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(54) BUILDING STRUCTURE

(71) We, V. E. ANDERSON MFG. CO., a corporation organised under the laws of the State of Kentucky, United States of America, of 1515E 18th Street, Owensboro, 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 present invention relates to window structures. In particular, the invention relates to window structures which are suitable for universal use as either a single hung window, a hopper window or a right or left hand glider (sliding) window without modification of the basic structure. There is also disclosed improvements in window frame construction, mulling means for the window, (i.e. means whereby separate window structures may be joined), screen retaining clips, glazing strips, sash balance supporting structure, sealing structure including sealing strips, corner inserts and hurricane clips (i.e. clips for retaining the window during high winds), pivot structure and locking means for the window and improvements in structure for guiding and releasing the movable sash of the window and for retaining the movable sash in use as a hopper window in predetermined pivoted positions.

In the past, window structure has generally been designed for a single use. That is, it has been designed as a single hung window, as a hopper window, or as a glider window, for example. Such single purpose windows require large dealer inventories to meet demand for each type of window, which is undesirable.

The present invention provides a window structure for installation in either a position in which the head portion of the window structure 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 comprising a head, jambs and a sill and at least one sash adapted to be slidable in the plane of the window structure and to be pivoted about one edge thereof out of the

plane of the window, the or each slidable and pivotable sash including sash jambs in spaced relation to the jambs of the window frame in the plane of the window when the sash is in the plane of the window, flexible seal structure extending between the jambs of the window frame and the sash for sealing between the window frame and sash with the sash in a closed position in the plane of the window, pivot structure extending between the frame jambs and the sash jambs at the one edge of the sash providing a pivot axis for pivoting the sash out of the plane of the window, sash guide and pivot release structure extending between the jambs of the window frame and the sash at the edge of the sash opposite said one edge thereof for guiding the sash in movement in the plane of the window and for releasing said opposite edge of the sash for pivoting out of the plane of the window, a glazing member in said sash and means between the glazing member and the sash for securing the glazing member in the sash.

Various preferred features of the desired embodiments of the invention overcome a number of problems of prior window structures as follows. Thus, window structures of the past have not been constructed to be as simply manufactured with tolerances as low as the window structure of the invention so that they have had relatively high production costs. Also, with past window structures it has not always been possible to as readily mull or join the window structures for multiple installation or to retain accessories such as screens and sash balances in assembly therewith.

Furthermore, the sealing of prior window structures has permitted excessive air passage, and the pivot details of hopper windows have not permitted raising and lowering of the hopper sash. Further, windows permitting up and down movement of a sash have rarely in the past also permitted swinging of the sash about one edge thereof.

Also, the locking means of prior window structures has not generally permitted move-

ment of the locking means on the sash, and no provision for ventilation with a locked window has been provided in slidable windows of the past without the addition of secondary hardware. Further, separate means for locking, guiding and securing the hopper sash in a pivoted position have often been required in previous window structures which have added to the expense of the window structures.

Wherein separate small glazing panels have been provided in windows of the past, either separate dividing muntins have been required or false muntin structure has been used which has been complicated and therefore expensive. Similarly, storm windows of the past have usually been complete window structures in themselves positioned over the entire prime window structure whereby many of the components of the prime window structure have been unnecessarily duplicated. Window trim specifically constructed to make a rapid, economical and esthetically pleasing transition between a window and adjacent wall has not generally been available previously.

To overcome or reduce these problems, the described window frame has been constructed to require a minimum of close tolerance parts and to facilitate assembly thereof as well as to accommodate assembly therewith of a screen and sash balance if required.

The glazing of the window has been improved with special glazing strips, pivoting of the movable sash and removal thereof has been improved by means of special pivot structure. Locking of the movable sash of the window structure has also been improved by the inclusion of locking construction in the window and the guiding of the movable sash of the window is accomplished by a construction.

Sealing of the movable sash is accomplished by improved sealing strips, hurricane clips and frame corner inserts, while the retaining of the movable sash in a hopper position is improved with hopper locks.

A window structure embodying the present invention and a number of modifications thereof, will now be described by way of example and with reference to the accompanying drawings in which:—

Figure 1 is an exploded broken view of part of the window structure of the invention.

Figure 2 is a reduced perspective view of the window structure illustrated in Figure 1 installed as either a single hung or hopper window with the movable sash in a tilted or hopper position and illustrating false muntin structure in assembly therewith.

Figure 3 is a reduced view of the window structure of Figure 1 installed as a glider (sliding) window with the movable sash closed and false muntin structure in assembly therewith.

Figure 4 is a broken section view of a pair of window structures such as illustrated in Figure 1 mounted adjacent each other with mulling structure therebetween to form a double window.

Figure 5 is an enlarged section view of the mulling structure and associated window structure illustrated in Figure 4.

Figure 6 is an enlarged section view similar to Figure 5 illustrating modified mulling structure for joining two window structures of Figure 1.

Figure 7 is an enlarged section view of mulling structure such as illustrated in Figure 6 for window structure having a modified window frame cross section.

Figure 8 is an enlarged section view of the head extrusion of the window structure illustrated in Figure 1 particularly showing a glazing strip and a sash balance mounting insert in assembly therewith.

Figures 9, 10, 11, 12 and 13 illustrate possible modifications of the glazing strip cross section illustrated in Figure 8.

Figure 14 is an enlarged exploded elevation view of the upper right corner of the window structure of Figure 1 illustrating the sash balance mounting insert in relation to a sash balance and the window frame.

Figure 15 is a section view of a portion of the head and jamb extrusions of the window structure of Figure 1 illustrating the sash balance and sash balance mounting insert in assembly therewith taken substantially on the line 15—15 in Figure 14.

Figure 16 is a section view of a portion of the head and jamb extrusions of the window structure of Figure 1 illustrating the sash balance and sash balance mounting insert in assembly therewith taken substantially on the line 16—16 in Figure 14.

Figure 17 is an enlarged perspective view of the sash balance mounting insert illustrated in Figures 8 and 14 to 16.

Figure 18 is an enlarged broken away partial vertical section view of the jamb of the window structure illustrated in Figure 1 particularly showing the sash pivot structure and a removable sash balance in assembly therewith.

Figure 19 is a perspective view of a part of the pivot structure of the window structure illustrated in Figure 18.

Figure 20 is a perspective view of another part of the pivot structure of the window structure illustrated in Figure 18.

Figure 21 is a perspective view of a modification of the part of the pivot structure illustrated in Figure 20.

Figures 22, 23 and 24 are perspective views of sash pivot structure modifications suitable for use in the window structure of Figure 1.

Figure 25 is a section view of the jamb extrusion of the window frame and jamb adaptor extrusion of the window structure

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illustrated in Figure 1 showing a plan view of the head of the movable sash and sash guide and tilt release structure in assembly therewith.

Figure 26 is a perspective view of a portion of the sash guide and tilt release structure illustrated in Figure 25.

Figure 27 is a perspective view of a further portion of the sash guide and tilt release structure illustrated in Figure 25.

Figures 28 and 29 are plan views of sash guide and tilt release structure modifications suitable for use with the window structure of Figure 1.

15 Figures 30, 31 and 32 are plan views of a combination sash guide, tilt release and locking structure modification suitable for use with the window structure of Figure 1.

20 Figures 33 and 34 are plan views of another sash guide and tilt release structure modification suitable for use in the window structure of Figure 1.

25 Figures 35 and 36 are perspective views of the parts of the sash guide and tilt release structure illustrated in Figures 33 and 34.

30 Figures 37, 38 and 39 are plan views of still another sash guide and tilt release structure modification suitable for use in the window structure of Figure 1 which also includes a hopper lock feature.

35 Figure 40 is an enlarged partial section view of the sash jamb extrusion of the window structure illustrated in Figure 1 showing a hopper lock (sash retaining link) in a pivoted position therein.

40 Figure 41 is an elevation view of the hopper lock illustrated in Figure 40 taken in the direction of arrow 41 in Figure 40 and showing a portion of the sash jamb in assembly therewith.

45 Figure 42 is a section view of the hopper lock illustrated in Figure 40 taken substantially on line 42—42 in Figure 40 and showing a portion of the sash jamb in assembly therewith.

Figure 43 is an elevation view of a modified hopper lock suitable for use with the window structure of Figure 1.

50 Figures 44, 45 and 46 illustrate modifications of the hopper lock modification illustrated in Figure 43.

55 Figure 47 is a section view of the jamb of the window structure illustrated in Figure 1 taken substantially on the line 47—47 in Figure 49 and showing a hurricane clip in assembly therewith.

Figure 48 is a perspective view of the hurricane clip illustrated in Figure 47.

60 Figure 49 is an enlarged section view of the jamb of the window structure illustrated in Figure 1 particularly showing the sealing strip between the window frame and movable sash.

65 Figure 50 is a partial section view similar to that of Figure 49 and illustrating a modi-

fied sealing strip positioned between the window frame and movable sash.

Figure 51 is a partial section view of the window structure of Figure 1 similar to that of Figure 50 and illustrating a screen retainer 70 clip in assembly therewith.

Figure 52 is a partial section view of the window structure of Figure 1 similar to that of Figures 50 and 51 and illustrating a modified screen retainer clip in assembly there- 75 with.

Figure 53 is a perspective view of the modified screen retainer clip illustrated in Figure 52.

Figure 54 is an elevation view of the lower 80 right hand corner of the window structure illustrated in Figure 1 showing a corner insert in assembly therewith.

Figure 55 is a reduced perspective view of the corner insert illustrated in Figure 54. 85

Figure 56 is a reduced cross section of the corner insert in assembly with the jamb extension in the direction of the arrow 56 in Figure 54.

Figure 57 is a reduced cross section view 90 of the sill extrusion of the window frame showing the corner insert of Figure 55 in assembly therewith taken in the direction of arrow 57 in Figure 54.

Figures 58, 59 and 60 and Figures 61, 62 95 and 63 and Figures 64, 65 and 66 are similar to Figures 55, 56 and 57 and illustrate modified corner inserts in perspective view and in assembly with the jamb extrusion and the sill extrusion of the window frame respec- 100 tively.

Figure 67 is an enlarged section view of the sill of the window structure illustrated in Figure 1 showing the locking mechanism 105 therefor.

Figure 68 is a reduced perspective view of a portion of the locking mechanism illustrated in Figure 67.

Figure 69 is a section view similar to that of Figure 67 and illustrating modified lock- 110 ing structure for use with the window structure of Figure 1.

Figure 70 is a section view similar to Figure 69 showing another modified window 115 locking structure.

Figures 71 and 72 are perspective views of parts of the locking structure illustrated in Figure 70.

Figure 73 is an enlarged partial section view of false muntin structure for use with the window structure illustrated in Figure 1 120 taken on the line 73—73 in Figure 2.

Figure 74 is a section view of the false muntin structure similar to Figure 73 and showing the method of connection of the false 125 muntin bar members.

Figure 75 is a perspective view of the interlocking member of the false muntin structure illustrated in Figure 73.

Figure 76 is a perspective view of one of 130

the false muntin members of the false muntin structure illustrated in Figure 73.

Figure 77 is an enlarged perspective view of a retaining clip for securing the false muntin structure illustrated in Figures 2 and 3 to the frame of the window structure.

Figure 78 is an enlarged plan view of a modified retaining clip for use in securing the false muntin structure to the frame of the window.

Figure 79 is an elevation view of the retaining clip illustrated in Figure 78 taken substantially in the direction of arrow 76 in Figure 78.

15 Figure 80 is an elevation view of the retaining clip illustrated in Figure 78 taken in the direction of arrow 80 in Figure 78.

20 Figures 81, 82 and 83 are perspective views of additional modifications of the retaining clip illustrated in Figure 77.

Figure 84 is a section view of one jamb of the window structure illustrated in Figure 1 showing storm sash structure in assembly therewith.

25 Figure 85 is an enlarged perspective view of a plastics strip member of the storm sash structure illustrated in Figure 84.

30 Figure 86 is a section view similar to the section view of Figure 84 and showing modified storm sash structure in assembly with the window structure of Figure 1.

Figure 87 is an enlarged perspective view of the plastics strip member of the storm sash structure illustrated in Figure 86.

