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(54) SLIDING DOOR 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 a sliding door structure.

In the past, sliding door structures have not generally included all mitered corners. In particular, the jambs at the bottoms of previous sliding doors have generally either been straight-cut across the sill, or where the sill has been inclined, the jambs have been diagonally cut, which means that they can only be used in one position which is undesirable from an inventory and thus cost point-of-view. Further, wherein mitered corners have been provided in sliding doors in the past, no means have been provided to prevent misalignment of the mitered joints on securing the members forming the mitered joints to each other. Thus, mitered joints in the past have required skilled workmen to produce and have often been misaligned.

In addition, in prior sliding door structures, either two pockets formed by three fins, one pocket for each of a movable and fixed door panel with a fin between the door panels, have been provided in the frame head, or alternatively, three pockets have been provided between two outer fins and two intermediate or guide fins in the frame head for guiding the top rails of a movable and a fixed door panel, with the guide fins received in slots in the door panel top rails. In both structures, considerable weather sealing and/or fabrication of weather seal interlocks on the door panels has been necessary. This has added an undesirable cost

factor and inventory requirement to previous sliding door structures.

Further, previous sliding door structures have usually not been suitably weathertight without expensive and sometimes complicated structure. Thus, for example, a complete aluminium surround has often been provided in the past for glazing sliding door panels from the inside to prevent popping of the glazing panels out of the frame of the door panel under high wind loads. Complicated structure has sometimes been required to prevent entire sliding door panels from being blown out of the outer frame therefor.

In addition, with prior sliding doors, stopping of the sliding door on opening has sometimes been a problem. Wherein stops have been provided only at the tops or bottoms of the movable door panel, the door panel tends to cock in the frame on hitting the stop, thus wearing door panel rollers and damaging the outer frame or movable door panel. Prior stop structures have also required separate fabrication and installation to the frame member and sometimes themselves have been complicated and therefore expensive. Central stops have in general not been utilized due to their appearance and the fact that they tend to damage the door and/or frame members due to single-point contact therewith centrally thereof.

Further, with prior sliding doors it has often been possible on jiggling the movable door panel to unlock it and to gain entrance into the building in which the doors have been installed. It has generally been impossible with sliding doors to lock the movable door panel in a partly open position to provide, for example, ventilation without allowing small children to go out or prowlers to come in the doors.

Also, it has been difficult in the field, with the size of sliding doors usually installed

today, to obtain square structural openings for the sliding door structures. It has therefore been necessary to adjust the movable door panel of sliding doors to compensate for the out-of-square door openings. In the past, such adjustment has usually been accomplished by adjusting the movable door panel at both sides thereof, which requires separate adjusting mechanisms and separate adjustments which are not entirely independent at both sides of the movable door panels.

Sliding doors provided with the sliding door structures of the past have usually had roll formed frames and have been required to have deep pockets in the upper and lower frame rails to receive adjustable rollers at the corners of the screen doors to enable the doors to slide. The frame members have therefore often been of different cross section and have not always been provided with mitered corners. In addition, in the past, screen members have been secured to the frames in rectangular recesses receiving either round or rectangular splines. Such structure has not always securely held the periphery of the screen to the frame. Separate handle and locking structures have usually been provided with prior sliding screen doors.

Further, in the past, sliding door structures have not always been adapted for installation in a wide variety of building structures with a single frame, as for example, building structures which require nailing fins for securing the frame to the exterior of the building structure. In addition, neither interior nor exterior trim for sliding doors have normally been readily available and extensions of sliding door frame sills have in the past generally been field fabricated.

In accordance with the present invention, there is provided a sliding door structure comprising an outer frame having a head with a single door panel guiding fin extending inwardly of the frame and only one additional fin extending inwardly of the frame in spaced relation to the guiding fin, at least one movable door panel in assembly with the outer frame having a slot in the top edge thereof receiving the guiding fin, at least one fixed door panel positioned between the additional fin and the movable door panel and weather seal means sealing all four sides of each door panel when the movable panel is closed.

According to a preferred embodiment the sliding door structure further includes a sliding screen door with the plane of the fixed door panel(s) being between the plane of the movable door panel(s) and the plane of the screen door.

At least one of the corners of the outer frame may be mitered and may further

include means at the mitered corner for preventing misalignment of the mitered corner in assembly thereof including abutment structure at the end of one frame member at the one corner engaged with the other frame member at the one mitered corner.

The structure may further include structure positioned within the slot in the top of the movable door panel having a hairpin shaped cross section portion receiving the guiding fin which is of a material different from that of the guide fin and top of the movable door panel whereby the movable door panel is guided in sliding movement without galling and with a minimum of noise and transverse movement.

Preferably the outer frame includes jambs and the movable door panel includes a top rail, and further including a top weather seal for the movable door panel extending longitudinally between the fixed door panel and one jamb of the outer frame including a relatively hard portion engaged with the head of the outer frame and a relatively soft portion engageable with the top rail of the movable door panel.

Preferably the fixed door panel includes side rails and the frame includes jambs, one of which jambs has a returned fin thereon extending inwardly of the frame jamb adjacent the fixed door panel and then toward the fixed door panel, and wherein portions of one of the side rails of the fixed door panel are staked-out and are cammed over the returned fin to inhibit disengagement of the fixed door panel from the frame jamb after assembly thereof.

The outer frame preferably includes jambs and a seal the head and sill of which outer frame include longitudinally extending ribs thereon and further including elongated resilient bumpers having a longitudinally extending slot in one side thereof positioned over the ribs on the head and sill of the outer frame and between one of the frame jambs and the movable door panel at both the head and sill of the outer frame to prevent damage to the frame or movable door panel on opening of the movable door panel.

In a preferred arrangement the frame includes jambs, and further including a combined weather stop, miter aligning and prowler security member comprising a triangular fin having a pair of generally rectangular portions secured to one acute corner thereof and providing a triangular slot between the rectangular portions receiving a portion of the guiding fin of the frame head positioned at each upper corner of the outer frame for closing the area between the ends of the head of the frame and the jambs of the frame, aligning the head and jambs for field assembly of the

upper corners of the frame and for preventing upward movement of the movable door panel with the movable door panel in a fully closed position.

5 The frame may include jambs each having a returned fin thereon and a sill, and including combined weather stops and aligned members which are generally triangular and include a peripheral recess in the top thereof adapted to receive the returned fins on the jambs secured between the sill and jambs at the lower corners of the frame.

10 Preferably the door panels include frame rails having peripheral recesses therein opening inwardly of the panels, and further including glazing members for glazing the sliding door panels including a first glazing member secured in the peripheral recesses in the rails of the sliding door panels and a second glazing member positioned between the first glazing member and glass panes in the door panels whereby the glass panes are held in position in the door panels subjected to high wind pressures.

15 According to a preferred arrangement the structure includes prowler lock structure in combination with the movable door panel for locking the movable door panel in closed and partly open positions.

20 The structure preferably includes an expander positioned within the bottom of the movable door panel, a wedge secured to the expander, a wedge block secured to the movable door panel in engagement with the wedge, and means for moving the wedge relative to the wedge block to pivot the movable door panel about the bottom thereof in the plane of the movable door panel.

25 The frame may include jamb and sill members and including separate nailing fin adapters secured to the frame members and extending in the plane of the frame for permitting securing of the outer frame in a building opening by fastening devices extending transversely of the outer frame.

30 The door structure may preferably include an inner trim extrusion extending around at least a portion of the outer frame and a resilient coupling member secured between the inner trim extrusion and the outer frame.

35 The frame of the door structure may include a sill and further include a sill adapter extrusion extending transversely of the outer frame at the outside of the outer frame interlocked with the sill to provide an extension of the sill in assembly therewith.

40 Preferably the frame includes a sill and further including a flexible bullnose interior trim member and means for securing the bullnose trim member to the inside of the sill to accommodate different thickness of floor material.

