Feb. 21, 1967 J. FOX-WILLIAMS 3,304,993

WINDOW ASSEMBLIES

Filed Sept. 22, 1964

3 Sheets-Sheet 1

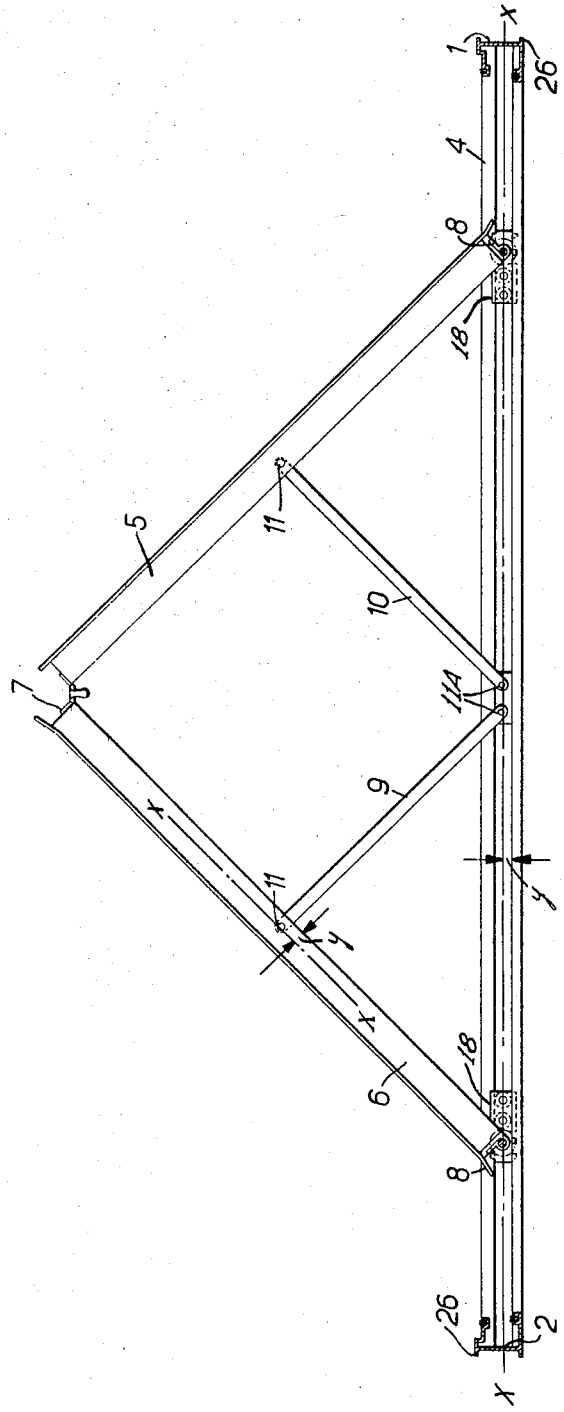


FIG. 1.

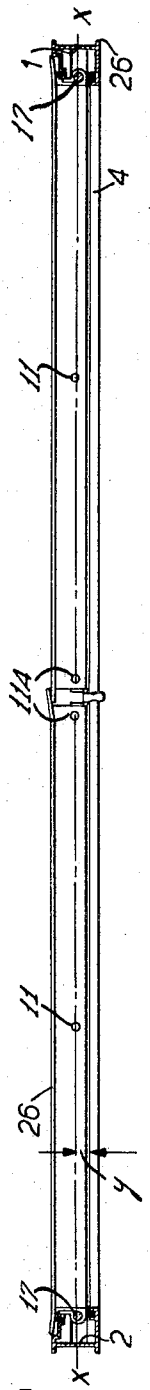


FIG. 2.