35 Figure 88 is a perspective view of a retainer clip for use in securing a storm sash as illustrated in Figure 86 to the window structure illustrated in Figure 1.

40 Figure 89 is another section view similar to the section view of Figure 84 and showing another modified storm sash structure in assembly with the window structure of Figure 1.

45 Figure 90 is a perspective view of a retainer clip for use in securing a storm sash as illustrated in Figure 86 to the prime window structure illustrated in Figure 1.

50 Figure 91 is another section view similar to the section view of Figure 84 and showing still another modified storm sash structure in assembly with the window structure of Figure 1.

55 Figure 92 is a perspective view of a retainer clip for use in securing a storm sash as illustrated in Figure 91 to the prime window structure illustrated in Figure 1.

60 Figure 93 is another section view similar to the section view of Figure 84 and showing still another modified storm sash structure in assembly with the window structure of Figure 1.

65 Figure 94 is a perspective view of a retainer clip for use in securing a storm sash as illustrated in Figure 93 to the window structure illustrated in Figure 1.

Figure 95 is a section view of one jamb of the window structure illustrated in Figure 1 secured in position in a wall and particularly illustrating window trim structure in assembly therewith.

Figures 96 and 97 are enlarged cross section views of trim members of the window trim structure illustrated in Figure 95.

Figure 98 is a section view of one jamb of the window structure illustrated in Figure 1 secured in position in a wall and illustrating modified window trim structure in assembly therewith.

Figure 99 is a cross section view of an expanded member for use in window trim structure as illustrated in Figure 98.

Figures 100, 101, 102, 103 and 104 are section views of modified window trim members for use in window trim structure as illustrated in Figure 98.

Figure 105 is a perspective view of an enlarged corner bracket for use in window trim structure as illustrated in Figure 98.

Figure 106 is a section view, similar to Figure 98, of one jamb of the window structure illustrated in Figure 1 secured in position in a wall and illustrating modified window trim structure in assembly therewith.

Figures 107 and 108 are views of the mitred end of one of the window trim members illustrated in Figure 106 and illustrating a corner bracket in assembly therewith.

Figures 109, 110 and 111 are top, bottom and side views respectively of the corner bracket illustrated in Figures 107 and 108 for securing the window trim structure in Figure 106 together at mitred corners.

The window structure of the invention is adapted to be mounted either in an orientation shown in Figure 2 in which it may be used as a hopper window or in an orientation at right angles to that in Figure 2 such as is shown in Figure 3 in which the window may be used as a glider (sliding) window. Throughout the specification the various terms applied to the various parts will be such as would be applied to the window structure in the orientation of Figure 2. The window structure is shown in more detail in Figure 1.

The window structure of Figure 1 includes a fixed frame 10 constructed of head, jamb and sill extrusions 14, 16 and 18, best shown in Figures 8, 25 and 67 respectively, in conjunction with a jamb adaptor extrusion 20 shown in Figure 25 which adapts the jamb extrusion 16 to mount a glazing panel 50 and a frame check rail extrusion 22 (Figure 1) extending between the jamb extrusions 16 centrally thereof. The head, jamb and sill extrusions are mitred at the corners of the frame 12 and are secured together by means of screws extending through the head and sill extrusions at the ends thereof and into the screw runner grooves 21 and 23 in jamb members 16 (Figure 25).

Jamb adaptor extrusions 20 are formed from an extrusion section miter-cut at each end and then cut in two centrally. The jamb adaptor extrusions 20 having one square-cut end are then slidably mounted on the frame jamb extrusions 16 by means of the co-operating tongue and groove structures 28 and 30 illustrated best in Figure 25. The square-cut ends of the jamb adaptor extrusions 20 are positioned against the head extrusion 14 with the glazing flange 32 (Figure 8) of the head extrusion 14 notched to receive the square-cut ends of the jamb adaptor extrusions 20.

The mitred ends of a frame check rail 22 are then placed in engagement with the miter-cut ends of the jamb adaptor extrusions 20 and the frame check rail is screw-connected to the jamb extrusions 16 to complete the frame 12. If desired, additional screws may be inserted through the frame check rail 22 and into the screw runner grooves 32 of the jamb adaptor extrusions 20 and further screws through the head extrusion 14 of the window frame 12 and into the screw runner grooves 32. The additional screws provide a more rigid construction; however, they are not essential.

The particular jamb adaptor extrusions 20 and their assembly with the frame 12 in the construction of the window structure 10 simplifies the extrusions necessary for the frame 12 and the tolerances which must be maintained in cutting the frame members. Thus, the jambs 16 may be of a single extrusion for their entire length. Furthermore, since the check rail extrusion 22 is not particularly critical in location vertically of the window frame 12, the jamb adaptor extrusion sections from which extrusions 20 are formed need not be initially cut to an exact length but need only be divided and mitred centrally, since in assembly they will then be the same length and will similarly position the ends of the check rail extrusion 22 vertically of the frame 12.

With the frame 12 including the nailing flange 36 and extension 38 therearound, window structures such as that illustrated in Figure 1 in either the position illustrated in Figure 2 or Figure 3 may be mull (i.e. joined side-by-side) side by side with the so-called mull structure illustrated in Figures 4 and 5. Thus, multiple adjacent window installation is possible with the window structure 10.

As shown best in Figure 5, adjacent window structures are positioned so that the nailing flanges 36 overlap when window structures are fixed side-by-side. In assembly the inside mulling member 40 is first clipped into the pocket 42 formed in the jamb extrusion 16 of a first window structure 10 installed in a fixed location. The second window structure 10 is then placed adjacent the first window

structure with the nailing flanges 36 overlapping as shown in Figure 5, and the inside mull member 40 is clipped into the pocket 42 in the jamb extrusion 16 of the second window structure 10. The outside mull member 44 is then clipped over the extensions 38 of the window structures as shown in Figure 5 to complete the mulling of the window structures.

The mulling of window structure 10 as shown in Figures 4 and 5 is doubly sealed against ingress of rain. Thus, the area 45 between the exterior mull member 44 and the nailing flanges 36 is exposed to a greater exterior pressure than the area 47 between the nailing flanges 36 and the interior mull member 40, and the seal provided by the mull member 44, nailing flanges 36 and mull member 40 is progressively tighter toward the mull member 40. Rain driven into area 45 is thus less likely to penetrate through area 47 and ultimately into the interior of a building having window structure 10 installed therein than with other mull structure.

The window structure 10 may also be mull (i.e. joined side-by-side) with a mulling extrusion 46 illustrated in Figure 6. When using the mulling extrusion 46, the nailing flanges 36 of jamb extrusions 16 are broken off at the notch 48 shown in Figure 5. Again, the mulling extrusion 46 is positioned in assembly with a first window structure 10 as illustrated in Figure 6, and a second window structure 10 is then assembled with the mulling extrusion 46 to complete the mulling operation. The mulling extrusion 46 may also be used to mull window structures having jamb extrusion cross sections different from Figure 6 as particularly illustrated in Figure 7.

The glazing panels 50 and 52 of the window structure 10 as particularly shown in Figure 8 are secured in the frame 12 and the window sash 54 by glazing strips 56 which are received in recesses in the frame and sash members such as recess 58 in the frame head extrusion 14. The glazing strip 56 illustrated in Figure 8 was evolved from the glazing strips illustrated in Figures 9 and 10 and includes a generally L-shaped member which is adapted to be secured in the recess 58 with one end 60 in engagement with the periphery of a glazing panel to hold the glazing panel in position.

Separating the end 62 of the glazing strip 56 into two leg portions permits easy assembly of the strip 56 in recesses 58 or 81, while inclining the portion of the strip 56 between the ends 60 and 62 thereof at an angle to the glazing panel 50 with the portion thereof adjacent the end 60 independently flexible permits use of a single glazing strip with a greater selection of glazing panel widths with substantially the same appearance. Thus, with only the two separate glazing strips 56 and

76 (which is offset to accommodate thicker glass) of Figures 8 and 11, substantially the entire range of normal glass widths may be glazed in either the frame 12 or the sash 54 of the window structure 10.

More specifically, the modified glazing strip 64 of Figure 9 includes the initial L-shaped portion 68 having a solid foot portion 66 connected to one end thereof. The part 69 of the L-shaped portion of strip 64 is nominally parallel to a glass pane glazed thereby.

The modified glazing strip 70 illustrated in Figure 10 shows a foot portion and part of the one end of the L-shaped portion of the glazing strip split to provide leg parts 72 and 74 permitting easier assembly and disassembly of the strip 70 by the flexing of the leg parts 72 and 74.

The glazing strip 56 of Figure 8 followed strips 64 and 70 to provide for uniform glazing strip appearance with different thicknesses of glass and to provide greater clamping strength for the glazing strip 56 on the glazing panel 50.

Glazing strip 76 illustrated in Figure 11 was developed along with and is generally similar to glazing strip 56. Glazing strip 76 has a longer foot portion 78. Also, the part 80 of the L-shaped portion of the glazing strip 76 is less inclined than the similar portion of the glazing strip 56, and the part 65 of the L-shaped portion of the glazing strip 76 is considerably shorter than the corresponding part 60 of the glazing strip 56. The glazing strip 76 is used in the first recess 58 to accommodate glazing panels thicker than can be conveniently glazed with glazing strip 56 in the first recess 58 and thinner than can be conveniently glazed with glazing strip 56 in recess 81. The glazing strip 76 is used in conjunction with the second recess 81 in the frame and sash members to permit installation of particularly thick insulating glazing panels in the window structure 10. By using either of the two glazing strips 56 and 76 in conjunction with either of the two recesses 58 and 81 in the window structure 10, the entire range of normal glazing panel thicknesses may be accommodated in the window structure 10 so that only two glazing strips need be stocked.

A projection 82 has been provided on the modified glazing strip 84 (Figure 12) which is otherwise substantially the same as the glazing strip 56. The projection 82 as shown in Figure 12 is used to flex the part 67 of the glazing strip 84 to allow movement of the foot portion 69 into the recess 58 or 81. Thus, the glazing strip 84 may be hand installed by first placing the part 71 in a recess 58 or 81 and pivoting the glazing strip toward the glazing panel about the part 71 so that the foot portion 69 is rotated into the recess 58 or 81 due to flexing of the part 67

away from the glazing panel on contact of the projection 82 with the glazing panel. In contrast, the foot portion 73 of the glazing strip 56 is first inserted in a recess 58 or 81 and a tool is used to roll the leg portion 62 into the recess 58 or 81 on installation of the glazing strip 56.

The modified glazing strip 77 illustrated in Figure 13 includes the foot portion 79 adapted to be inserted in the recess 58 or 81 to secure the strip 77 to the frame or sash of the window structure 10, the L-shaped portion 83 connected to the foot portion 79 at one end and having the notches 85 therein as shown and the portion 87 connected to the foot portion 79 and separated from the L-shaped portion 83. In use, the portion 87 of the glazing strip 77 is urged into wedging engagement with the notches 85 to force the end 75 of the L-shaped portion 83 against a glazing panel. The glazing strip 77 has the advantage of being easy to install without the use of special equipment. The glazing strip 77 also accommodates a particularly wide range of glazing panels with the same general appearance.

The movable sash 54 of the window structure 10 includes the head extrusion 86, the jamb extrusions 88, shown better in cross section in Figure 49, and the sill extrusion 90, shown better in cross section in Figure 67. As shown better in Figure 2, the window sash 54 may be pivoted about the bottom thereof to provide a hopper window in place of the conventional single hung window with the window frame 12 in a vertical position. With the window structure 10 in the position shown in Figure 3, the sash 54 is movable horizontally to provide a glider window. When used as a glider window, the window structure 10 may be installed with the head 14 to the right or left.