45 Preferably there is provided an exterior trim member at the outside of the outer frame including an inner soft core and an outer extruded skin adapted to be interlocked with the outer frame in assembly therewith.

50 In a preferred arrangement there is provided struck out portions in the frame head over the movable door panel in a closed position extending toward the movable door panel for preventing vertical movement of the movable door panel at least in a closed position thereof.

55 Preferably the door structure includes an interior trim member comprising an extrusion having a generally Y-shaped cross section with flexible arm portions and a stem portion, a pocket for receiving an edge of the outer frame formed at the intersection of the arm and stem portions of the cross section of the trim member.

60 In a preferred arrangement there is provided a completely reversible sliding screen door structure including head, jamb and sill frame extrusions secured together at their ends into a rectangular frame having no top to bottom, right to left or inside and outside orientation each of which frame extrusions have a cross section including an inner and outer rectangular portion separated by a web portion, a screen member, and means for securing the periphery of the screen member to the frame.

65 Preferably at least two movable door panels positioned in the frame for sliding movement in the same plane toward and away from each other which include adjacent locking rails with the movable door panels in a closed position and an astragal adapter having an H-shaped cross section extending longitudinally in the direction of the locking rails receiving one of the locking rails in one half of the cross section thereof and being secured to the one locking rail, the astragal adapter receiving the other locking rail in the other half of the cross section thereof with the movable door panels in a closed position.

70 Further arrangements of the invention will now be described by way of example only with reference to the accompanying drawings in which:

75 FIGURE 1 is a partly broken away and exploded perspective view of one embodiment of sliding away and exploded perspective view of sliding door structure constructed in accordance with the invention.

80 FIGURE 2 is an enlarged, broken section view of the sliding door structure illustrated in FIGURE 1, taken substantially on the line 2-2 in FIGURE 1.

85 Figure 3 is an enlarged, broken section view of the sliding door structure illustrated in Figure 1, taken substantially on the line 130

3-3 in Figure 1.

Figure 4 is an enlarged, partial section view of the door structure illustrated in Figure 1, taken substantially on the line 4-4 in Figure 1.

Figure 5 is an enlarged, perspective view of a portion of an alternative sealing member for use between the bottom rail of the fixed door panel and the frame sill of the sliding door structure illustrated in Figure 1.

Figure 6 is an enlarged perspective view of a portion of the frame sill of the sliding door structure illustrated in Figure 1, including a weather stop in assembly therewith and showing a side rail of the fixed door panel of the sliding door structure in assembly therewith in phantom.

Figure 7 is an enlarged, partial perspective view of one upper corner of the sliding door structure illustrated in Figure 1, illustrating a flexible bumper for the movable door panel and a weather stop and prowler security member installed at the head of the sliding door frame.

Figure 8 is an enlarged, perspective view of the weather stop and prowler security member shown in Figure 7.

Figure 9 is an enlarged, perspective view of a weather stop member also used for aligning the bottom of the mitered jambs of the outer frame illustrated in assembly with the lower end of a frame jamb which is shown in phantom.

Figure 10 is an enlarged, perspective view of a sliding door moving panel top guide with the guiding flange of the frame head illustrated in phantom in assembly therewith.

Figure 11 is a perspective view of a top guide member for the movable sliding door panel.

Figure 12 is an enlarged, exploded, perspective view of structure for use in adjusting the movable door panel illustrated in Figure 1 to compensate for out-of-square building openings including a perspective view of a wedge adapted to fit into the expander inserted in the movable door panel bottom rail and a perspective view of a wedge block adapted to fit into the side rail of the movable door panel in engagement with the wedge.

Figure 13 is a broken section view of a second embodiment of sliding door structure of the invention which is similar to the section view of Figure 2, which is particularly economical in respect of the outer frame, both the movable and fixed door panels and the sliding screen door.

Figure 14 is a broken section view of the second embodiment of the sliding door structure of the invention as shown in Figure 13 similar to the section view of Figure 3.

Figure 15 is an enlarged, partial perspective view of a two-member glazing system for use in the sliding door structure of the invention as particularly illustrated in Figures 13 and 14.

Figure 16 is an enlarged, partial perspective view of one of the two glazing members illustrated in Figure 15 showing an alternative cross section therefor.

Figure 17 is an enlarged, partial perspective view of a single extrusion modification of the two glazing members illustrated in Figure 15.

Figure 18 is an enlarged, partial perspective view of another embodiment of the single extrusion modification of the two glazing members illustrated in Figure 15.

Figure 19 is an exploded, perspective view of the sliding door screen structure modification illustrated in Figures 13 and 14.

Figure 20 is an enlarged, section view of the screen structure illustrated in Figure 19, taken substantially on the line 20-20 in Figure 19.

Figure 21 is an enlarged, perspective view of the spline recess and spline of the screen structure illustrated in Figure 19.

Figure 22 is an enlarged, partly broken away, elevation view of a corner of the screen door structure illustrated in Figures 13 and 14, showing one of the spring loaded, adjustable roller assemblies at the four corners thereof in one adjusted position thereof.

Figure 23 is a view similar to Figure 22, showing the spring loaded, adjustable roller assembly in an alternative adjusted position thereof.

Figure 24 is an enlarged, partial section view of the screen door structure illustrated in Figure 19, taken substantially on the line 24-24 of Figure 23.

Figure 25 is a partly broken away, perspective view of the roller assembly of a spring loaded roller assembly similar to that illustrated in Figures 22 and 23.

Figure 26 is a partial section view through sliding door structure, showing a four-panel construction including a moving panel astragal adapter and screen locking structure.

Figure 27 is an enlarged side view of the mitered left hand upper corner of the outer frame of a sliding door structure of the invention.

Figure 28 is a partial section view of the mitered upper corner of the outer frame illustrated in Figure 27, taken substantially on the line 28-28 in Figure 27.

Figure 29 is a partial section view of the mitered upper corner of the outer frame of the sliding door structure, taken substantially on the line 29-29 in Figure 27.

Figure 30 is an enlarged, elevation view of prowler lock structure for use in the

sliding door structure of the invention.

Figure 31 is an enlarged, elevation view of a modification of prowler lock structure for use in the sliding door structure of the invention.

Figure 32 is a partial section view of the prowler lock structure illustrated in Figure 31, taken substantially on the line 32-32 in Figure 31.

Figure 33 is an enlarged, partial section view of still another embodiment of prowler lock structure for use in the sliding door structure of the invention.

Figure 34 is a partial section view of the prowler lock structure illustrated in Figure 33, taken substantially on the line 34-34 in Figure 33.

Figure 35 is an enlarged, elevation view of an additional prowler lock structure for use in the sliding door structure of the invention.

Figure 36 is an enlarged, section view of a jamb of the outer frame of the sliding door structure of the invention, showing a nailing fin adapter and an inside trim extrusion in assembly therewith.

Figure 37 is a reduced portion of Figure 36, showing a modified nailing strip between the frame jamb and brick exterior construction.

Figure 38 is an enlarged, section view of the sill extrusion of the sliding door structure frame, showing a sill extender extrusion in assembly therewith and illustrating a flexible bullnose interior molding in assembly therewith.

Figure 39 is a section view of a modified, flexible, bullnose interior trim extrusion for use with the door structure of the invention.

Figure 40 is another enlarged, section view of a jamb of the outer frame of the sliding door structure of the invention, showing an exterior trim member in assembly therewith, including a soft core having an extruded, tougher skin thereon and showing another embodiment of an inside trim extrusion in assembly therewith.

The first modification of the preferred embodiment of the sliding door structure 10 shown in Figure 1 includes an outer frame 12, a fixed door panel 14, a movable door panel 16 and a movable screen panel 18. The sliding door structure 10 may have one or a plurality each of fixed and moving door panels. Thus, the invention is not intended to be limited to sliding doors having a single fixed door panel and a single movable door panel.

