

PATENT SPECIFICATION

(11) 1390 192

1390 192

- (21) Application No. 10725/72 (22) Filed 8 March 1972
 (31) Convention Application No. 121985 (32) Filed 8 March 1971 in
 (33) United States of America (US)
 (44) Complete Specification published 9 April 1975
 (51) INT CL² E06B 3/50
 (52) Index at acceptance

E1J 221 225 226 231 303 322 361 377 391 393 401



(54) WINDOW STRUCTURE

(71) We, V. E. ANDERSON MFG. CO., of 1515 E 18th Street, Owensboro, Kentucky, United States of America, a corporation organised and existing under the laws of the State of Kentucky, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to window structures and refers more specifically to a window structure which is suitable for use as a single-hung window (that is, a window having a fixed sash and a sliding sash, the sliding sash sliding vertically in the plane of the window and the fixed sash being at the top or bottom of the window), a hopper window, or a right or left-hand glider (sliding) window without modification of the basic window structure.

In the past, window structure has generally been designed for a single use. That is, it has been designed, for example, as a single-hung window, as a hopper window, or as a glider window. Such single-purpose windows require large dealer inventories to meet demand for each type of window, which is undesirable. In addition, multipurpose window structures of the past have generally had complicated frame sections which were less strong and less aesthetically pleasing than desirable.

The present invention provides a window structure for installation in either a position in which the head portion of the window is at the top or bottom, or in a right or left position in which the head structure is to the right or left of the window, the window structure including; a rectangular outer frame of rails and a transverse intermediate rail which intermediate rail has a generally rectangular cross section; and at least one movable sash secured within the rectangular frame for selective sliding movement in the plane of the rectangular frame and tilting out of the plane of the rectangular frame about one edge of the sash, the movable sash including a frame of rails, the rectangular

outer frame of rails including a fixed frame rail, guiding frame rails for guiding the sash during sliding movement and a locking frame rail for locking the sash to the outer frame, each rail of the rectangular outer frame being of a cross section including a first generally U-shaped portion having a longer leg and a shorter leg opening toward the inside of the window structure, a second generally U-shaped portion having a longer leg and a shorter leg with the shorter leg being on the inside of the window structure with respect to the longer leg, the longer leg of the second U-shaped portion being integral at its end with the shorter leg of the first U-shaped portion at its end and extending at right angles thereto whereby the first and second U-shaped portions open at right angles to each other, and the rails of the movable sash including a tilt rail about which the sash may tilt, guide rails adjacent the guiding frame rails and a lock rail for cooperation with the locking frame rail.

Various preferred embodiments overcome other problems. Thus, at times the frame sections of previous window structures have had metal-to-metal contact in at least one of their multiple uses whereby operation of the window structure caused galling of the parts thereof and was noisy. Also the mulling of a plurality of multipurpose windows together in past has sometimes been difficult and unsatisfactory in appearance.

In addition, the ancillary parts of multipurpose window structures in the past has generally been complicated and therefore expensive and often inefficient.

Due to the requirement for a movable sash of multipurpose window structure to tilt freely, the movable sash has not generally run in tracks in the window frame, so that multipurpose windows of the past have been extremely difficult to seal tightly and weather stripping therefore has often been inefficient. Installation of even single-purpose windows in the past has usually not been possible from the interior of a window opening and separate clips have generally been required for installa-

tion of screens on both single and multipurpose windows of the past.

One view of these deficiencies of prior window structures, an improved multipurpose window is needed. To provide such a multipurpose window wherein the window is easily sealed even with regard to high-force winds yet has provision for weepage in all positions of use thereof and which includes integral means for securing a screen thereto and may be easily and rapidly installed from either the interior or exterior of a window opening, is therefore desirable.

There is disclosed a universal window structure which may be used as a single-hung window, as a hopper window, and as a right or left-hand glider window without alteration. The window structure as described includes a rectangular outer frame for strength and appearance including members contoured to prevent metal-to-metal contact so that the window operates quietly and without galling. The window structure includes a mull cover which permits a single workman to mull adjacent window structures.

The window structure may also include sealing means including weather strips and a sash sealing strip including means for retaining a window screen constructed integral therewith. Installation clips and brackets are also provided whereby the window structure may be rapidly and easily installed from either the interior or exterior of a window opening.

In particular, in the described window structure, the movable sash has been separated from the frame so that the sash guide rails no longer move in a frame channel and may be termed to be "floating" in the window frame. Guiding tilt release and pivot structure have been constructed to space the sash from the frame and both the sash and frame have been so contoured as to prevent metal-to-metal contact and subsequent galling of the window structure members and noise during operation of the window.

In addition, structure for maintaining the window sash and frame in engagement centrally of the window sash guide rails with the movable sash closed has been provided, which structure requires no operation other than the normal opening of the movable sash to disengage the sash from the frame and normal closing of the movable sash to engage the sash with the frame.

In addition, inasmuch as the universal window structure is intended for use with either guiding frame rails or the locking frame rail in a lower position, weepage channels and passages have been constructed in the window structure to permit weepage with the window installed in each of the intended positions thereof. The weepage is permitted while maintaining a superior weather seal, particularly about the movable sash of the window

structure. The weepage is provided by shrouded opening at the juncture of the guiding frame rails and the locking frame rail of the frame at both ends of the locking frame rail formed in conjunction with a combination weather strip window screen retaining member extending over the guide rails of the movable sash and secured to the guiding frame rails.

Preferred embodiments of the invention will now be described by way of example only and with reference to the accompanying drawings in which:

Figure 1 is an exploded broken view of the universal window structure of the invention,

Figure 2 is an enlarged section view of part of two adjacent window structures as shown in Figure 1, particularly illustrating a metal mull cover,

Figure 3 and 3A illustrate modifications of the mull cover shown in Figure 2,

Figure 4 is an enlarged cross section of part of the window structure illustrated in Figure 1, constructed to prevent metal-to-metal contact therebetween and illustrating a fixed single pane glazing panel and a removable storm sash fixed in the window structure along with a double pane glazing panel in the movable window sash of the window structure, both of which glazing panels are glazed with a glazing strip.

Figure 5 is an enlarged cross section of part of the window structure illustrated in Figure 1 showing sash guide and tilt release structure in assembly therewith,

Figure 6 is a section view taken substantially on the line 6-6 in Figure 5,

Figure 7 is an exploded perspective view of the sash guide and tilt release structure illustrated in Figures 5 and 6,

Figure 8 is an enlarged section view of part of the window structure illustrated in Figure 1, showing a sash guide and pivot member and a sash balance shoe in assembly therewith,

Figure 9 is a section view of the sash guide rail and guiding frame rail shown in Figure 8, with a sash guide and pivot structure and a sash balance shoe in assembly therewith, taken substantially on the line 9-9 in Figure 8,

Figure 10 is a perspective view of the sash balance foot illustrated in Figures 8 and 9,

Figure 11 is an exploded perspective view of the sash guide and pivot structure illustrated in Figures 8 and 9,

Figure 12 is an enlarged perspective view of modified sash guide and pivot structure for use with the sash balance shoe modifications illustrated in Figures 13 and 14.

Figures 13 and 14 are enlarged perspective views of a modified sash balance shoes.

Figure 15 is an enlarged inside elevation

view of a portion of the lock rail of the movable sash of the window structure illustrated in Figure 1, showing the lock structure for the movable sash,

Figure 16 is a section view of the movable sash lock rail and lock mechanism of the window structure of Figure 1, taken substantially on the line 16—16 in Figure 15.

Figure 17 is an exploded perspective view of the lock structure illustrated in Figures 15 and 16,

Figure 18 is an enlarged elevation view of a portion of the window structure illustrated in Figure 1, showing high wind retaining clips in assembly therewith,

Figure 19 is an enlarged perspective view of a high wind retaining clip as illustrated in Figure 18,

Figure 20 is an enlarged partial section view of a guiding frame rail and movable sash guide rail of the window structure illustrated in Figure 1, particularly showing a combination sash weather seal and screen retainer clip strip in assembly therewith,

Figure 21 is a reduced perspective view of the sash weather seal and screen retainer clip strip illustrated in assembly in Figure 20.

Figures 22 and 23 are enlarged section views of the locking frame rail of the window structure illustrated in Figure 1 installed in a building opening by means of an installation clip and showing a window plastics and wood trim member in assembly therewith respectively,

Figure 24 is a perspective view of the window structure installation clip illustrated in Figures 22 and 23,

Figure 25 is a perspective view of a modification of the window installation clip illustrated in Figure 24,

Figure 26 is a section view similar to Figures 22 and 23 showing the installation of the window structure of Figure 1 but illustrating a modified installation clip,

Figure 27 is a perspective view of the modified installation clip illustrated in Figure 26,

Figure 28 is a perspective view of another modification of the installation clip illustrated in Figure 26,

Figure 29 is an enlarged section view of the locking frame rail of the window frame of the window structure illustrated in Figure 1, installed in a window opening from the outside of the window opening in conjunction with an installation bracket and window trim.

