To aid in this pulling and actuation of the pivoting motion, the first framework can comprise a handle such as a pull flush handle, although other suitable handles or pulling actuators can be used, as will be appreciated by those skilled in the art.

[0060] It will be appreciated that the sliding window panel, and more specifically the first framework, can comprise a glazing unit. The glazing unit can comprise a single window pane or multiple window panes of glass. For example, the glazing unit may be in the form of a double-glazed unit. So as to prevent or minimise the breakage of or damage to the glazing unit, the glazing unit can comprise at least one pane of security glass.

[0061] The pivoting mechanism can comprise one or more friction stays. Preferably, the pivoting mechanism comprises a pair of friction stay hinges. In one embodiment, the pair of friction stay hinges are coupled to adjacent top and bottom frame bars of the first and second frameworks.

[0062] The pivoting mechanism can be a manually operable. In one embodiment, the pivoting mechanism can be concealed within the second framework. In this embodiment, when the first framework is in a closed position, the first and second framework are adapted to form a sealing engagement so as to restrict or prevent any access via the opening aperture.

[0063] As a result of the dual slide and pivot movement of each window panel, the cleaning, maintenance and/or repair of both the internal and external facing glazing unit of the window assembly is easier and safer, especially in contrast to window assemblies with outward pivoting glazing unit. Further, the independent sliding movement of each window panel and inwardly opening first framework removes the need for dismantling the

window assembly for cleaning, repair and/or maintenance needs. Specifically, an operator can access the interior region of both the support frame and second framework by simply moving the window panel and/or first framework to a desired position. It is not necessary to reach outside the window nor use an extension or other specialized equipment. Hence, the window assembly and mechanical components may be cleaned, maintained, repaired etc. more efficiently, simply and cheaply.

[0064] The importance of the aforementioned safety features is further extolled when the window assembly is installed into a high rise building parapet where the external cleaning of window panes can both difficult, unsafe and a expensive. This is particularly beneficial in areas where the window assembly is prone to accumulate excess debris or dirt with the potential for mechanical deterioration.

Locking Mechanism

[0065] The window assembly can comprise a locking mechanism to restrict the sliding movement of the window panels and/or the pivoting movement of the first framework. For example, a locking mechanism can define the closed position of the window panel and/or the first framework. The locking mechanism can comprise a key operated lock. The locking mechanism is provided so that only an authorised operator may open and close the window panel and/or the first framework. In one embodiment, the locking mechanism is positioned on the internal side of the window assembly.

[0066] In one embodiment comprising at least two window panels, the locking mechanism of the sliding window panels comprises a locking unit with complementary members configured to be positioned on the second framework of each window panel for engagement with one another. In another embodiment, the locking mechanism is a crescent lock set with complementary parts positioned on the second framework of separate window panels.

[0067] In one embodiment, the first framework of each window panel comprises a locking mechanism to be positioned on the first framework and is arranged in sealing

engagement with the second framework of the same window panel. In one embodiment, the locking mechanism positioned on the first framework is a push bolt lock. Other suitable locking mechanisms that may be used will be readily appreciated in the art, such as a mortise latch and lock set.

[0068] In the following description, reference is made to the accompanying drawings which form a part hereof, and in which is shown by way of illustration a specific example of a window assembly in which the invention may be practiced. It is to be understood that other embodiments may be utilized and structural changes can be made without departing from the scope of the present invention.

[0069] FIG. 1 depicts the completed window assembly (100) comprising two window panels within a support frame. The window assembly (100) can be mounted in a wall defining a room space. An inner side of the window assembly (100) is preferably configured to face inward or internally towards the room space. An outer side of the window assembly (100) is preferably configured to face outward or externally in the opposite direction away from the room space.

[0070] Specific reference is made in FIG. 1 to the sliding mechanism with the window panel mounted on a sliding track or guide rail via at least two rollable members (wheels) on each panel (122). The pivoting mechanism (112) of a friction stay hinge is shown for the inward opening of the window as indicated relative to the internal wall surface where the parapet is positioned. Moreover, the second framework of one of the window panels comprises a crescent lock with the receiver (lock hook) (121) positioned on the adjacent second framework of the other window panel to form a manual locking unit.

Multi-Frame Construction

[0071] As shown in FIG. 2, a dissected and exploded view of the window assembly highlights the integration and positioning of each of the support frame (130), second framework (120) and first framework (110) in relation to one another. Also illustrated is the general construction of the support frame (130), second framework (120) and first

framework (110) with each frame generally comprising a top bar, bottom bar and two side bars. In particular, the first and second frameworks are designed and configured to complement each other such that the first framework aligns within the second framework and fits tightly and securely within the opening aperture of the second framework. The sliding mechanism (122), pivoting mechanism (112) and window panel locking unit (121) are also shown. Slide guiding spacers (131) may also be installed in to the interior portion of the support frame (130), and specifically the top frame bar, to reduce the movement of the window panel within the support frame and consequently improve the sturdiness and safety of the window panels. Moreover, the second framework (120) can comprise safety guides positioned on the top and bottom corners (128a, 128b) to secure the window panels onto the track or rail for safety and alignment purposes.

[0072] A single window panel is illustrated in FIG. 3 complete with a first framework (110) pivotally attached to a second framework (120) by a pair of friction stays (112), a pull flush handle (118), a locking unit (121), a sliding mechanism (122) and a spring-loaded roller catcher set (119).

[0073] The pair of friction stays (112) are coupled to adjacent top and bottom frame bars of the first and second frameworks, whereby the first framework is in a fully open position that may be substantially perpendicular to the horizontal axis of the second framework. In this regard, the pair of friction stays (112) are coupled close to one side bar frame of both the first and second frameworks. The opposite adjacent side frame bars of both the first and second frameworks are releasably locked together with a spring-loaded roller catcher set mechanism (119) that provides a push-lock action, such as a spring-loaded roller catcher set or equivalent. This spring-loaded roller catcher set mechanism (119) can be positioned at the top and bottom of the side frame bar. The spring-loaded roller catcher set mechanism (119) can be attached using screws. This spring-loaded roller catcher set mechanism (119) is included in the window assembly to allow for both the first and second framework to be held together in a closed position as well as allowing the first framework to be releasable from the second framework for opening. Specifically, during an open inward movement of the first framework, the pull motion will activate the spring-

loaded roller catcher mechanism (119) to release the catcher element (e.g. roller or equivalent) from the complementary receiver element on the second framework in order to allow the opening inward direction of the first framework.

[0074] The pull flush handle (118) is recessed within the centre of the right-side frame bar of the second framework in a locked set position and may be attached using self-drilling screws. The flush alignment of the pull flush handle (118) with the first framework avoids obstruction of the sliding window panels.

[0075] As will be appreciated for a window panel disclosed herein, the closed position of the first framework should be configured for ensuring that respective parts of the first framework are held tightly together against the second framework to prevent water seepage. In this regard, a rubber gasket or equivalent tubing (129) may be placed and fixed around the protruded inner face of the second framework to form a tight seal with the abutting portion of the first framework.

[0076] For ease of reference, structural features of the completed window assembly and their relationship with one another will be elaborated on in reference to the figures provided.

Friction Stay

[0077] In one embodiment, the pivoting mechanism described herein is a friction stay, and more preferably a pair of friction stays.

[0078] In the window assembly as depicted in FIG. 3, a friction stay is used to harness the strongest form of friction for improved strength and thus safety of the window assembly. A friction stay is depicted in FIG. 4 in an expanded or open position (top) as well as a retracted or closed position (bottom). The friction stay (112) comprises four arms that provide the pivoting movement and a stationary plate that is to be affixed to the

second framework of the window panel. In this regard, the opening and closing of the first framework is relative to the secured stationary link plate.

[0079] In one embodiment, the stationary plate of each pair of friction stay is affixed to an inner surface of the top or bottom frame bar of the second framework and one arm of the friction stay is coupled to a portion of the adjacent top or bottom frame bar of the first framework. In one embodiment, the stationary plate and the arm are affixed onto the respective frameworks using stainless steel screws. In this regard, as illustrated in FIG. 3, the pair of friction stays are fitted to adjacent frame bars of the first and secondary frameworks.

[0080] The friction stay allows the first framework within the second framework to pivot out from a first closed position to a fully open second position creating an opening through the aperture of the second framework, whereby access to the interior region of the window assembly and/or second framework can be reached, for cleaning, maintenance, repair, etc. of the window panel and window assembly as a whole.

[0081] In one embodiment, the friction stays are mounted within the window assembly such that they are fully concealed when the first framework is in its first closed position. In the closed position, the first framework is arranged in sealing relationship with the second framework so as to restrict or prevent access across the opening aperture.

[0082] As readily appreciated by those skilled in the art, there are four types of friction: static, sliding, rolling, and fluid friction. Static friction acts on objects when they are resting on a surface; sliding friction refers to the friction that acts on objects when they are sliding over a surface and is weaker than static friction; rolling friction is friction that acts on objects when they are rolling over a surface and is much weaker than sliding friction or static friction (e.g. ball bearings use rolling friction); and fluid friction occurs in fluids.

[0083] The type of frictional force to utilise between moving mechanical parts of a window assembly is dependent on the desired application and degree of force required for movement of the related structures. It is important to note the different frictional forces

that conventional window assemblies may utilize are based upon a distinct objective or purpose, whereby a looser force such as kinetic or rolling friction is desired for more freely moving relevant structures relative to static friction forces. Accordingly, the friction stays are selected for the window assembly described herein as they provide the desired static frictional force required for safely and securely pivoting the first framework taking into consideration the range of desired movement and the weight load of the first framework. In one embodiment, the friction stay mechanism applied to the window assembly described herein does not need a restrictor to be allocated on the desired opening position and it can be calibrated based on the frictional force needed. This provides an advantage of improving safety by preventing any issue on looseness of the moving window frameworks during use.

[0084] In this regard, the weight of the first framework including the bars and glazing unit dictate the size of the friction stay to be used. Specifically, to determine the size of friction stay to be used in the window assembly described herein the weight of the glazing unit and first framework are calculated using the following equation to give the total weight and load $(\text{Distance} \times \text{Height} \times \text{thickness of glazing unit} + \text{weight of profile frame bars} \times 2.5) = \text{Load of Panel}$. The length (L) of the friction stay indicated in FIG. 4 is selected base on the load, the distance and height of the window panel. In one embodiment, the size of the friction stay may be selected from 12", 14" or 16".