As shown, the outer frame 12 includes a head extrusion 20, jamb extrusions 22 and 24 at opposite sides of the sliding door structure 10 and a sill extrusion 26, which extrusions have the cross sections best shown in Figures 2 and 3. Each of the four corners

of the outer frame 12 are mitered as shown in Figures 27 to 29 and may be held together by suitable screw means 25 (Figure 29). With all four corners being mitered, the jambs are universal in that they have no left, right, up or down orientation.

To aid in securing the mitered corners of the frame 12 together in the desired alignment, one or more portions 31 of the jambs 22 and 24 at the ends thereof are offset or depressed as shown best in Figure 28 to provide an end abutment 33 against which the side of the web 35 of the head 20 and a similar portion of the sill 26 are urged by the screw means 25 extending into the screw runners 37 (Figure 29) in the jambs 22 and 24 in assembly of the frame 12. With such structure, the mitered members at the four corners are not permitted to slip past each other along the miter joint as might otherwise happen if the securing screw means 25 were drawn too tight. The mitered corners of the frame 12 may thus be accurately constructed by relatively unskilled workmen. It will be understood that the miter joint aligning concept embodied in the abutting portions formed in the jambs is not limited to extrusion structures.

The fixed door panel 14 includes a fixed door panel frame 28 having a top rail 30, a bottom rail 32 and free and fixed side rails 34 and 36 respectively, again having the cross section shown best in Figures 2 and 3. The side rails 34 and 36 extend the entire length of the fixed door panel as shown best in Figure 1 and are secured to the top and bottom rails 30 and 32 at opposite ends thereof by suitable means such as screws or the like. A glazing panel 38 is secured in the fixed door panel frame 28. The fixed door panel 14 is constructed so as to incorporate as many interchangeable members as possible.

The sliding door panel 16 includes a top rail 40, a bottom rail 42 and locking and free side rails 44 and 46, respectively. Also as before, the side rails 44 and 46 extend the full height of the movable door panel 16 and are connected to the top rail 40 and bottom rail 42 at the opposite ends thereof as shown best in Figure 1. The glazing panel 48 is secured in the movable door panel 16 as before and the members of the movable panel 16 are constructed so as to be as interchangeable as possible.

Thus, the sliding door structure 10 may be constructed in a great number of configurations with a minimum of separate parts such as frame jambs and panel rails, and a complete inventory of sliding doors may be stocked, again with a minimum of separate sliding door elements such as exterior frames, fixed and moving panels. The cost of a sliding door inventory and production equipment and facilities is thus re-

duced.

The screen structure 18 shown in Figure 1 includes the frame 50 having a top rail 52, a bottom rail 54 and side rails 56 and 58. A screen 60 is secured within the frame 50 by convenient means such as a peripheral recess 62 in the rails having screen retaining members 64 positioned therein. Rollers 66 are mounted in the top and bottom screen frame rails and run on tracks 68 and 70 in the frame head 20 and sill 26 as shown. Suitable handle structure 72 and latch structure 74 are provided for moving the screen structure 18 in plane of the frame 12 and retaining the screen in a closed position over the opening provided by the movable door panel 16, respectively.

The head 20 of the door frame 12 has a cross section shown best in Figure 3 which includes an outer fin 76 and an inner fin 78 which are only outside and inside trim in the door structure 10. A fin 80 which is a seal for the fixed door panel 14 is positioned between the outer fin 76 and the inner fin 78 and separates the pocket 82 in which the screen panel 18 is received and the pocket 84 in which the top rails 30 and 40 of the fixed door panel 14 and the movable door panel 16 are positioned. A guiding fin 86 is further provided in the pocket 84 for guiding the movable door panel 16 within the frame 12.

Since the head 20 does not include a separate fin positioned between the top rails 30 and 40 of the fixed and movable door panels, no special fabrication of the interlocking portions of free side rails 34 and 46 is required. Similarly, since only the movable door panel 16 is provided with a guiding fin 86, special weather stripping to prevent the passage of wind and water through the door structure 10 between the head 20 the top rails 30 and 40 is minimized and uncomplicated.

Thus, the fixed door panel 14 is provided with an elongated sealing member 88 at the top rail 30 having the cross section shown best in Figure 3. The sealing member 88 performs the dual function of providing structural integrity at the top of the fixed door panel 14 between the head 20 and the top rail 30 and seals the top of the fixed door panel. As shown, the sealing member 88 has a generally S-shaped cross section configuration, one portion of which fits over the top of one side portion of the top rail 30 and the other portion of which fits over the bottom of the head fin 80.

An identical sealing member 90 is provided at the bottom rail of the fixed door panel 14 and as shown best in Figure 3 includes a portion fitting over one side portion of the bottom of the bottom rail 32 of the fixed door panel 14 and another portion fitting over the rib 92 on the frame sill 26.

Again, the sealing member 90 provides structural integrity between the frame 12 and fixed door panel 14 at the same time that it provides a seal for the sliding door structure 10.

Alternatively, the sealing member 94 illustrated best in Figure 5 may be used in place of the sealing member 90. When the sealing member 94 is used, the structural integrity of the fixed door panel 14 at the bottom is provided primarily by the weight of the door panel 14 resting on the sill 26 between the ribs 92 and 96. The member 94 functions primarily as a weather seal.

The sealing of the fixed door panel 14 between the fixed side rail 36 and the frame jamb 24 is accomplished by means of a flexible sealing strip 98 which may be of vinyl or felt in contact with the fin 100 of the frame jamb 24 as shown best in Figure 2. In addition, the structural integrity of the side rail 36 with the jamb 24 is maintained by the staked-out portions 102 of the side rail 36 fitting behind the returned end portion of the fin 104 of the jamb 24. If desired, the side rail 36 may be secured to the fixing devices in keeping with present conventional construction.

In assembly, the sealing members 88 and 90 or 94 are positioned on the fixed door panel 14 and the door panel 14 is positioned in the frame 12 by first placing the fin 80 in the seal 88 and pivoting the fixed door panel 14 inwardly of the frame 12 at the bottom while moving the fixed door panel 14 upward so that the bottom rail 32 clears the track 70 and rib 92. When the door panel 14 is thus positioned in the frame 12, the door panel 14 is allowed to drop vertically slightly to position the seal 90 or 94 over the rib 92.

The fixed door panel 14 is then moved toward the frame jamb 24 to cam the staked-out portions 102 of the side rail 36 of the fixed door panel 14 into the jamb pocket 106, whereby the sealing strip 98 is positioned in contact with the fin 100 of the jamb 24 and the fixed rail 36 is locked in assembly with the jamb 24. Removal of the fixed door panel 14 then requires the placing of a screwdriver or the like between the fin 104 and rail 36 to spring the fin 104 and permit the staked-out portions 102 of the rail 36 to be removed from the jamb 24. Such removal of the fixed door panel can only be accomplished from the inside of the door.

The fixed door panel 14 and the movable door panel 16 are sealed at the interlocking portions of the free side rails thereof by the flexible strips 108 and 110 positioned in the side rails 34 and 46 as shown best in Figure 2. Similarly, the locking side rail 44 of the movable door panel is sealed in the pocket 112 of frame jamb 22 with the

movable door panel 16 in a closed position by the flexible strip 114. Strips 108, 110 and 114 may be vinyl or felt. As shown, a suitable handle 116 and lock structure 118 are also secured to the locking side rail 44 of the movable door panel 16 and the frame jamb 22.

The bottom of the movable door panel 16 is sealed by a sealing member 122 having a cross section illustrated best in Figure 3 and extending from the side of the movable door panel expander 124, which will be considered subsequently. It will be noted that the sealing member 122 extends toward the outside side of the sliding door structure 10 whereby wind pressure on the door structure 10 increases the seal provided by the sealing member 122. The top rail 40 of the movable door panel 16 is provided with a weather seal by the sealing member 126, the cross section of which is shown best in Figure 4. The portion 128 of the sealing member 126 is of relatively rigid plastic which is flexible enough to be snapped in place over the rib 130 on the head 20 of the frame 12, with the opposite end thereof being constructed to cam over and receive the end of the fin 80 of the head 20. Thus, the sealing member 126 may be positioned within the part of the pocket 84 in the head 20 of the frame 12 not occupied by the top rail 30 of the fixed door panel 14. With the sealing member 126 so positioned, the softer, more pliable portion 134 of the sealing member wipes against the upper rail 40 of the movable door panel 16 when it is adjacent the sealing member 126 to provide a seal therefor.