Figure 30 is another enlarged section view of the locking frame rail of the frame of the window structure illustrated in Figure 1 installed in a different building opening from the exterior in conjunction with the installation bracket and an elongated extruded window trim member,

Figure 31 is an enlarged partial perspec-

tive view of one end of the installation bracket illustrated in Figures 29 and 30,

Figure 32 is an enlarged section of a weather strip for use in the window structure illustrated in Figure 1 between the frame and a window opening, as shown particularly in Figure 29,

Figures 33 and 34 are section views of modifications of the weather strip illustrated in Figure 32,

Figure 35 is an enlarged section view of a weather strip for use in the window structure illustrated in Figure 1,

Figure 36 is a section view of a sash guide rail illustrating modified sash glazing structure in use therewith,

Figure 37 is a section view of a modified glazing stuffer member for use in the sash glazing structure illustrated in Figure 36,

Figure 38 is a cross section of a guiding frame rail of the window structure illustrated in Figure 1 in assembly with a trim member.

Figures 39 and 40 are section views of modifications of the trim member illustrated in Figure 38.

As shown in Figure 1, the window structure 10 includes the frame 12 having a floating sash 14 movably positioned therein and a fixed glazing panel 16 secured thereto. The sash 14 may be moved parallel to the frame guide rails 18 and 20 to provide a single-hung window with the window structure 10 installed with the orientation illustrated in Figure 1 (or upside down therefrom). The sash 14 may also be pivoted or tilted about its lower edge to provide a hopper window when the window structure is installed with the orientation illustrated in Figure 1. Installed with guiding frame rails 18 and 20 horizontal to the window structure 10 provides either a left or right-hand glider window. Thus the head of the window may selectively be mounted in a building structure at the top, bottom or either side of the window depending on the type of window desired.

Window frame 12 includes a rectangular frame of rails including the guiding frame rails 18 and 20, the fixed frame rail 22 and locking frame rail 24, and a transverse intermediate rail in the form of a frame check rail 26. Frame adaptor members 28 and 30 are secured to the guiding frame rails 18 and 20, and in conjunction with the fixed frame rail 22 and frame check rail 26 receive the fixed glazing panel 16. The frame rails 18, 20, 22, 24, 26, 28 and 30 are all extruded in generally box-like rectangular cross sections illustrated of aluminum or other extrudable material. In particular, it will be noted that rails 18, 20, 22 and 24, forming a rectangular outer frame each have a cross section including a first generally U-shaped portion having a longer leg and a shorter leg opening toward the inside of the window structure, a second

generally U-shaped portion having a longer leg and a shorter leg with the shorter leg being on the inside of the window structure. With respect to the longer leg, the longer leg of the second U-shaped portion being integral at its end with the shorter leg of the first U-shaped portion at its end and extending at right angles thereto whereby the first and second U-shaped portions open at right angles to each other. Thus, in contrast to prior window frame structures, the window frame 12 is particularly strong in that it resists torsion and bending. In addition, due to the cross section of the frame rails, the window structure 10 presents a particularly simple and clean appearance in installation whereby the aesthetic appearance of the window structure 10 is an improvement over prior window structures having a relatively fussy appearance due to the cross section of the window frame extrusions used therein.

The movable window sash 14 includes a lock rail 32, guide rails 34 and 36, and a tilt rail 38, all extruded in the shapes shown of aluminium or other extrudable material. The frame check rail 26 and sash tilt rail 38 are provided with interlocking projections 40 on the frame check rail 26 and 42 on the sash tilt rail 38 to effect a particularly tight weather seal therebetween. In addition, an improved weather strip member 44 as illustrated particularly in Figure 32, and which will be considered in more detail subsequently, is provided between the frame check rail 26 and sash tilt rail 38, as shown in Figure 1.

The guiding frame rails 18 and 20, fixed rail 22, and locking frame rail 24 are connected together at the mitered corners of the frame 12 by convenient means such as screws 46. The frame adaptor members 23 and 30 are each made from a single piece of extrusion subsequently slid on the edge of the guiding frame rails 18 and 20, as shown, prior to connecting of the fixed frame rail 22 and frame check rail 26 to the guiding frame rails 18 and 20, after which the frame check rail 26 and then the fixed frame rail 22 are secured to the guiding frame rails 18 and 20 to lock the frame adaptor members 28 and 30 in position. Thus, close tolerance cutting of the frame adaptor members and installation of the frame check rail 26 in an exact position is not necessary with the window structure 10 illustrated in Figure 1.

In a window structure 10, possible collection of water behind the weather plane must be considered and provision for weepage of such water to the exterior of the window structure 10 positioned as shown in Figure 1, or with one of the guiding frame rails 18 or 20 positioned horizontally must be provided for. In the window structure 10 a channel 47 illustrated best in Figure 20 is provided between the movable window sash 14 and a composite sealing strip and screen retaining

member 284. Weepage of any liquid trapped therein occurs from between the end of the member 284 and the locking frame rail and the adjacent surface of the lock rail of the sash in the window structure 10.

With the window structure 10 positioned as shown in Figure 1, a weepage opening (i.e. an opening to allow air to penetrate the structure for ventilation purposes) is provided at each of the corners of the window structure adjacent the opposite ends of the sash lock rail. With the window structure 10 positioned as a glider window, a weep opening is provided at whichever end of the movable sash lock rail is lower. All of the weep openings so provided are shrouded by the end of the composite sealing strip and screen retaining member 284 to prevent wind passage through the window structure 10 or driving of rain through the window structure 10. Thus, the member 284 provides weepage for the window structure 10 in conjunction with the locking frame rail 24 and sash lock rail 32 as well as it provides a seal for the movable window sash 14 and retains the screen structure 304, which functions will be considered subsequently.

As shown best in Figure 2, a plurality of window structures 10 may be positioned side by side and milled (i.e. joined) together through the use of a mull cover member 48 which receives the edges of one guiding frame rail 20 and the adjacent guiding frame rail 18 of two separate window structures 10. In installation, the first window structure 10 is set in place by the installer. The mull cover extrusion 48, which may be of aluminum or similar extrudable material, is clipped on the guiding frame rail of the installed window structure 10, followed by the subsequent clipping of the adjacent guiding frame rail of the second window structure 10 to the mull cover and the securing of the second window structure 10 in the window opening. The camming and barb portions 50 and 52 on the mull cover 48 for receiving the guiding frame rail parts 51 and 53 together with the recesses 54 and 56 for receiving the projections 60 and 62 of the guiding frame rails permit the simple, efficient installation of the mull cover on the guiding frame rail of the first window structure and the similarly simple and efficient connection of the guiding frame rail of the second window structure to the mull cover 48.

As shown best in Figure 3, a first modification of the mull cover 48 illustrated in Figure 2 is executed in plastics and includes the resilient return portions 64 adjacent each of the recesses 54 and 56 oriented as shown in Figure 3 whereby the guiding frame rail projections 60 and 62 are cammed into the recesses 54 and 56 and are subsequently locked in the recesses by the end 66 of the return portions 64 extending over the projections 60

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and 62 thereof in the recesses 54 and 56. In all other respects, the modified mull cover of Figure 3 has the same cross section as the mull cover 48.

The modification of the mull cover 48 illustrated in Figure 3A includes extended camming and barb portions 55 and 57 which diverge from each other and the portions 59 and 61 which are slanted toward each other as shown. In installation the modified mull cover illustrated in Figure 3A is snapped in place over two adjacent guiding frame rails 18 and 20 which have previously been secured adjacent each other in the position illustrated in Figure 2. The portions 55 and 57 of the mull cover illustrated in Figure 3A are cammed over the portions 51 and 53 of the adjacent guiding frame rails and the portions 59 and 61 are cammed over the portions 60 and 62 of the guiding frame rails. One man can easily install mull windows using the mull cover of Figure 3A since the mulling of the windows is accomplished with the windows in place in contrast to prior procedures wherein windows have been mulled before installation thereof and a number of men have been required to install the pre-mulled windows.

The window structure 10 may be glazed in a plurality of different manners, as shown particularly in Figure 4, wherein in the present window structure 10 illustrated in Figure 1, the fixed glazing panel 16 is a single pane of glass held in position by glazing strip 68 in the inner glazing groove 80. Glazing strip 68 is disclosed in more detail in our Patent Specification 1364484 and permits the installation of both single and double pane glazing panels of different thicknesses in the window structure 10 with a single glazing strip.

In addition, a storm window including a glazing panel 70 and edge strip 72 may be installed over the glazing panel 16 by means of installation clips 74 to provide storm window protection for the fixed glazing panel of the window structure 10, as shown in more detail in Patent Specification 1364484.