[0085] The functionality of the friction stays used for the window assembly provides the advantage of allowing for cleaning or repair of the glazing unit attributable by the controlled and secure movement of the window panels to a designated open position as well as having the capability of holding the weight of the window panel while opening. Further, the pull movement of first framework (110) when being opened allows for the user to select a window opening position without the first framework moving further in the absence of the user's force.

Support Frame

[0086] The support frame (130) of the window assembly is illustrated In FIG. 5A – FIG. 5D. The support frame (130) is configured to be installed into a window parapet and is substantially rectangular in shape. The support frame (130) is configured to receive and support at least two window panels and may be sized as appropriate to fit within any desired parapet. In one embodiment, the support frame (130) can be sized in the range of 0.5 meter (m) to 4m in length and 0.5m to 2m in height, or variations within these ranges dependent upon factors including the size of the parapet and window panels to be installed, as well as the number of window panels to be installed. For example, the size range of the support frame (130) for 2 window panels may be 0.6m to 1.2m in length and 0.6m to 1.5m in height; the size range for 3 window panels may be 0.9m to 1.8m in length and 0.6m to 1.5m in height; the size range for 4 window panels may be 1.2m to 2.4m in length and 0.6m to 1.5m in height; the size range for 5 window panels may be 1.5m to 3.0m in length and 0.6m to 1.5m in height; and the size range for 6 window panels may be 1.8m to 3.6m in length and 0.6m to 1.5m in height. Further, the width of support frame for a two track design is 0.07m. The width for three track design is 0.11m.

[0087] The support frame (130) is comprised of four bar structures: the support top frame bar (133); support bottom frame bar (134); and two support side frame bars (135). Both support side frame bars may comprise a rubber gasket or equivalent tubing along the inner edges in order to prevent water seepage when the side bars of the window panels are abutting and are in close position. Moreover, as indicated in FIG. 2 the support frame can include sliding guide spacers (131) and top and bottom safety guides spacers (128a, 128b) to prevent unnecessary movement and improve safety control.

[0088] The completed support frame (130) defines an opening aperture (136) with a width dependent upon the size and number of the window panels that are to be slidably mounted therein. The frame bars (133, 134, 135) of the support frame (130) are attached to one another at each corner. As depicted in FIG. 5B, a pair of self-tapping stainless

steel screws (132) attach the top and bottom of each side frame bar to complementary receivers (e.g. screw port holes) in the abutting end of the top or bottom frame bar.

[0089] In one embodiment, the support bottom frame bar (134) can be comprised of two separate portions defined as the bottom sill bar (134a) and the bottom mounting bar (134b), as illustrated in FIG. 5B. The two bottom bar portions (134a, 134b) represent different cross-sectional profiles as depicted in FIG. 5C (two-track) and 5D (three-track). ‘View A’ depicts bottom roller guide track or rails (137) for slidably mounting at least one window panel in parallel horizontal planes. Accordingly, the two bottom bar portions (134a, 134b) define two or three slidable guide tracks or rails (137) configured such that when window panels are mounted on both portions in a fixed closed position they are arranged adjacent in a stepped configuration. The bottom guide tracks or rails (137) allow for roller wheels attached within the housing of the window panels to be seated at a given distance apart and able to slide freely along the tracks. In one embodiment, the support bottom frame bar may comprise punched water seepage holes (not show) in the outer walls and guide tracks for water drainage purposes.

[0090] In a preferred design, the sloped gradient profile tracks are inclined. As depicted, the tracks are at a 0.0458 or 3 degree angle inclined angle above the horizontal floor sitting area. The purpose of the inclined angle is to allow any rain water captured to flow outward, away from the parapet inner wall through the water seepage holes.

[0091] The two side bar portions (135) are depicted in ‘view B.’ The cross-sectional profile of the support top frame bar (133) is shown by ‘vie w C’ and is symmetrical, whereby two or three top alignment guide tracks or rails (138) are provided for slidably mounting window panels. The top alignment guide tracks or rails (138) are for guiding the window panels to move along the support frame within a given alignment and spacing between the windows panels.

[0092] Accordingly, in one embodiment the window assembly and support frame (130) comprise two guide tracks or rails (137) for slidably mounting at least two window panels.

In another embodiment, the window assembly and support frame (130) comprise three guide tracks or rails (137) for slidably mounting at least three window panels.

[0093] During installation, the completed window panels are first inserted on to the top alignment guide tracks (138) of the top frame bar (133) and subsequently the window panels are pushed downward onto the bottom roller guide tracks (137) of the bottom sill bar (134a) and the bottom mounting bar (134b) such that the rollers housed in the window panel engage with the bottom mounting bar (134b). The sliding movement of each window panel mounted on both the top frame bar (133) and bottom sill bar (134a) and the bottom mounting bar (134b) are tested for redundant movement, alignment and smoothness and can be locked in a closed position. It will be appreciated that all window panels are to be adhered to checks for ensuring all top and bottom safety guides and sliding guide spacers are present and properly engaged. This is to prevent any occurrence of window panels falling from the supporting frame (130). The final stage is to manually place the bottom sill bar (134a) into the bottom mounting bar (134b) and be affixed by silicon sealant on all edges. The initial separation of the bottom sill bar (134a) from the bottom mounting bar (134b) is due to the easy access and assembly of the window panels into the supporting frame (130).

[0094] The support frame (130) is preferably manufactured from a material to resist damage or breakage upon impact, for example aluminium. In one embodiment, the frame bars (133, 134, 135) are made of aluminium and manufactured using an extrusion process. Specifically, the frame bars (133, 134, 135) are made from aluminium 6063-T5 or T6 or equivalent and manufactured using an extrusion process.

Second Framework

[0095] In FIG. 6A and FIG. 6B, the second framework (120) of the window assembly is illustrated with two interlocking window panels to be slidably mounted in the support frame (130). The second framework (120) of each window panel is comprised of four bar structures termed the second top frame bar (123), second bottom frame bar (124), an

interlocking side frame bar (125) and an outer side frame bar (126). The profile of each individual frame bar of the second framework (120) is configured and designed to match, align and complement the bar design of the first framework (110) when positioned within the opening aperture defined by the second framework. In an embodiment comprising two window panels slidably mounted within the support frame in a stepped configuration, inner surface (120a) of each window panel face each other whereas the surfaces of each window panel that are facing away from one another are outer surfaces (120b).

[0096] The completed second framework (120) defines an opening aperture with a width dependent upon the size of the first framework to be positioned within and pivotally attached thereto. The frame bars (123, 124, 125, 126) of the second framework (120) are attached to one another at each corner. In particular, self-tapping stainless screws (not shown) tightly attach the top and bottom of each side frame bar to complementary receiver elements (e.g. screw port holes) in the abutting end of the adjacent second top or bottom frame bar. A profile rubber gasket or equivalent tubing (129) can be positioned on the face of the inner edge of the frame bars (123, 124, 125, 126) to engage with the abutting surface of the first framework (110) to prevent water seepage at these adjoining structures.

[0097] Safety guides (128) can be secured with self-tapping stainless screws on the outer surface corners of the outer side frame bar (126). The second bottom frame bar (124) comprises a housing (122a) for containing the sliding mechanism. In particular, two rollers are included for each window panel within the housing (122a). These rollers can be, for example, SW rollers (25mm width x 33mm height). The sliding mechanism of the rollers and housing (122a) are configured to be mounted on the sliding guide or rail track within the support frame. The sliding guide or rail track provides for a smooth transition of each window panel between a first and second position.

[0098] As shown in FIG. 6B, two window panels are arranged in a stepped configuration such that one panel is positioned in front or behind of the other in a parallel horizontal plane. This movement and positioning of the two window panels is attributed to each of the two window panels being slidably mounted on separate sliding guide tracks relating

to the bottom sill bar (134a) and the bottom mounting bar (134b) of the support frame (130).

[0099] As illustrated in FIG. 6A, FIG. 6B and FIG. 9A, two window panels can be positioned relative to one another in a first position (i.e. the closed position whereby upon installation into the support frame (130) the entire opening aperture of the support frame is obstructed). This closed position refers to the occasion when the outer side bar frame (125) of each window panel are abutting with one of the support side frame bar (135) of the support frame. The passage of air through the window assembly will occur once one or both the window panels are translated from the first position towards a second position and the opposite support side frame bar (135) of the support frame (130), as shown in FIG. 9B. As shown in FIG. 7B and FIG. 3 – FIG. 6, window panels can be installed on two or three guide tracks and positioned relative to one another in a first position (i.e. the closed position) whereby upon installation into the support frame (130) the entire opening aperture of the support frame is obstructed.

[00100] In the first closed position of the window panels, it is desirable for the adjacent interlocking side frame bars (125) of each window panel to be securely engaged with one another to ensure that the window panel has been slid to the most appropriate position for closing as well as to prevent water seepage and provide an air tight seal therebetween. Accordingly, an interlocking mechanism (127) can be provided between the vertical length of each interlocking side frame bar (125), whereby interlocking members are separately provided along the vertical length of each interlocking side frame bar (125). In addition to the interlocking mechanism, an overlapping mechanism (139) can be provided along the vertical length of one side of each overlapping side frame bar (125) of window panels mounted on the same guide track (FIG. 7D). In one embodiment, a window panel can comprise either an interlocking mechanism or an overlapping mechanism. In another embodiment, a window panel can comprise both an interlocking mechanism and an overlapping mechanism, whereby these mechanisms are positioned on opposite side frame bars of the window panel.

[00101] FIG. 6C depicts a cross-sectional view of the second framework with two window panels. The second frame can include sliding guide spacers (131) and top and bottom safety guides (128a, 128b) to prevent unnecessary movement and improve safety control. The sliding mechanism (122) is also depicted along with the supporting bottom frame bar (134).

[00102] The second framework (120) is preferably manufactured from a material to resist damage or breakage upon impact, for example aluminium extruded bars. In one embodiment, the frame bars (123, 124, 125, 126) are made of aluminium 6063 T5 or T6 or equivalent and manufactured using an extrusion process.