Thus, both the fixed door panel 14 and the movable door panel 16 are completely sealed around their entire periphery when the movable door panel is closed, with a minimum number of simple sealing members. At the same time, due to the single guiding fin provided in the head member 20 and the deletion of a separating fin between the fixed and movable door panels in the head 20, and the sealing members 88, 92 or 94, 122 and 126 provided, a more efficient and less expensive sealing system for the sliding door structure 10 than has been available in the past is provided.

Should the sliding door structure 10 shown in Figure 1 be installed in areas where extremely high winds of for example hurricane velocity may be expected, a weather stop bracket 136, shaped as shown best in Figure 6, is provided at the bottom of the free rail of the fixed door panel 14. In installation, the open end of the fixed door panel free side rail 34 is positioned over the rectangular portion 138 of the bracket 136 and positioned within the groove 141 in the part 142 of bracket 136. A screw 140 is used to secure the bracket 136 to the

sill 26.

In addition to the weather stop 136, the side rail 36 may, if considered necessary, be secured by a screw centrally thereof to the fin 100 of jamb 24, and the top rail 30 may be secured by a screw to the fin 80 of the head 20 adjacent the free side rail 34. With such additional structure, the sliding door structure 10 can withstand extremely high winds of hurricane velocity.

As shown best in Figure 7, the upper corners of the sliding door structure 10 are provided with a weather stop and prowler security member 144. The member 144, (a modification of which is shown in perspective in Figure 8,) includes the triangular fin portion 146 adapted to complete the guide fin 86 of the head 20 and a slot 160 for engagement over a remaining portion of fin 86. The fin 146 is necessary due to the mitered corner and the provision of the fin 86 on the head 20 without a similar fin on the jamb members 22 and 24.

In addition, the member 144 is provided with the rectangular portions 148 and 150 out of sight in Figure 7 which extend across the pocket 112 in the jamb 22. The member 144 is spaced in the pocket 112 by the projections 152 and 154 thereon (these projections 152 and 154 not being present on the modification of Figure 8). The flanges 156 and 158 out of sight in Figure 7 aid in retaining the member 144 in position at the top of the jamb members 22 and 24 with the upper portion of the fin 86 in the slot 160 between the portions 148 and 150. When installed on the head 20, member 144 also aids in the alignment of the mitered upper corners of frame 12 in field assembly of the frame.

In use, the member 144 also serves to prevent upward jiggling of the movable door panel 16 and consequent unlocking of the latching mechanism by prowlers or the like. Thus, with the movable door panel 16 closed, the top of the locking side rail 44 will engage the bottom side of the portions 148 and 150 to prevent undesired upward movement thereof.

A similar function may be accomplished by cut-out and folded-down rectangular portions such as portions 151 and 153 in the head 155 of the frame 157 shown in Figure 14. Such cut-out and folded-down portions may be provided anywhere along the length of the head 157 where they are desired, but will most usually be spaced out across the opening provided in the sliding door structure by the open movable door panel.

Bumpers 164 as shown best in Figure 7 are provided at the top and bottom of jamb 24 to prevent damage to the movable door panel 16, rollers secured thereto and/or the frame 12 due to rapid opening of the

movable door panel 16 and/or cocking of the movable door panel 16 which might occur on engagement of the movable door panel with a single bumper 164 at either the head or sill of the frame 12. Thus, separate stop members 164 are positioned both on the rib 130 of the head and on the track 166 of the sill so that they engage the free rail 46 of the movable door panel 16 as the door panel approaches a fully open position. The bumpers 164 have the cross section illustrated in Figure 7 and are provided with a slot 166 so that no fabrication of the head 20 or sill 26 is necessary to install the bumpers 164.

The triangular member 168 (Figure 9) is provided at the bottom of the frame jambs 22 and 24 to close the bottom of the mitered jambs at the jamb fins 104. Fins 104 include the portion 105 which wraps around the top of a member 168 and fits within the offset 170 in the top of the triangular member 168 as shown in Figure 9. Before being inserted in the ends of the fins 104 at the bottoms of the jamb members 22 and 24, the triangular members 168 may be secured in position on sill 26 by means of screws or the like, whereby the members 168 align the bottom mitered corners of the frame 12 in field assembly.

The glazing members 174 illustrated in Figures 1-3 can withstand high wind loads on the glazing panels 38 and 48. However, such channel type glazing is expensive and requires that the panels be removed and disassembled for reglazing. Therefore, since glazing removable from the interior of the building is desirable, as for example in apartment buildings and the like, door panel top, bottom and side rails having a glazing cross section configuration such as that illustrated in Figure 15 including the recess 176 are provided. Such rails in conjunction with the glazing members 180 and 182 or 184 illustrated in Figures 15 and 16 provide a very high wind resistant glazing system which may be installed from the inside of the sliding door and will accommodate substantially the full range of glazing panel thicknesses from thin, single strength to thicker insulating glazing panels at a moderate cost.

With the glazing system illustrated in Figure 15, a glazing panel such as panel 186 is positioned in the door panel opening against the glazing flange 188. The glazing member 180 having the L-shaped cross section having the leg 190 and the leg 192 is positioned in the recess 176 with the leg 190 as shown within the recess. A glazing member 182 or 184, depending on the thickness of the glazing panel 186, is inserted between the glazing panel 186 and the portion 192 of the glazing member 180 with the projection 194 on the member 180 extending within

the recess 196 in the member 182 or 184.

The modified glazing member 191 as shown in Figure 17 is a dual durometer member (i.e. an integral member having portions of different hardness) having a relatively hard portion 193 similar to the L-shaped glazing member 180 and a relatively soft portion 195 similar to the glazing member 182. The portions 193 and 195 of the glazing member 191 are connected by the relatively soft, flexible portion 197. In installation, the L-shaped portion 193 of the glazing member 191 is installed in the recess 176 in the rails of a door panel and the portion 195 is rotated counterclockwise into the position shown for glazing member 182 in Figure 15. The advantage of the dual durometer glazing member 191 is a saving in extrusion time, since only one extrusion need be made, and in cutting and assembly time, since only one glazing member 191 need be cut to length and handled.

The modified dual durometer glazing strip 199 illustrated in Figure 18 has a relatively hard, L-shaped portion 201 and the relatively soft portion 203 connected by a frangible portion 205 so that, after cutting to length, the portions may be separately installed. In assembly of the glazing member 199, the L-shaped portion is positioned in recess 176 and the portion 203 is forced between the L-shaped portion 201 and the glazing panel 186.

To facilitate movement of the sliding door panel along the guide fin 86 without galling the guide fin 86 or causing objectionable noise due to metal to metal scraping between the movable door panel 16 and the guide fin 86, the moving panel top guide 200 as shown best in Figure 10 is provided. The top guide 200 is provided with a hairpin shaped portion 202 which fits within a slot 204 in the upper end of the side rails 44 and 46 of the movable door panel 16 as shown in Figure 3. The hairpin shaped portion 202 of the top guide 200 includes a slot 206 in which the guide fin 86 is slidably received and a flange 208 which aids in securing the member 200 in the slot 204. The top guide 200 is provided with the extension 210 having the spacing structure 212 on the ends thereof whereby with the top guide 200 in position at the ends of the top rail 40, the slot 206 is positioned centrally of the top rail.