A sash counter balance such as the sash balance structure 89 of Figure 14 is not necessary in the window structure 10 when used as a glider window as in Figure 3. Further, sash balance structure is not essential with lighter window sash 54 with the window structure 10 used as a single hung window as in Figure 1 or as a hopper window as in Figure 20. The securing of sash balance structure 89 to the frame jambs 16 of the window structure 10 during initial assembly of the window structure 10 requires separate windows to be inventoried depending on the ultimate use of the windows. Alternatively, the securing of the separate sash balance structure 89 to the window structure 10 may be accomplished in the field by screws or the like as shown in Figure 1. Heavy inventories and field assembly of sash balance structure is objectionable. Therefore, a sash balance supporting insert 91 shown in perspective in Figure 17 and illustrated in assembly with the sash balance structure 89 and positioned in

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the frame head and frame jamb extrusions 14 and 16 respectively in Figures 14 to 16 is provided to make one window structure 40 universally usable without objectionable old assembly of sash balance structure.

As illustrated in Figure 14, the sash balance structure 89 is supported by the projection 93 on the insert 91 extending through the opening 95 in the sash balance structure 89. The insert 91 with the sash balance structure 89 held thereon by thin fins 107 extending into hollow tube 109 of the sash balance structure is placed in the pocket 97 (see Fig. 8) in the frame head extrusion 14 and is moved toward the jamb extrusion 16 until the barb portions 99 of the insert 91 cam over the portions 101 and 103 of the jamb extrusion 16 cross section to lock the insert 91 in position. Camming of the barb portions 99 over the portions 101 and 103 of the jamb extrusions 16 is permitted due to flexing of the portions 106 of the insert 91. With the barbs positioned over the portions 101 and 103 of the jamb extrusion 16, the sash balance assembly 89 is supported in the pocket 110 in the jamb extrusion 16 as shown, for example, in Figure 16.

The sash 54 is guided at the bottom in the position illustrated in Figure 2 for movement vertically in the plane of the frame 12 the entire height of the window to effect opening of the window by the pivot structure 92 illustrated best in Figures 18, 19 and 20. The sash 54 is offset from the fixed glazing panel 50 so as to be slidable over the fixed glazing panel 50 which is secured to the jamb adapter extrusion 20 and the head extrusion 14. The pivot structure 92 also permits tilting of the sash 54 about the bottom thereof into the hopper window position illustrated in Figure 2. Further, the pivot structure 92 is constructed of two separate parts 94 (Fig. 20) and 96 (Fig. 19) which are disengageable to permit removing of the movable sash 54 from the frame 12 of the window structure 10 as desired.

The part 94 illustrated best in Figure 20 includes a generally rectangular portion 98, a generally elliptical portion 100 and an intermediate flange 102. A countersunk screw opening 104 extends through the part 94 to permit mounting of the part 94 in the sash jamb recess 106 as illustrated particularly in Figure 18. With the part 94 installed in each sash jamb extrusion 88 adjacent the bottom thereof, the flange 102 provides sliding engagement with the frame jamb 16 on movement of the sash 54 relative to the frame 12. The mounting screw for the part 94 extends into a screw runner 105 in the sash sill extrusion 90 illustrated best in Figure 67 for assembly of the sash 54.

With or without the part 98, the part 94 provides a pivot mounting and guide for the sash 54. The part 96 is used in conjunction

with a sash balance tape 120 of sash balance structure 89. The part 96 in assembly is slidably positioned in the longitudinal pocket 110 formed in the frame jamb extrusion 16 and receives the elliptical end 100 of the part 94 in the recess 112 therein. The recess 112 is open on two sides as shown best in Figure 19 to allow the end 100 of the part 94 to engage the edges of the pocket 110 of the frame jamb 16 with the sash 54 in a pivoted or hopper position and thus prevent sliding action of sash 54 with or without balance structure 89. The same camming or locking action on pivoting of the sash 54 will occur without the member 96.

In addition, the part 96 is provided with the recesses 114 and 116 connected by the transverse slot 118 as shown in Figure 18 to permit connection of the spiral tape 120 of sash balance structure 89 through its offset end 122 to the part 96 on insertion of the offset end 122 through the slot 118, as shown best in Figures 18 and 19. The part 96 of the pivot structure 92 is thus readily removed from or installed on the tape 120 of the sash balance structure 108 without the use of any mechanical connectors. However, accidental removal of the member 96 from the sash balance structure 89 is substantially impossible with the sash 54 installed, since initial tilting of the top of the member 96 toward the sash 54 is required for the removal of the member 96 from the tape 120.

Flanges 124 on the part 96 as shown in Figure 19 provide frictional engagement of the member 96 with the edge 128 of the pocket 110 in the frame jamb 16 when the part 94 is removed from the recess 112 of the part 96 to remove the sash 54 from the window structure 10. The frictional engagement is produced by the torsion in the sash balance tape 120 and causes the part 96 to be held in a fixed position when the sash 54 is removed from the frame 12 to facilitate replacing of the sash 54. To prevent the top of part 96 from coming out of the pocket 110 when the sash 54 is removed, a ridge 111 is provided on part 96 to engage the edge 128 (Figure 8) of pocket 110.

The member 94 may be replaced by the modified pivot member 117 illustrated in Figure 21, particularly in installations wherein the removal and replacement of the sash 54 is frequent. The member 117 includes a bottom extension 119 on the central flange 121 thereof which permits square cutting of the bottom of the sash jambs with no possible damage to the sealing strips 242 or 280 illustrated in Figures 49 and 50 which might occur if the rounded bottom extension 119 were not provided. Member 117 further includes the extension 121 and the flanges 123 engageable with the edge 136 of the pocket 106 which prevent movement of the member 117 from an installed position

further into pocket 106, thus impairing removal or tilting of the sash 54. Extension 121 and flanges 123 also space the metal of the sash 54 from the metal of the frame 12. Again, it will be understood that the member 117 may be used without the member 96 if no sash balance is provided in a window structure 10.

In the modified pivot structure of Figure 22, the pivot member 130 is provided with longitudinally extending grooves 134 on the opposite sides thereof which are press fit onto the edges 136 of the pocket 106 of the sash jamb extrusion 88 to retain the pivot member 130 in position adjacent the bottom of the sash 56. A cylindrical portion 138 extends outwardly of the pivot member 130 to receive the end 140 of the spring type sash balance structure 142 as shown in Figure 22. A retaining head portion 144 is connected to the cylindrical portion 138 of the pivot member 130 and prevents slipping of the end 140 of the spring type sash balance structure 142 off of the cylindrical portion 138 of the pivot member 130 in assembly. Again, the same pivot member 130 extending into the pocket 110 in the frame jamb 16 permits pivoting of the sash 54 when no balance structure 142 is connected thereto. A torsion type balance structure such as balance structure 89 with the end of the tape 120 wrapped around cylindrical portion 138 of pivot member 130 may be used in place of sash balance structure 142 if desired.

To permit ready removal of the sash 54 when sash balance structure 89 or 142 is used, an additional pivot member 146 is provided in the pivot structure shown in Figure 23. The member 146 has the opening 150 therein through which the end 140 of the spring of sash balance structure 142 extends. The member 146 also has the opening 152 extending therethrough through which the head 144 of the pivot member 132 extends with the members 132 and 146 in assembly as shown in Figure 23. The opening 152 has a larger upper portion, as shown in Figure 23, to permit disengagement of the pivot member 132 and 146 when the members 132 and 146 are pivoted at right angles to each other with respect to the position thereof illustrated in Figure 23.

It will be seen that in the modified structure of Figure 23, the member 132 is provided with a head portion 144 turned at right angles to the head portion of the member 130 of Figure 22 to secure pivot member 146 in assembly therewith with greater facility when sash 54 is in a closed position. Also, a larger rectangular portion 154 is provided on pivot member 132 in Figure 23 to stabilize the position of the pivot member 132 in the sash jamb 88.

In the modified pivot structure of Figure 24, the pivot member 156 is provided with a

vertically extending flange 158 located inwardly of the flange 102 with respect to the axis of pivot part 94 illustrated in Figure 20. The pivot part 156 illustrated in Figure 24 is thus more stably secured in the sash jamb 88. Part 94 is between the part 96 and the part 117 in development.

The guide structure 160 illustrated particularly in Figure 25 is provided at the top of the sash 54 on both sides thereof. The guide structure 160 guides the top of the sash 54 at both upper corners thereof during sliding opening or closing movement within the frame 12. Guide structure 160 may be released to permit pivoting of the sash 54 to the position indicated in Figure 2 to provide a hopper window.

In particular, the guide structure 160 includes member 162 illustrated best in Figure 26 and the member 164 illustrated best in Figure 27. In assembly as shown in Figure 25, the portion 166 (Figure 26) of the member 162 is positioned in the pocket 106 in the sash jamb member 88 and a screw is provided extending centrally through the part 166 of member 162 through the jamb extrusion 88 and into a screw runner in the sash head extrusion 86 to secure the member 162 to the sash 54 at an upper corner thereof with the bottoms of the projections 170 in engagement with the top of the head extrusion 86 of the sash. An opening is provided between the upper part of portion 166 of the member 162 and the projections 170 to receive the central cylindrical portion 172 of the member 164 for rotation.

The member 164 is secured to an upper corner of the sash 54 and may be rotated about the longitudinal axis of the central cylindrical portion 172 thereof to place the transversely extending locking portion 174 thereof in the pocket 176 provided in the jamb adaptor extrusion 20. In this position of the locking portion 174 of the member 164, the sash 54 is guided in vertical movement and prevented from pivoting out of the plane of the window frame 12. In such vertical movement, the upper edge of the member 162 is spaced from the frame jamb extrusion 16 by the pads 178 provided on the portion 166 of the member 162 as shown best in Figure 25.

When it is desired to pivot the sash 54 into a position such as that shown in Figure 2, the handle portion 177 of the member 164 may be grasped and the member 164 rotated to remove the locking portion 174 from the pocket 176 permitting desired tilting of the sash 54.

Other guiding and tilt release structure may be provided in conjunction with the sash 54 and frame jamb extrusion 16 as shown in Figures 28 to 29. In Figure 28, a simple bolt 180 is guided in movement toward and away from the frame jamb member 16 by the guide

182 secured to the top of the head extrusion 86 of the sash 54 through which the bolt 180 extends. A guiding portion 184 is provided on one end of the bolt 180 adapted to be positioned in the pocket 110 in the frame jamb 16 or removed therefrom on movement of the bolt 180 by grasping the bolt head 186 provided on the opposite end of the bolt 180.

Alternatively and as best shown in Figure 29, a fixed guiding member 188 similar to members 162 and 164 secured together with member 164 in a sash restraining position may be secured to the sash 54 adjacent the top thereof on each side by convenient means and a cooperating notch 192 provided in the jamb adaptor extrusion 20 at a different elevation on opposite sides of the window structure 10. Each side of the sash 54 may then be tilted outwardly of the frame at a different elevation to permit tilting of the sash 54 into the hopper position. Such structure has the advantage of being particularly simple.

The guiding structure 194 illustrated in Figures 30 to 32 includes a member 196 having the generally triangular portion 198 and the handle portion 200. The member 196 is in assembly fastened to the top of the sash 54 adjacent the end thereof by the pivot structure 202 which may be a rivet or bolt allowing pivoting of the member 196 thereabout into the positions shown in Figures 30, 31 and 32. Detent means 204 may be provided as shown associated with each position of the member 196. The member 196 may be a half an inch in dimension vertically of the window structure 10.

In the position illustrated in Figure 30, pivotal movement of the sash 54 with respect to the frame jamb 16 is prevented due to the engagement of the one end of the portion 198 of member 196 with the frame jamb extrusion 16. The one end of the portion 198 of the member 196 in the position illustrated in Figure 30 thus guides the sash 54 in vertical movement in the jamb 16. As shown in the position of Figure 31, the member 196 permits pivoting of the sash 54 out of the plane of the frame 12 as shown in Figure 2. Pivoted further as shown in Figure 32, the other end of the member 196 extends through the slot 208 in the frame check rail extrusion 22 to prevent movement of the sash 54 up and down and thus lock the sash in the closed position.

In the modification illustrated in Figures 33 to 36, the sash guiding and tilt release structure 181 includes a separate bolt 183, illustrated best in Figure 36, and a separate bolt guiding member 185. With the bolt guiding member 185 secured to the window sash 54 at an upper corner thereof, the bolt member 183 may be inserted therethrough and into the pocket 110 of the frame jamb 16.

