# DUAL MOVEMENT CASEMENT WINDOW

## FIELD OF THE INVENTION

[0001] The present disclosure relates generally to casement windows, and more particularly to casement windows moveable in both an inward direction and an outward direction.

## BACKGROUND OF THE INVENTION

[0002] Casement windows can be used in high rise buildings. Typically, a framed piece of glass is secured by a latch to an outer frame, and release of the latch allows for the window to be pivoted away from a closed position to an open position. However sometimes such windows need to be cleaned, repaired or maintained, and when the window is part of a high-rise building, it can be difficult to access some or all of each window. It would therefore be desirable to provide a casement window which is capable of movement (principally pivoting) in one direction for user comfort, and movement (principally pivoting) in another direction for ease of cleaning, maintenance and/or repair.

## SUMMARY OF THE INVENTION

[0003] In accordance with a first aspect, a casement window in a wall separates an interior from an exterior. The casement window comprises an outer frame adapted to be secured to the wall and defining an opening, a pane, a first inner frame and a

second inner frame, wherein the pane is affixed to the second inner frame, the first inner frame positioned between the outer frame and the second inner frame, a first hinge assembly connecting the first inner frame to the outer frame, and a second hinge assembly connecting the second inner frame to the first inner frame. The first inner frame, second inner frame and the pane cooperate in a closed position to close the opening, and are moveable together from the closed position outward to a first open position, and the second inner frame and the pane are moveable together inward from the closed position to a second open position while the first inner frame remains in the closed position.

[0004] From the foregoing disclosure and the following more detailed description of various embodiments it will be apparent to those skilled in the art that the present invention provides a significant advance in the technology of casement windows. Particularly significant in this regard is the potential the invention affords for providing a casement window which is safe and easy to clean and repair, even when the casement window is part of a high-rise building. Additional elements and advantages of various embodiments will be better understood in view of the detailed description provided below.

## BRIEF DESCRIPTION OF THE DRAWINGS

[0005] Fig. 1 shows a side view of a casement window in accordance with one embodiment shown looking from the inside in an initial, closed position.

[0006] Fig. 2 shows the window moved to an open position where a first inner

frame, a second inner frame and the panel/windowpane open outward.

[0007] Fig. 3 shows the window moved to another, second open position where the second inner frame and the panel open inward but the first inner frame stays at the closed position.

[0007] Fig. 4 shows a schematic top-down view of the first open (outward) position, the closed position, and the second open (inward) position for the elements of the casement window.

[0008] Fig. 5 is a partially exploded, isolated isometric view of the first frame, second frame and pane, along with the first hinge assembly.

[0009] Fig. 6 is a partially exploded, isolated isometric view of the second frame, panel and secondary latch mechanism.

[0010] Fig. 7 is cross section view of the primary latch releasably securing the first inner frame to the outer frame.

[0011] Fig. 8 is a cross-section view of one of the secondary latches releasably engaging the second inner frame to restrict motion of the second inner frame with respect to the first inner frame.

[0012] Fig. 9 is a view of a bottom leg of the first inner frame, showing holes for drainage.

[0013] It should be understood that the appended drawings are not necessarily to scale, presenting a somewhat simplified representation of various features illustrative of the basic principles of the invention. The specific design features of the casement window as disclosed here, including, for example, the specific dimensions of the latches, will be determined in part by the particular intended application and use environment. Certain features of the illustrated embodiments have been enlarged or distorted relative to others to help provide clear understanding. In particular, thin features may be thickened, for example, for clarity of illustration. All references to direction and position, unless otherwise indicated, refer to the orientation illustrated in the drawings.

## DETAILED DESCRIPTION OF CERTAIN EMBODIMENTS

[0014] It will be apparent to those skilled in the art, that is, to those who have knowledge or experience in this area of technology, that many uses and design variations are possible for the casement windows disclosed here. The following detailed discussion of various alternate elements and embodiments will illustrate the general principles of the invention with reference to a casement window suitable for use in high-rise buildings, where cleaning the outside of the window is otherwise difficult and repair or maintaining the pane is best performed inside the building. Other embodiments suitable for other applications will be apparent to those skilled in the art given the benefit of this disclosure.

[0015] Turning now to the drawings, Fig. 1 shows a casement window 10 in

accordance with one embodiment shown in an initial or closed position looking at the window from the inside. The casement window has an outer frame 20 intended to be secured to a wall or parapet, a first inner frame 30, a second inner frame 40 and a panel or windowpane 50. The pane is typically formed from glass or a transparent plastic. As shown, the pane 50 has a smaller area than the second inner frame 40, and the pane is affixed to the second inner frame so that these two elements always move together. The first inner frame 30 is seen to fill the space between the second inner frame 40 and the outer frame 20. A primary latch 60 is shown which releasably secures the first inner frame 30 to the outer frame 20. A secondary latch is shown which can comprise a single secondary latch or a pair of secondary latches 62, 64 as shown here. Preferably the primary latch extends inward somewhat compared the secondary latch(es) and is more prominent, as the primary latch will be used in most instances for regular operation to open the window.