In contrast, the movable window sash 14 is glazed with glass 76 having a double thickness with a sealed space therebetween with the same glazing strip 68 placed in the outer glazing groove 78 rather than the inner glazing groove 80. In addition to the two glazing grooves 78 and 80, it will be understood that due to the shape of the glazing strip 68, it may be flexed to accommodate single or double-pane glazing material of different thickness whereby the one glazing strip is universal for substantially all normal glazing panel thicknesses.

Again, as shown best in Figure 4, the frame adaptor extrusions 28 and 30 are provided with a beveled surface 82, while the movable sash guide rails 34 and 36 are provided with a complementary beveled surface

84 positioned to be in spaced relation to the beveled surface 82. Thus, on movement of the movable sash 14, particularly when the window structure 10 is used as a glider window, no metal-to-metal contact is present so that galling of the metal surfaces and noisy operation of the window structure 10 is eliminated. Care has also been taken in all other areas of the window construction where movement exists to prevent metal-to-metal surface engagement and facilitate the overall quiet operation of the window structure 10.

In addition, the movable sash 14 is positively spaced from adjacent metal members such as the frame 12 by, for example, such structure as the tilt release and guide structure 90 and the sash guide and pivot structure 92 so that the movable sash 14 floats in the frame 12. Thus, overall quiet operation of the window structure 10 is again facilitated and metal-to-metal surface engagement and therefore galling of the members of the window structure 10 is prevented.

The movable sash guide rails 34 and 36, tilt rail 38 and lock rail 32 are secured together by convenient means such as screws 86 and 88 which are also used to install the sash guide and tilt release structure 90 and the sash guide and pivot structure 92, respectively.

False window mullion structure 96 including false window mullion members 98, connecting members 100, and installation brackets therefor 102, as disclosed in more detail in Patent Specification 1364484 may be provided in conjunction with the window structure 10 and are shown in Figure 1. Window structure 10 also includes the known sash balance structure 104 adapted to be secured within the pocket 106 in guiding frame rail 20 by means of screw 108 or the like.

A hopper lock 110 again as considered in more detail in Patent Specification 1364484 may be used in conjunction with the window structure 10, and is shown in Figure 1. The hopper lock 110 is engaged at end 112 in pocket 114 in sash guide rail 36 and is slidably engaged at end 114 in pocket 106 of guiding frame rail 20 in the window structure 10 so as to be movable therealong and limits pivotal movement of the movable sash 14 about the lock rail thereof in accordance with the position of the hopper lock 110 in the guiding frame rail 20 and the position of the movable sash 14 when it is tilted.

In more detail, the improved sash guide and tilt release structure 90, as shown best in Figures 5-7, includes a separate sash guide member 118, a separate tilt release member 120 and biasing spring 122. As shown best in Figures 5 and 6, the sash guide member 118 is secured in the pocket 114 in the sash guide rail 36 by means of the assembly screw 86 for the movable sash 14.

In assembly, the spaced apart flanges 124 space the sash guide rail 36 from the guiding rail 20. The flanges 124 on the sash guide member 118 are beveled at 126 as a continuation of bevel 84 on guide rail 36 to provide clearance between the sash guide member 118 and the frame adaptor members 28 and 30 on opposite sides of the frame 12 with the member 118 used on either side of the frame 12. The flanges 124 are provided with a further bevel 128 to provide clearance for the sash balance 104 in assembly. The flanges 124 further include the hook-like ends 130 thereon which define a pivot notch 132 into which part of the tilt release member 120 of the sash guide and tilt release structure is positioned in assembly, as will be seen best in Figure 6.

The head portion 136 of the sash guide member 118 fits within the slot 138 in the tilt release member to guide the tilt release member on pivoting thereof about the pivot portion 134 thereof. Head portion 136 has the camming abutment 140 thereon which permits camming of the head portion into the slot 138 and which abuts the handle portion 142 of the tilt release member 120 in assembly to prevent disassembly of the sash guide and tilt release structure 90 except on upward bending of the handle 142.

The tilt release member 120 as shown best in Figure 7 includes the handle portion 142 having the slot 138 therein for receiving and guiding the head 136 of the sash guide member 118, which slot is maintained in relatively close tolerance by means of a spacing strap 144 placed across the open end thereof above the opening 146 in the tilt release member 120 through which the head of the screw 86 extends for ease in assembly. The tilt release member 120 further includes the flanges 148 thereon extending beyond the end 150 of the handle 142 so that in assembly the flanges 148 extend within the pocket 106 in a frame jamb member to prevent tilting of the movable sash 14 except on pivoting of the tilt release member 120 about pivot portion 134 thereof to compress spring 122 and remove flanges 148 from the pocket 106. The end 150 of the handle 142 abuts the edges of the pocket 106 in jamb 20 to prevent entry of the handle 142 into the pocket 106 and thus limits entry of the flanges 148 into the pocket 106 in assembly so that contact of flanges 148 with the sash balance 104 on movement of the sash 14 is prevented.

The recess 152 is provided in the tilt release member 120 and in conjunction with a similar recess in the sash guide 118 locates the ends of the spring 122 between the sash guide member 118 and the tilt release member 120 in assembly. The toe portion 154 of the tilt release member 120 is adapted to steady the member 120 on vertical movement of the movable sash 14, while the heel por-

tion 156 of the tilt release member 120 engages the guide rail of the sash 14 within the pocket 114 to limit the pivotal movement of the member 120 under bias of the spring 122 in assembly.

In use the sash guide and tilt release structure 90 is first assembled by placing the pivot portion 134 of the tilt release member 120 in the notch 132 and positioning one end of the spring 122 in the recess 152 with the other end of the spring 122 in a recess (shown in chain line in Fig. 6) therefor in the sash guide member 118. The spring is then compressed by pivoting the tilt release member 120 about the pivot portion 134 thereof to cam the head 136 of the sash guide member 118 into the slot 138 in the tilt release member 120. So assembled, the sash guide and tilt release structure 90 is secured in the sash guide rail pocket 114 adjacent the tilt rail 38 of the movable sash 14 by means of the screw 86 and the spring 122 released.

The handle 142 of the tilt release member 120 is then moved toward the sash guide member 118 to compress the spring 122 again and the movable sash 14 which has been in a tilted position in the frame 12 is tilted into the plane of the frame 12 of the window structure 12. The tilt release member 120 is then released so that the spring 122 moves the flanges 148 into the pocket 106 in the guiding frame rail 20 as shown in Figures 5 and 6 and the end 150 of the handle 142 abuts the guiding frame rail 20 at the entrance to the pocket 106 to limit insertion of the tilt release member 120 into the pocket 106 under bias of the spring 122. The movement of the sash 14 in the frame 12 is then guided by the flanges 148 on the tilt release member 120, and the sash 14 and frame 12 are spaced by the flanges 124 on the sash guide member 118. When it is desired to again tilt the movable sash 14 into the hopper position, the handle 142 is grasped and moved toward the movable sash 14 to remove the guide flanges 148 from the pocket 106 of the guiding frame rail, and the movable sash 14 may be tilted.

In the above consideration of the sash guide and tilt release structure 90, it will be understood that one such structure may be provided at each end of the tilt rail of the movable sash 14.

The movable sash 14 is also guided by the sash guide and pivot structure 92 as indicated above, which is shown best in Figures 8-11. As shown in Figure 11, the sash guide and pivot structure 92 includes the sash guide and pivot member 160 and the spring 162.

The sash guide and pivot member 160 includes the pivot portion 164 which as shown is beveled at the outer end thereof for insertion in the pocket 106 in the guiding frame rail 20. Pivot portion 164 provides a pivot

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axis at the ends of the lock rail of the movable window sash 14 for tilting the sash 14 into a hopper position. The sash guide and pivot member 160 further includes the rectangular portion 166 separated from the pivot portion 164 by the flange 168, which flange also extends beneath the rectangular portion 166 thereof as shown in Figure 11.

In assembly, the rectangular portion 166 is positioned within the pocket 114 in the lock rail 36 of the movable sash 14 with the flange 168 extending over the exterior edge of the lock rail and over the end of the lock rail to provide a finished corner for the movable sash 14 so that the sealing strip for the movable sash 14 will not be damaged on movement of the movable sash as, for example, into and out of a tilted position. The sash guide and pivot member is secured to the end of the sash guide rail 36 and to the lock rail 32 by means of the screw 88 illustrated in Figure 1 extending through the opening 170 in the sash guide and pivot member.

The sash guide and pivot member 160 further includes the extension 172 having the spring guide 174 thereon and which includes a guide portion 176 on one side of the end thereof and a barb portion 178 on the other side of the end thereof. The end of the extension 172 is further provided with beveled surfaces 180 and 182 at both sides of the barb and is provided with feather edges 184 and 186 as shown best in Figure 11, all of which facilitate pivotal movement of sash 14 into and out of the plane of the window structure 10.