With end 187 of bolt 183 extending into the pocket 110, the bolt member 183 will

provide frictional engagement with the frame jamb member 16 so that the bolt member 183 may replace both sash balances or may maintain the sash 54 in a square relation to the frame 12 so that only a single sash balance is necessary in the window structure 10.

With the bolt 183 extending through the guiding member 185 in the opposite direction so that the end 189 extends into the pocket 110 in the frame jamb member 16, the sash 54 is again maintained square with the frame 12 and is also permitted vertical or horizontal movement with minimum sliding contact between the frame jamb and window sash 54. In this position, the bolt 183 also allows easy tilt release of the window sash 54 by sliding the end 189 out of the pocket 110 and a snap-lock feature on return of the window sash 54 to a vertical position.

With either end of bolt 183 engaged with the frame jamb member 16 and with the sash slightly tilted into the hopper position so that instead of both bifurcations of the bolt 183 engaging with the jamb member 16 only one of the bifurcations is so engaged, ventilation with the window locked can be obtained.

The guiding member 185 as shown in detail in Figure 35 includes a hollow rectangular portion 191 through which the bolt member 183 is received. The hollow rectangular portion 191 is secured to a rectangular portion 193 adapted to fit within the pocket 106 in the jamb member of the sash 54 at the top thereof. The rectangular portion 193 has a countersunk opening 195 therethrough through which a bolt extends into the screw runner groove in the head member of the sash 54 to secure the guiding member 185 to the sash 54 at the upper corner thereof. A flange 197 is provided on the guiding member 185 which engages the edge of the pocket 106 and may be arranged to provide a metal to plastics sliding surface between the sash 54 and the frame 12.

The end 187 of bolt 183 is bifurcated to provide an axial slot 199 having a tapered open end 201. The slot 199 may be varied in width, but preferably in depth, to provide variable frictional engagement of the surfaces 205 on opposite sides of the end 187 of bolt 183 with the edge of the pocket 110 in the frame jamb 16. The bolt 183 is thus firmly mounted but permitting a wide variation in possible frictional engagement with the frame jamb 16. Due to the variation in frictional engagement with the frame jamb 16 possible due to the provision of the slot 199, the bolt 183 with the end 187 inserted in the pocket 110 may replace one or both sash balance structures in the window structure 10 in lighter and more economical windows.

The open ends of the slots 199 and 219 permits securing the window the window sash 54 in a slightly tilted position wherein the portion 207 of the frame jamb extrusion 16

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is in the tapered open end of the slots. The sash 54 may thus be locked in a ventilating position.

The tapered portions 209 and 211 of the end 187 of the bolt 183 guide the bolt 183 into the pocket 110 in the frame jamb member 16 and the tapered portion 213 of the end 187 of bolt 183 prevents movement of the end 187 of bolt 183 out of the pocket 110 accidentally. Abutments 215 prevent insertion of the end 187 of the bolt 183 too far into the pocket 110 of the frame jamb 16, and the taper 217 immediately behind the abutments 215 prevent accidental disengagement of the bolt 183 from the guiding member 185.

The bolt 183 may be assembled with the guiding member 185 by placing a screwdriver or similar object in the slot 219 in the end 189 of the bolt 183 and spreading the end 189 with the screwdriver, which action will cause the sides of the slot 199 in the end 187 to converge and therefore permit insertion of the bolt 183 through the guiding member 185. The bolt 183 may thus be assembled with the guiding member 185 with either the end 187 or the end 189 adjacent the frame jamb 16.

With the end 189 of bolt 183 adjacent the frame jamb 16, the end 189 of the bolt 183 may be inserted in the pocket 110 in the frame jamb 16 on movement of the bolt projection 221 toward the jamb 16. The taper 223 on the end 189 prevents accidental movement of the end 189 of the bolt 183 from the frame jamb 16. Abutments 225 provide minimum sliding contact between the bolt 183 and the frame jamb 16 with the end 189 of the bolt 183 in the pocket 110 in the frame jamb 16. In use, the end 189 of the bolt 183 is urged toward the frame jamb 16 due to the tapered camming surface 227 on end 189 of the bolt 183 which acts in conjunction with the guiding member 185 to resiliently urge the bolt 183 toward the frame jamb 16.

When the end 189 of the bolt 183 is positioned adjacent the frame jamb 16, snap closing of the sash 54 from the tilted hopper position thereof is provided due to the reduced length of the projection 229 and the cam surface 231 on the end 189 of the bolt 183. Thus, on pivotal movement of the sash 54 toward the frame 12, the end of the projection 229 just barely clears the frame jamb 16 so that the bolt 183 is cammed away from the frame jamb 16 as the sash 54 is moved into the vertical position by surface 231. At this time the bolt 183 is spring loaded due to movement of the camming surface 227 into the guiding member 185 permitted by flexure of the end 189 of the bolt 183 due to the provision of the slot 219 therein. As the point 233 of the end 189 passes the edge of the pocket 110 on pivotal movement of the sash 54 into the closed position, the end 189 of the

bolt 183 is snapped into the guiding position wherein the edge of the pocket 110 of the frame jamb 16 is held against the abutment surfaces 225.

The guiding and tilt release structure of Figures 37 to 39 again includes a bolt member 210 adapted to extend through an opening 212 in a guide member 214 secured to the top of the window sash 54. As shown in Figure 37, with the end 216 of the bolt 210 extending into the pocket 110 of the frame jamb 16, the sash 54 is guided in vertical movement and is prevented from tilting with respect to the window frame 12. Further, since the end 216 of the bolt 210 is bifurcated as shown and a slight taper is provided on the sides thereof, the end 216 of the bolt 210 provides greater or less frictional engagement with the edges of the pocket 110 in accordance with the degree of insertion of the end 216 of the bolt 210 into the pocket 110 and is a ready substitute for a sash balance on windows of moderate weight. The serrations 218 on the bolt 210 cooperate with similar serrations on the inside of the opening 212 in the guide member 214 to maintain the bolt 210 in a set position. The frictional engagement of the bolt 210 with the frame 16 may be varied to prevent sliding of the sash under its own weight by varying the depth of insertion of end 216 in pocket 110 or preferably by varying the depth of slot 217 in bolt 210 while maintaining the bolt as stiff as possible to reduce flexure thereof.

With the bolt 210 turned in the opposite direction and inserted through the opening 212 in the guide member 214 as shown best in Figure 38, it does not prevent sliding movement of the sash. The bolt 210 then guides the window sash 54 in its vertical movement in the frame 12 and spaces the sash 54 from the frame 12.

The bolt member 210 of the guiding structure illustrated in Figures 36 to 38 has a separate function when the window sash 54 is tilted as for example into the position illustrated in Figure 2. In such case, the bolt 210 is removed from the guide member 214 and the end 216 is secured around the sash jamb member 88 as shown in Figure 39 and the projection 220 on the bolt 210 is inserted in the pocket 110 of the frame jamb 16 to secure the sash 54 at a particular tilted angle. The angle of tilt may, of course, be changed by moving the bolt 210 in the position illustrated in Figure 39 vertically of the sash 54. Bolt 210 may thus be substitute for the separate hopper lock members illustrated in Figures 40 to 46.

A hopper link member 241 illustrated in Figure 1, and Figures 40, 41 and 42 includes the end 243 adapted to be inserted in the pocket 110 of the frame jamb 16 and the end 245 adapted to be inserted in the pocket 106 in the jamb of the sash 54 secured together

by the elongated strap central portion 247 which is sufficiently wide to prevent the hopper link 241 from going into either of the pockets 106 or 110 in assembly.

5 The end 243 of the hopper link 241 snaps into the pocket 110 and is held therein by the shoulder 249 extending therearound. As shown, the end 243 has the opening 251 extending therethrough and is split at 253. 10 Since the end 243 is split at 253 and is oversize in the frame jamb pocket 110, the end 243 is under stress in the pocket 110 and thus slides in the pocket 110 less readily than the end 245 of the hopper link 241 which is 15 under little or no stress. To insure greater friction between the sash jamb 16 and the end 243 of the hopper link 241 with the sash in an untilted position, ribs 255 are provided on the end 243 in the position shown so that the 20 friction is present when the sash 54 is in a closed position.

The end 245 is again slightly oversize in the pocket 106 in the jamb of the sash 54, snaps in the pocket 106 and is held in the 25 pocket by the shoulder 257. The tapered sides 259 of the end 245 of hopper link 241 limit relative movement between the hopper link 241 and sash 54 with the hopper lock installed on either side of the sash 54. Thus, the hopper 30 lock 241 never rotates relative to the sash on tilting of the sash into a hopper position to such an extent that the hopper link 241 will bind when the sash 254 is tilted back into the closed position. The hopper lock always 35 maintains an angle of at least 45 degrees with respect to the window sash 54 with the end 245 always being above the end 243.

A tapered shoulder 261 is provided on the strap portion of the hopper link 241 adjacent 40 the end 245 as shown in Figures 40 and 41. The shoulder 261 urges the end 243 of the hopper link 241 into pocket 110 in the frame jamb 16 on pivoting of sash 54 into the hopper position to help prevent accidental disengage- 45 ment of the hopper link.

Due to the greater frictional engagement of the end 243 with the frame jamb 16 in relation to the frictional engagement of the end 245 of the hopper link 241 with the 50 window sash 54, the hopper link 241 will be retained in an upper or minimum ventilation position on movement of the sash 54 up with the window in use as a hopper window. As the sash 54 is raised the pivot structure moves 55 upward although the hopper link 241 remains stationary until it is engaged by the pivot structure which moves it upwardly. On subsequent lowering of the sash 54, the hopper link 241 remains in the position to which it 60 has been moved by the pivot structure while the sash 54 is lowered with the sash sliding relative to the end 245 of the hopper link 241 which is retained in a raised position by the frame jamb 16. Thus, after raising the 65 sash 54, accidental maximum pivoting of the

sash 54 about the bottom thereof is prevented by the hopper link 241 being in its uppermost position.

A similar hopper link or tilt link 222 for maintaining the pivoted sash 54 at a pre- 70 determined angle, which angle may be varied, as illustrated in Figure 43. The hopper link 222 as shown in Figure 43 includes an elongated strap central portion 224 terminat- 75 ing in a portion 226 extending at right angles thereto at one end thereof and concentric disc portions 228 and 230 at the opposite end thereof.

In the modification of the hopper link 222 illustrated in Figure 44 the outer, larger 80 diameter disc 230 is only partial to facilitate insertion thereof into pocket 106 in sash jamb 88. In Figure 45 a projection 234 is provided on the partial disc portion 230 to 85 more easily retain the hopper lock end in the pocket 106. In the modified structure of Figure 46, flanges 238 are provided at each side of the strap portion 224 of the hopper link 222 to increase the rigidity thereof and 90 to provide a pocket 240 to more positively hold the edge of the frame pocket 110.

In use, the hopper link 222 or any of the modifications thereof may be stored in the 95 pocket 106 in the sash jamb members 88 and when the sash 54 is tilted, the hopper link 22 is exposed whereby the end portion 226 may be grasped and the hopper link 222 pivoted to a horizontal position and the end 226 inserted in the pocket 110 of the frame 100 jamb 16 to hold the sash 54 in a tilted position which may be varied again on movement of the hopper link 222 vertically of the frame 12. The disc portion 228 provides a bearing on the edge of pocket 106.

To prevent hurricane strength winds from 105 separating the sash jamb 88 from the frame jamb 66, hurricane clips 246 as shown in Figure 48 have been provided extending between the frame jambs and sash jambs. The hurricane clips 246 are positioned in the 110 pockets 106 in the sash jamb extrusions 88 and are urged outwardly thereof into the pockets 110 in the frame jamb extrusions 16 by the springs 248 as shown in Figure 47. 115 The hurricane clips 246 extend for the full distance between the edges of the pocket 106 and include a flange 150 extending on each side thereof in engagement with each edge of the pocket 106 to retain the clips 246 in 120 the pockets 106.

The hurricane clips 246 may be moved 125 along the length of the sash jamb members 88 as needed to provide added strength of the jamb extrusions 88 in assembly with the frame extrusions 16. With the hurricane clips 246 in position in a window sash 54, 130 tilting of the window sash may be accomplished on movement of the sash vertically until a sash balance engages the hurricane clip 246 to force it back into the pocket 106.