Interlocking Mechanism

[00103] The interlocking mechanism (127) depicted in FIG. 6B is further illustrated and elaborated upon in FIG. 7A and FIG. 7B with respect to the engagement of two window panels slidably mounted within the support frame (130). FIG. 7A depicts the sliding movement of a two-window panel assembly while FIG. 7B depicts the pivoting movement of the first frame in relation to the second framework.

[00104] The interlocking mechanism (127) is comprised of L-shaped interlocking members (127a) separately provided on each interlocking side frame bar (125). The L-shaped interlocking members (127a) run the vertical length of each interlocking side frame bar (125) and may be in an L-shape form that tapers towards its distal end. The L-shaped interlocking members (127a) engage or interlock with each other on tapered surfaces which are able to perform a positive engagement during hooking or catching action such that they prevent each other from being further slidably translated away from one another and define a maximum first closed position. It will be appreciated that other suitable shapes of interlocking members may be provided to achieve the aforesaid function.

[00105] In addition to the interlocking members, a rubber gasket or equivalent tubing can be positioned at the outer side of the interlocking members to prevent water seepage when the window panels are in a first closed position, as well as provide an air tight seal between the window panels.

Overlapping Mechanism

[00106] The overlapping mechanism (139) illustrated in FIG. 7C and 7D aids in the engagement of two window panels slidably mounted on the same guide track within the support frame (130).

[00107] Alternative designs can include additional tracks and window panels. FIG. 7C depicts the arrangement of three, four, five and six window panels relative to one another using the interlocking mechanism between window panels on separate guide tracks and the overlapping mechanism for window panels on the same guide tracks.

[00108] FIG. 7D and FIG. 7E depict the overlapping mechanism for eliminating the vertical gap in side frame bars when two window panels use the same track. The overlapping mechanism (139) is comprised of a protruding member provided on one side of each overlapping side frame bar (125). Each protruding member may comprise a sheet of material coupled to one side of the overlapping side frame bar that extends along the horizontal axis of the window panel. The protruding member may run along the vertical length of the side frame bar (125). The overlapping member engages with a side bar frame (125) of an adjacent window panel on the same guide track such that in a first closed position the clearance space or gap in between the two window panels is covered to prevent water seepage, as well as providing a substantially air tight seal between the window panels.

[00109] Individual components are further depicted in FIG. 7F. A sliding guide spacer (131) and a top and bottom safety guide (128a, 128b) control the sliding movement of window panels via rollers. 'X' indicates the distance control for redundant

movement between the guide tracks and rollers of the window panels and alignment guide tracks and sliding guide spacer.

First Framework

[00110] In FIG. 8A, the first framework (110) of the window assembly is illustrated to be pivotally coupled within the secondary frame (120). The first framework (110) of each window panel is comprised of four bar structures termed the first top frame bar (116), first bottom frame bar (117) and two first side frame bar (115). The profile of each individual frame bar of the first framework (110) is configured and designed to match, align and complement the bar design of the second framework (120) for its positioning within the opening aperture defined by the second framework. In an embodiment, the first framework (110) and frame bars (116, 117, 115) comprise an inner portion (110a) and an outer portion (110b), whereby the inner portion (110a) is facing inward towards the enclosed area or room.

[00111] The completed first framework (110) defines an opening aperture with a width dependent upon the size of the second framework for positioning within and pivotally attached thereto. The frame bars (116, 117, 115) of the first framework (110) are attached to one another at each corner. In particular, self-tapping stainless steel screws (113) tightly attach the top and bottom of each side frame bar to complementary receiver elements (e.g. screw port holes) in the abutting end of the adjacent first top or bottom frame bar.

[00112] The first framework (110) comprises a glazing unit (111) with outer edges that are slotted into complementary openings around the entire inner edge of the frame bars (116, 117, 115). The glazing unit (111) may comprise a single window pane or multiple window panes of glass. For example, the glazing unit may be in the form of a double glazed unit. So as to prevent or minimise the breakage of or damage to the glazing unit, the glazing unit may comprise at least one pane of security glass. A profile rubber gasket or equivalent tubing (111a) is positioned on the inner edge of the frame bars (116, 117, 115) to prevent water seepage.

[00113] For pivotal attachment of the first framework (110) to the second framework (120) the pair of friction stays are attached to the inner portion (110b) of the top and bottom frame bars (116, 117).

[00114] The first framework (110) is preferably manufactured from a material to resist damage or breakage upon impact, for example aluminium extruded bars. In one embodiment, the frame bars (116, 117, 115) are made of aluminium 6063-T5 or T6 or equivalent and manufactured using an extrusion process.

[00115] FIG. 8B, depicts the first framework (110) coupled with the secondary frame (120). Also depicted is a safety edge protector (140) that can be attached to one or two corners of the first framework. As may be appreciated, in instances where the first framework (110) is in an open position, the protruding corner edge may present a safety hazard for individuals with the potential to cause injury from impacting with the protruding corner edge. Accordingly, in one embodiment, the corner edge at the lowest right hand side of the opened first framework comprise a safety edge protector (140) cum internal profile for fingers to grip and assist further opening of the first framework besides using the flush pull handle. The edge protectors (140) are positioned on the outer surface of the first framework and are configured to conform with the profile of the corner edge. The edge protector can be affixed to the first framework with self-tapping stainless steel screws. In this regard, the edge protectors are attached to the corner edges such that the pivotal operation of the first framework is not impacted nor is the mating and closing positioning of the first framework within the second framework. The edge protectors can be manufactured from any heavy duty rubber (neoprene), synthetic plastic polymer, preferably polyvinyl chloride (PVC) or an equivalent.

[00116] FIG. 9A depicts a window panel assembly installed in a parapet. The supporting top frame bar (133) is detached to show the arrangement of the first and second framework. The second framework is slid in a closed positioned and the first framework is in a closed position in alignment with the second framework. A user is present inside a room or residence, facing the window and inner wall.

[00117] FIG. 9B also depicts the completed window assembly. Here, a panel of the second framework is slid into an open position. Also, a panel of the first framework is pivotally opened inward, toward the user and the internal area. The design allows greater versatility for a user. It also allows one to clean and/or service both sides of a window pane with minimal effort. Further, because the window opens inward, it does not present a danger of falling outward that is common with conventional designs.

Working Example

[00118] The methodology described below includes testing conducted to meet use and reliability standards. A representative window assembly shall be tested by an industry standard in accordance to BS EN 13126-6:2008 and an analysis study is performed on the strength and durability of all structural components of the completed window assembly. All raw material for the parts are compliant to the certificate of conformance. The components manufactured have a certificate of performance on the quality compliance. This includes all bars, friction stay hinges, pull flush handle, glazing units, safety guides, spacers, lock units, spring loaded roller catchers, rubber gaskets, safety edge protector and screws in the following:

- ~ Bar material is made of aluminum grade 6063 Tempered T3 or T5. The bar is produced by extrusion method and tempered to specification to give a good homogenous grain size and flow. The overall profile thickness specification is between 1mm to 1.5mm;
- ~ Friction stay hinge is manufactured from high quality 304 austenitic stainless steel or equivalent for long life performance and enhanced corrosion resistance accordance to technical specification requirement (BS EN 1670 Grade 5 & BS EN 13126-1:2009-para. 7.7.1) The parts are produced by forming or pressing method;
- ~ Safety guide and sliding spacer material are made of Polyoxymethylene (POM) or equivalent. The plastic parts are produced by injection molding;

- ~ Rubber gasket material is made of Ethylene-propylene diene monomer (EPDM) or equivalent. The parts are produced by injection molding;
- ~ Edge protector is made of heavy duty rubber (neoprene), synthetic plastic polymer, preferably polyvinyl chloride (PVC) or an equivalent. The parts are produced by injection molding;
- ~ Lock unit is made of zinc alloy and lock hook is made of stainless steel SS201 or cold rolled steel. Both parts are plated or powder coated to resist corrosion. The parts are produced by casting, riveting and forming process;
- ~ Pull flush handle is made of stainless steel, zinc alloy, polyamide-based (PA) technopolymer material or equivalent that is reinforced with glass fiber. The parts are produced by cast, press or injection molding;
- ~ Spring-loaded roller catcher set is made of cold rolled steel or brass that is plated or coated to resist corrosion. The torsion leaf spring is made of spring steel. The rollers are made of nylon plastic material. The parts are produced by stamping, forming, coiling and riveting method. The rollers are produced by injection molding.
- ~ Glass panel has a wide range of selection and colours found in the market such as clear glass, fully tempered glass, heat soaked tempered glass, laminated glass, wire glass, low-emissivity glass, glazing type etc. suitable for our use; and
- ~ Screw material is made of stainless steel. The nominal size use is range from no.2 to no.8. The screw head is either Pan or Countersunk. The length varies from $\frac{1}{4}$ to 3 inches.

[00119] With the above testing compliance certification the representative window assembly of the present invention can meet the requirements of BS EN 13126-6:2008 (Building hardware).

[00120] The window assembly shall be tested to be capable of meeting the requirements of the standardized test of BS 6375-1 as part of a compliant for window system and their performance of the windows & doors. The test performance for B.S 63751 specifies the exposure categories related to test pressure levels for air permeability, water-tightness and wind resistance.

[00121] As to a further discussion of the manner of usage and operation of the present invention, the same should be apparent from the above description. Accordingly, no further discussion relating to the manner of usage and operation will be provided.

[00122] With respect to the above description then, it is to be realized that the optimum dimensional relationships for the parts of the invention, to include variations in size, materials, shape, form, function and manner of operation, assembly and use, are deemed readily apparent and obvious to one skilled in the art, and all equivalent relationships to those illustrated in the drawings and described in the specification are intended to be encompassed by the present invention.

[00123] Therefore, the foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of the invention.

[00124] The foregoing has described the principles, embodiments and modes of operation of the present invention. However, the invention should not be construed as being limited to the particular embodiments discussed. The above described embodiments should be regarded as illustrative rather than restrictive, and it should be appreciated that variations may be made in those embodiments by workers skilled in the art without departing from the scope of the present invention as defined by the following claims.

[00125] The invention has been described broadly and generically herein. Each of the narrower species and subgeneric groupings falling within the generic disclosure also

form part of the invention. This includes the generic description of the invention with a proviso or negative limitation removing any subject matter from the genus, regardless of whether or not the excised material is specifically recited herein.

[00126] Other embodiments are within the following claims and non-limiting examples. In addition, where features or aspects of the invention are described in terms of Markush groups, those skilled in the art will recognize that the invention is also thereby described in terms of any individual member or subgroup of members of the Markush group.