In assembly the sash guide and pivot member 92 with spring 162 on guide 174 is secured to an end of the sash guide rails at an end of the lock rail as shown in Figure 9 by means of a screw extending through opening 170. The guide portion 176 assumes a normal operating position within the pocket 114 of the sash guide rail 36 of the sash 14 on installation. On pivoting of the sash 14 into the plane of the window frame 12 from the tilted position thereof in which the pivot portions 164 of member 160 are inserted in pockets 106, the extension 172 is cammed into the desired position thereof by the cam surface 180 on the extension 172 engaging the rails 18 and 20. In the plane of frame 12, the extension 172 cannot enter the recess 106 in the guiding frame rail 20 and is guided into movement into and out of the plane of the frame 12 not only by the beveled edge 180 but by the beveled edge 182 and the feathered edges 186 and 184 as indicated above.

The sash guide and pivot member 160 is useable without the sash balance shoe 188 in a glider window installation or on the side of a single-hung window installation even with the spring 162 is removed. Removal

of spring 162 deactivates portions 172 of member 160.

In addition, it will be understood that the extension 172 of member 160 could be a separate member pivoted to the pivot portion and rectangular portion separated by the flange 168 as for example in the sash guide and tilt release structure 90.

The barb 178 on extension 172 is operable in conjunction with the sash balance shoe 188 illustrated best in Figure 10 to secure the sash balance 104 which is in the pocket 106 to the movable sash 14 through the sash guide and pivot member 160.

The sash balance shoe 188 as shown best in Figures 9 and 10 includes the recess 190 in the rear thereof and the recess 192 in the front thereof, which recesses are connected by a transverse slot 194 extending therebetween. Thus, the end of the torsion ribbon 196 of the sash balance 104 is readily secured to and released from the sash balance shoe 188 on moving the end thereof which includes the offset portion 198 through the slot 194, all as considered in more detail in Patent Specification 1364484.

The sash balance shoe includes the surfaces 200 and 202 thereon shown best in Figure 10 which are engageable with the internal surface of the pocket 106 at one side of the entrance thereof and with the external surface at the entrance of the pocket 106 on the other side thereof as shown best in Figure 8 in assembly. The surfaces 200 and 202 locate the sash balance shoe in the pocket 106 when it is connected to the torsion ribbon 196. Torsion ribbon 196 is constructed to provide only counterclockwise torsion on the sash balance shoe 188 as illustrated in Figure 8. Torsioning of the sash balance in the wrong direction is thus not possible with the sash balance shoe 188, since it would not be possible to install the sash balance shoe 188 in the recess 106 if the sash balance shoe were torsioned in the wrong direction.

The bevel surface 204 on one side of the sash balance shoe provides clearance for assembly screws. The arcuate surface 206 on the other side of the sash balance shoe 188 permits easy rotating of the sash balance shoe 188 installed on the torsion ribbon 196 into the pocket 106 in the guiding frame rail 20 and removal thereof from the pocket 106.

In operation, with the sash balance shoe attached to the sash balance 104 within the pocket 106, the sash balance shoe 188 will be moved to the upper limit thereof allowed by the sash balance 104. The movable sash 14 may then be inserted in the window opening therefor between the guiding frame rails 18 and 20 with the pivot portions of the sash guide and pivot member 160 in the pockets 106 which will require canting of the lock rail of the movable window member 14 from

a position wherein the movable window is in a substantially horizontal plane to a position which the movable window slants toward the guiding frame rails or the other and subsequent movement of the movable window into a horizontal plane after the pivot portions 164 of the sash guide and pivot members 160 at each side thereof have been positioned in the respective pockets 106 in the guiding frame rails 18 and 20.

The movable window 14 is then pivoted into a closed position with the extension 172 of the sash guide and pivot member 160 being cammed past the guiding frame rails 18 and 20 to place the movable window sash 14 in the plane of the frame 12 position. The movable window sash is then moved toward the fixed frame rail 24 as far as possible at which time the lower beveled edge 208 on the sash balance shoe 188 will cam past the barb 178 on the extension 172, and the barb 172 will snap over the upper edge 210 of the sash balance shoe 188. Subsequently, when the movable sash 14 is moved toward the locking frame rail, the sash balance shoe 188 will be secured to the sash guide and pivot member 160 for movement therewith to provide a counterbalance for the movable window sash 14 in use as a single-hung window.

On subsequent pivoting of the movable window sash 14 past approximately 30°, the sash balance shoe member 188 is released by the barb 178 on the extension 172 of the sash guide and pivot structure and will return toward the fixed frame rail to a limiting position thereof to be re-engaged on subsequent tilting of the sash back into the plane of frame 12 and movement toward the fixed frame rail. The sash balance shoe 188 is not released on tilting of the movable sash 14 less than approximately 30° to permit ventilation. With such operation, it will be readily seen that it is not necessary with the sash guide and pivot structure and the particular sash balance shoe associated therewith disclosed herein to exactly locate the pivot portions 164 of the sash guide and pivot member on installation of the movable sash 14 after it has been removed to ensure engagement of a sash balance shoe which has been maintained in the position it held on removal of the movable window sash.

The modified sash guide and pivot member 212 illustrated in Figure 12 is intended for use by itself without a sash balance or with either of the sash balance shoes 214 and 216 illustrated in Figures 13 and 14.

The sash guide and pivot member 212 includes the pivot portion 218 and a rectangular portion 220 separated by the flange 222 which as shown extends around the bottom of the rectangular portion 220. As with the sash guide and pivot member 160 illustrated in Figures 8-11, the sash guide and pivot member 212 is secured to the end of a

movable sash guide rail at the end of the sash lock rail in the pocket 114 by an assembly screw extending through the opening 224.

Also as before, the pivot portion 218 is slightly larger in the direction of movement of the movable sash 14 in the plane of the frame 10 than it is transverse to the plane of the frame 10 with the movable sash 14 in a non-tilted position and the sash guide and pivot member 212 installed thereon whereby on pivoting of the sash 14 out of the plane of the window frame into the hopper position, the bottom edge of the movable sash 14 is locked in a predetermined position in the frame 12 by wedging the pivot portion 218 between the opposite surfaces at the opening of the pocket 106.

The sash balance shoe 214 is similar to the sash balance shoe 188 in the upper portion 226 as shown. However, an extension 228 is provided on the bottom thereof which includes an elongated opening 230 therethrough for receiving the pivot portion 218 of the sash guide and pivot member 212. Thus, with the sash guide and pivot member 212 used in conjunction with the sash balance shoe 214, the pivot portion 218 must be exactly located on reinstalling a removed movable window sash 14 to position the pivot portion 218 in the opening 230.

Similarly, the sash balance shoe 216 may be used with the sash guide and pivot member 212, and again receives the offset end 198 of the sash balance ribbon 196 in the same manner as the sash balance shoes 188 and 214, as particularly shown in Figure 9. However, in place of the opening 230 in the lower extension 228 shown on the sash balance shoe 214, the opening 234 in the sash balance shoe 216 is open at the lower end and has hook portions 236 at the open end thereof with arcuate lower camming surfaces 238. Thus, with the sash balance shoe 216 a sash 14 may be replaced in the window frame 12 in any position along the guiding frame rails and when moved toward the fixed frame rail will spread the lower portion of the sash balance shoe 216 apart with the pivot portion 218 of the sash guide and pivot member 212 whereby the pivot portion 218 is received in the opening 234 and the sash balance shoe 216 is locked to the movable window sash 14 until such time as the movable window sash 14 is again removed from the frame 12.

With the movable sash 14 in the position in the window structure 10 shown in Figure 1, the lock rail of the movable window sash 14 is automatically locked to the locking frame rail 24 of the window frame 12 by the lock structure 240. Lock structure 240 includes the lock body member 242 and the lock actuating member 244 together with the lock spring 246, illustrated best in Figure 17.

Lock body member 242 includes an end

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elevation and transverse cross section which allows it to be slidably received in the longitudinally extending recess 248 in the lock rail 32 of the movable sash 14, as shown best in Figure 16. In addition, the lock body member 242 includes the slot 250 therein for receiving a locking frame rail cross section part 252 having the barb 254 thereon with the movable sash 14 in a fully closed position. Slot 250 serves to align the lock structure 240 with the locking frame rail 24 of the window frame 12.

An opening 256 is provided through the lock body member 242 to receive the lock actuating member 244 and is provided with recesses 258 in the opposite ends thereof for receiving the pivot portions 260 of the lock actuating member 244. The lock body member 242 is further provided with a cylindrical portion 262 including a recess 268 therein for receiving the spring 246 in assembly.