Alternatively a knife may be slipped between the sash jamb member 88 and the frame jamb member 16 and moved vertically into engagement with a cam surface 236 on the hurricane clip 246 to cam the hurricane clip 246 back into the pocket 106 to permit pivoting of the sash 54 as before.

When the sash is not in the pivoted position illustrated in Figure 2; that is, when it is in the position illustrated in Figure 1, the sash jamb extrusion 88 engages the plastics sealing strip 242 which is secured in the recess 244 in the frame jamb member 16 and extends between the frame check rail 22 and frame sill 18 as shown best in Figure 49. With the sealing strip 242 constructed with the cross section shown in Figure 49, the seal provided thereby with the window sash 54 in the closed position is particularly tight and will become tighter as wind force increases on the outside of the window structure 10 until the wind pressure is so great as to cause separation of the frame jamb member 16 and the sash jamb member 88 due to different bending strengths thereof.

Due to the mitred lower corners of the sash frame and the profile of the frame sill member 18 as compared to the frame jamb members 16, a small triangular opening is provided at each lowered mitred corner of the window structure which with sealing strip 242 is objectionable since air leakage may occur through the small triangular opening. Corner inserts 250 in the main frame as shown best in Figure 55 have therefore been provided at each mitred lower corner of the window structure 10 to seal the triangular opening and provide excellent wind tightness for the window structure 10.

As shown in Figure 55, the corner insert includes the generally triangular portions 252, the lower edge of which is adapted to seat on the frame sill member 18 at the mitred end thereof as shown in Figure 57. The extension 254 then extends within the pocket 110 of the frame jamb member 16 as shown in Figure 56 with the corner insert 250 in assembly as shown in Figure 54.

Alternative corner inserts 256, 258 and 260 for sealing the same triangular opening between the sill extrusion 18 and the jamb extrusion 16 at the mitred connection therebetween are shown in Figures 58, 61 and 64 and are illustrated in assembly with the frame jamb members 16 in Figures 59, 62 and 65. The corner inserts 256, 258 and 260 are illustrated in assembly with the frame sill extrusions 18 in Figures 60, 63 and 66 respectively.

The insert 258 is provided with the two sloping surfaces 262 and 266. Both the inserts 250 and 258 may be used at either side of the window structure 10 as is the case of all of the hardware for the window structure 10 including the previously discussed

pivot structure, guiding structure, and hopper lock member, all of which are made of suitable plastics material.

The corner insert 256 again has sloping surfaces 268 and 270 as is the case with the insert 258. However, instead of the rectangular positioning portion 272 provided with the insert 258, the insert 256 is secured to the jamb extrusion 16 by means of the spaced apart extensions 272 and 271 extending over a portion of the jamb extrusion at one side of the pocket 110. The portion 273 of insert 256 aids in securing a screen to the frame 12 over the opening for sash 54.

Similarly, the insert 260 has the separate extensions 274 and 276 adapted to fit on both sides of one side of the pocket 110 in the extrusion 16. Insert 260 is again, due to its symmetry, suitable for use on either side of the window structure and is located on the frame sill member 18 by means of the ribs 278 thereon.

When the modified sealing strip 280 of Figure 50 is used in the window structure 10, the triangular opening between the sill extrusion 18 and the jamb extrusion 16 of the frame 12 is covered by the sealing strip 280 and therefore no corner inserts are necessary. The modified sealing strip 280 fits over the projections 282 and 284 on the jamb extrusions 16 as shown in Figure 50 and provides a particularly tight weather seal which is not readily damaged on removal and reassembly of the sash 54 in the frame 12. Sealing strip 280 is constructed of plastics. The part 281 is of relatively hard plastics while the part 283 is relatively soft plastics.

The screen retaining clip 271 illustrated in Figure 51 is carried by the sealing strip 280. Screen clip 271 is adapted to receive the frame of the screen 273 between the legs 275 and 277 of the U-shaped portion thereof in assembly therewith. An open returned portion 279 of clip 271 is placed over the flange 281 of the harder portion of the sealing strip 280 to secure the screen clip 271 to the sealing strip.

In installation a screen 273, as shown best in Figure 1, is inserted in the clips 271 secured to the sealing strip 280 and moved to the top of the opening to be covered by the screen. The bottom of the screen 273 is then pivoted about the top thereof toward the sill extrusion 18 and is allowed to drop behind the vertical flange 283 on the sill extrusion 18. The clips 271 which are provided at each jamb of the window frame 12 are moved down so that they are substantially centrally located along the frame jambs in the window opening covered by the screen. The screen 273 is thus securely held in place by two screen clips 271 and may be easily removed and replaced in the window structure 10.

The modified screen retaining clip 285 illustrated in Figures 52 and 53 includes a

portion 287 for securing the clip 285 to the jamb extrusion 16 of the window structure 10, a portion 289 and the connecting portion 291 extending between the portions 287 and 289 and cooperable therewith to receive the frame of the screen 273 and secure the screen to the window structure 10. In particular the tabs 293 of the portion 287 of the screen clip 285 extend over the frame of the screen 273 to hold it in assembly with the clip 285. The clip 285 is in turn secured to the window structure 10 by means of the tab 295 extending from the frame jamb extrusions 16 over the portion 297 of the screen clip 285 as shown best in Figure 52. The clip 285 has the advantage of being secured directly to the frame jamb 16 rather than to the sealing strip 280 whereby the flange 299 illustrated on the sealing strip in Figure 51 is not necessary when the clip 285 is used.

With the sash 54 in a down position in the plane of the frame 12; that is, when the sash sill extrusion 90 rests on the sill 18 of the frame 12, as shown in Figure 67, locking structure 286 is provided to lock the sash 54 in its down position. Locking structure 286 includes the locking member 290 illustrated in perspective in Figure 68 which is received in the longitudinally extending pocket 292 in the sash sill extrusion 90 and the spring 294 urging the locking member 290 into the locked position wherein the barb portion 296 thereof engages the barb projection 298 on the frame sill extrusion 18. The locking member 290 pivots about the inner edge of flange 300 in opposition to the bias of the spring 294 to permit releasing the locking member 290 from the frame sill projection 298. Engagement of the portion 302 of the locking member 290 with the surface of the pocket 292 prevents removal of the locking member 290 from pocket 292 with the sash 54 in a raised position due to the bias of the spring 294.

Alternatively, the locking structure 308 Figure 69 including locking member 304 biased by the leaf spring 306 may be positioned in the pocket 292. The locking member 304 and spring 306 function in substantially the same manner as the locking structure 286 and in addition may be gravity latched since the member 304 tends to assume the latched position thereof as illustrated in Figure 69 without the spring 306.

The modified locking structure 310 illustrated in Figure 70 includes locking member 314 and the separate lock surround member 312 illustrated in Figures 71 and 72 respectively and the spring 316 operable therebetween.

The lock surround member 312 includes the generally rectangular portion 320 adapted to fit within the sash sill extrusion 90 as shown in Figure 70 and the portions 322 and 324 integral the ends of the lock surround member 312 and projecting outwardly from

the sash sill extrusion 90 and downwardly therefrom to engage the portion 326 of the frame sill member 18 in the slots 328 therein as the sash 54 having the lock surround member 312 installed in the sill extrusion 90 thereof is lowered. Thus, the locking member 314 positioned between the portions 322 and 324 of the lock surround member 312 is always aligned with the portion 326 of the frame sill extrusion 18 to insure engagement of the barb projection 330 on the locking member 314 with the barb projection 298 on the frame sill extrusion 18. Also, the lock surround member 312 prevents outward movement of the sill 90 of sash 54 to disengage the locking member 314 and thus provides a lock safety feature.

As before, the locking member 314 is pivoted about the inner edge of the flange 300 of the sash sill extrusion 90 and is maintained in pivotal relation with the inner edge of the flange 300 by means of the longitudinally extending portions 332 and 334 of the locking member 314. The spring 316 is received in the recess 336 in the locking member 314 and tends to pivot the locking member 314 out of the sash sill extrusion 318 while such movement of the locking member 314 is prevented due to engagement of the extensions 338 of the locking member 314 with the abutment portions 340 on the lock surround member 320.

All of the locking structures 286, 308 and 310 may be moved longitudinally of the sill extrusion 90 of the window structure 10 within the pocket 292 to any desired position thereof permitting advantageous location of the locking structure when the window structure 10 is used as a sliding window as illustrated in Figure 3. Advantageous location of the locking structure also permits avoiding of drapes and the like with the locking structures when the window is used as a single hung or hopper window.

As shown best in Figures 2 and 3, the glazing panels 50 and 52 of the window structure 10 are apparently divided into smaller window panes by the false muntin structure 350 including false muntin members 352 and false muntin member retaining clips 364. The false muntin members 352 are, however, provided on one side of the glazing panels 50 and 52 only and therefore do not require division of the glazing panels 50 and 52 into smaller panes as in the past. In addition, the false muntin structure 352 is readily removable from the window structure 10 and replaceable thereon to facilitate cleaning of the glazing panels 50 and 52. The aesthetic appearance of small glass panes may thus be obtained in the window structure 10 without the added expense of joining a lot of small panes and maintenance of the window structure 10 is facilitated through the use of the false muntin structure 350, which

false muntin structure requires a minimum amount of fabrication and does not come apart accidentally in use.

More specifically, the muntin members 5 352 are hollow and have the cross section illustrated in Figure 76. The muntin members 352 are provided with a notch 354 centrally of their lengths extending halfway through the members to permit assembly of two false muntin members by means of the cross shape interlocking member 356 illustrated in perspective in Figure 75. With two false muntin bars 352 connected as illustrated in Figure 3, the cylindrical end portions 358 of the interlocking member 356 are received in the longitudinally extending channels 360 of the false muntin members 352 which extend at right angles to each other with the muntin members in assembly. With two 20 muntin members 352 extending at right angles to each other with the notch 354 in one receiving the notch 354 of the other, the false muntin members 352 are in the same plane so that flanges 362 on the false muntin members 352 provide strength and rigidity 25 for the connected false muntin members 352 as well as giving a finished appearance thereto.

To assemble two false muntin members 352 30 having notches 354 therein, an interlocking member 356 constructed as illustrated in Figure 75 is first positioned in one false muntin member 352 with the cylindrical projections 358 on one portion of the cross-shaped interlocking member positioned within the longitudinal channels 360 of the one false muntin member 352. The other portion of the interlocking member will thus extend perpendicular to the longitudinal extent of the one false muntin member and should be 40 centered in the notch 354. The one false muntin member is then positioned perpendicular to a second false muntin member with the notches 354 therein substantially aligned as shown in Figure 71 and one of the cylindrical portions 358 on the portion of the interlocking member extending at right angles to the one false muntin member is urged into the notch 354 and channel 360 in the other 50 false muntin member 352, while the one false muntin member 352 is rotated slightly to permit sliding of the one false muntin member longitudinally of the other false muntin member past the notch therein to permit snapping of the remaining cylindrical portion 358 of the interlocking member 356 into the notch of the other false muntin member. On 55 movement of the one false muntin member back over the notch 354 in the other false muntin member, the notch of the one false muntin member is drawn into the notch of the other false muntin member by the elasticity of the plastics interlocking member 356 to form a completed connection between the 60 false muntin members 352 as illustrated in

Figure 73. On reversal of this procedure, the false muntin members 352 may be disconnected.

The retaining clips 364 may be used to secure the false muntin members 352 to the frame 12 of the window structure 10 and to the sash 54 of the window structure 10. The retaining clip 364 which is universal; that is, may be used with either wood or metal frames and with hollow or solid false muntin members of different thicknesses, includes the central abutment portion 368 against which the end of a false muntin member 364 may be abutted and which in turn abuts the frame or sash of the window structure 10. The structure 370 extends from one side of the abutment portion 368 to secure the retaining clip to the frame or sash and the structure 372 extends from the other side of the abutting portion of the retaining clip 364 for securing the false muntin member to the retaining clip.