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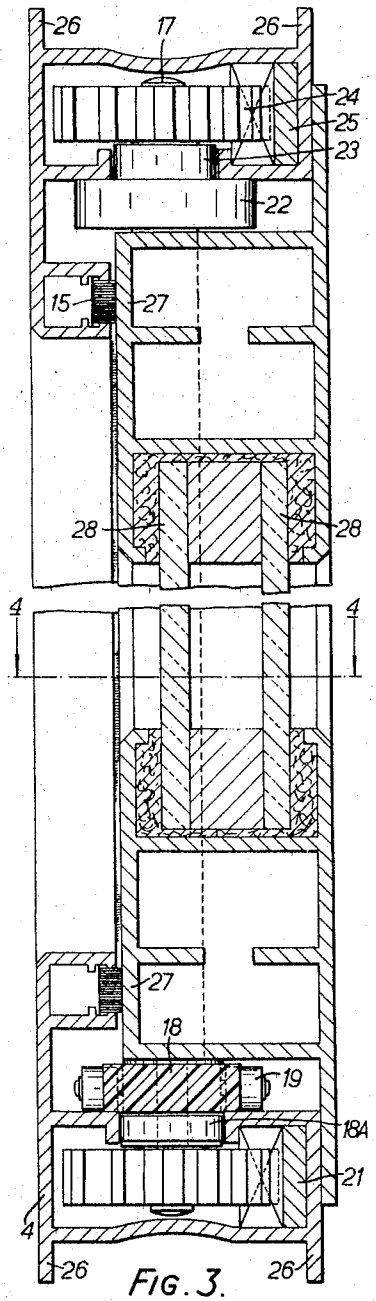


FIG. 3.

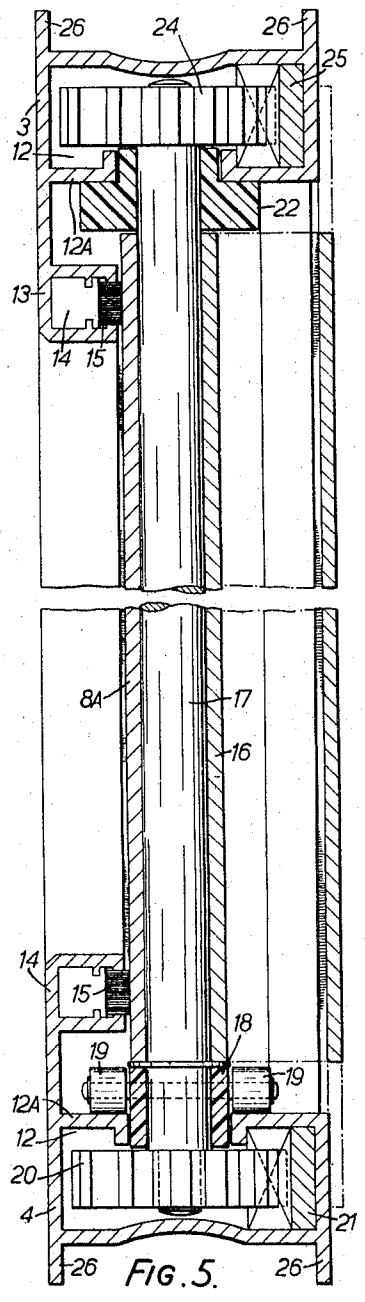


FIG. 5.

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WINDOW ASSEMBLIES

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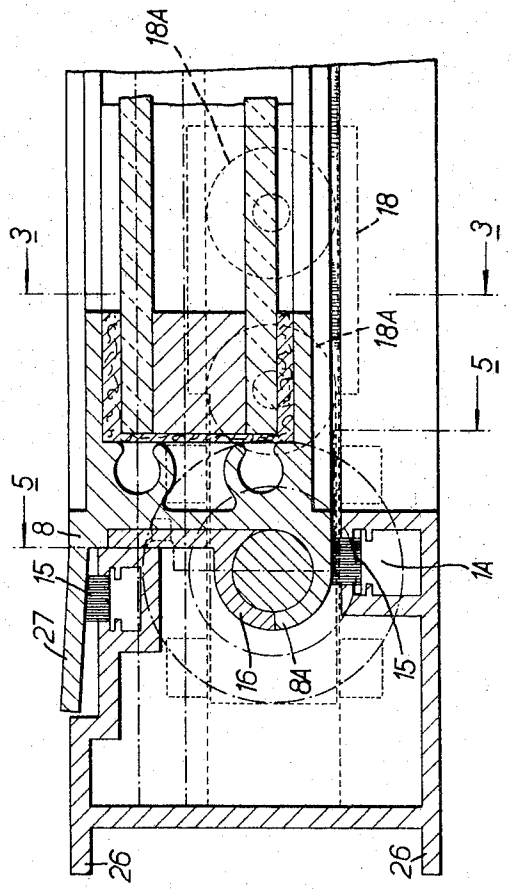


FIG. 4.