The lock actuating member 244 includes the locking part 263 having barb 264 thereon engageable with the locking barb 254 on extension 252 of the locking frame rail 24 in operation to lock the movable window sash 14 in a closed position. Lock actuating member 244 is further provided with a centrally located projection 266, shown best in Figure 16, adapted to extend within the recess 268 in the cylinder 262 beneath the spring 246 in assembly. The handle portion 270 on the lock actuating member 244 is movable to pivot the lock actuating member 244 about the pivot means 260 thereof in opposition to the bias of the spring 246 which is in engagement at the opposite ends thereof with projection 266 of the member 244 and the top of the pocket 248 in the sash lock rail 32 in assembly to pivot the locking barb 246 out of engagement with the locking barb 254 on the locking frame rail extension 262 and permit movement of the window sash 14 as desired. The lock structure is automatically re-engaged on closing of the movable window sash 14 fully to cam the locking barb 214 over the locking barb 254.

It will be particularly noted that the locking structure 240 permits movement of the locking structure 240 anywhere within the recess 248 in the sash lock rail 32 so that with the window structure mounted for use as a glider window (i.e. at 90° to the orientation of Fig. 1), the lock structure 240 may be positioned lower for use by shorter people or higher to prevent use thereof by children, as desired.

Even with the sash guide and tilt release structure 90 and the sash guide and pivot structure 92 engaged with the frame jambs 18 and 20 and with the lock structure 240 secured, during very high winds the movable sash guide rails 34 and 36 which are not in-

serted in the usual guide channels to permit tilting of the sash may bend sufficiently to break the seal between the guiding frame rails and movable sash guide rails without additional support of the sash guide rails. Accordingly, the bracket structure 272 may be provided in conjunction with sash having a large vertical dimension in areas where extremely high winds may occasionally be expected.

The bracket structure 272 includes brackets 274 and 276 secured at right angles to each other on, for example, the sash guide rail 36 and the guiding frame rail 20 by means of screws or the like (not shown). The brackets which are identical include the rectangular spacing portion 278 having the screw opening 282 extending therethrough and the locking portion 280 as shown in the perspective view of the bracket 276 illustrated in Figure 19.

With a pair of brackets 274 and 276 installed at both sides of the movable window sash 14, as shown in Figure 18, the sash guide rails 34 and 36 are locked to the guiding frame rails 18 and 20 so that the sash may not be pivoted until the movable sash 14 is raised approximately a half inch to remove the locking portion of the bracket 274 on the sash guide rail 36 from the pocket formed by the locking portion of the bracket 276 in conjunction with the guiding frame rail 20. No special knowledge or instructions are necessary to permit operation of bracket structure 272.

The bracket structure 272 provides the additional support of the guiding frame rails 18 and 20 which are comparatively very strong to the sash guide rails 34 and 36, with the movable jamb 14 in a locked position. By placing the brackets 274 and 276, which are very inexpensive, in the center of the sash guide rails an increase in sash guide rail strength of eight hundred percent is possible.

A seal is provided between the sash guide rails 34 and 36 of the movable sash 14 and the guiding frame rails 18 and 20 by the composite sealing strip and screen retaining member 284 shown in installation on the guiding frame rail 20 and in conjunction with the sash guide rail 36 in Figure 20. As shown, the composite sealing strip and screen retaining member 284 includes a relatively rigid L-shaped cross section portion 290 having hook parts 292 and 294 on one leg thereof which engage the grooves 296 and 298 extending longitudinally in the guiding frame rail 20 and the camming part 300 and locking lip 302 for retaining the screen structure 304 on the other leg thereof. A relatively soft sealing strip portion 306 is extruded simultaneously with the L-shaped portion 290 of the composite member and is adapted to extend over the sash guide rails 36 with the composite member 290 secured to the guiding frame rail 20 as shown in Figure 20 to pro-

vide a seal therebetween which is increased by wind pressure on the exterior of the window structure 10 until the sash guide rails 14 and 36 deflect sufficiently to require the bracket structure 272. The composite sealing strip and screen retaining member 284 thus eliminates the need for separate screen retaining clips.

In installation, the composite sealing strip and screen retaining member 284, as shown in perspective in Figure 21, is snapped onto a guiding frame rail such as rail 20 and extends substantially the entire length of the movable sash 14 in a closed position over the guide rail 36 thereof as shown in Figure 20. Screen structure 304 is then inserted behind the retaining lip 308 on the frame check rail 38 as shown best in Figure 1, and the screen is cammed into the screen retaining portion of the L-shaped portion of the composite member 284 over the camming part 300 until it snaps behind the locking lip 302, after which the screen is lowered to be received behind the screen retaining lip 310 illustrated in Figure 1 on the locking frame rail 24.

The composite sealing strip and screen retaining member 284 provides a superior bug seal. Thus, even though a screen frame member may be bowed, the L-shaped portion 290 of the member 284 prevents bugs from getting between the window frame 12 and screen structure 304 with the screen structure behind the locking lip 302. In addition, the L-shaped portion 290 of the member 284 provides a wind screen so that wind does not get behind the screens and build up pressure which has in the past resulted in screens popping out of window structures of, for example, moving mobile homes.

Window structure 10 may be installed in a window opening 312 from the inside thereof by use of installation clips 314, illustrated best in Figure 24. Installation clip 314 includes the U-shaped portion 316 having the connecting part 318 and the leg parts 320 and 322. A spacing portion 324 is provided extending from the connecting part on 316 of the clip 314, as shown in Figure 24. The nailing strip 326 and the resilient retaining portion 328 having the retaining lip 330 thereon are connected to an extension 332 of the connecting portion 318 of the cross section of the clip 314, all as shown best in Figure 24.

Installation clips 314 are installed in the guiding frame rails 18 and 20, fixed frame rail 22 and locking frame rail 24, as shown for example in Figure 22, by inserting the leg portions 320 and 322 thereof in the pocket 334 in, for example, the locking frame rail 24 illustrated in Figure 22 until the locking lip 330 cams over the portion 336 of the rail 24. The window structure 10 with the installation clips 314 assembled therewith is then positioned in the window opening 312 until the spacing portion 324 abuts the wood buck

338 defining the window opening 312, and the clips 314 are nailed to the wood buck 338 by driving a nail through the nailing strip 326 of the clip 314 which may be accomplished from the inside (i.e., right hand side in Fig. 22) of the window opening 312. The window opening 312 may then be finished by securing the trim members 340 around the opening 312 as shown and as more fully described in patent Specification 1364484.

If it is subsequently desired to remove the window structure 10 from the window opening 312, removal may be accomplished by first depressing the resilient retaining portion 328 of the installation clips 314 by means of a screwdriver positioned on the end thereof to provide clearance between the retaining lip 330 and the locking frame rail 24 and similar members having installation clips 314 secured thereto. Window structures 10 may then be reinstalled by merely moving them into the opening again over the installed clips to place the leg portions of the clips in pockets 334 and to move the locking lip 330 over the part 336 of the frame rail. Installation of and removal and replacing of window structures 10 in multistoried construction is thus greatly facilitated, since all such work may be accomplished from inside the building structure.

Wherein it is desired to use wood trim members 342, the nailing portions 326 of the installation clips 314 may be deformed prior to or at the time of nailing thereof to bucks 338 about the opening 312 to permit the placing of the wood trim members 342 over the top thereof and between the nailing portion 326 and the retaining portion 328 of the installation clips 314 as illustrated in Figure 23.

In an alternative construction illustrated in Figure 25, clips 315 include the U-shaped portion 317 having a generally V-shaped connecting part 319 to permit easy insertion of the clip 315 within the pocket 334 in for example the frame rail 24. The spacing part 321 is secured to the leg 323 of the U-shaped portion 317 by means of an offsetting part 325. The nailing strip 327 and resilient retaining portion 329 are secured to an offsetting portion 331 extending from the end of the other leg 333 of the U-shaped portion 317 of the clip 315.

The installation and use of the clip 315 is substantially the same as the installation and use of the clip 314. The V-shaped connecting part 319 of the U-shaped portion 317 of the clip permits easy insertion of the clip into the pocket 334. Also the clip 315 has been made nonreleasable once it is inserted in a window frame so that the resilient portion 329 of the clip 315 is terminated at the lip 335 whereby in installation there will be no part of the retaining portion 329 extending beyond the part 336 of frame rail 24 in installation so that depression of the resilient

portion once the clip 315 is installed is difficult or impossible. The clips 314 can of course be provided with the resilient portion 328 terminated at the lip 330 if it is not desired to separate the clips from the window frame.

In a further alternative construction as illustrated in Figure 26, an installation clip 343 constructed from sheet metal is used to install the window structure 10 in a window opening 344 from the inside of the window opening. As shown in Figure 26, the clip 343 includes the leg portions 346 offset at 348 and again at 350 to provide integral nailing portions 354 for securing the clips 343 to the wood buck 352. The leg portions 346 are connected by the connecting portion 356. The resilient locking portion 358 of the installation clip 343, as shown, is a portion cut out of the sheet metal clip between the leg portions thereof which is connected thereto at the connecting portion of the clip 356 which locking portion 358 is inclined with respect to the leg portions of the bracket and is provided with an offset central portion 360 and an L-shaped terminal portion 362. Alternatively, nailing openings may be provided in flat ends of the leg portions 346 of the clip 343 in place of the integral nailing portions 354 and offsets 350.