[0016] Fig. 2 shows the casement window 10 moved outward to a first open position. The first inner frame 30, second inner frame 40 and windowpane 50 all have moved from the closed position outward to the first open position. Opening 15 defined by and within the outer frame 20 is now apparent, and air can move from the outside to the inside (and vice versa). A first hinge assembly is shown as a pair of hinges 35, 45, such as friction stay hinges. The outer frame 20 has at least one first flange, here a top flange 23 and a bottom flange 25 can be provided. Hinge 35 cooperates with hinge 45 to connect the first inner frame 30 to the outer frame 20 and allow for movement of the first inner frame with respect to the outer frame. The movement can be pivotal only, or a combination of pivotal movement and translational movement. Optionally the top flange 23 can define a run channel for

part of the hinge 35, and the bottom flange 25 can provide a run channel for part of the hinge 45. The run channel can be part of the hinge assembly or part of the flanges. The hinges may be friction stay hinges to help provide smooth movement over the travel range from the closed position to the first open position and to resist movement so that the windowpane ordinarily stays in the last position the user selected.

[0017] Fig. 3 shows the casement window 10 moved inward to a second open position. The second inner frame 40 and windowpane 50 have moved from the closed position outward to the second open position, but the first inner frame 30 has stayed in the closed position (with the primary latch 60 locking the first inner frame to the outer frame). Advantageously, with the windowpane moved inward as shown, both sides of the pane are closer to a user positioned on the inside for cleaning. Air can still move from the outside to the inside (and vice versa). A second hinge assembly is shown as a pair of hinges 55, 65, such as friction stay hinges. The second inner frame 40 may be provided with at least one second flange, such as top flange 43 and bottom flange 47. At least one of these second flanges can engage the first inner frame to restrict movement of the second inner frame from the closed position toward the first open position beyond the first inner frame. Optionally the top flange 43 can define a run channel for part of the hinge 55, and the bottom flange 45 can provide a run channel for part of the hinge 65. The run channel can be part of the second hinge assembly or part of the flanges, in a manner similar to the first hinge assembly. Second hinge 55 cooperates with the other second hinge 65 to connect the first inner frame 30 to the second inner frame 40 and allow for movement of the second inner frame (and pane) with respect to the first inner frame

inward. The movement of both the first inner frame and the second inner frame can be pivotal only, or a combination of pivotal movement and translational movement. Optionally gaskets/seals may be positioned around the outer frame, first inner frame and second inner frame at the locations which would otherwise directly abut against one another (such as at the closed position) in part to help reduce leaks and in part to reduce the potential for damage to the frames after repeat cycling between positions.

[0018] Fig. 4 shows a schematic top-down view of the three different positions of the casement window: the first open (outward) position on the left, the closed position in the middle, and the second open (inward) position for the elements of the casement window on the right. In the first open position the first latch 60 is released, allowing for movement from the closed position to the first open position of the first inner frame 30, second inner frame 40 and windowpane 50, all moving together. The second latch(es) are closed so that the second inner frame 40 and windowpane 50 move together with the first inner frame 30 when moving from the closed position to the first open position. From the closed position, after the second latch is disengaged, the second inner frame 40 and pane 50 are free to move to the second open position which is inside the building. Note that the first inner frame 30 is preferably prevented from moving inward from the closed position, even if the primary latch is in the unlocked position, as the outer frame 20 bars additional movement (such as by having the at least one first flange extending into abutment with the first inner frame 30). The second flange of the second inner frame engages the first inner frame 30 to restrict movement of the second inner frame 40 from the closed position toward the first open position beyond the first inner frame. So, if the

first inner frame 30 is locked and in the closed position, the second inner frame cannot move toward the first open position.

[0019] Fig. 5 is a partially exploded, isolated isometric view of the second inner frame 40, first inner frame 30 and windowpane 50, along with the first hinge assembly with top hinge 35 and bottom hinge 45 in accordance with one embodiment. Here the first hinge assembly is a pair of friction stay hinges adapted to slide in a run channel formed in the outer frame 20 as the first inner frame, second inner frame and pane move from the closed position to the first open position. The top flange 23 of the outer frame restricts further inward motion of the first inner frame with respect to the outer frame at the closed position. In the closed position the outer frame, first inner frame and second inner frame are generally flush with one another. In the first (outward) closed position only the second inner frame and the second inner frame are generally flush with one another, and in the second (inward) closed position the outer frame and the second inner frame remain generally flush with one another at the closed position (while the second inner frame and pane move inward) since the outer frame is at a fixed position and the first inner frame abuts against the outer frame.