What is claimed is:

1. A window assembly for a parapet, comprising:
 - a support frame comprising two sliding guide tracks on a bottom frame bar, wherein the two guide tracks are positioned on a sloped gradient and the bottom frame bar comprises punched water seepage holes;
 - two window panels each slidably mounted on a separate guiding track in the support frame such that each window panel can translate between a first closed position and a second open position and any position therebetween, wherein each window panel comprises a first framework and a second framework defining an opening aperture,
 - wherein the first framework is configured for positioning within the opening aperture defined by the second framework,
 - wherein the first framework is pivotally attached to the second framework with a pair of friction stays to pivot about a substantially vertical axis such that the first framework can pivot between a closed position, an inward open position and any position therebetween; and
 - an interlocking mechanism positioned on the second framework of each window panel for a sealing engagement between each window panel when the two window panels are in the first closed position, wherein the interlocking mechanism comprises L- shaped interlocking members and rubber gasket tubing wherein the second framework comprises safety guides on each corner,
 - wherein the support frame comprises sliding guide spacers positioned on an interior portion of a top frame bar,
 - wherein each of the pair of friction stay comprises four arms and a stationary plate, wherein the pair of frictions stays provide static frictional force.
2. The window assembly of claim 1, wherein the inward open position is 90° relative to the longitudinal axis of the parapet.
3. The window assembly of claim 1, further comprising a locking mechanism to secure the two panels in the first closed position.

4.The window assembly of claim 1, wherein in the first closed position the two window panels are arranged adjacent to one another in a stepped configuration such that there is no opening aperture in the support frame.

5.The window assembly of claim 1, wherein the second framework comprises an interlocking side bar with an inner and outer side, and wherein the interlocking mechanism is positioned on the inner side of the interlocking side frame bar.

6.The window assembly of claim 1, wherein the second framework defines the opening aperture with a rubber gasket attached to inner edge of the second framework.

7.The window assembly of claim 1, wherein the two window panels are each independently slidably mounted via roller wheels.

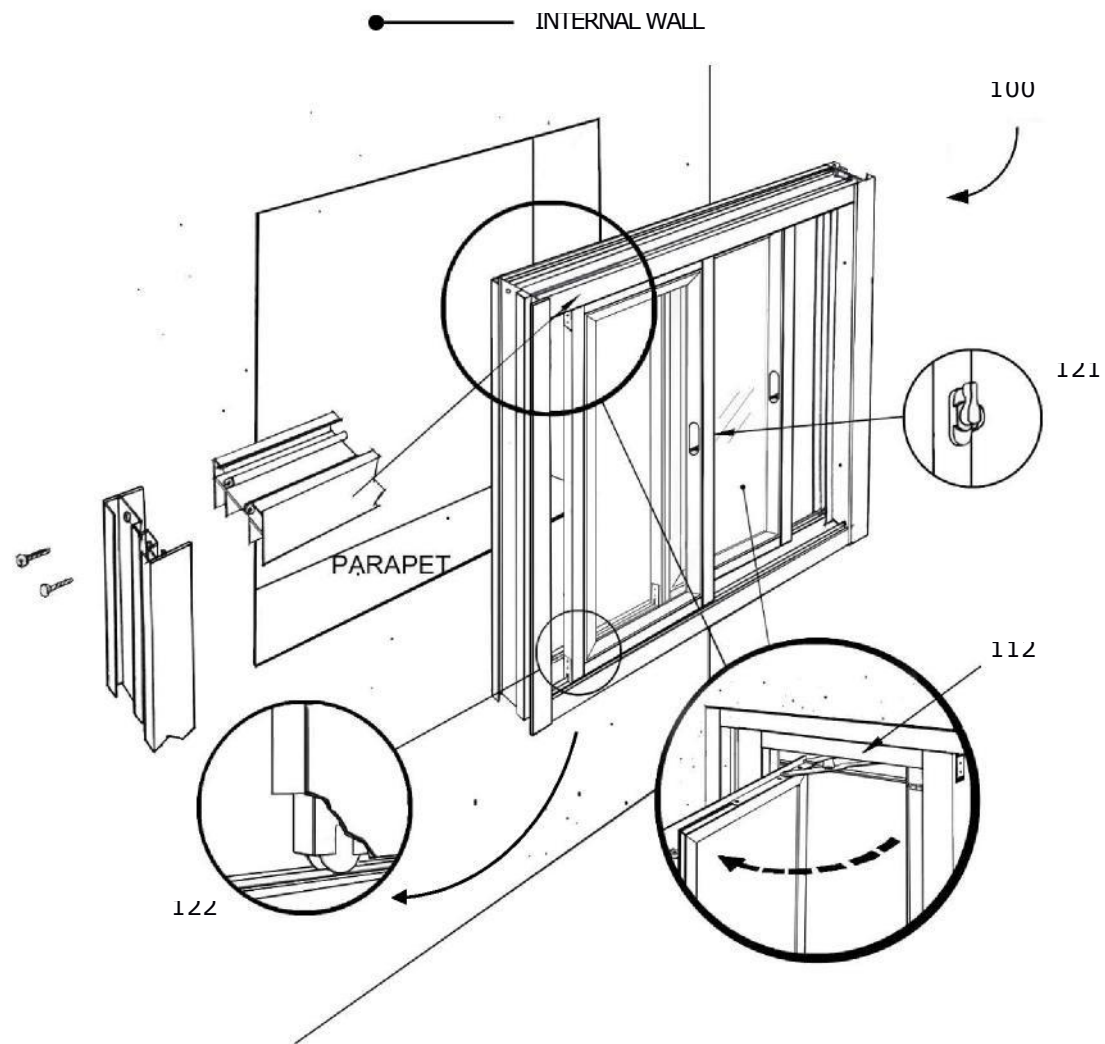
8.The window assembly of claim 1, wherein the first framework comprises edge protector positioned at one bottom corner.

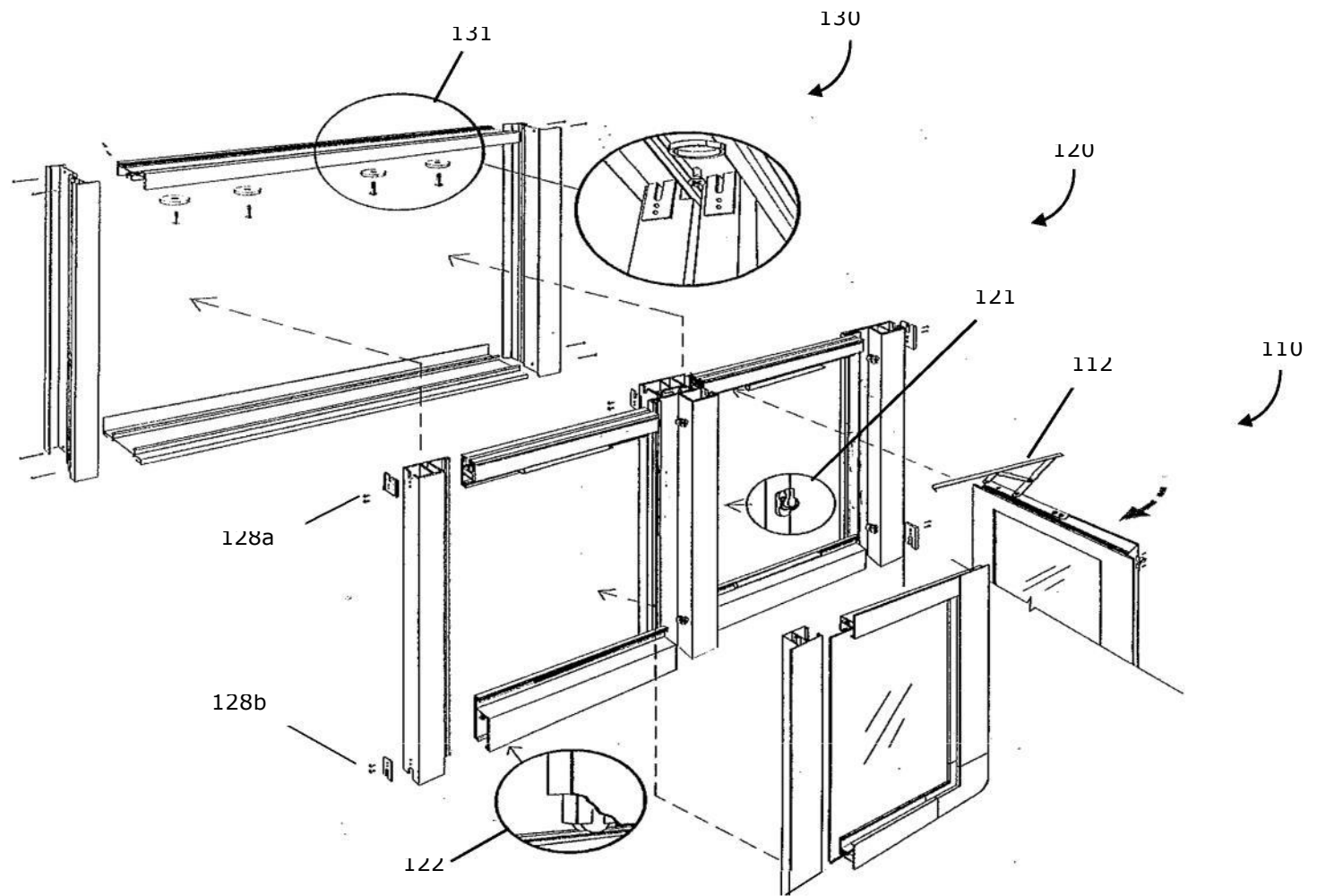
9.The window assembly of claim 1, further comprising one, two or four additional window panels, wherein the additional window panels are slidably mounted on any one of the guide tracks.