As shown in Figure 26, clips 343 are installed on wood buck 352, for example. The window structure 10 is then inserted in the window opening 344 and the clips 343 are placed in the pockets 344, after which suitable trim 364 is applied around the interior of the window opening 344. This is in contrast to clips 314 which are placed in pockets 344 and are subsequently nailed to the wood buck. Again, if it is desired to remove the window structure 10, the clips may be compressed by means of a screwdriver placed on the part 366 of the L-shaped terminal portion 362 of the central portion 360 of the clips.

The modified installation clip 368 illustrated in Figure 28 is substantially the same in operation as the clip 343 but is formed of spring wire including integral nailing portions 370 on the ends thereof and an L-shaped locking portion 372. The use of the clip 368 and the position thereof in assembly is substantially the same as the use of the clip 343 and the position of the clip 343 in assembly.

As shown best in Figures 29 and 30, the window structure 10 as illustrated by the frame sill member 24 may also be installed from the exterior of different window openings 374 and 376 in conjunction with the installation bracket 378 illustrated best in Figure 31. As shown, the installation bracket 378 has a T-shaped cross section with a screw runner channel 380 extending the length thereof at the intersection of the stem and crossbar of the T-shaped cross section. Bracket 378 has notches 382 and 384 at the

ends thereof constructed to provide room for sealing strips 384 on the part 386 of the cross section of jamb 24, as shown best in Figure 30. Notches 382 and 384 are desirable but not essential.

In installation of a window structure 10 from the exterior of the window opening 374 in conjunction with the installation brackets 378, the brackets are inserted in the pockets 334 at required positions around the window frame 12. The screws 390 are passed through prepared openings in the window frame 12 and through the screw runners 380. The window structure 10 is then positioned in the window opening 374 and the screws 390 are driven into the wood bucks 392 defining the window opening 374. Subsequently the extruded plastics trim members 374 are placed in position in the window opening 374 from the interior thereof. When it is desired to remove the window structure 10 from the opening 374, it is merely necessary to remove the screws 390 and subsequently remove the window structure 10.

The installation of the window structure 10 illustrated in Figure 30 illustrates the versatility of the installation bracket 378 with different building structures and is shown in conjunction with an elongated plastic trim member 410 for use in providing an installed, trimmed window in solid masonry construction.

As shown best in Figure 32, the weather seal 384 includes a generally H-shaped cross section having a cross-bar 396 and the shorter sealing leg 398 and the longer sealing leg 400 which engage the surface of the building construction surrounding the window opening 374, as shown in Figure 30. The sealing strip 384 further includes the leg 402 extending along the bottom of the part 386 of the window frame sill 24 and the leg 404 having the locking rib 406 thereon which extends into a recess 408 extending longitudinally in the part 386 of the locking frame rail 24 to secure the sealing strip 396 to the rail. The sealing strips 384 have been found to provide a more reliable and less messy weather strip which is easy to install in conjunction with the window frame 12 than the usual caulking.

The modified weather seal 385 illustrated in Figure 32 is exactly the same as weather seal 384 with the exception of the leg 387 which in the modified weather seal 385 has a portion 389 extending parallel to and away from the crossbar 391 and has a returned portion 393 shaped as shown in Figure 32. The portion 389 provides more flexibility in the leg 387 and the returned portion 393 permits movement of the window frame in the direction of extent of portion 389 of leg 387 without damage to the seal provided by strip 385.

In the further modified weather seal 395 illustrated in section in Figure 34, the cross-

bar 397 and the legs 399 and 401 of the generally H-shaped cross section are the same as the corresponding portions of the weather seals 384 and 385. The leg portions 403 and 405 are, however, thinner than the leg portions 398 and 400 of the weather seal 384 and are more arcuate than the leg portion 387 of the weather seal 385. Thus, in installation the legs 403 and 405 may be more readily flexed to provide a continuous weather seal and the window may be moved in the direction of extent of either leg 403 or 405 from the crossbar 397 without breaking the weather seal due to deforming the legs 403 or 405.

The sealing strip 44 between the sash lock rail 32 and the locking frame rail 24, as shown best in Figure 31, has a generally Y-shaped cross section including a shorter, thicker leg 412 which is more resistant to bending than the longer, thinner leg 414. This configuration for the sealing strip 44 permits ready installation of the sealing strip in the dovetail recess 416, inhibits removal of the strip from the recess in operation and facilitates deforming of the sealing portion 418 of the Y-shaped cross section 44 to provide a seal in operation. Such sealing members have been found to be easier to install by rotating the sealing members into position in the recesses 416 on flexing of the thinner leg 414 and to be more efficient particularly between the sash lock rail 32 and locking frame rail 24 and at the frame check rail 26 and sash tilt rail 38 than the usual felt weather stripping at these points.

The improved window glazing structure 440 illustrated in assembly in Figure 36 comprises a retaining member 442 and a stuffer member 444. As shown, the retaining member 442 is an elongated strip with an L-shaped cross section having a foot portion 446 which is adapted to fit within the recesses 78 or 80 in the window sash guide rail 36. The stem portion 448 of the retaining member 442 which is connected at an angle slightly greater than 90° to the foot portion 446, as illustrated, is terminated in the portion 450 extending substantially perpendicular to the window pane 76. The stuffer member is also an elongated strip provided with a cross section as shown in Figure 36 and includes the recess 452 into which the terminal portion 450 of the retaining member 442 extends in assembly and barbs 454 and 456 engaged with the window pane 76 in assembly.

With the structure 440, when it is desired to glaze a window sash 14, the window pane 76 or other closure panel is positioned as shown in Figure 34. The retaining member 442 is positioned with the foot portion 446 thereof in the recess 80 and the stuffer member 444 is then wedged between the retaining member 442 and the window pane 76 with the barbs 454 and 456 in sealing engagement with the window pane 76 until

the end 450 of the retaining member 442 snaps within the recess 452 in the stuffer member 444. A tight glazing seal may thus be provided extending completely around the window pane 76.

The retaining member 442 is used in conjunction with a second similar stuffer member 458 illustrated in section in Figure 37 in place of member 444 to glaze window rails such as sash rail 14 with glass panes or panels having different thicknesses. The stuffer member 458 is similar to the stuffer member 444 but includes the elongated barbs 460 and 462 thereon. Barb 462 extends from the end 464 of the stuffer member 458 rather than the center thereof as in the case of stuffer member 444. Thus, the stuffer member 458 will be used to glaze panels of lesser thickness, while the stuffer member 444 will be used to glaze panels of relative greater thickness with the retaining member 442 in either of the alternative recesses 78 and 80. Since both of the stuffer members 444 and 458 may be used to glaze a plurality of sizes of panels in themselves due to the flexibility of the retaining member 442 and the barbs 454, 456, 460 and 462, the entire range of normal glazing panels may be glazed with the three members 442, 444 and 458, which are particularly simple to install and which are capable of being removed on stripping of the stuffer members from the retaining member 442, if desired.

The trim member 468 shown in section in Figure 38 is an elongated L-shaped strip having a foot part 470 terminated at one end in a portion 472 extending in the same direction as the stem part 474 of the L-shaped strip. As shown, the strip 468 is adapted to receive an edge of the dry wall structure 466 in assembly and is spaced therefrom by the terminal portion 472. An extension 476 of the foot part 468 engages one end of the lip portion 471, extending around frame 12. An open returned portion 478 depends from the end of the stem part 474 of the strip 468 to close the joint between the strip 468 on the portion 471 of the frame 12.

When the window structure 10 is installed in conjunction with dry wall material 466, as shown in Figure 38, a trim member 468 is provided to extend over the frame portion 471 to finish the edge of the dry wall material. As shown, in installing the window frame 10 illustrated by the guiding frame rail 18 in Figure 33 in a window opening 472 defined by wood member, the window frame 12 is positioned in the window opening in the usual manner, the trim member 468 is applied to the portion 471 of the guiding frame rail 18 and the dry wall material 466 is subsequently positioned as shown in Figure 38 to complete a trimmed window installation.

The modified trim member 482 illustrated in Figure 39 has a cross section exactly the same as the cross section of the trim member

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468 and in addition the cross section of the trim member 482 includes the second L-shaped portion 484 having the stem part 486 which is a continuation of the stem part 474 of the L-shaped trim member 468 and the foot part 488 extending at an angle of less than 90° to the part 486, as shown in Figure 39. The part 488 of the trim member 482 is adapted to fit between the dry wall structure 466 and the wall stud 474 so that in assembly the terminal portion 472 is biased into engagement with the dry wall structure trimmed thereby which has a thickness such that in assembly the foot part 488 of the second L-shaped portion 484 of the trim member 482 is forced into a substantially perpendicular position with respect to the stem part 486 of the portion 484. The installation of the trim member 482 on the window structure 10 is similar to the installation of the trim member 468.