A modified moving panel top guide 214 is illustrated in Figure 11. The structure 214 is again provided with a hairpin portion 216 for receiving the fin 86 and adapted to be held within the slot 204. A flexible extension 218 is provided on one side of the hairpin portion 216 which engages the side of the guide fin 86 in assembly and prevents jiggling of the movable door panel 16 transverse of the door panel in operation.

With the larger size sliding doors today, it is unusual to find a building opening for a door which is exactly square. Thus, adjustment of the movable door panel 16 is normally required to provide a desired fit within the frame 12, the members of which are secured in the building opening and to some extent follow the irregularities of the building opening.

10 The structure shown in Figure 12 provides adjustment of the moving door panel 16 by pivoting the moving door panel about the bottom of the locking rail on vertical adjustment of the free rail side thereof.

15 The adjustment of the movable door panel 16 is accomplished through the use of expander 124, a wedge 236 adapted to fit within the expander 124, and a wedge block 238 secured within the side and bottom rails 46 and 42 of the door panel 16 in engagement with the wedge 236. In operation, the wedge 236 and the wedge block 238 provide an adjustment great enough so that the adjustment of only one side of the movable door panel 16 is normally required.

25 As shown, the wedge having the flanges 240 and 242 thereon fits within the expander 124 with the inclined plane portion 244 extending through the slot 246 therein and with the flanges 240 and 242 resting underneath and on top of the ribs 248 and 250 in the expander 124, respectively. The wedge block 238 shaped as shown best in Figure 19 is secured to the side rail 46 by the screw 252 and extends within the bottom rail 42 with the inclined plane surface 254 in engagement with the inclined plane surface 244. The adjusting screw 256 extends through the slot 258 in the side rail 46 of the movable door panel 16.

40 Thus, in operation, on adjustment of the position of the wedge 236 longitudinally in the expander 124, the side rail 46 of the movable door panel 16 is adjusted vertically to pivot the door panel 16 in the plane thereof about the bottom of the locking side rail and the bottom rail 42 is also tilted. The movable door panel 16 is thus adjusted relative to the expander 124 which carries the rollers 260 for the movable door panel 16 and carries the weather strip member 122 on the side thereof. The movable door panel 16 is thus adjusted to meet any out-of-squareness of the frame 12 without disturbing the rollers or the weather seal at the bottom of the door.

In addition, the use of the expander 124 permits exchange of the movable door panel 16 end for end to provide right and left hand operation by simply removing the expander 124 and the wedge block 238 and placing them in the other end of the movable door panel 16.

It will also be noted that the adjustment of the movable door panel 16 is accom-

plished with a minimum number of parts in the simplest manner without disturbing the weather tightness or structural integrity of the movable door panel while preserving the lack of specific orientation of the movable door panel.

To provide a three-step, coarse vertical adjustment for the movable door panel 16, the wedge 236 may be positioned with the flanges 240 or 242 on top of ribs 248 or with flanges 242 on top of ribs 250. Additional coarse adjustment could be provided by adding ribs intermediate ribs 248 and 250. In any position of wedge 236, fine adjustment of the edge of the door is accomplished by movement of the wedge 236 horizontally with respect to the wedge block 238 with the inclined plane portions 244 and 254 thereof in surface to surface engagement.

Adjustment of the other edge of the movable door panel 16 is possible with wedges and wedge blocks at both ends of expander 124.

Alternatively, the web 259 of rail 46 may be extended towards toward wedge 236 and used in place of wedge block 238 in conjunction with wedge 236 to provide adjustment of the edge of the movable door panel 16.

Another embodiment 262 of the sliding door structure of the invention illustrated best in Figures 13 and 14 is similar to the sliding door structure 10 and may in fact use an exterior frame 157 which is similar to the frame 12 of the sliding door structure 10 but may be of lighter and therefore more economical cross section. The head extrusion 155, jamb extrusions 264 and 266 and the sill extrusion 268 of the frame 157 are thus substantially the same as the head, jamb and sill members of the sliding door 10 as shown in Figure 13 except for the previously considered tabs 151 and 152.

Similarly, the fixed and sliding panels 270 and 272 respectively are similar to door panels 14 and 16. The cross section of the rail members of the panels 14 and 16 is however altered as shown in Figures 13 and 14 to provide a lighter, more economical and even more universal rail member. Thus, with the rail member cross sections illustrated in Figures 13 and 14, maximum strength per unit weight and maximum universality is provided to reduce inventory and thus cost of the sliding door structure.

As shown in Figures 13 and 14, the sliding door panels 270 and 272 utilize the dual member glazing system previously considered and illustrated in Figures 15-18 to secure the glazing panels 274 and 276 in the door panels. The sliding door structure 262 may utilize the mitered corner joints as illustrated in Figures 27-29, the weather seal and prowler protection structure and

bumpers illustrated in Figure 7, the weather seal structure illustrated in Figures 4 and 9, and the top guides of Figures 10 or 11, along with the adjusting structure for the movable door panel 272 as illustrated in Figure 12.

In the sliding door structure illustrated in Figures 13 and 14, the fixed door panel 270 is secured in position by screws passing through the fins 278 of jamb 266 and fin 280 of head 155 in conjunction with an L-shaped bracket 282 secured between the fixed rail 284 of the fixed door panel 270 and sill 268 of the door structure 262.

In addition, the modified door structure 262 of Figures 13 and 14 includes the screen door structure 286 illustrated in detail in Figures 19-25. The screen door structure 286 has been particularly designed for economy and efficiency of operation in conjunction with the sliding door structure 262 but is equally as economical and efficient in use with other sliding door structures such as sliding door structure 10.

As shown in Figure 19, the screen door structure 286 includes a frame 288 having top and bottom rails 290 and 292 and side rails 294 and 296. The screen rails have a cross section as shown best in Figure 20 including a first rectangular portion 298 and a second rectangular portion 300 separated by a web portion 302. The rectangular portion 298 has a width transverse of the screen door structure 286 greater than that of the rectangular portion 300, which rectangular portion 300 has an open outer side 304.

Also, the cross section of the screen rails as shown in Figure 20 includes an integral portion 306 in the shape of a parallelogram having one open side 308 which forms a recess in which the edge of the screen member 310 is secured by an H-shaped spline 312 having outer dimensions which define a parallelogram similar to the recess 314. The integral parallelogram structure and the spline securing the periphery of the screen member 310 to the frame 288 is illustrated best in Figure 21.

Such frame cross section is easily extruded and adapts itself to being connected with a pair of corner brackets 316 and 318 at each corner thereof whereby the frame 288 is particularly stiff. Such frame cross section also eliminates the necessity for separate handle structure for opening and closing the screen since the screen can be moved by placing the fingers in the recesses formed on either side of the web portion 302 of the cross section and applying pressure against either portion 298 or 300 depending on the direction of movement of the screen door 286 that is desired.

The cross section of the rail members of the frame 288 further permits the use of a relatively simple locking structure 320 with

the screen door 286. The locking structure 320 includes a bushing 322, a locking member 324 having camming beads 321 thereon positioned adjacent one end of the bushing 322 and pivotally secured thereto by a pivot bolt 326. The pivot bolt 326 extends through the locking member 324, the bushing 322 and the jamb 264 of the sliding door structure 262. Thus, pivoting of the locking member 324 into and out of the recess provided between the rectangular portions 298 and 300 of the rail cross sections locks and unlocks the screen door 286 in a closed position.

Spring biased adjustable roller assemblies 325 (Figs. 22-25) are provided in all four corners of the screen door structure 286 to adjust the screen door to sliding door frames which are not exactly square. One adjusting assembly 325 is shown in detail in Figures 22-25. The adjusting assembly 325 includes the biasing spring 332, an adjustable roller assembly 334, and an adjusting wedge 336.

As shown best in Figure 25, the adjustable roller assembly 334 includes a roller housing 338 having a hook 340 at one end thereof which is pivotally engageable with a corresponding hook portion 342 on a corner bracket 316 to provide pivoting of the adjustable roller assembly 334 about the point 344 under urging of the bias spring 332.