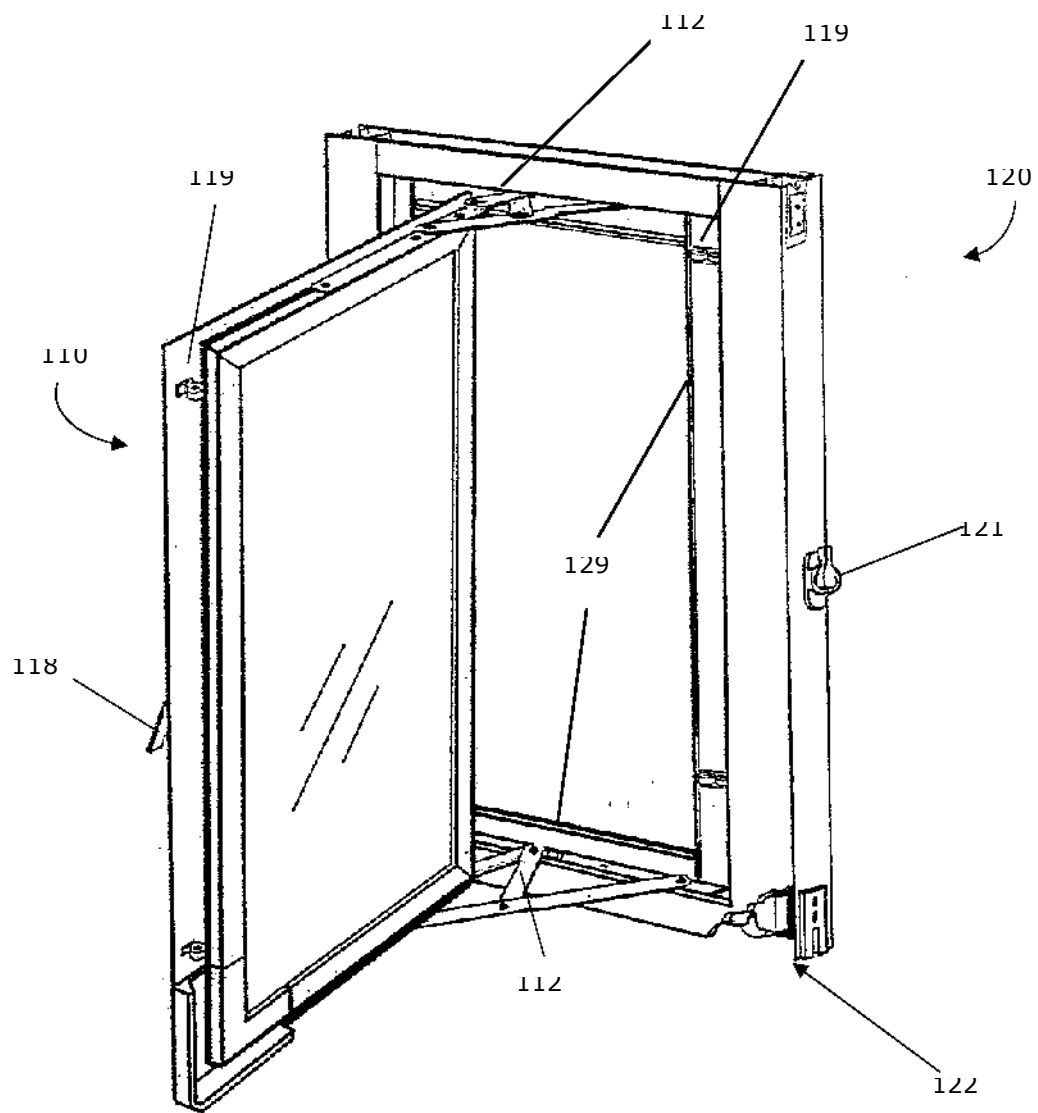
10. The window assembly of claim 1, wherein the support frame comprises an additional sliding guide track and the window assembly further comprises three, five or six additional window panels slidably mounted on any one of the guide tracks.

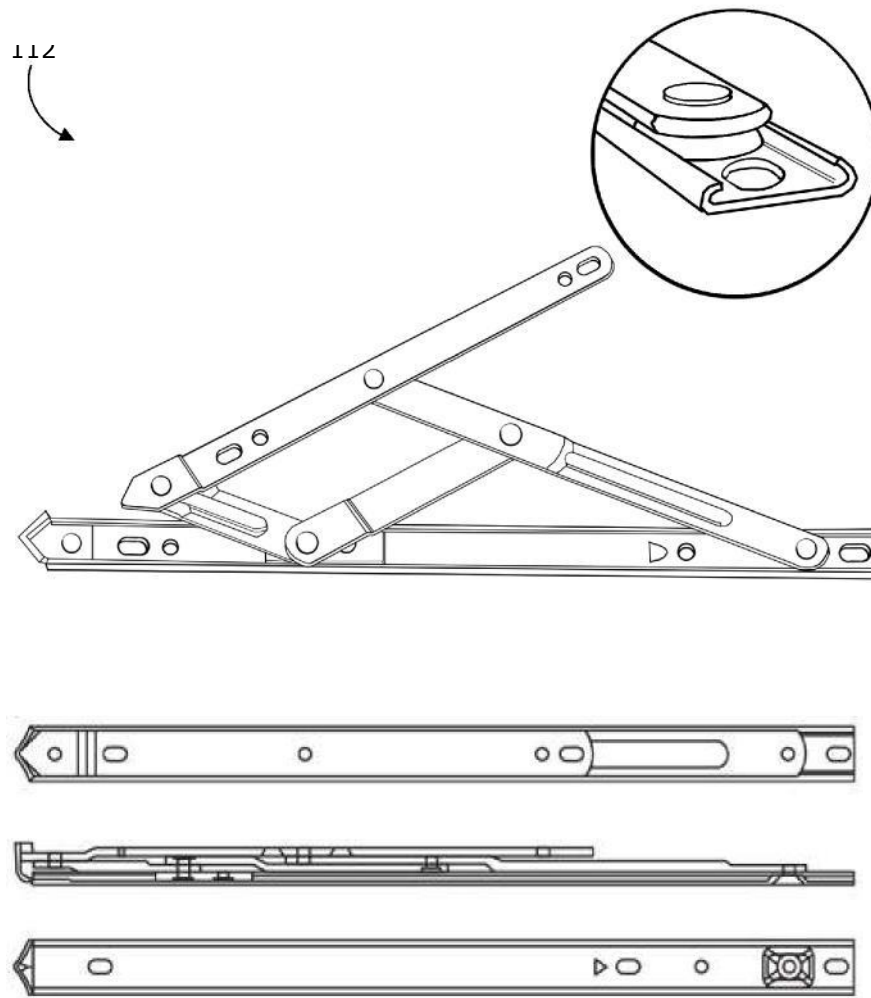
11. The window assembly of claim 10, wherein any one of the three, five or six additional window panel are slidable mounted on to the additional sliding guide track and comprise an interlocking mechanism positioned on the second framework for a sealing engagement with an adjacent window panel on a separate guiding track when the window panels are in a first closed position.

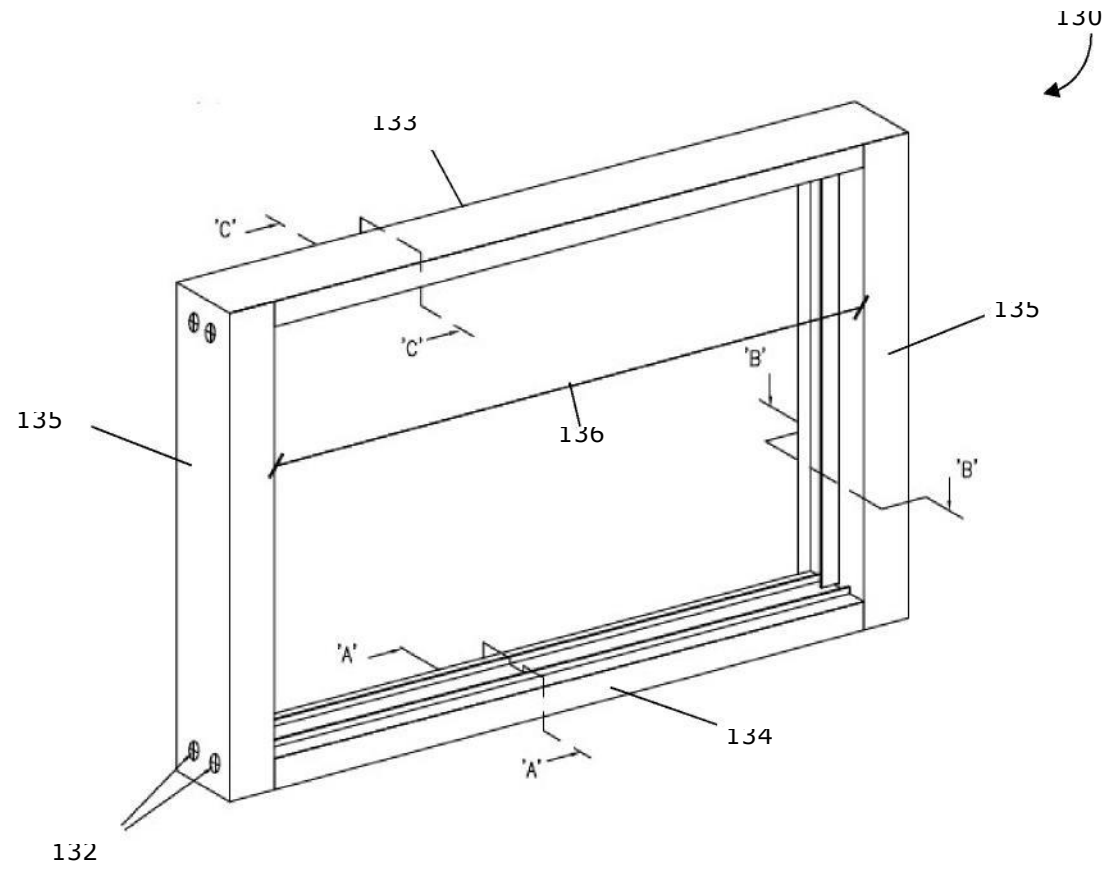
12. The window assembly of claim 10, wherein any one of the three, five or six additional window panel is slidable mounted on to the same guiding track of either the two sliding guide track and comprises an overlapping mechanism for coordinated slidable movement.