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WINDOW ASSEMBLIES

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3 Claims. (Cl. 160—187)

This invention relates to window and like assemblies, that is to say assemblies comprising a fixed frame or supporting structure having at least one rectangular aperture therein arranged to be opened or closed by movement relatively thereto of at least one movable element connected to the fixed frame and supporting or comprising one or more "panes" or panels of glass or other material, whether transparent or translucent or not, the assembly being of the kind in which the fixed frame or supporting structure is of generally rectangular form and has two opposite side members thereof formed to provide guides while one edge of the movable element or of each movable element extends between the guides substantially at right angles thereto and has at its ends members or parts (hereinafter for convenience called sliding members) arranged for sliding movement along the guides all in such manner that the movable element is capable of pivotal movement about an axis extending parallel and adjacent to such edge, and of movement (hereinafter referred to for convenience as sliding movement) as the sliding members slide along the guides. For convenience herein, although as indicated the movable element may comprise a panel or panels of glass without a surrounding frame, the term "movable frame" will be used to identify this element and is thus to be interpreted as including an unframed panel or panels. Moreover the term "fixed frame" will be used to refer to the supporting structure having the rectangular opening therein although in some cases it may comprise only the two guides suitably mounted in opposite sides of an aperture in a wall.

It is usual in window assemblies of the kind referred to for the movable frame or each movable frame to be controlled by a link or links extending between it and the fixed frame which cause simultaneous pivotal and sliding movement of the movable frame or each movable frame and sliding movement, and in window assemblies according to the present invention such link or links may or may not be provided.

Moreover in window assemblies according to the invention the guides may either extend along two parallel horizontal sides of the fixed frame or along two vertical or inclined parallel sides of the fixed frame.

It is an object of the present invention to provide an improved form of window assembly of the general kind referred to which will have certain advantages over window assemblies of this kind as hitherto made.

The term "aperture" used herein is to be understood in appropriate cases as including part of an aperture, where, for example, a single aperture is arranged to be closed by two or more movable frames.

In a window assembly according to the present invention comprising a fixed generally rectangular frame having at least one aperture therein arranged to be opened or closed by movement relatively thereto of a movable frame supporting one or more panes or panels of glass or other sheet material, the fixed frame has two opposite side members thereof formed to provide guides while one edge of the movable frame extends between the guides substantially at right angles thereto and has at its ends members or parts arranged to slide along the guides, and interconnecting mechanism is provided by which the ends of the edge of the movable frame which extends between the sliding members or parts are constrained to move simultaneously and similarly relatively to their respective guides.

The expression "simultaneously and similarly" is to be understood as referring to movements in the same direction and at the same speed.

In some cases a single movable frame may be provided while in others there may be two or more movable frames each constructed and arranged as described above, and in the latter case the two or more movable frames may be separate and movable independently of one another, or two or more such movable frames may be pivotally connected to one another about axes parallel and adjacent to the edges remote from the sliding members.

In a preferred construction according to the invention the interconnecting mechanism by which the ends of the edge of the movable frame which extends between the sliding members or parts are constrained to move simultaneously and similarly comprises a rack secured to and extending longitudinally of each of the guides, a rod mounted for rotation in the movable frame about an axis adjacent and parallel to the said edge at the opposite ends of which the sliding members lie, and pinions connected to the ends of the rod so as to rotate with the rod and respectively engaging the said racks.