As shown, the structure 370 for securing the retaining clip 364 to the window frame or window sash includes two triangular portions 374, one at each end of the abutment portion 368 of the clip 364 and extending outwardly of and beyond the clip 364, as shown best in Figure 78. In addition, the triangular portions 374 of the clip 364 are provided with serrations 378. In use, the triangular portions 374 of the clip 364 are forced between the frame or sash and glazing panel positioned therein and are retained in position between the frame or sash and glazing panel by engagement of the serrations 374 with the frame or sash in the case of wood window construction. In the case of metal window construction such as the window structure 10, the inclined portions of the triangular portions 374 of clips 376 extend behind retaining beads or the glazing strips 56 on the frame 12 or sash 54 to secure the retaining clips 364 in position.

The retaining clips 364 are then moved along the edge of the glazing panel until they are positioned correctly to receive the ends of the false muntin structure 350 at which time the ends of the false muntin members 352 of the false muntin structure 350 are forced into the retaining clips 364 by spreading parts 380 and 382 of the portion 372 of the clip 364 apart. As shown best in Figure 79, the parts 380 and 382 include two or more separate notches 384 and 386 therein to accommodate false muntin members 352 having different thicknesses.

The modified retaining clip 388 shown in Figure 77 includes the relatively thin semi-circular portion 390 which may be serrated and is adapted to be inserted between the frame or sash and a glazing panel or glazing strip and which has the cut and bent-out barb 392 positioned centrally thereof for retaining the clip 390 in the window structure 10.

The retaining clips 394, 396 and 398 illustrated in Figures 81, 82 and 83 are further possible modifications of the retaining clips 364 and 390. The retaining clip 394 includes a single barb portion 400 which is relatively thin and serrated so that the retaining clip 394 is particularly suited for use with wood window construction. In contrast, the retaining clip 396 is provided with a single triangular barb portion 402 having a single abutment 404 thereon for engagement with a bead on a metal window frame or sash whereby the retaining clip 396 is especially suited for use with metal windows. Also, it will be noted that the retaining clip 396 is especially suited for use with hollow false muntin members by the provision of a portion 406 extending from the side thereof opposite the triangular portion which is adapted to extend into the end of the hollow false muntin members for securing the hollow false muntin members thereto. The clip 398 also includes a portion 408 extending from one side of the abutment portion 410 adapted to fit within the end of a hollow false muntin member, while the structure 410 provided on the clip 398 to secure the retaining clip 398 to window structure is the same as that provided in the retaining clip 390.

Any of the retaining clips 374, 390, 396 and 398 are suitable for use with the window structure 10. As pointed out above, the retaining clip 394 is more suited for use with wood window structure.

The storm sash 420 provided with the window structure 10 and particularly illustrated in Figures 84 to 94 is adapted to be secured to the window structure 10. Thus, the storm sash 420 does not require separate frame structure and the like and does not alter the appearance of the prime window structure 10. In addition, the storm sash 420 is particularly simple in construction and therefore economical while being especially efficient in use.

In Figure 84, the storm sash 420 includes the storm glazing panel 422 and the plastic strip 424. The plastics strip is applied to the storm glazing panel 422 around the periphery thereof and the assembled storm glazing panel and plastics strip are secured in the prime window structure 10.

As shown better in Figure 85, the plastics strip 424 includes the relatively hard U-shaped cross section portion 426 into which the edge of the storm glazing panel 422 is inserted and the relatively soft barb portions 428 for retaining the storm glazing panel 422 and the plastics strip 424 in assembly. The plastics strip 424 further includes the relatively soft sealing flange 430 for sealing between the storm sash 420 and the glazing strip 56, as shown best in Figure 84.

The plastics strip 424 further includes the relatively hard cross section portion 432

extending generally arcuately from the bottom of the U-shaped portion of the cross section of the plastic strip and terminating in an L-shaped cross section part 434 adapted to fit within the recess 73 in the window sash 54 and around bead 438 as shown in Figure 84 to retain the storm sash 420 in assembly with the prime window sash 54 without separate retainer clips.

The modified storm sash 440 illustrated in Figure 86 besides the glazing panel 422 includes a modified plastics strip 444 which is better shown in Figure 87 in perspective. A retaining clip 446 better shown in Figure 88 is used for retaining the assembled glazing panel 422 and plastic strip 444 on the prime window structure 10.

The plastic strip 444 (of Figure 87) again includes the rigid U-shaped cross section portion 448 and the relatively flexible barb portions 450 for receiving and holding the periphery of the glazing panel 422 respectively. The sealing flange 452 is again provided to seal between the storm sash 440 and the glazing strip 56 and is of softer plastics than the relatively hard U-shaped portion 448 of the strip 444. A longitudinally extending rib 482 (not shown in Figure 86) is provided on the rigid U-shaped cross section portion 448 as shown in Figure 87 to facilitate removal of strip 444 and use of the retaining clips 446 and 470.

The retaining clip 446 is substantially S-shaped in cross section and is provided with the longitudinally extending foot portion 454 and the flange portion 456. In assembly, the foot portion 454 of the clip 446 is received in the recess 73 in the prime window sash with the bead 438 between the foot portion 454 and the flange portion 456 of the clip 446, as shown in Figure 86. The retaining clip 446 which is of relatively rigid plastic may be of any desired length to provide the required holding force on the storm sash structure 440.

The prime window structure and the glazing panel and plastic strip of the storm sash jamb section illustrated in Figure 89 are the same as those illustrated in Figure 86. However, the retaining clip 460 as illustrated in Figure 90 includes a pivot head 462, a transition portion 464, a retaining portion 466 and a camming portion 468. In use, the pivot head 462 of the retaining clip 460 is positioned in the recess 73 (Figure 86) in the prime window sash 54 and the retaining portion 466 together with the transition portion 464 is rotated about the pivot head 462 until the cam portion 468 snaps over the bead 438 of the sash jamb to lock the storm sash in position on the prime sash.

Similarly, the storm glazing panels and plastics strips illustrated in Figures 91 and 93 are the same as those illustrated in Figures 86 and 89. However, the retaining clip illustrated in Figure 92 has been used to mount

the storm glazing panel and plastics strip on the prime window sash 54 as shown in Figure 91, while the retaining clip illustrated in Figure 94 has been used to secure the storm glazing panel and peripheral plastic strip on the prime window sash 54 as illustrated in Figure 93.

The retaining clip 470 illustrated in Figure 92 includes the tabs 472 and 474 at the opposite ends thereof and the body portion 476 located centrally thereof and in spaced relation to the tabs 472 and 474, which body portion has the toe portion 478 at the end thereof. A camming portion 480 is provided centrally of the body portion of the retaining clip 470 cooperable with rib 482 of strip 444 to retain the clip 470 in assembly with the strip 444 as shown in Figure 91.

In assembly as shown in Figure 91, the relatively thin tabs 472 and 474 are inserted between the U-shaped portion 448 of the plastic strip 444 and the storm glazing panel 422 on movement of the clip 470 to cam the camming portion 480 of the clip over the rib 482 until the toe portion 478 of the clip snaps over the bead 438 on the sash to lock the clip in position as shown in Figure 91.

With such construction, the camming portion 480 tends to apply pressure to hold the toe portion 478 against bead 438 when removal of the clip 470 is attempted. Physical bending of the plastics clip 470 is thus necessary to remove the storm sash received thereby.

The retaining clip 472' includes the elongated bar portion 486 having longitudinal groove 498 therein and terminates in the end portions 488 and 490 extending at right angles thereto and the foot portion 492 extending in the same direction as the end portions 488 and 490 of the bar portion. The retaining portion 494 of retaining clip 472 extends at right angles to the foot portion and includes the bead 496 thereon, as shown in Figure 94.

In use, the foot portion 492 and the end portions 488 and 490 of the bar portion 486 and the bar portion 486 are inserted in the recess 73 in the prime sash 54, as shown best in Figure 93, with bead 438 in groove 498. The elongated bar portion 486 permits flexing of the clip 472 in the recess 73 to engage or disengage the clip from the bead 438 to remove the clip 472 from the recess 73 when it is desired to remove the clip.

Furthermore, with the clip 472 at one extreme of the movement thereof in the recess 73, the storm sash may be removed from the window structure 10 without removing the clip 472. Loss of the clips on inserting and removing the storm sash when the clips 472 are used is therefore not likely.

When the window structure 10 is installed in a window opening in building construction, the trim structure 520 illustrated in Figures

95 to 105 may be used in conjunction therewith to provide a finished window opening.

The window trim structure 520 particularly illustrated in Figure 95 includes the trim members 522 and 524 illustrated in enlarged cross section in Figures 96 and 97 respectively.

As shown, the member 522 which may be of plastics material has a U-shaped portion 526 including the legs 528 and 530 adapted to receive the edge of a plywood trim panel 532 therebetween as illustrated particularly in Figure 95. Leg 528 includes the return bent portion 534 which operates to resiliently urge the trim panel 532 away from the batten 538 surrounding and defining the window opening 536 and extending between the interior wall panel 540 and the exterior wall panel 542. The trim member 522 further includes the U-shaped portion 544, one leg of which is formed by the connecting portion of the U-shaped portion 526 and which receives the flange 546 of the window structure 10 in assembly.

The trim member 524 as shown best in Figure 97 again includes the U-shaped portion 548 having the leg member 550 and the leg member 552 with the return portion 554 thereon, which structure is similar to the U-shaped portion 528 of the trim member 522. The U-shaped portion 548 of the trim member 524 receives the other edge of the trim panel 532. The member 524 further includes the decorative extension 556 which may be secured to the inner wall panel 540 by convenient means such as nails or retaining clips to complete the trim of the installed window structure 10 as illustrated in Figure 95. The trim members 522 and 524 may be connected as desired at the corners, preferably by mitred joints.

The nailing flange 36 of the window structure 10 is secured to the batten through the exterior wall panel by convenient means such as nails driven therethrough. The nailing flange 36 may of course be covered by exterior panelling of the building structure, if desired.

The modified trim structure 558 illustrated in Figure 98 includes the trim and casing member 560 and the casing expander 562 having the cross sections illustrated in Figure 98 which are secured to the wall structure 564 which includes batten 566, interior wall panel 568 and exterior wall panel 570 by convenient means such as nails.

Again, the window structure 10 is assembled with the casing expander 562 (which allows different width walls to be trimmed) on placing of the flange 546 of the window structure in the recess 572 provided in the casing expander 562. The window trim and casing member 560 in conjunction with the casing expander 562 permits trim of windows in walls of different thickness with equal facility. The leg 574 of the casing

expander is inclined toward the leg 576 thereof prior to insertion of end 578 of the member 560 therein so that the finished trim structure always presents the same tight appearance regardless of slight variations in the dimensions of the trim and casing member 560 and expander 562.

The window trim and casing member 560 may be connected at the corners thereof in a mitred joint as will be understood by those in the art. To facilitate such a mitred joint, a corner clip 580, as particularly shown in Figure 105, having portions 582 and 584 adapted to be inserted in the areas 586 and 588 in the trim member 560 is provided. Thus, a mitered corner may be provided with a single corner insert 580.

When it is desired to trim a window opening wider than can be accommodated by the casing expander 562, a separate casing expander member 586 illustrated particularly in Figure 99 may be used in conjunction with the trim member 560 and the expander 562 by inserting the end 588 of the expander 586 in the expander 562 and receiving the end 578 of the trim member 558 in the end 590 of the expander 586.

Two additional modifications of the extruded window trim and casing member 558, that is, 592 and 594, are illustrated in Figures 100 and 101. A deluxe, heavier-appearing inside window trim and casing member 596 is illustrated in Figure 102, while two roll-formed inside window trim and casing members 598 and 600 are illustrated in Figures 103 and 104. The members 598 and 600 differ in the provision of the rolled edge 602 on the member 598 and the intermittent portions 604 on the rolled member 600 for securing the members 598 and 600 within an expander member such as 562 and also serve to center the window trim structure in a window opening. The trim members 592, 594, 596, 598 and 600 are interchangeable with the trim member 558 and may be assembled in mitred corner joints in conjunction with corner brackets similar to corner bracket 580.