In the roller assembly 334 illustrated in Figure 22, a hemispherical abutment 346 is provided on the roller housing 338 to limit pivotal movement of the roller assembly 334 out of the recess 348 provided in portion 300 of the top rail 290. In the modification of the adjustable roller assembly 334 into the recess 348 is limited by the flanges 352 on the bifurcated end of the roller housing 338.

Openings 354 are provided in the bifurcated end 356 of the roller housing 338 for receiving the integral axle portions 358 of the roller 360 whereby the roller 360 is secured in the roller housing 338 in alignment with the slot 362 therein produced by the bifurcation of the end 356 thereof. The track 364 of the frame head extrusion 157 is received in the slot 362 of the adjustable roller assemblies 334 in the top rail 290 of the screen 268, while the track 366 is received in the slot 362 in the adjustable roller assemblies in the bottom rail of the screen 286.

The pivotally adjusted position of the adjustable roller assembly 334 is also limited with respect to movement inward of the recess 348 by the adjusting wedge members 336 slidable along the top and bottom rails of the screen 286 within the recesses 348. As shown best in Figure 24, the adjusting wedge members 336 include the guide flanges 364 and the adjusting flanges 366 by which the wedge members are guided and moved

respectively in the recesses 348. Further, the wedge members 336 are provided with notches 368 on inclined camming surfaces adjacent the adjustable roller assemblies 5 334, which notches provide points 369 for successively engaging a notch 370 in the roller housing 338 of the adjustable roller assemblies on movement of the wedge members 336 toward or away from the adjustable roller assemblies. (Figure 22 shows notch 10 370 and points 369 disconnected for clarity.)

With such spring biased adjustable roller assemblies, the actual roller 360 may be 15 relatively small so that the open depth of the top and bottom rails need not be large, whereby a relatively strong frame may be produced with a minimum of material by a simple extrusion cross section.

20 In four-panel sliding door installations, a portion of one of which is illustrated in Figure 26, an astragal adaptor 372 having the general cross section illustrated in Figure 26 and extending substantially the full 25 length of the locking rails 375 and 377 of the two movable door panels in such four-panel door installations is secured to one of the locking rails by convenient means such as screws and releasably receives the locking 30 rail of the other of the movable door panels. Conventional handle and locking structures may be secured to the abutting locking rails and/or astragal adaptor.

With such structure, one of the usual two 35 sliding screen doors 286 is provided with an L-shaped base bracket 374 secured to one of the abutting locking rails 238. A bushing 376 is positioned with one end against the bracket 374. A locking member 378 is positioned 40 against the other end of the bushing and is pivotally secured to the other end of the bushing by means of the pivot bolt 380 extending through the locking member 378, the bushing 376 and the base bracket 45 374. The operation of such locking structure 382 is similar to the operation of the locking structure 320.

With the sliding door structures 10 and 262, it is often desirable to double lock the 50 movable door panel or open it a few inches to provide ventilation and still maintain the movable door panel locked to prevent entry of prowlers or the like or to prevent small children from going out of the sliding door. 55 As indicated above, in the past such locks have not been provided on sliding door structure or have either been too complicated or not sufficiently sophisticated. Thus, in the past a length of pipe which may be inserted 60 between the frame jamb and the free rail of the movable door panel of the sliding door structures has been used to prevent opening of the movable door panel more than a predetermined amount.

65 In accordance with the present invention,

a prowler lock structure 384 is provided as shown in Figure 31 which includes a generally V-shaped member 386 having a notch 388 at the end of one leg thereof, a notch 390 adjacent the apex thereof and an open- 70 ing 392 in the apex thereof in which a stud 394 is secured extending on both sides of the member 386. The stud 394 has enlarged headed portions 396 on the ends thereof. The prowler lock structure 384 has the elevation 75 configuration illustrated in Figure 31 and is substantially flat except for the stud extending therethrough as shown in Figure 32.

On installation, the prowler lock member 385 is positioned with the top of one side 80 of the movable door panel free side rail received in the notch 388. The notch 388 and the relative dimensions of the prowler lock member 386 together with the positioning of the movable door side rail in relation to 85 the head of the sliding door frame is such that after installation, the prowler lock member 386 cannot be removed from the moving panel side rail without adjusting the movable panel to its lowermost position. 90

After installation of the prowler lock member 386 on the side rail, the prowler lock member 386 is pivoted counterclockwise about the top of the side rail portion within the notch 388 until the stud 394 on 95 the prowler lock member 386 engages the fin of the frame head member, at which time a hole 398 is drilled through the template opening 390 in the adjacent fin of the head member. Such holes are drilled wherever it 100 is desired to lock the movable door panel.

In operation then, with the holes 398 drilled in the head fin and with the prowler lock member 386 positioned as indicated in 105 Figure 31, the movable door panel may be completely opened and closed with the prowler lock member 386 serving no function. When it is desired to lock the movable door panel in a position at which there is a hole 398, the prowler lock member 386 is 110 pivoted counterclockwise so that the stud 394 aligns with the desired hole 398, after which the prowler lock member 386 is moved transversely outwardly of the sliding door structure to engage one end of the 115 stud 394 in the selected hole 398. The other end of the stud 394 may be used as a handle in accomplishing the alignment and movement of the prowler lock member 386. On release of the prowler lock member 386, the 120 head portion 396 on the end of the stud 394 within the hole 398 will prevent accidental removal of the stud from the hole and provide a positive lock of the sliding door panel in the selected position. 125

In the modified prowler lock structure 400 illustrated in Figure 33, the prowler lock member 402 has a side elevation as shown and again is generally flat except for a stud 404 extending transversely therethrough, 130

which stud may have a head 406 on the side adjacent the fin of the sliding door frame head and may have a nut 408 associated therewith which would serve as a handle on the opposite side thereof, as shown in Figure 34.

With the prowler lock structure 400 illustrated in Figures 33 and 34, again the prowler lock member 402 is positioned over the end of the side rail by means of the slot 410 in which position the prowler lock member 402 may be moved up or down, as desired. Again, an opening through the prowler lock member 402 (not shown) may be used as a template for drilling holes 412 in the flange of the frame head at the locations where locking is required.

In operation, with the prowler lock member 402 in a down position, the prowler lock structure is not operative. When it is desired to lock the movable door panel in a selected position, the movable door panel is moved to the position desired, the prowler lock member 402 is moved up and the stud 404 is aligned with an opening 412, after which the prowler lock member is moved toward the fin of the frame head to insert the stud 404 through the selected hole 412 and provide a positive lock for the movable door panel.

A third prowler lock structure 414 suitable for use with the sliding door structures 10 and 262 and illustrated in Figure 30 includes the prowler lock lever 416 including the notch 425 therein adapted to receive the upper end of the moving panel free side rail. Lever 416 further has a projection 418 on the end 420 thereof adapted to fit within openings 422 provided in the sliding door frame head. The end 424 of the prowler lock lever 416 is weighted to bias the projection 418 into an opening 422 in the head. A further notch 426 is provided in lever 416 which is also adapted to fit over the top of the free side rail of the sliding door moving panel and thus retain the lever 416 in a stored position with the end 418 not biased into engagement with the sliding door frame head as shown in phantom in Figure 30.

Thus, in operation of the prowler lock structure 414, with the top of the rail within notch 426 in lever 416, the movable door panel 16 may be moved to any desired location. With the top of the free rail of the sliding door panel in the notch 425 in lever 416, the projection 418 of the lever 416 will be biased into the first opening 422 in the frame head that it comes to on sliding of the movable door panel in either direction to positively lock the movable door panel in a desired position.