Alternatively, however, the said mechanism may comprise cords, tapes or like substantially inextensible flexible tension members passing around rollers or sprockets on the ends of the rod and having their ends connected to points adjacent to the ends of the guides, or may comprise cords, tapes or like substantially inextensive tension members passing around rollers, sprockets or the like rotatably mounted in the fixed frame at points adjacent to the ends of the guides, the opposite ends of each of such cords, tapes or the like being connected to the adjacent sliding member while the rollers or sprockets are interconnected by rods so as to be caused to rotate simultaneously.

In any event the movements of the movable frame or movable frames may be controlled by a link or links and/or frictionally.

One example of a window assembly according to the invention is shown in the accompanying drawings, in which

FIGURE 1 is a sectional plan view of the window assembly as a whole with the movable frames in the partially open position,

FIGURE 2 is a similar view to FIGURE 1 with the movable frames in the closed position,

FIGURE 3 is a cross-section on an enlarged scale on the line 3—3 of FIGURE 4 looking in the direction of the arrows, part of the movable frame being omitted for the sake of compactness,

FIGURE 4 is a cross-section on the line 4—4 of FIGURE 3, and

FIGURE 5 is a cross-section on the line 5—5 of FIGURE 4.

In the construction shown the window assembly comprises a rectangular fixed frame consisting of two side members 1 and 2 and upper and lower horizontal members 3 and 4, and two movable frames 5 and 6 which are pivotally connected to one another at their adjacent vertical edges as indicated generally at 7, while each of their opposite vertical edges 8, which thus extends between

and at right angles to the members 3 and 4, is connected to such members (as hereinafter more fully described) in a manner enabling them to slide horizontally longitudinally of said members and also to move pivotally about a vertical axis.

In addition the movements of the movable frames 5 and 6 are controlled by two links 9 and 10 each of which is pivoted at one end to its associated movable frame 5 or 6 as indicated at 11, and at its other end to a fixed block as indicated at 11A, so that two frames 5 and 6 as they are moved between their open and closed positions, are constrained so that their outer edges at any moment are equidistant from the vertical members 1 and 2 of the fixed frame. As hereinafter explained, however, the links 9 and 10 may be omitted in constructions according to the invention. Where, for example it is desired that the positions of the vertical edges 8 of the movable frames 5 and 6 relative to the lengths of the horizontal members 3 and 4 shall be independently variable or where the movable frames 5 and 6 have different widths.

The upper and lower horizontal members 3 and 4 of the fixed frame are conveniently of similar cross-section as shown in FIGURES 3 and 5 and are each formed to provide a channel-like housing 12 having a slot in its inner wall 12A (that is the wall facing the movable frames when in the "closed" position), and an inwardly projecting flange 13 formed to provide a channel-like support 14 for a sealing strip 15 which projects from the channel in a manner known per se. Further channels may be provided on the members 1 and 2 as indicated at 1A in FIGURE 4, to accommodate further sealing strips 15.

Provided on each of the edges 8 of each of the movable frames 5 and 6 and formed partly by a trough-like formation 8A and partly by a detachable element 16 is a tubular bearing through which extends a rotatable rod 17 and the lower end of each rod passes in a rotatable manner through a sliding member 18 which carries a pair of rollers 18A lying within the slot in the wall 12A of the member 4 and also carries two further pairs of rotatable rollers 19 which rest upon the upper surface of that wall 12A. In some cases only a single pair of rollers 18A might be provided while if desired only a single pair of rollers 19 might be provided.

The rod 17 moreover has connected to its lower end where this end projects beyond the sliding member 18, a gear wheel 20 which is non-rotatable relatively to the rod 17 and meshes with a rack 21 rigidly secured within the housing 12 of the member 14.

The upper end of each rod 17 passes through a sliding member 22 having a narrower extension 23 entering the slot in the wall 12A of member 3. The rod 17 is rotatable with respect to the member 22, 23 and there is connected to the part of the upper end of the rod 17 which projects above the member 22, 23 a gear wheel 24 which is non-rotatable relatively to the rod and meshes with a rack 25 similar to the rack 21 and similarly rigidly secured within the housing 12 of the member 3.