The window trim structure 600 illustrated in Figures 106 to 111 includes a modified trim and casing member 602 and a modified casing expander member 604 shown in assembly in Figure 106. The trim and casing member 602 includes the flanges 606 and 608 constructed integrally therewith for securing the corner bracket 610 illustrated in Figures 109 to 111 in assembly therewith as shown particularly in Figures 107 and 108. Again, the inclined resilient flange 612 and casing member 602 centers the trim and casing member in the window opening 614 during assembly and provides positive contact between the barbed end 616 of the trim and casing member 602 with the notches 618 on the casing expander 604. The casing expander

604 as shown in Figure 106 is provided with the U-shaped portion 620 for receiving the indicated portion of the frame of the window structure 10.

As shown in Figures 109 to 111, the corner bracket 610 includes the reinforcing ribs 622 and beads 624 and is generally L-shaped in configuration so that separate halves 626 and 628 thereof fit within the mitred ends of trim and casing members 602 abutting at the corners of window structure 10 as shown best in Figures 107 and 108. The abutments 630 and 632 are provided on the halves 626 and 628 of the corner bracket 610 and include tapered surfaces 634 adapted to cam over the flanges 606 of trim and casing members 602 so that the abutments 630 and 632 may be positioned in the cooperating notches 636 in the casing members 602 in assembly as shown best in Figure 107.

WHAT WE CLAIM IS:—

1. Window structure for installation in either a position in which the head portion of the window structure 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 comprising a head, jambs and a sill and at least one sash adapted to be slidable in the plane of the window structure and to be pivotable about one edge thereof out of the plane of the window, the or each slidable and pivotable sash including sash jambs in spaced relation to the jambs of the window frame in the plane of the window when the sash is in the plane of the window, flexible seal structure extending between the jambs of the window frame and the sash for sealing between the window frame and sash with the sash in a closed position in the plane of the window, pivot structure extending between the frame jambs and the sash jambs at the one edge of the sash providing a pivot axis for pivoting the sash out of the plane of the window, sash guide and pivot release structure extending between the jambs of the window frame and the sash at the edge of the sash opposite said one edge thereof for guiding the sash in movement in the plane of the window and for releasing said opposite edge of the sash for pivoting out of the plane of the window, a glazing member in said sash and means between the glazing member and the sash for securing the glazing member in the sash.

2. Structure as claimed in claim 1 further including at least one fixed sash including jamb adaptor extrusions mounted on the frame jambs having one end engaged with the frame head and the other end engaged with a frame check rail which check rail secures the jamb adaptor extrusions in position on the frame jambs.

3. Structure as claimed in claim 1 or 2 further including means for mulling a

expander is inclined toward the leg 576 thereof prior to insertion of end 578 of the member 560 therein so that the finished trim structure always presents the same tight appearance regardless of slight variations in the dimensions of the trim and casing member 560 and expander 562.

The window trim and casing member 560 may be connected at the corners thereof in a mitred joint as will be understood by those in the art. To facilitate such a mitred joint, a corner clip 580, as particularly shown in Figure 105, having portions 582 and 584 adapted to be inserted in the areas 586 and 588 in the trim member 560 is provided. Thus, a mitered corner may be provided with a single corner insert 580.

When it is desired to trim a window opening wider than can be accommodated by the casing expander 562, a separate casing expander member 586 illustrated particularly in Figure 99 may be used in conjunction with the trim member 560 and the expander 562 by inserting the end 588 of the expander 586 in the expander 562 and receiving the end 578 of the trim member 558 in the end 590 of the expander 586.

Two additional modifications of the extruded window trim and casing member 558, that is, 592 and 594, are illustrated in Figures 100 and 101. A deluxe, heavier-appearing inside window trim and casing member 596 is illustrated in Figure 102, while two roll-formed inside window trim and casing members 598 and 600 are illustrated in Figures 103 and 104. The members 598 and 600 differ in the provision of the rolled edge 602 on the member 598 and the intermittent portions 604 on the rolled member 600 for securing the members 598 and 600 within an expander member such as 562 and also serve to center the window trim structure in a window opening. The trim members 592, 594, 596, 598 and 600 are interchangeable with the trim member 558 and may be assembled in mitred corner joints in conjunction with corner brackets similar to corner bracket 580.

The window trim structure 600 illustrated in Figures 106 to 111 includes a modified trim and casing member 602 and a modified casing expander member 604 shown in assembly in Figure 106. The trim and casing member 602 includes the flanges 606 and 608 constructed integrally therewith for securing the corner bracket 610 illustrated in Figures 109 to 111 in assembly therewith as shown particularly in Figures 107 and 108. Again, the inclined resilient flange 612 and casing member 602 centers the trim and casing member in the window opening 614 during assembly and provides positive contact between the barbed end 616 of the trim and casing member 602 with the notches 618 on the casing expander 604. The casing expander

604 as shown in Figure 106 is provided with the U-shaped portion 620 for receiving the indicated portion of the frame of the window structure 10.

As shown in Figures 109 to 111, the corner bracket 610 includes the reinforcing ribs 622 and beads 624 and is generally L-shaped in configuration so that separate halves 626 and 628 thereof fit within the mitred ends of trim and casing members 602 abutting at the corners of window structure 10 as shown best in Figures 107 and 108. The abutments 630 and 632 are provided on the halves 626 and 628 of the corner bracket 610 and include tapered surfaces 634 adapted to cam over the flanges 606 of trim and casing members 602 so that the abutments 630 and 632 may be positioned in the cooperating notches 636 in the casing members 602 in assembly as shown best in Figure 107.

WHAT WE CLAIM IS:—

1. Window structure for installation in either a position in which the head portion of the window structure 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 comprising a head, jambs and a sill and at least one sash adapted to be slidable in the plane of the window structure and to be pivotable about one edge thereof out of the plane of the window, the or each slidable and pivotable sash including sash jambs in spaced relation to the jambs of the window frame in the plane of the window when the sash is in the plane of the window, flexible seal structure extending between the jambs of the window frame and the sash for sealing between the window frame and sash with the sash in a closed position in the plane of the window, pivot structure extending between the frame jambs and the sash jambs at the one edge of the sash providing a pivot axis for pivoting the sash out of the plane of the window, sash guide and pivot release structure extending between the jambs of the window frame and the sash at the edge of the sash opposite said one edge thereof for guiding the sash in movement in the plane of the window and for releasing said opposite edge of the sash for pivoting out of the plane of the window, a glazing member in said sash and means between the glazing member and the sash for securing the glazing member in the sash.

2. Structure as claimed in claim 1 further including at least one fixed sash including jamb adaptor extrusions mounted on the frame jambs having one end engaged with the frame head and the other end engaged with a frame check rail which check rail secures the jamb adaptor extrusions in position on the frame jambs.

3. Structure as claimed in claim 1 or 2 further including means for mulling a



plurality of the window structures together in horizontal or vertical juxtaposition.

4. Structure as claimed in claim 3 wherein the mulling means includes an interior mulling extrusion adapted to clip into the inside periphery of the adjacent window frames to be mulled to secure them together interior of the window structure.

5. Structure as claimed in claim 4, wherein the mulling means further includes an exterior mulling extrusion adapted to fit over projecting flanges on the outside periphery of the window frames to secure them together exterior of the window structure.

6. Structure as claimed in claim 3 wherein the mulling means includes a single mulling extrusion having a generally T-shaped cross section adapted to fit between the outer periphery of juxtapositioned window structures in engagement therewith adjacent the inside and outside thereof.

7. Structure as claimed in any of claims 1 to 6 including at least one glazing panel and a plastic glazing strip secured to the window structure and engaged with the glazing panel for holding glazing panels of different thickness in assembly with the window structure while providing the same general window glazing appearance.

8. Structure as claimed in claim 7 wherein the glazing strip has a cross section including an L-shaped portion one end of which is independently flexible and is adapted to engage the glazing panel and a foot portion secured to the other end of the L-shaped portion for securing the glazing strip to the window structure.

9. Structure as claimed in claim 8 wherein the other end of the L-shaped portion of the glazing strip cross section includes leg parts at least one of which is connected to the foot portion of the cross section which leg parts are adapted to urge the one end of the L-shaped portion of the glazing strip into engagement with the glazing panel.

10. Structure as claimed in claims 8 or 9 wherein the cross section of the glazing strip further includes a portion extending generally in the direction of the one end of the L-shaped portion of the cross section spaced from and connected to the other end of the L-shaped portion of the glazing strip cross section.

11. Structure as claimed in any of claims 1 to 10 including a sash balance mounting insert at at least one upper corner of the window structure in assembly with the head of the frame thereof and sash balance means carried by the insert extending within the jamb of the frame.

12. Structure as claimed in claim 11 wherein the sash balance mounting insert includes a shaft portion extending through one end of the sash balance structure for supporting the sash balance structure.

13. Structure as claimed in claim 11 wherein the sash balance mounting insert includes barbed portions cammed over a portion of the jamb of the frame to lock the insert in assembly with the frame.

14. Structure as claimed in claim 13 wherein the sash balance mounting insert further includes flexible extensions thereon facilitating camming of the barbed portions over the portion of the jamb of the frame.

15. Structure as claimed in claim 14 wherein the sash balance mounting insert further includes thin triangular fins on the flexible extensions received within the sash balance structure and retaining the sash balance structure on the shaft portion of the sash balance mounting insert.

16. Structure as claimed in any of claims 1 to 15 wherein the pivot structure includes means for releasably securing sash balance structure thereto.

17. Structure as claimed in claim 16 wherein the pivot structure includes a pivot part having a generally rectangular portion positioned within the jamb of the movable sash, a cylindrical portion extending within the jamb of the frame and a central flange positioned between the sash jamb and frame jamb for holding the sash jamb and frame jamb in spaced apart relation during relative movement thereof and means for securing the pivot part to the sash jamb.

18. Structure as claimed in claim 17 wherein the pivot part further includes an extension on the rectangular portion thereof adjacent the central flange and extending transversely of the pivot structure for stabilizing the pivot structure in the sash jamb.

19. Structure as claimed in claim 18 wherein the pivot part further includes an extension of the central flange on the side thereof opposite the extension extending axially of the rectangular portion and having rounded edges extending over adjacent portions of the sash jamb to prevent damage to sealing strips of the window structure by the adjacent portions of the sash jamb on pivoting of the sash jamb.

20. Structure as claimed in claim 17 wherein the pivot structure further includes a sash balance part for releasably connecting a sash balance to the pivot part having a pair of recesses on opposite sides thereof in one end thereof and a slot extending between the recesses for receiving an offset end of a sash balance torsion band and having a recess in one side of the other end thereof for releasably receiving the cylindrical portion of the pivot part.

21. Structure as claimed in claim 20 wherein the sash balance part of the pivot structure further includes flanges at the edges of the one side for spacing the window sash from the window frame and a projection on



the sash balance part of the pivot structure spaced inwardly of the flanges for preventing the sash balance part of the pivot structure from rotating out of the window frame due to torque applied thereto by a sash balance torsion band secured thereto.

22. Structure as claimed in any of claims 1 to 15 wherein the pivot structure includes a pivot part having a body portion with longitudinal grooves in the sides thereof tightly received in the jamb of the sash and a headed cylindrical portion extending transversely from the body portion for receiving one end of a sash balance spring.

23. Structure as claimed in claim 22 wherein the pivot structure further includes a separate sash balance part having an elongated slot in one end thereof adapted to fit over the headed cylindrical portion of the pivot part in one relative angular position between the pivot part and sash balance part and a slot extending through the other end thereof for receiving one end of a sash balance spring.

24. Structure as claimed in any of claims 1 to 23 in which the guiding and tilt release means is secured to the movable sash.

25. Structure as claimed in claim 24 wherein the guiding and tilt release means includes a bolt and guide means for mounting the bolt at one corner of the movable sash for guided movement into and out of the jamb of the window frame.

26. Structure as claimed in claim 24 wherein the bolt has at least one bifurcated end and in one position thereof with respect to the guide the bifurcated end extends within the jamb of the window frame to provide variable frictional resistance between the bifurcated end of the bolt and the frame jamb to counterbalance the movable window sash.