In the prowler lock structure 450 illustrated in Figure 35, a member 452 having the elevation illustrated in Figure 35 and a width suitable for fitting within the frame

head of the sliding door structure over the movable door panel is secured to the head of the frame adjacent the free end of the movable door panel by convenient means such as screws (not shown). A flexible spring member 456 having the configuration shown in Figure 35 is positioned in the recess 458 and the locking member 460 is hooked over the rib 462 by means of the hooked end 464 thereof whereby the end 466 thereof will engage the free side rail of the movable door panel and prevent undesired opening movement thereof.

When it is desired to open the movable door panel, the lock member 460 may be pivoted clockwise by insertion of a finger in the recess 468 after which the locked member 460 may be moved to the right in Figure 35 whereby the spring 456 maintains it in a horizontal position out of the way of the movable door panel. A reverse process may be used to move the lock member 460 into a locking position.

If desired, a ventilation stop 474 may be mounted at the other end of the member 452 by the interlocking-hook portions 476 and 478. In operation, the ventilation stop member 474 permits opening of the movable door panel only a desired amount as, for example, six inches, to prevent entry of prowlers and undesired exit of small children, and the like although on removal of member 452, the member 474 may move to allow further opening.

As shown best in Figure 36, the frames 12 and 157 of sliding door structures 10 and 262 may be secured in a building opening 480 by means of nails passed through nailing strip adapters 482 interlocked with a rib 485 on the frame members where direct connection of the frame members in the building opening is not desired. The nailing strip 482 has the cross section illustrated in Figure 36 and may be of any desired length. Alternative nailing strips 484 particularly suitable for use with brick construction may have the configuration shown in Figure 37.

Further, the interior trim of the building opening 480 may be facilitated with a trim extrusion 486 having the cross section illustrated in Figure 36. While other building constructions are possible, in Figure 36 brick facing 488, interior stud 490, wall 492 and interior wall 494 are illustrated. The joint between the frame jamb and the interior trim extrusion 486 is closed as shown by a closure strip 494 having substantially the same configuration as the glazing member illustrated in Figure 16.

Also, the interior trim of the building opening in which the sliding door structure is secured may be facilitated at the sill by means of the plastic bullnose extrusion 496 having the cross section shown in Figure 38 and adapted to fit between the inner sill

flange and the interior flooring 498. The bullnose extrusion 496 is flexible to permit varying dimensions of flooring to be used in conjunction with a standard sill.

5 A modification of the bullnose member 496 is shown in Figure 39 to accommodate thicker flooring such as carpeting as may be desired or to accommodate a lower inner flange on the frame sill. To this end, the extension 500 is provided on the bullnose interior trim member 502 illustrated in Figure 39.

15 Further, the sill may be extended by means of the adapter extrusion 504 having the cross section illustrated in Figure 38 and shown in conjunction with wood sub-flooring and masonry exterior building members 506 and 508.

20 The exterior trim member 510 illustrated in Figure 40 includes a relatively soft wood core 512 and an extruded shell 513 of relatively harder and/or more weather resistant material adapted to interlock with the sliding door frame as shown in conjunction with the frame jamb. The trim member 510 may be secured to the usual exterior wood building wall by convenient means such as nails (not shown).

30 Interior trim may assume the configuration of extrusion 514 having the cross section shown in Figure 40 including the pocket 516 for receiving the end 518 of the frame jamb cross section and the flexible leg portions 520 and 522. Assembly of the interior trim strip 514 is as shown in Figure 40.

WHAT WE CLAIM IS:—

1. Sliding door structure comprising an outer frame having a head with a single door panel guiding fin extending inwardly of the frame and only one additional fin extending inwardly of the frame in spaced relation to the guiding fin, at least one movable door panel in assembly with the outer frame having a slot in the top edge thereof receiving the guiding fin, at least one fixed door panel positioned between the additional fin and the movable door panel and weather seal means sealing about all four sides of each door panel when the movable panel is closed.

2. Structure as set forth in Claim 1, wherein the sliding door structure further includes a sliding screen door with the plane of the fixed door panels being between the plane of the movable door panels and the plane of the screen door.

3. Structure as set forth in Claim 1 or 2 wherein at least one of the corners of the outer frame is mitered and further including means at the mitered corner for preventing misalignment of the mitered corner in assembly thereof including abutment structure at the end of one frame member at the one corner engaged with the other frame member at the one mitered corner.

4. Structure as set forth in Claim 1, 2 or 3 including structure positioned within the slot in the top of the movable door panel having a hairpin shaped cross section portion receiving the guiding fin which is of a material different from that of the guide fin and top of the movable door panel whereby the movable door panel is guided in sliding movement without galling and with a minimum of noise and transverse movement.

5. Structure as set forth in any of Claims 1 to 4, wherein the outer frame includes jambs and the movable door panel includes a top rail, and further including a top weather seal for the movable door panel extending longitudinally between the fixed door panel and one jamb of the outer frame including a relatively hard portion engaged with the head of the outer frame and a relatively soft portion engageable with the top rail of the movable door panel.

6. Structure as set forth in any of Claims 1 to 5, wherein the fixed door panel includes side rails and the frame includes jambs, one of which jambs has a returned fin thereon extending inwardly of the frame jamb adjacent the fixed door panel and then toward the fixed door panel, and wherein portions of one of the side rails of the fixed door panel are staked-out and are canned over the returned fin to inhibit disengagement of the fixed door panel from the frame jamb after assembly thereof.

7. Structure as set forth in any of Claims 1 to 6, wherein the outer frame includes jambs and a sill, the head and sill of which outer frame include longitudinally extending ribs thereon and further including elongated resilient bumpers having a longitudinally extending slot in one side thereof positioned over the ribs on the head and sill of the outer frame and between one of the frame jambs and the movable door panel at both the head and sill of the outer frame to prevent damage to the frame or movable door panel on opening of the movable door panel.

8. Structure as set forth in any of Claims 1 to 7, wherein the frame includes jambs, and further including a combined weather stop, miter aligning and prowler security member comprising a triangular fin having a pair of generally rectangular portions secured to one acute corner thereof and providing a triangular slot between the rectangular portions receiving a portion of the guiding fin of the frame head positioned at each upper corner of the outer frame for closing the area between the ends of the head of the frame and the jambs of the frame, aligning the head and jambs for field assembly of the upper corners of the frame and for preventing upward movement of the movable door panel with the movable door panel in a fully closed position.

flange and the interior flooring 498. The bullnose extrusion 496 is flexible to permit varying dimensions of flooring to be used in conjunction with a standard sill.

- 5 A modification of the bullnose member 496 is shown in Figure 39 to accommodate thicker flooring such as carpeting as may be desired or to accommodate a lower inner flange on the frame sill. To this end, the extension 500 is provided on the bullnose interior trim member 502 illustrated in Figure 39.

Further, the sill may be extended by means of the adapter extrusion 504 having the cross section illustrated in Figure 38 and shown in conjunction with wood sub-flooring and masonry exterior building members 506 and 508.

- 20 The exterior trim member 510 illustrated in Figure 40 includes a relatively soft wood core 512 and an extruded shell 513 of relatively harder and/or more weather resistant material adapted to interlock with the sliding door frame as shown in conjunction with the frame jamb. The trim member 510 may be secured to the usual exterior wood building wall by convenient means such as nails (not shown).

Interior trim may assume the configuration of extrusion 514 having the cross section shown in Figure 40 including the pocket 516 for receiving the end 518 of the frame jamb cross section and the flexible leg portions 520 and 522. Assembly of the interior trim strip 514 is as shown in Figure 40.

WHAT WE CLAIM IS:—

1. Sliding door structure comprising an outer frame having a head with a single door panel guiding fin extending inwardly of the frame and only one additional fin extending inwardly of the frame in spaced relation to the guiding fin, at least one movable door panel in assembly with the outer frame having a slot in the top edge thereof receiving the guiding fin, at least one fixed door panel positioned between the additional fin and the movable door panel and weather seal means sealing about all four sides of each door panel when the movable panel is closed.

2. Structure as set forth in Claim 1, wherein the sliding door structure further includes a sliding screen door with the plane of the fixed door panels being between the plane of the movable door panels and the plane of the screen door.