[0020] Fig. 6 s a partially exploded, isolated isometric view of the second frame, windowpane and secondary latch mechanism, along with the second hinge assembly with top hinge 55 and bottom hinge 65 in accordance with one embodiment and shown movable from the second open position to the closed position. In this embodiment the second hinge assembly is similar to the first hinge assembly and is formed as a pair of friction stay hinges which can be adapted to

slide in a run channel formed in the second inner frame 30 as the second inner frame and pane move from the closed position to the second open position. At least one second flange 39 of the first inner frame 30 restricts further inward motion of the second inner frame with respect to the first inner frame at the closed position, irrespective of whether the secondary latches are engaged (which would lock the second inner frame/pane to the first inner frame).

[0021] Fig. 7 is a cross-section view of the primary latch 60. The primary latch is mounted on the first inner frame 30 and releasably engages the outer frame 20. in the embodiment shown the latch 60 is a rotatable latch and a segment engages a corresponding block on the outer frame to restrict movement of the first inner frame when locked.

[0022] Fig. 8 is a cross-section view of one of the secondary latches 62. The secondary latch(es) are mounted on the second inner frame 40 and releasably engage the first inner frame 30. In the embodiment shown in Fig. 8, each of the pair of slidable latches has a bolt which engages a corresponding surface on the first inner frame. The two slidable secondary latches 62, 64 are located generally equidistant away from the primary latch (above and below as shown in the Figs.), to help provide equal load against the gaskets/seals which in turn helps to ensure a watertight seal. The primary latch is shown preferably extending somewhat inward of the second latches. That is, the primary latch (especially the handle) is closer to the interior than the secondary latch when the first inner frame, second inner frame and the pane are in the closed position. This relationship between the primary latch and the secondary latch is advantageous in that the primary latch is intended to be

used preferentially, and is positioned so as to be easier for a user to access.

[0023] Fig. 9 shows an isolated view of a bottom segment 35 of the first inner frame 30 formed with one or more holes 34. The holes form a drain which allow for water to escape and move away from the first inner frame.

[0024] From the foregoing disclosure and detailed description of certain embodiments, it will be apparent that various modifications, additions and other alternative embodiments are possible without departing from the true scope of the invention. The embodiments discussed were chosen and described to provide the best illustration of the principles of the invention and its practical application to thereby enable one of ordinary skill in the art to use the invention in various embodiments and with various modifications as are suited to the particular use contemplated. All such modifications and variations are within the scope of the invention as determined by the appended claims when interpreted in accordance with the breadth to which they are fairly, legally, and equitably entitled.

CLAIMS

What is claimed is:

1. A casement window in a wall separating an interior from an exterior, comprising, in combination:

an outer frame adapted to be secured to the wall and defining an opening;

a pane;

a first inner frame and a second inner frame, wherein the pane is affixed to the second inner frame;

the first inner frame positioned between the outer frame and the second inner frame;

a first hinge assembly connecting the first inner frame to the outer frame; and

a second hinge assembly connecting the second inner frame to the first inner frame;

wherein the first inner frame, second inner frame and the pane cooperate in a closed position to close the opening, and are moveable together from the closed position outward to a first open position; and

wherein the second inner frame and the pane are moveable together inward from the closed position to a second open position while the first inner frame remains in the closed position.

2. The casement window of claim 1 further comprising a primary latch mounted on the first inner frame, wherein the primary latch releasably engages the outer frame to restrict motion of the first inner frame with respect to the outer frame.

3. The casement window of claim 2 further comprising a secondary latch mounted on the second inner frame, wherein the secondary latch releasably engages the second inner frame to restrict motion of the second inner frame with respect to the first inner frame.

4. The casement window of claim 3 wherein the primary latch is closer to the interior than the secondary latch when the first inner frame, second inner frame and the pane are in the closed position.

5. The casement window of claim 3 wherein the first hinge assembly allows for movement of the first inner frame, the second inner frame and the pane between the closed position and the first open position when the primary latch is released from the outer frame.

6. The casement window of claim 3 wherein the second hinge assembly allows for movement of the second inner frame and the pane between the closed position and the second open position when the secondary latch is released from the first inner frame.

7. The casement window of claim 3 wherein the primary latch is positioned inward of the second latch when in the closed position.

8. The casement window of claim 3 wherein the secondary latch comprises a pair of slidable latches, with each latch having a bolt slidable from a locked position

where each latch engages a corresponding surface of the first inner frame, to an unlocked position where the second inner frame and pane are free to move with respect to the first inner frame between the closed position and the second open position.

9. The casement window of claim 1 wherein the first inner frame engages the outer frame to restrict movement of the first inner frame from the closed position toward the second open position.

10. The casement window of claim 1 wherein the second inner frame defines at least one second flange which engages the first inner frame to restrict movement of the second inner frame from the closed position toward the first open position beyond the first inner frame.

11. The casement window assembly of claim 1 wherein the first inner frame defines a bottom segment, and the bottom segment has openings which form a drain.