**FIG. 2**

**FIG. 3**

**FIG. 4**

**FIG. 5A**

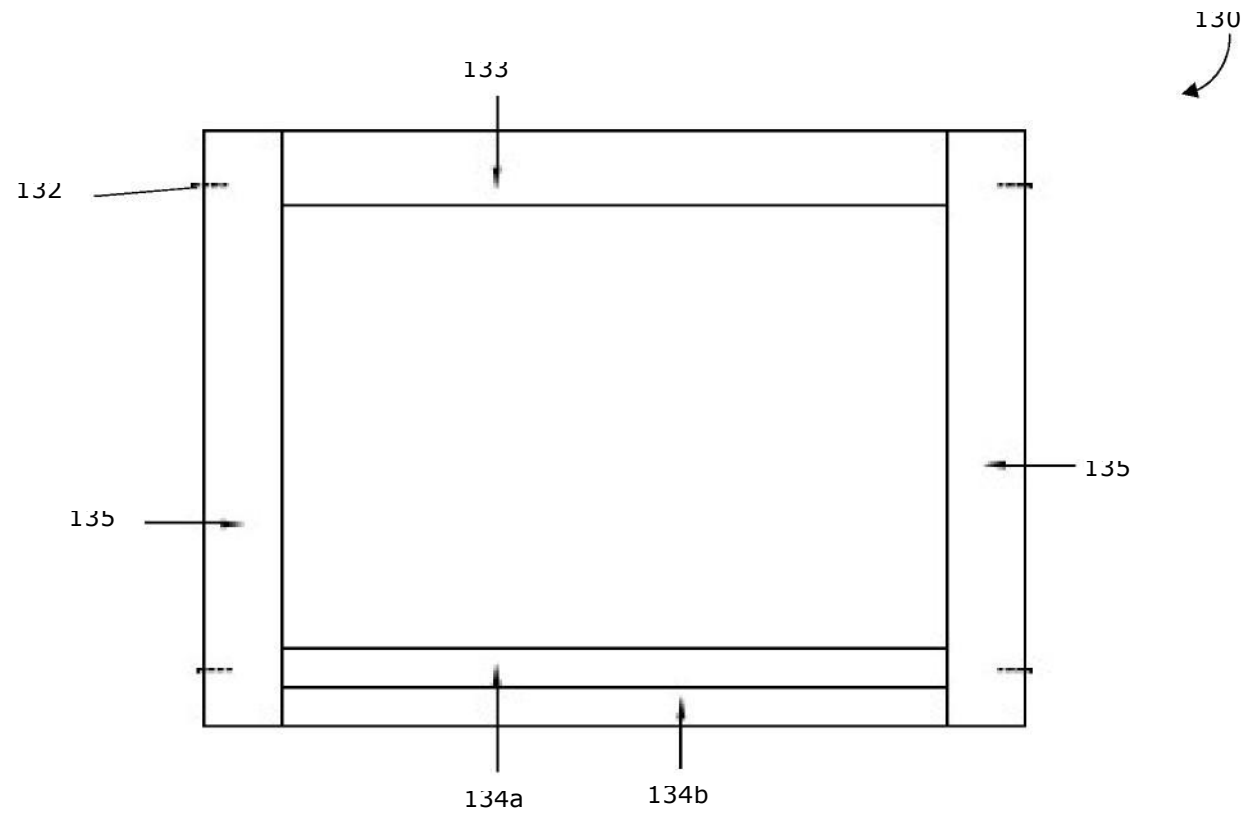


FIG. 5B

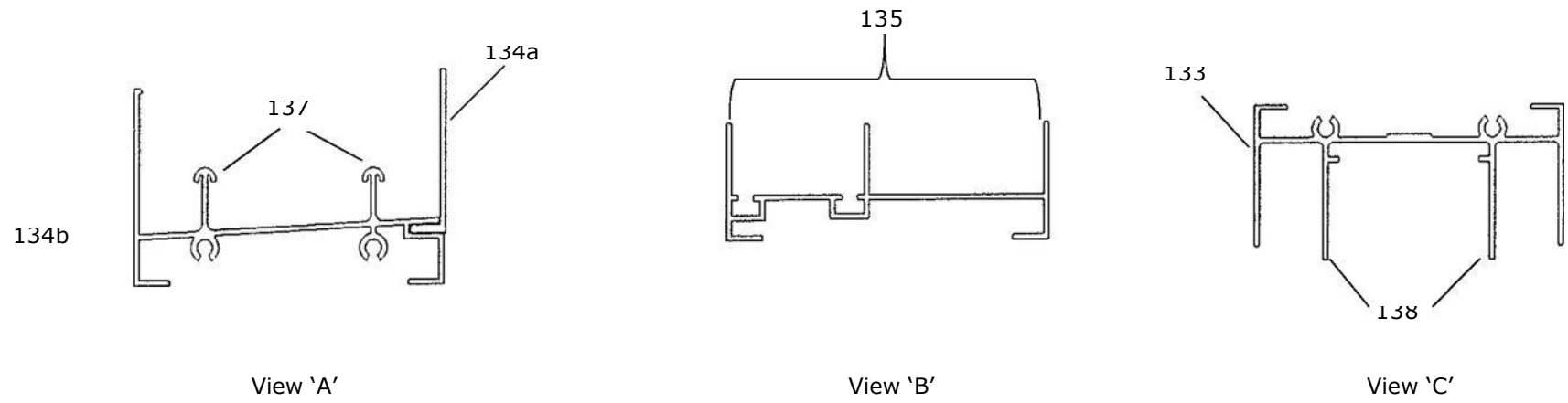
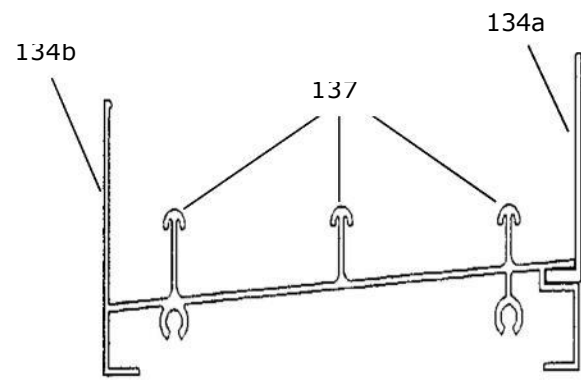
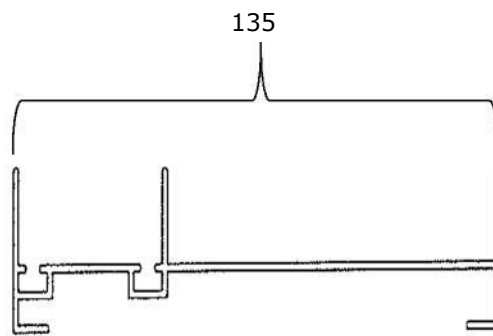


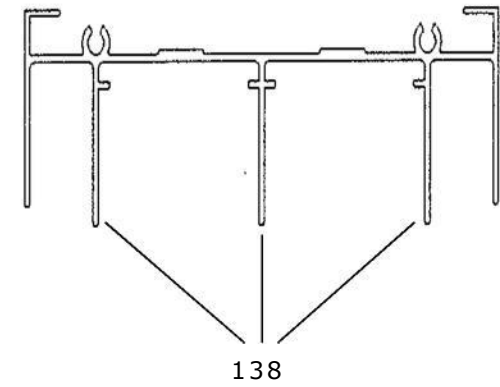
FIG. 5C



View 'A'



View 'B'



View 'C'