In the further modified trim member 490 illustrated in Figure 40, the extension 476 included on trim members 468 and 482 is removed from the first L-shaped portion 492 of the trim member 490 and extension 494 is placed thereon to space the trim member 490 from the end of the dry wall structure 466 in assembly in the same manner as the terminal portion 472 spaces the trim member 468 from the dry wall structure 466. The open returned portion 496 of the trim member 490 which forms recess 502 further has secured to the end thereof the L-shaped portion 498, the foot part 500 of which is again adapted to fit between the dry wall structure 466 and the stud 474 in assembly.

The aesthetic installation of the window frame 12 with the dry wall member 466 is thus facilitated.

WHAT WE CLAIM IS:—

1. Window structure for installation in either a position in which the head portion of the window is at the top or bottom, or in a right or left position in which the head structure is to the right or left of the window, the window structure including; a rectangular outer frame of rails and a transverse intermediate rail which intermediate rail has a generally rectangular cross section; and at least one movable sash secured within the rectangular frame for selective sliding movement in the plane of the rectangular frame and tilting out of the plane of the rectangular frame about one edge of the sash, the movable sash including a frame of rails, the rectangular outer frame of rails including a fixed frame rail, guiding frame rails for guiding the sash during sliding movement and a locking frame rail for locking the sash to the outer frame, each rail of the rectangular outer frame being of a cross section including a first generally U-shaped portion having a longer leg and a shorter leg opening toward the inside of the

window structure, a second generally U-shaped portion having a longer leg and a shorter leg with the shorter leg being on the inside of the window structure with respect to the longer leg, the longer leg of the second U-shaped portion being integral at its end with the shorter leg of the first U-shaped portion at its end and extending at right angles thereto whereby the first and second U-shaped portions open at right angles to each other, and the rails of the movable sash including a tilt rail about which the sash may tilt, guide rails adjacent the guiding frame rails and a lock rail for cooperating with the locking frame rail.

2. Structure as claimed in Claim 1 wherein the guiding frame rails further include a third generally U-shaped cross section portion having a common connecting portion with the second U-shaped portion and legs extending in a direction opposite to the extent of the legs of the second U-shaped portion which third U-shaped portion is adapted to receive window hardware structure.

3. Structure as claimed in Claim 1 or 2 wherein the fixed box frame rail further includes an L-shaped cross section portion extending toward the outside of the window from one leg of the third U-shaped cross section portion and away from the opening of the third U-shaped cross section portion and toward the locking frame rail of the window frame to receive a glazing panel positioned in the window structure.

4. Structure as claimed in Claim 1, 2 or 3 wherein the locking box frame rail further includes a locking cross section portion extending from the connecting part of the second U-shaped portion away from the leg portions thereof toward the fixed frame rail of the window frame on the inside thereof terminating a locking barb.

5. Structure as claimed in any of Claims 1 to 4 wherein the movable sash guide rails are spaced from the guiding frame rails and further including spacing and guiding means positioned between the movable sash guide rails and the guiding frame rails whereby the movable sash floats within the frame for movement within the frame and tilting movement relative thereto without metal-to-metal contact and consequent galling of the window structure members and noise in operation.

6. Structure as claimed in any of claims 1 to 5 further including sash guide and tilt release structure on the one movable sash at at least one corner thereof including a sash guide member secured to the movable sash at the one corner thereof, a tilt release member pivotally engaged with the sash guide member for movement into and out of a position wherein it extends into an adjacent window frame rail for guiding the movable sash in movement thereof and a position in which it clears the adjacent frame rail to

468 and in addition the cross section of the trim member 482 includes the second L-shaped portion 484 having the stem part 486 which is a continuation of the stem part 474 of the L-shaped trim member 468 and the foot part 488 extending at an angle of less than 90° to the part 486, as shown in Figure 39. The part 488 of the trim member 482 is adapted to fit between the dry wall structure 466 and the wall stud 474 so that in assembly the terminal portion 472 is biased into engagement with the dry wall structure trimmed thereby which has a thickness such that in assembly the foot part 488 of the second L-shaped portion 484 of the trim member 482 is forced into a substantially perpendicular position with respect to the stem part 486 of the portion 484. The installation of the trim member 482 on the window structure 10 is similar to the installation of the trim member 468.

In the further modified trim member 490 illustrated in Figure 40, the extension 476 included on trim members 468 and 482 is removed from the first L-shaped portion 492 of the trim member 490 and extension 494 is placed thereon to space the trim member 490 from the end of the dry wall structure 466 in assembly in the same manner as the terminal portion 472 spaces the trim member 468 from the dry wall structure 466. The open returned portion 496 of the trim member 490 which forms recess 502 further has secured to the end thereof the L-shaped portion 498, the foot part 500 of which is again adapted to fit between the dry wall structure 466 and the stud 474 in assembly.

The aesthetic installation of the window frame 12 with the dry wall member 466 is thus facilitated.

WHAT WE CLAIM IS:—

1. Window structure for installation in either a position in which the head portion of the window is at the top or bottom, or in a right or left position in which the head structure is to the right or left of the window, the window structure including; a rectangular outer frame of rails and a transverse intermediate rail which intermediate rail has a generally rectangular cross section; and at least one movable sash secured within the rectangular frame for selective sliding movement in the plane of the rectangular frame and tilting out of the plane of the rectangular frame about one edge of the sash, the movable sash including a frame of rails, the rectangular outer frame of rails including a fixed frame rail, guiding frame rails for guiding the sash during sliding movement and a locking frame rail for locking the sash to the outer frame, each rail of the rectangular outer frame being of a cross section including a first generally U-shaped portion having a longer leg and a shorter leg opening toward the inside of the

window structure, a second generally U-shaped portion having a longer leg and a shorter leg with the shorter leg being on the inside of the window structure with respect to the longer leg, the longer leg of the second U-shaped portion being integral at its end with the shorter leg of the first U-shaped portion at its end and extending at right angles thereto whereby the first and second U-shaped portions open at right angles to each other, and the rails of the movable sash including a tilt rail about which the sash may tilt, guide rails adjacent the guiding frame rails and a lock rail for cooperating with the locking frame rail.

2. Structure as claimed in Claim 1 wherein the guiding frame rails further include a third generally U-shaped cross section portion having a common connecting portion with the second U-shaped portion and legs extending in a direction opposite to the extent of the legs of the second U-shaped portion which third U-shaped portion is adapted to receive window hardware structure.

3. Structure as claimed in Claim 1 or 2 wherein the fixed box frame rail further includes an L-shaped cross section portion extending toward the outside of the window from one leg of the third U-shaped cross section portion and away from the opening of the third U-shaped cross section portion and toward the locking frame rail of the window frame to receive a glazing panel positioned in the window structure.

4. Structure as claimed in Claim 1, 2 or 3 wherein the locking box frame rail further includes a locking cross section portion extending from the connecting part of the second U-shaped portion away from the leg portions thereof toward the fixed frame rail of the window frame on the inside thereof terminating a locking barb.

5. Structure as claimed in any of Claims 1 to 4 wherein the movable sash guide rails are spaced from the guiding frame rails and further including spacing and guiding means positioned between the movable sash guide rails and the guiding frame rails whereby the movable sash floats within the frame for movement within the frame and tilting movement relative thereto without metal-to-metal contact and consequent galling of the window structure members and noise in operation.

6. Structure as claimed in any of claims 1 to 5 further including sash guide and tilt release structure on the one movable sash at at least one corner thereof including a sash guide member secured to the movable sash at the one corner thereof, a tilt release member pivotally engaged with the sash guide member for movement into and out of a position wherein it extends into an adjacent window frame rail for guiding the movable sash in movement thereof and a position in which it clears the adjacent frame rail to



permit tilting of the movable sash into a upper position and resilient means operable between the sash guide member and the tilt release member for biasing the tilt release member toward the adjacent frame rail.

7. Structure as claimed in claim 6 wherein the sash guide member includes a generally flat first portion adapted to be secured to the movable sash, flanges extending transversely outwardly from and then parallel to the edges of the installed first portion to beyond the one end thereof to provide pivot mounting notches for the tilt release member, and a head portion connected to the first portion and engageable with a slot in the tilt release member to guide the tilt release member in pivotal movement thereof about the pivot mounting notches and toward and away from the sash guide member.

8. Structure as claimed in claim 6 or 7 wherein the tilt release member includes a pivot portion adjacent one end thereof for pivotally mounting the tilt release member in the pivot mounting notches in the sash guide member, a pair of flanges adjacent the other end of the tilt release member for entry into adjacent frame rail member to guide the movable sash in movement therealong, an L-shaped sash guide and pivot limiting portion at the one end of the tilt release member and a handle portion including a slot therein for receiving the head portion of the sash guide member at the other end of the tilt release member operable to abut the frame rail with the flanges within the frame rail to limit pivotal movement of the tilt release member toward the frame rail.