As will be seen, the members 1, 2, 3 and 4 of the fixed frame are provided with outwardly extending flanges, generally indicated at 26, for engagement with the part of a wall surrounding an opening in which the fixed frame is to be secured.

It will also be apparent that in the construction shown each of the movable frames 5 is provided with a peripheral part, indicated generally at 27, which, when the frames are in the closed position, engage the sealing strips 15 and is also formed to accommodate a pair of spaced glass panels, as indicated at 28, to provide what is usually termed "double glazing."

It will be seen that with the construction shown each of the movable frames 5 and 6 is able to pivot about the axis of its associated rod 17, while the edges 8 of the movable frames can move towards and away from one another by reason of the ability of the sliding members 18 and 22, 23, to slide along the guides constituted by the walls 12A, and that the co-operation between the gear wheels 20 and 24 (which are caused to rotate together by their rods 17) and their respective racks 21 and 25 maintains the edges 8 of the movable frames always truly parallel to the edges 1 and 2 of the fixed frame. True parallelism between the edges 8 and their maintenance truly at right angles to the upper and lower edges 3 and 4 of the fixed frame is thus assured.

It is obvious from an inspection of FIGURES 1 and 2 of the drawings that when in closed position the axes of the shafts 17, the link and sash pivots 11, and the stationary link pivots 11A are all in substantial alignment occupying a single plane parallel with the plane of the fixed frame 1, 2. For further emphasis of this condition, construction lines X—X indicate said common plane, and the short distances y indicate the spacing of the named pivot points from the inner edges of sashes 5 and 6, and it will be noted that the distance y is substantially constant in all cases.

It will be understood that in any event frictional or other means may be provided for maintaining the movable frames in one or more desired open or partially open positions, as well as suitable catch mechanism for maintaining the movable frames in their closed positions.

What I claim as my invention and desire to secure by Letters Patent is:

1. A window assembly comprising a generally rectangular fixed frame enclosing an aperture and comprising spaced vertical side frame members and horizontal top and bottom frame members; a ventilator of the casement type arranged to open and close the aperture at will, said ventilator comprising a rectangular movable frame having spaced vertical side edges; a straight continuous vertical shaft having continuous rotary bearing within one of said side edges and extending the full length thereof, and means for guiding said opposite upper and lower end portions for sliding movement within the top and bottom frame members of said fixed frame; mechanism operatively connecting said shaft ends respectively with said top and bottom fixed frame members for maintaining said shaft axis, and consequently said movable frame, in true vertical and non-sagging position throughout their movement in the fixed frame, regardless of the displacement of the center of gravity of the movable frame outwardly of the confines of the fixed frame; and a link arranged to restrict the movement of the movable frame, said link having one of its ends pivotally connected on a vertical axis to one of the horizontal frame members of the fixed frame at a point within the plane of said fixed frame, and the other end pivotally connected on a vertical axis to an intermediate portion of the movable frame; the axes of said two pivot points and that of said shaft being parallel at all times and disposed substantially in a common vertical plane parallel to the plane of the fixed frame when the movable frame is in closed position.

2. The window assembly as set forth in claim 1 in which said mechanism comprises fixed rigid toothed racks secured respectively within the top and bottom horizontal frame members of the fixed frame, and gear wheels of equal diameter fixedly secured to the respective upper and lower ends of said shaft and meshing with the teeth of the respective racks for simultaneous and equal movements while guided along said fixed frame members.

3. The window assembly as set forth in claim 2 in which said ventilator comprises two movable frames having their remote vertical edge portions adapted to close against the respective side frame members of the fixed frame, and each lateral portion of the adjoining fixed and movable frames provided with one of said rigid continuous vertical shafts, a set of top and bottom fixed gear wheels, guide means, and racks as set forth; the inward adjacent vertical side edges of the two movable frames being pivotally connected; and a second link having its opposite ends pivotally connected respectively with a portion of one of the horizontal frame members of the fixed

frame and an intermediate portion of the second movable frame as described, all of the link pivot points and the axes of both shafts being parallel and in the same vertical plane when the ventilator is closed.

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