FIG. 5D

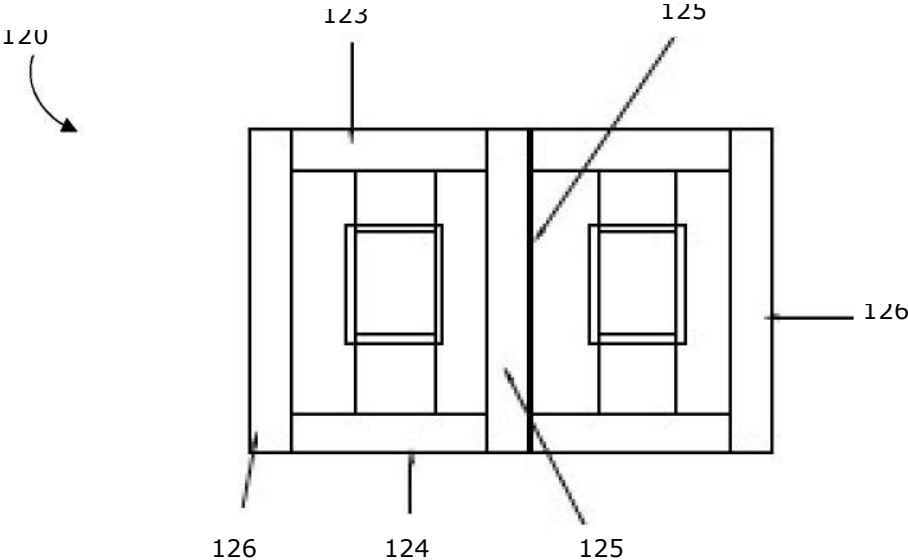


FIG. 6A

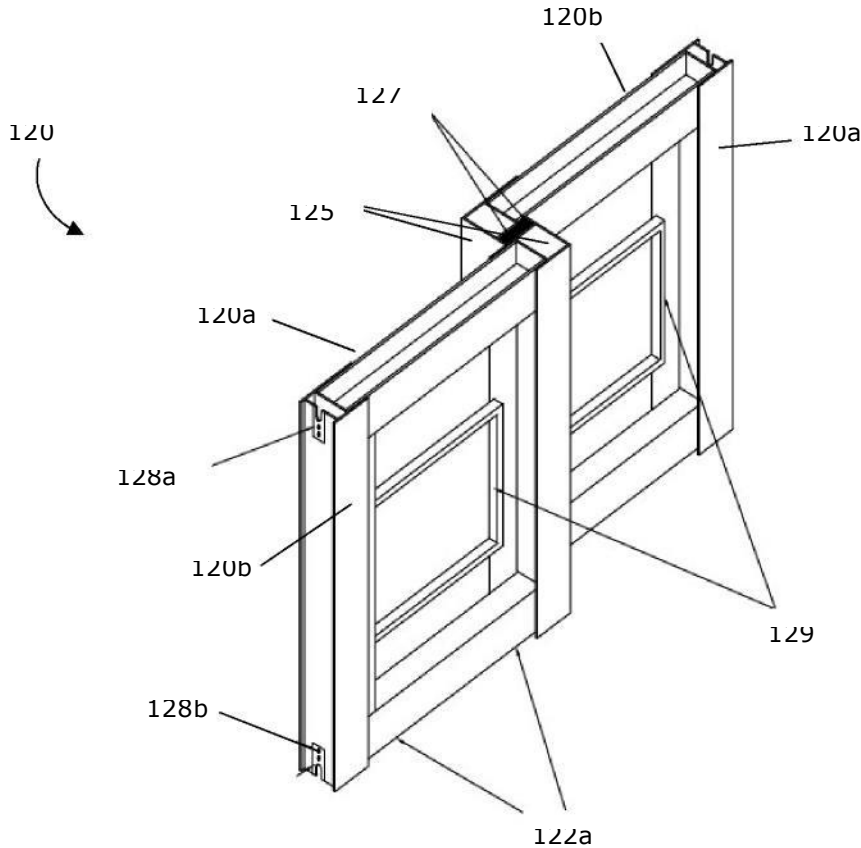


FIG. 6B

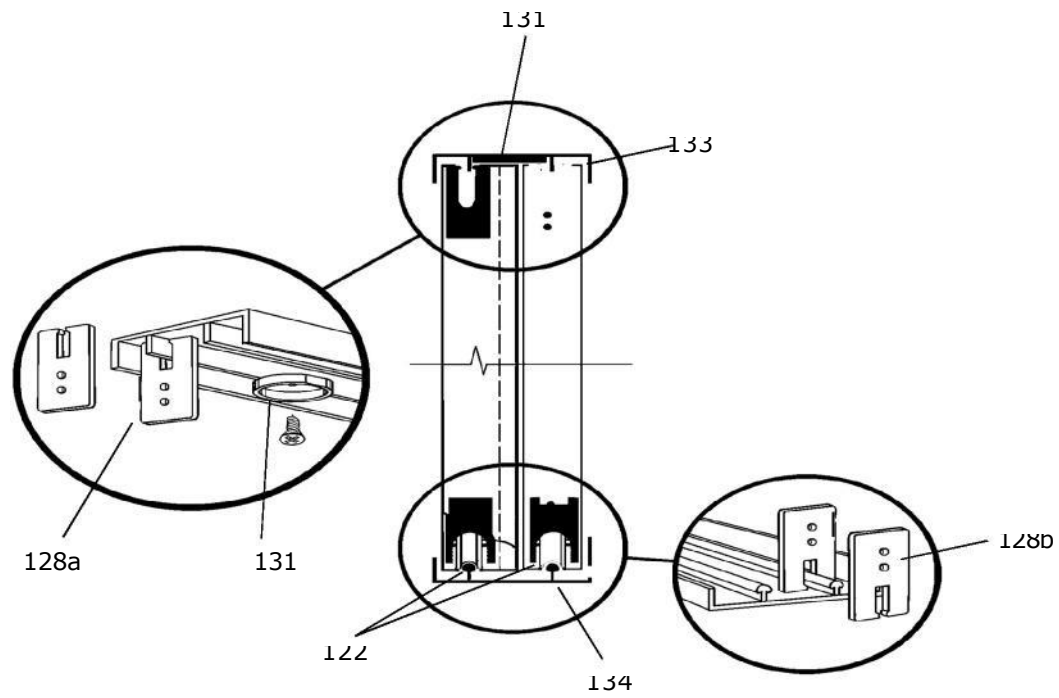


FIG. 6C

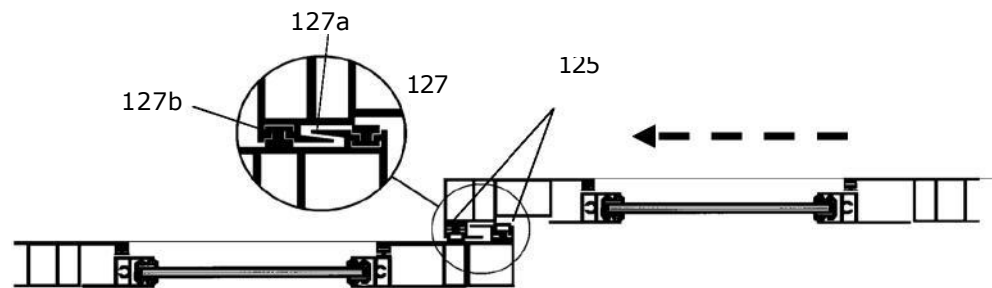


FIG. 7A

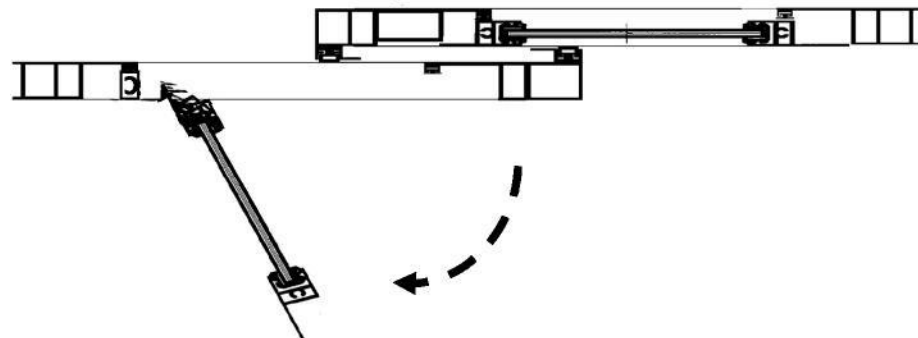
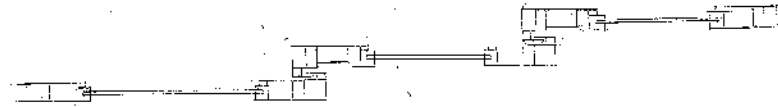