27. Structure as claimed in claim 25 or 26 wherein the bolt has at least one bifurcated end and with the window sash slightly tilted into the hopper position and the bolt moved toward the window frame a jamb flange of the window frame fits within the bifurcated end of the bolt to provide ventilation with the window secured.

28. Structure as claimed in claim 26 or 27 wherein the other end of the bolt extends into the frame jamb in the opposite bolt position with respect to the guide to space the movable window sash from the frame jamb.

29. Structure as claimed in any of claims 26 to 28 wherein the other end of the bolt includes a cam portion thereon engageable with the window frame on return of the sash into the plane of the window frame from a hopper position and resilient means are provided urging the bolt toward the window from the hopper position the bolt cams over a portion of the window frame and snaps into a locked position.

30. Structure as claimed in claim 25

wherein the bolt may be removed from the guide means, the movable sash of the window may be tilted into a hopper position and the bolt includes a projection at one end thereof engageable with the frame jamb and the other one end of the bolt is engageable with the jamb of the sash to hold the sash in varied tilted hopper positions depending upon the position of the bolt vertically of the sash.

31. Structure as claimed in claim 24 wherein the guiding and tilt release means for the movable sash comprises a guide member secured to the sash at at least one corner thereof and having a portion extending into a frame jamb and a notch in the frame jamb through which the guide member portion may be moved with the movable sash in one position thereof with respect to the window frame for tilting of the sash.

32. Structure as claimed in claim 24 wherein the frame includes a check rail, the guiding and tilt release means includes a pivotally mounted triangular member secured to the head of the movable sash at at least one corner thereof having an end adapted to extend within the frame jamb in one pivoted position thereof, which triangular member is adapted to permit tilting of the movable sash of the window structure in another pivoted position thereof and which triangular member has another end adapted to extend within a slot in the frame check rail in a further pivoted position thereof to lock the movable sash in a closed position.

33. Structure as claimed in claim 24 wherein the guiding and tilt release means includes a rotatable cylindrical member extending axially, transversely of the head of the movable sash at at least one corner thereof having at transverse locking portion on at least one end thereof cooperable in one rotated position thereof with a portion of the window frame to guide the movable sash in movement within the window frame and operable in a second rotated position thereof to permit tilting of the movable sash out of the plane of the window frame and structure secured to the movable sash at the one corner thereof for rotatably mounting the cylindrical member and spacing the jamb of the movable sash from the jamb of the window frame during relative movement therebetween.

34. Structure as claimed in claim 25 wherein the bolt may be inserted through the guide with either end toward the window frame and at least one end of the bolt is bifurcated to provide variable frictional engagement with the window frame and the other end of the bolt is adapted to engage the window frame with a minimum of frictional resistance to guided movement of the sash in the frame.

35. Structure as claimed in claim 25 wherein the bolt includes means at at least one end engageable with the window frame





and means at at least the other end engageable with the frame of the sash in a tilted hopper position whereby the bolt may be used as a hopper lock with the sash in a tilted position.

36. Structure as claimed in any of claims 1 to 35 further including means for retaining the movable sash in any tilted hopper position thereof any place in the movement of the movable sash along the window frame comprising a hopper link including a substantially flat strap portion terminating in a portion extending perpendicularly thereto at one end thereof from one side thereof and adapted to be received in a longitudinal pocket in the sash jamb and terminating at the other end thereof in a portion extending perpendicular thereto from the opposite side thereof and adapted to be received in a longitudinal pocket in the window frame jamb.

37. Structure as claimed in claim 36 wherein the strap portion of the hopper link is wider than the recess in the window sash jamb and the recess in the window frame jamb to prevent movement of the hopper lock into either recess.

38. Structure as claimed in claims 36 or 37 wherein the portion at one end of the hopper link is a radially split annulus and includes an undercut portion in spaced relation to the flat strap portion.

39. Structure as claimed in claim 38 further including ribs on the outer surface of the split annulus end of the hopper link extending perpendicularly to the direction of extent of the flat strap portion of the hopper link for providing added frictional engagement with a window frame in installation with the sash in the plane of the window frame.

40. Structure as claimed in any of claims 36 to 39 wherein the portion at the other end of the hopper link is tapered to limit pivotal movement of the hopper lock with respect to the recess within which it is inserted whereby the hopper link is always returned to a predetermined position on tilting of the sash into the plane of the window frame.

41. Structure as claimed in any of claims 36 to 39 wherein a transversely arcuate portion is provided on the flat strap portion of the hopper link tapered axially inwardly toward center of the flat strap portion of the hopper link from one end thereof for urging the other end of the hopper link into the recess associated therewith on tilting of the sash from the window frame into the hopper position.

42. Structure as claimed in any of claims 36 to 40 wherein the terminal portion at the other end of the hopper link comprises a pair of disc members, the outer disc being larger in diameter than the inner disc between the outer disc and the strap portion of the hopper link.

43. Structure as set forth in claim 42 wherein the outer disc of the other end of the hopper link is less than 360° in extent.

44. Structure as claimed in claim 43 and further including an extension on the outer disc centrally of the incomplete part thereof extending radially beyond the inner disc portion.

45. Structure as claimed in claim 44 and further including ribs at the opposite sides of the strap portion of the hopper link terminating in spaced relation to the terminal portion thereof on the same side of the strap portion of the hopper link.

46. Structure as claimed in any of claims 1 to 45 wherein the seal structure comprises a sealing strip secured to the jamb of the frame and extending over a portion of the jamb of the movable sash.

47. Structure as claimed in claim 46 wherein the sealing strip is of different hardness across its cross section and extends over a substantial portion of the jamb of the frame in the plane of the frame.

48. Structure as claimed in claim 47 wherein the frame jambs and sill are mitred at the corners and further including a corner insert between a frame jamb and sill at at least one corner of the window structure for sealing a triangular opening at the corner not covered by the sealing strip.

49. Structure as claimed in claim 48 wherein the corner insert includes a body portion having one side inclined at the miter angle between the jamb and sill of the frame, triangular portions at each of the body portions, the base of which are coextensive with the inclined side of the body portion and a generally rectangular portion extending out of the inclined side of the body portion.

50. Structure as claimed in claim 48 wherein the corner insert includes a body portion having an end sloping in each direction from the center thereof at the miter angle between the frame jamb and sill of the frame, projections extending in spaced apart relation to each other away from the gabled end thereof for locating the corner insert on the jamb of the frame and a screen retaining portion extending perpendicularly from the other end of the body portion.

51. Structure as claimed in claim 48 wherein the corner insert includes a generally triangular portion having sides extending at an angle to the hypotenuse which is substantially the same as the miter angle between the frame jamb and sill and a rectangular locating portion secured to one side of the triangular portion and including one side spaced from the hypotenuse of the triangular portion toward the apex thereof and parallel thereto.

52. Structure as claimed in claim 48 wherein the corner insert includes a triangular portion having a rib extending

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parallel to one leg on each side thereof, a rib extending parallel to the other leg centrally of the other leg and a pair of spaced part locating projections extending from the hypotenuse of the triangular portion parallel to the one leg thereof in the plane of the sides of the triangular portion.

53. Structure as claimed in any of claims 1 to 52 and further including a screen clip having a U-shaped cross section portion adapted to receive and retain a screen frame therein and including means for securing the slip to the window structure for movement longitudinally thereof.

54. Structure as claimed in any of claims 1 to 53 and further including a hurricane clip positioned in a longitudinally extending recess in one of the frame and sash jambs and extending into a longitudinally extending recess in the other of the frame and sash jambs for movement longitudinally thereof operable to support the weaker of the frame and sash jambs from the stronger under hurricane forces applied to the window structure.

55. Structure as claimed in any of claims 1 to 54 further including structure for locking the movable sash to the frame sill in the closed position thereof which is movable longitudinally of the sash sill.

56. Structure as claimed in claim 55 wherein the sash sill includes a longitudinal recess therein and the locking structure includes a locking member having a pivot surface thereon pivotally engaged with a portion of the sash sill for movement thereabout out of and into the recess in the sash sill, the locking member also having a portion co-operable with the frame sill for locking the sash in a closed position and a portion engageable with the sash sill for retaining the locking member within the recess in any position therealong with the sash in other than a closed position.

57. Structure as claimed in claim 56 wherein the locking structure further includes a lock surround member positioned between the locking member and sash sill within the longitudinal recess therein receiving the locking member and operable to align the sash sill and window frame sill on closing of the sash to facilitate locking of the sash with the locking member and prevent movement of the sash sill transversely relative to the jamb sill and consequent unlocking of the locking structure.

58. Structure as claimed in claim 57 and further including resilient means biasing the locking member out of the recess in the sash sill extrusion and into locking engagement with the frame sill.

59. Structure as claimed in any of claims 1 to 58 including at least one glazing panel and false muntin structure comprising a grill including a plurality of intersecting linear

members having ends terminating adjacent the edges of the glazing panel, means for securing the linear members together at the intersection thereof and retaining clips secured to the window structure and the ends of the linear members.

60. Structure as claimed in claim 59 wherein the linear members are hollow and have a generally elliptical central cross section with transversely extending flanges at each end of the cross section of substantially the same width as the width of the elliptical central cross section thereof.

61. Structure as claimed in claim 59 or 60 wherein the means for securing the linear members together at the intersection thereof includes a cross-shaped interlocking member having raised portions at the ends thereof extending perpendicularly to the plane of the interlocking member which interlocking member is received within the separate linear members at the intersection thereof.

62. Structure as claimed in any of claims 59 or 61 wherein the retaining clips each include a central abutting portion positioned against an end of a linear member, a portion extending from one side of the abutting portion securing the end of the linear member thereto against transverse movement and a portion extending from the other side of the abutting portion extending into the window structure for securing the retaining clip and linear member held thereby to the window structure in contact with the glazing panel.

63. Structure as set forth in any of claims 1 to 62 further including a storm sash positioned on the window structure and means securing the storm sash to the window structure.

64. Structure as claimed in claim 63 wherein the storm sash includes a glazing panel and a plastics strip surrounding the edge of the glazing panel.

65. Structure as claimed in claim 64 wherein the plastics strip includes a relatively soft flexible sealing strip surrounding the edge of the storm glazing panel.

66. Structure as claimed in any of claims 63 to 65 wherein the means securing the storm sash to the window structure includes a retaining clip engaged with the storm sash and releasably secured to the window structure.

67. Structure as claimed in any of claims 1 to 66 further including separate window trim structure in assembly with the window structure, the window trim structure being mounted in the window opening to provide a finished window installation.

68. Structure as claimed in claim 67 wherein the window structure is secured over the window opening at one side thereof and the window trim structure includes a first elongated window trim member secured to the window structure at the edge thereof and extending transversely of the window opening

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at the edge of the window opening, a second elongated window trim member having a generally L-shaped cross section including a first portion extending transversely of the window opening on the other side of the window opening at the edge thereof and a second portion extending parallel to the window structure and outwardly of the window opening at the other side of the window opening and means connecting the window trim members.

69. Structure as claimed in claim 68 wherein the first window trim member and first portion of the second window trim member each include an elongated recess therein, each recess opening toward the other and the means connecting the window trim members comprises a trim panel, the edges of which are secured in the recesses.

70. Structure as claimed in claim 68 or 69 wherein the means connecting the window trim members comprises a recess in the one of the window trim members receiving the free end of the one portion of the L-shaped window trim member whereby a complete window casing is formed by the window trim members.

71. Structure as claimed in claim 68 wherein the first window trim member is an elongated casing extender member having a cross section including a recess at one end

thereof for receiving the free end of the cross section of the one portion of the second window trim member to connect the window trim members and having another end adapted to receive the edge portion of the window structure whereby window trim and casing may be provided for window openings having different depth.

72. Structure as set forth in claim 68 wherein second trim members are mitred at the corners of the window opening and corner brackets are provided at the mitred corners securing the second trim members together.

73. Structure as claimed in claim 68 wherein the means connecting the window trim members comprises a barbed free end on the cross section of the one portion of the L-shaped window trim member and cooperating notches on the first window trim member.

74. Window structures as claimed in claim 1 substantially as hereinbefore described with reference to the accompanying drawings.

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