9. Structure as claimed in any of Claims 1 to 5, and further including sash guide and pivot structure secured to opposite corners of the movable sash for spacing the movable sash from the guiding frame rails, for finishing the ends of the movable sash guide rails at the ends of the sash lock rail to prevent damage to weather stripping on pivoting of the movable sash about the lock rail thereof and for providing a pivot axis for the movable sash on pivoting thereof which sash guide and pivot structure is operable to lock the movable sash in a pivoted position with respect to movement of the movable sash along the frame.

10. Structure as claimed in Claim 9 wherein the sash guide and pivot structure includes a rectangular portion adapted to fit within the movable sash guide rail at the end thereof adjacent an end of the sash lock rail, an L-shaped flange extending over perpendicular sides of the rectangular portion for engaging the side and one end of the guide rail of the movable sash and an elongated pivot portion extending on the opposite side of the flange from the rectangular portion of the sash guide and pivot structure and away from the sash guide rail and into the guiding

frame rail in installation on a movable sash installed in the window structure and having a larger dimension in the plane of the window structure than transversely of the window structure whereby on tilting of the movable window sash the pivot portion of the sash guide and pivot member extending within the guiding frame rail engages portions of the rail to lock the movable sash in the frame with respect to movement of the sash along the frame.

11. Structure as claimed in Claim 10 and further including a flexible extension secured to the sash guide and pivot member, and extending toward the tilt rail of the sash with the sash guide and pivot member in installation which extension includes a sash balance shoe retaining barb on the end thereof projecting in the same direction as the pivot portion of the sash guide and pivot member, and resilient means urging the extension toward the guiding frame rail in assembly whereby on movement of the movable window sash into a limiting position toward the fixed frame rail the flexible extension on the sash guide and pivot member is cammed over a sash balance shoe positioned in the guiding frame rail to lock the sash guide and pivot member and the sash balance shoe together.

12. Structure as claimed in Claim 11 wherein the flexible extension is integral with the sash guide and pivot member.

13. Structure as claimed in Claim 11 wherein the window structure further includes a sash balance positioned in a pocket in a guiding rail including a sash balance torsion ribbon having an offset portion at the end thereof and a sash balance shoe including recesses on two sides thereof extending in the direction of the guiding frame rail and a centrally located slot extending between the recesses constructed to receive the offset end of the sash balance torsion ribbon.

14. Structure as claimed in Claim 13 wherein the sash balance shoe further includes a surface on one side thereof for engagement with an inside surface of the guiding frame rail on one side of the pocket therein and a surface on the other side thereof for engagement with an outside surface of the guiding frame rail on the other side of the pocket therein with the sash balance torsion ribbon being stressed to rotate the sash balance shoe toward the other side of the pocket on the outside of the pocket, the sash balance shoe further including an arcuate side portion for permitting rotating of the sash balance shoe into the pocket in installation.

15. Structure as claimed in Claim 14 wherein the sash balance shoe further includes an extension on the bottom thereof having an opening therein for receiving the pivot portion of the sash guide and pivot member.

16. Structure as claimed in Claim 15 wherein the opening in the extension on the bottom



of the sash balance shoe is split at the bottom thereof and the edge portions at the split in the opening are arcuate toward the sash balance shoe to permit entry of the pivot portion of the sash guide and pivot member on spreading of the sides of the sash balance shoe extension apart by movement of the movable sash into a limiting position toward the fixed frame rail.

17. Structure as claimed in any of Claims 1 to 16 and further including locking means carried by the lock rail of the movable sash and operable between the lock rail of the movable sash and the locking frame rail of the window frame to automatically lock the movable window sash with the window sash in a fully closed position including a lock body member secured in the lock rail of the movable sash, a lock actuating member pivotally mounted in the lock body member and movable into and out of locking engagement with the locking frame rail, and resilient means operable between the lock actuating member and the movable sash lock rail for biasing the lock actuating member into a locking relation with the locking frame rail.

18. Structure as claimed in Claim 17 wherein the lock body member has a cross section permitting insertion of the lock body member into the end of the movable sash lock rail from the end of the lock rail and the lock rail prevents removal of the lock body member from other than an end of the lock rail, the lock body member also includes a slot therein extending longitudinally of the sash lock rail for receiving a longitudinally extending locking part on the window locking frame rail to align the locking means therewith, an opening through the lock body member, pivot mounting recesses at the ends of the opening for receiving the lock actuating member and a centrally located retaining cylinder on the lock body member for the resilient means.

19. Structure as claimed in Claim 18 wherein the lock actuating member includes pivot portions receivable in the pivot mounting recesses in the lock body member in assembly, an elongated locking portion including a locking barb extending longitudinally thereof for engagement with a complementary locking barb on the locking part of the locking frame rail, a handle portion for pivoting the locking portion about the pivot portions and a biasing projection extending into the retaining cylinder for the resilient means in the lock body member.

20. Structure as claimed in any of Claims 1 to 19 and further including a first bracket secured to one of the sash guide rail and guiding frame rail, a second bracket secured to the other of the movable sash guide rail and guiding frame rail immediately adjacent the first bracket positioned to be received between the first bracket and rail to which it is connected with the movable window sash

in a fully closed position to provide added strength for the sash guide rail, the clips permitting tilting of the movable sash on movement of the movable sash relative to the window frame to permit the clips to clear each other.

21. Structure as claimed in any of Claims 1 to 20 and further including a combination weather strip screen retainer member secured to each of the guiding frame rail members adjacent the movable window sash in the closed position thereof including a flexible sealing portion extending over the guide rail of the movable window sash and a relatively rigid portion extending outwardly of the window structure terminating in a camming and locking lip for receiving the edges of a screen for the opening covered by the movable sash in the closed position thereof.

22. Structure as claimed in any of Claims 1 to 21 and further including installation clips, means securing the clips to the window frame at selected points therearound and means for securing the clips secured to the frame in a window opening from the interior of the window opening.

23. Structure as claimed in Claim 22 wherein the clips further include means for releasing the clips from the frame.

24. Structure as claimed in Claim 23 wherein the clips each include a generally U-shaped clip portion adapted to be received in a pocket in the frame and a resilient portion extending from the U-shaped clip portion for releasably engaging an abutting portion on the frame and wherein the means for securing the clip in the window opening from the inside of the window opening include a nailing strip extending from the U-shaped portion in the same direction as the resilient portion and beyond the resilient portion.

25. Structure as claimed in Claim 23 wherein the means for securing the clip to the frame includes an offset resilient portion having an L-shaped abutment part at the end thereof for engaging an abutment portion of the window frame and wherein the means for securing the clip in the window opening from the inside of the window opening includes a nailing portion having a connecting part integral with the offset resilient portion.

26. Structure as claimed in Claim 23 wherein the clip is a spring wire clip including an L-shaped abutment central part, offset resilient portions supporting the abutment part and nailing portions supporting the offset resilient portions having perpendicular integral nailing ends thereon for nailing the clip in the window opening from the inside thereof.

27. Structure as claimed in any of Claims 1 to 26 and further including installation brackets secured in pockets in the window structure frame to provide a screw runner and frame spacing member for installation of the



40. Structure as claimed in Claim 37 where in the trim member further includes a second L-shaped cross section including a stem portion connected to the open returned part of the first L-shaped cross section and a foot portion extending in the same direction as and away from the foot portion of the first L-

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shaped cross section whereby with the dry wall structure received between the foot portions of the L-shaped cross sections the stem of the first L-shaped cross section is urged into engagement with the frame portion.

41. A combination of two window structures as claimed in any of Claims 1 to 36 positioned adjacent each other and a mull cover connected to the adjacent edges of the window structures having a generally T-shaped cross section with a stem portion and two spaced apart crossbar portions one of which is terminated in barb portions extending toward the stem portion and away from the other crossbar portion and the other of which includes recesses at the ends thereof, both the barb portions and recesses being adapted to receive separate portions of the adjacent edges of the window structures on the opposite sides of the stem portions, whereby mulling of the adjacent window structures may be accomplished by a single workman.

42. A combination as claimed in Claim 41 wherein the mull cover is plastic and the

other crossbar member includes a flexible returned portion adjacent the recesses at the ends thereof for locking the edges of the adjacent window structures in the recesses.

43. A combination as claimed in Claim 41 or 42 wherein the barb portions include a cam surface thereon and further including a camming extension at the ends of the other crossbar member adjacent the recesses therein whereby the mull cover may be cammed over the adjacent edges of the window structures from the inside of a structure in which they are installed.

44. Structure as claimed in claim 1 substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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Printed for Her Majesty's Stationery Office, by the Courier Press, Leamington Spa, 1975.
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.