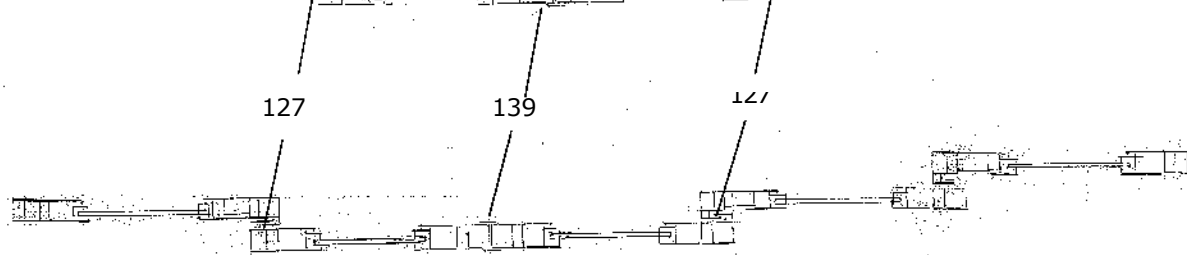
FIG. 7B



Three Panels



Four Panels



Five Panels



Six Panels

FIG. 7C

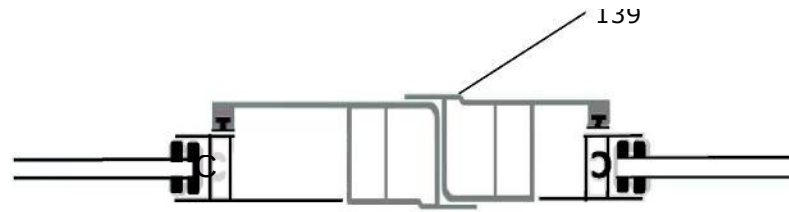


FIG. 7D

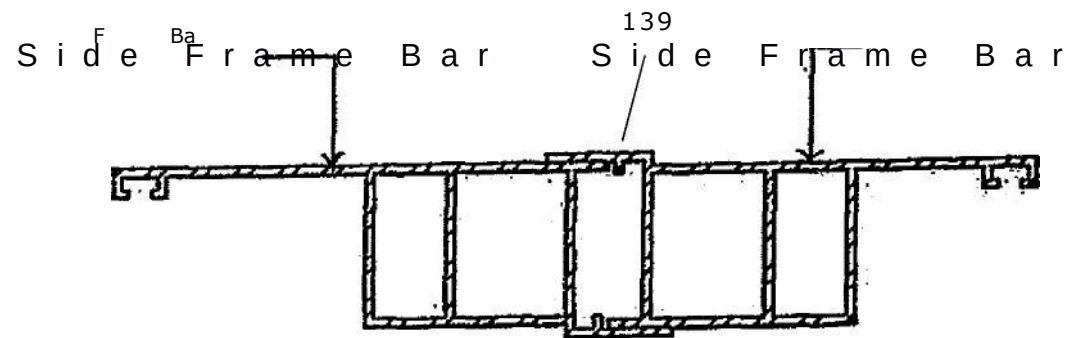


FIG. 7E

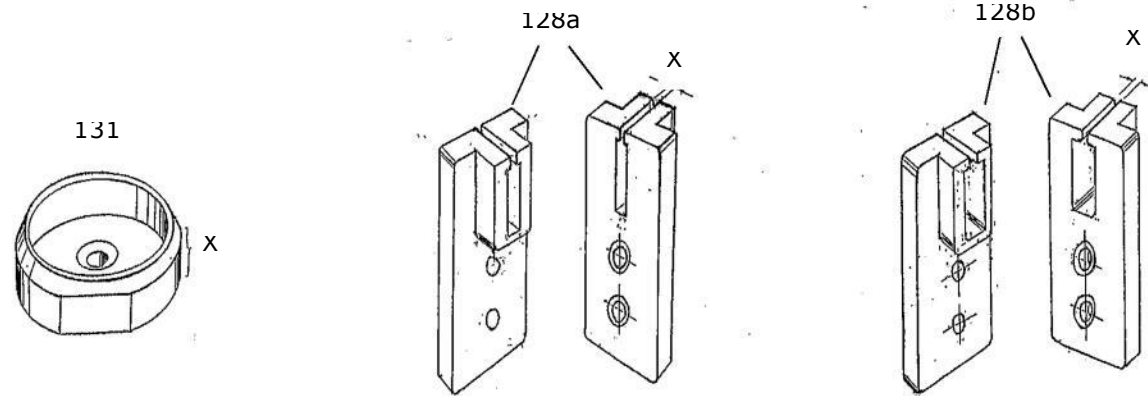
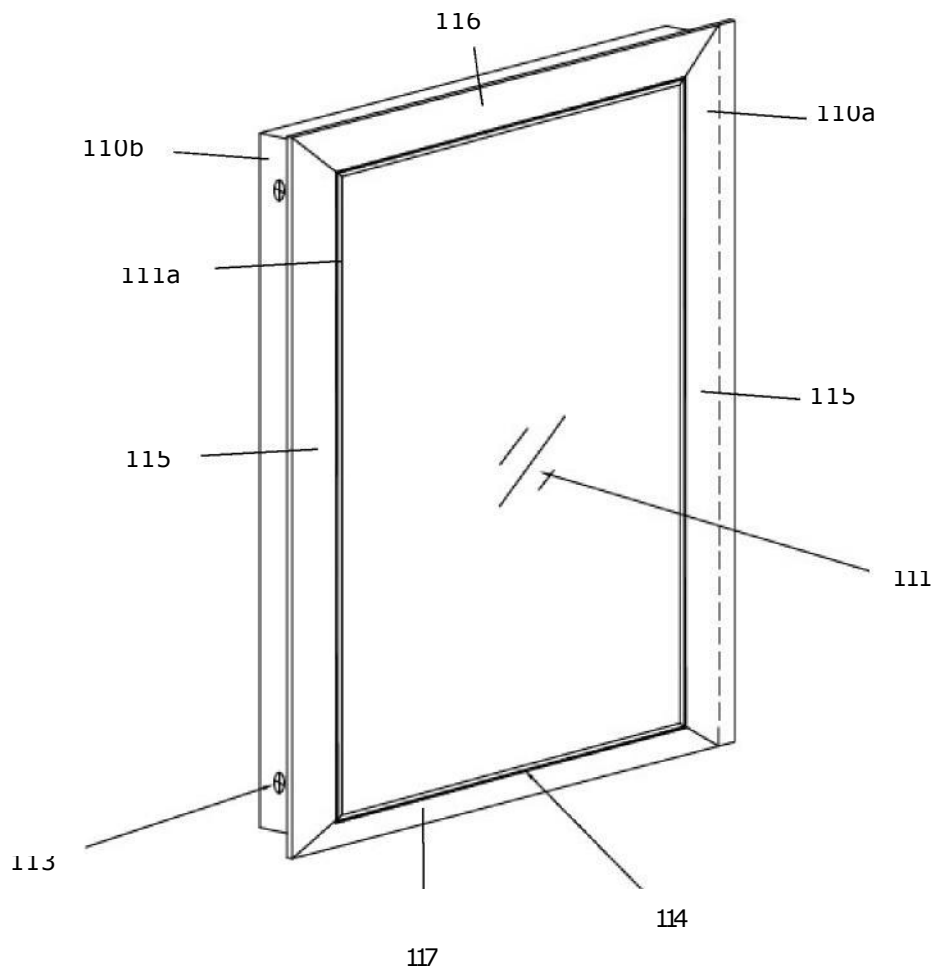


FIG. 7F

**FIG. 8A**

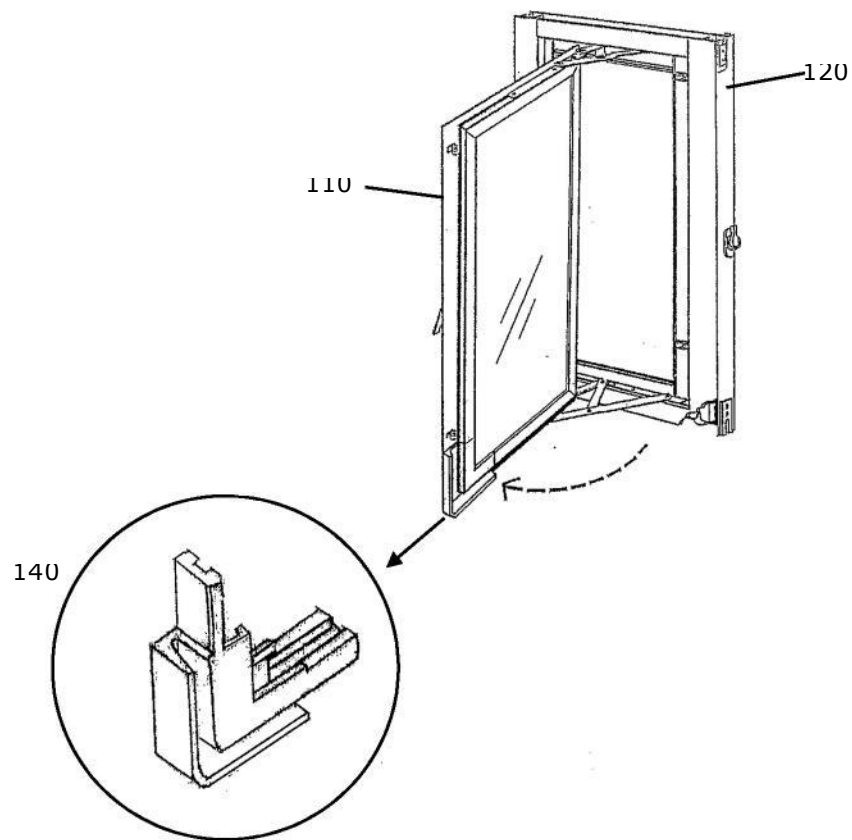


FIG. 8B

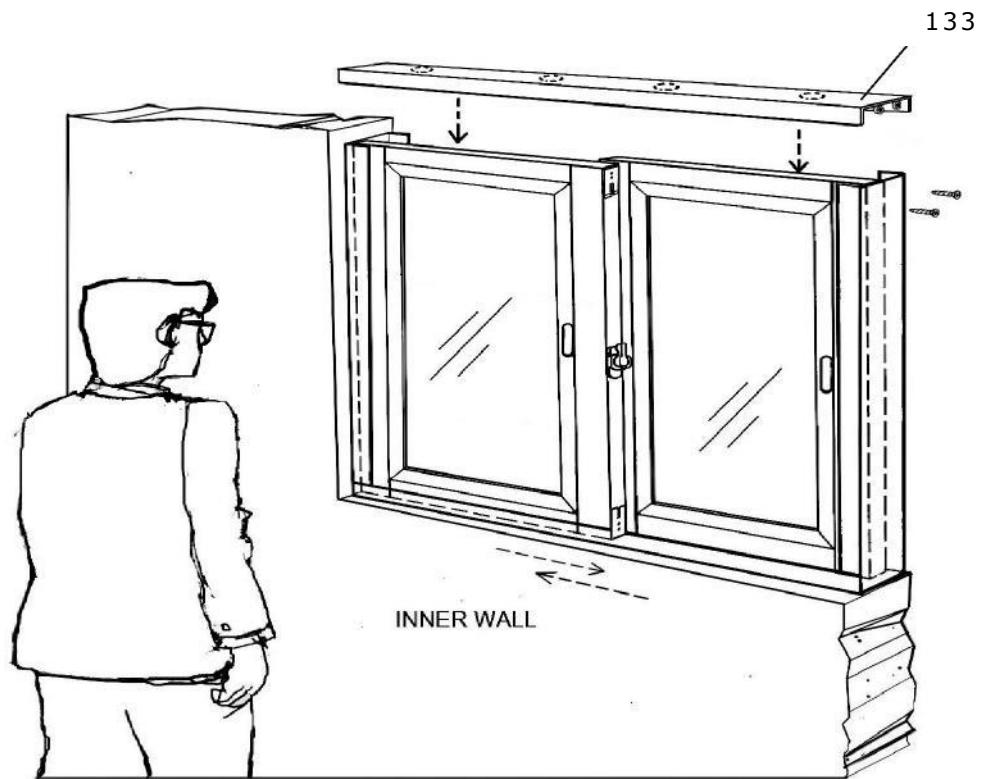


FIG. 9A

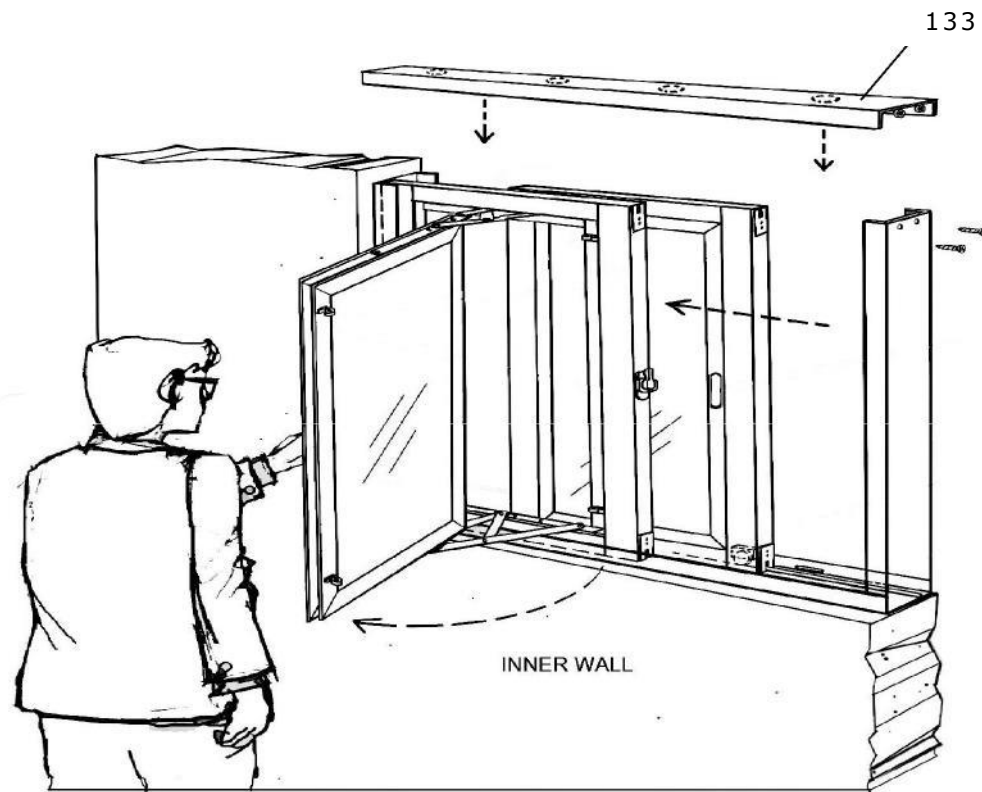


FIG. 9B