3. Structure as set forth in Claim 1 or 2 wherein at least one of the corners of the outer frame is mitered and further including means at the mitered corner for preventing misalignment of the mitered corner in assembly thereof including abutment structure at the end of one frame member at the one corner engaged with the other frame member at the one mitered corner.

4. Structure as set forth in Claim 1, 2 or 3 including structure positioned within the slot in the top of the movable door panel having a hairpin shaped cross section portion receiving the guiding fin which is of a material different from that of the guide fin and top of the movable door panel whereby the movable door panel is guided in sliding movement without galling and with a minimum of noise and transverse movement.

5. Structure as set forth in any of Claims 1 to 4, wherein the outer frame includes jambs and the movable door panel includes a top rail, and further including a top weather seal for the movable door panel extending longitudinally between the fixed door panel and one jamb of the outer frame including a relatively hard portion engaged with the head of the outer frame and a relatively soft portion engageable with the top rail of the movable door panel.

6. Structure as set forth in any of Claims 1 to 5, wherein the fixed door panel includes side rails and the frame includes jambs, one of which jambs has a returned fin thereon extending inwardly of the frame jamb adjacent the fixed door panel and then toward the fixed door panel, and wherein portions of one of the side rails of the fixed door panel are staked-out and are cammed over the returned fin to inhibit disengagement of the fixed door panel from the frame jamb after assembly thereof.

7. Structure as set forth in any of Claims 1 to 6, wherein the outer frame includes jambs and a sill, the head and sill of which outer frame include longitudinally extending ribs thereon and further including elongated resilient bumpers having a longitudinally extending slot in one side thereof positioned over the ribs on the head and sill of the outer frame and between one of the frame jambs and the movable door panel at both the head and sill of the outer frame to prevent damage to the frame or movable door panel on opening of the movable door panel.

8. Structure as set forth in any of Claims 1 to 7, wherein the frame includes jambs, and further including a combined weather stop, miter aligning and prowler security member comprising a triangular fin having a pair of generally rectangular portions secured to one acute corner thereof and providing a triangular slot between the rectangular portions receiving a portion of the guiding fin of the frame head positioned at each upper corner of the outer frame for closing the area between the ends of the head of the frame and the jambs of the frame, aligning the head and jambs for field assembly of the upper corners of the frame and for preventing upward movement of the movable door panel with the movable door panel in a fully closed position.



9. Structure as set forth in any of Claims 1 to 8, wherein the frame includes jambs, each having a returned fin thereon and a sill, and including combined weather stops and aligning members which are generally triangular and include a peripheral recess in the top thereof adapted to receive the returned fins on the jambs secured between the sill and jambs at the lower corners of the frame.

10. Structure as set forth in any of Claims 1 to 9, wherein the door panels include frame rails having peripheral recesses therein opening inwardly of the panels, and further including glazing members for glazing the sliding door panels including a first glazing member secured in the peripheral recesses in the rails of the sliding door panels and a second glazing member positioned between the first glazing member and glass panes in the door panels whereby the glass panes are held in position in the door panels subjected to high wind pressures.

11. Structure as set forth in any of Claims 1 to 10, including prowler lock structure in combination with the movable door panel for locking the movable door panel in closed and partly open positions.

12. Structure as set forth in any of Claims 1 to 11, including an expander positioned within the bottom of the movable door panel, a wedge secured to the expander, a wedge block secured to the movable door panel in engagement with the wedge, and means for moving the wedge relative to the wedge block to pivot the movable door panel about the bottom thereof in the plane of the movable door panel.

13. Structure as set forth in any of Claims 1 to 12, wherein the frame includes jamb and sill members and including separate nailing fin adapters secured to the frame members and extending in the plane of the frame for permitting securing of the outer frame in a building opening by fastening devices extending transversely of the outer frame.

14. Structure as set forth in any of Claims 1 to 13 and including an inner trim extrusion extending around at least a portion of the outer frame and a resilient coupling member secured between the inner trim extrusion and the outer frame.

15. Structure as set forth in any of Claims 1 to 14, wherein the frame includes a sill and further including a sill adapter extrusion extending transversely of the outer frame at the outside of the outer frame interlocked with the sill to provide an extension of the sill in assembly therewith.

16. Structure as set forth in any of Claims 1 to 15, wherein the frame includes a sill and further including a flexible bullnose interior trim member and means for securing the bullnose trim member to the

inside of the sill to accommodate different thickness of floor material.

17. Structure as set forth in any of Claims 1 to 16, and further including an exterior trim member at the outside of the outer frame including an inner soft core and an outer extruded skin adapted to be interlocked with the outer frame in assembly therewith.

18. Structure as set forth in any of Claims 1 to 17, and further including struck out portions in the frame head over the movable door panel in a closed position extending toward the movable door panel for preventing vertical movement of the movable door panel at least in a closed position thereof.

19. Structure as set forth in any of Claims 1 to 18, including an interior trim member comprising an extrusion having a generally Y-shaped cross section with flexible arm portions and a stem portion, a pocket for receiving an edge of the outer frame formed at the intersection of the arm and stem portions of the cross section of the trim member.

20. Structure as set forth in any of Claims 1 to 19, including a completely reversible sliding screen door structure, including head, jamb and sill frame extrusions secured together at their ends into a rectangular frame having no top to bottom, right to left or inside and outside orientation each of which frame extrusions have a cross section including an inner and outer rectangular portion separated by a web portion, a screen member, and means for securing the periphery of the screen member to the frame.

21. Structure as set forth in Claim 20, wherein the cross section of the sliding screen door structure frame members further include a generally L-shaped portion extending from the inner rectangular portion at an angle to the plane of the screen door forming a screen retaining recess having the shape of a parallelogram with one open side for receiving the edge of the screen member, and a spline having a cross section with outer dimensions defining a parallelogram positioned within the recess over the edge of the screen for holding the edge of the screen in the screen retaining recess.

22. Structure as set forth in Claim 20 or 21 and further including a lock in combination therewith including a bushing parallel to the plane of the screen door adjacent one edge of the screen door, a locking member and means pivotally securing the locking member to one end of the bushing for pivotal movement into and out of the space between the rectangular portions of the screen frame and into engagement with the outer rectangular portion for locking the screen door in a closed position.



23. Structure as set forth in any of Claims 20 to 22 and further including a spring loaded adjustable roller assembly at at least one corner of the screen door including a spring loaded roller assembly pivotally mounted at one end of the corner of the screen door and having a guide roller at the other end thereof for guiding the screen in operation, and an adjustable wedge slidably secured to the screen door adjacent the one corner thereof for adjusting the position of the roller assembly relative to the one corner of the screen door.

24. Structure as set forth in any of Claims 20 to 23, including lock structure for the screen door comprising a bushing having an opening therethrough, a locking member positioned over one end of the bushing and extending perpendicularly thereto, and pivot means extending through the locking member and bushing to pivotally secure the locking member to the bushing and the bushing to a fixed support therefor so that the locking member may be pivoted into a locking and unlocking position.

25. Structure as set forth in any of Claims 20 to 24, including a spring loaded adjustable roller assembly for use at the screen corners comprising a roller assembly, one end of which is pivoted to the corner,

a roller at the other end thereof for engaging a guide member, spring means urging the roller assembly pivotally away from the corner, and an adjustable wedge positioned adjacent the roller assembly and movable relative thereto for adjusting the pivoted position of the roller assembly.

26. Structure as set forth in Claim 1, including at least two movable door panels positioned in the frame for sliding movement in the same plane toward and away from each other which include adjacent locking rails with the movable door panels from each other which include adjacent having an H-shaped cross section extending longitudinally in the direction of the locking rails receiving one of the locking rails in one half of the cross section thereof and being secured to the one locking rail, the astragal adapter receiving the other locking rail in the other half of the cross section thereof with the movable door panels in a closed position.

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