SLIDING DOOR LOCK SYSTEM

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ABSTRACT

A multiple-locking bar for securing a sliding glass door and preventing a fixed glass door adjacent the sliding glass door from being pried outward or forced inward; the bar is pivotally attached to the fixed door, and pivots to a horizontal position in the path of the sliding door to block the sliding door; in various embodiments a key-lock-controlled bolt at the free end of the bar engages a keeper on the edge of the sliding door, a bolt extension at the pivoted end of the bar engages the jamb channel ordinarily supplied with glass door installations, a hook on the bar engages the fixed door, and an offset angle engages wall structure adjacent the glass door installation, to prevent forcing the fixed door in or out and to secure the sliding door; special locking bolt and keeper structures are also disclosed.

8 Claims, 13 Drawing Figures
This invention relates generally to fastening devices and specifically to sliding panel securances such as sliding glass door securances and the like.

In the prior art, various pivoting bars have been disclosed as door locks and window fasteners but until the present invention no universally adaptable pry-proof locking system for modern channel jamb building access sliding glass doors has been available. Such installations ordinarily include a fixed panel and a sliding panel adapted to move in a plane adjacent to parallel to the fixed panel. The most commonly described method of preventing a glass door for sliding has been the placing of an elongate rigid member in the jamb channel at the bottom of the door with one end resting against the lower side edge of the door. Similar devices have been provided for installation at the top of a door and in some cases have been provided for installation at the mid-height of the door. However, in every case the devices have required extensive work for installation on ordinary doors such as the so-called "patio doors" or else have not been capable of guarding against the most effective method of forcing entry short of breaking the glass.

The most effective method of forcing entry through a channel jamb or channel from sliding glass door is to pry the fixed or non-sliding panel outward. Garden apartments and similar establishments using such doors may have several doors forced in a short period of time by a single intruder. Bars which are customarily laid parallel with the fixed member, sometimes being fastened to it, are ineffective to prevent it from being drawn outward together with the sash because they are disposed only to prevent the sliding panel from moving along the channel. Other drawbacks of the prior art have been that the devices were capable of being unassembled in some instances from outside the door assembly by releasing the attachment means and also that the devices were capable of being released by means of thin blades or other thin objects slipped through the joint between the overlap of the sliding panel and the fixed panel.

Further, there was no effective way in the prior art of preventing children or unauthorized persons from opening or releasing the sliding door securance from the inside.

Principal objects of the present invention are to overcome these prior art objections and provide a sliding glass door securance which guards against forcing or prying the fixed element outward, which offers maximum security together with maximum convenience of installation and operation, which is extremely economical, durable, and which is virtually pry-proof from either side and forced-entry proof short of smashing or cutting away the glass to form openings large enough to admit the entire body, neither of which methods is satisfactorily quiet, safe and swift from the intruder's point of view.

In typical embodiment the invention comprises a bar having means pivotally securing the bar to the fixed panel of the sliding door assembly intermediate the width of the panel with one end secured in position against the edge of the sliding panel and the other end of the bar adapted to enter between portions of the jamb in such manner as to secure the fixed panel against forcing either inwardly or outwardly.

The above and other objects and advantages of the invention will be more readily appreciated on examination of the description including the drawings, in which, like parts being designated by like reference numerals:

FIG. 1 is a diagrammatic detail in section viewed in plan of a typical sliding glass door installation;

FIG. 2 is an isometric detail of an embodiment of the invention;

FIGS. 3, 4, 5 and 6 are diagrammatic details of embodiments of the invention similar to the FIG. 1 view;

FIG. 7 is a detail in vertical section of a special provision of the invention, taken at 7—7, FIG. 6;

FIG. 8 is an elevation detail of an embodiment of the invention;

FIGS. 9 and 10 are respectively an isometric detail and a plan section detail of provisions of the invention;

FIG. 11 is an isometric exploded view detail; and

FIGS. 12 and 13 are plan details in partial section of locking provisions according to the invention.

FIG. 1 shows details of a typical sliding glass door installation D in reference lines, all strucure shown being conventional. The door is shown closed.

Sliding panel S slides in way channels, not shown, in the direction of the arrow, when opened. The way channel is substantially the same as jamb channel C, framing the doorway.

Conventionally, one panel is fixed as at F, the inactive or fixed panel, which rests at the left edge in the jamb channel C, which in turn is attached, as by embedding, to wall W. Similar construction is used at the other edge of the assembly, to receive the moving or sliding panel when closed.

Each door has a glass pane P1, P2 in a frame of hollow tubing having uprights U1, U2 and U3 (the remaining sliding door upright is not shown) connected by horizontal members, not shown, at the top and bottom and by an intermediate member, such as will be described in reference to FIG. 2. Obviously the glass pane can be double, as in any of the well known insulated glass structures. T is a weather-tight inward extension of U3.

Dimensions "A," the door sliding clearance, and dimension "B," the fixed panel-to-inner face of the wall dimension, vary with the installation and one aspect of the present invention deals with means of accommodating the lock bar of this invention to such dimensional variations in the simplest effective manner.

FIGS. 2 and 5 show an installation of an embodiment 10 of the invention in a typical sliding glass door installation.

Horizontal intermediate frame member H of the fixed door F has a pivot pedestal 12 mounted to it by screws 14 or other suitable means, at a position determined by the "A" dimension, FIG. 1. In turn, the pedestal 12 has a hollow pivot bolt 16 welded or otherwise integrally affixed to it and extending inwardly perpendicular to the panel. Pivoted secured in the pivot bolt by an interference fit with the bore is a capsing bolt 18, compressing a spring washer 20, so as to retain bar 22 securely.

The bar 22 in the horizontal position shown extends between the advancing edge E of the sliding door S and the wall-backed jam channel C, preventing the door S from sliding open.
Bar 22 has an end bolt extension 24 fitting the inside of the bar, which is a rectangular tube. The end bolt extension is adjustably secured by pivot bolt 16 at a protrusive length (suiting the "A" dimension, FIG. 1) causing the extension to lie between the jam channel flanges C1 and C2 when the bar 22 is horizontal.

The free end 26 of the bar 22 has a combination locking arrangement, consisting of a locking bolt 28 controlled by keylock 30 and thumb lever 32. The locking bolt 28 extends from the free end of the bar 22 and engages a keeper or catch plate 34 which is screwed to the advancing edge E of the sliding door. On retraction by the thumb lever the bolt 28 moves to a position inside the bar 22 at which the end of the bolt is flush with the end of the bar, allowing the bar to be swung up or down to permit the sliding panel S to open.

In the horizontal position, the bar engagement with the jamb at one end and with the sliding panel at the other end prevents the fixed panel F to which it is attached by pivot bolt 16 from being forced outward, as it might otherwise be, on distortion by the relatively soft retaining flange C3 (FIG. 5) on the exterior of the jamb by a would-be intruder's pry-bar P or the like.

In the above arrangement it will be apparent that none of the lock bar attachment structure is accessible from the exterior when the bar is horizontal. Further, when the keylock is in the locked position, the thumb latch is made inoperative by means which will be described later. Therefore the bar cannot be opened without the use of a key, even with the glass broken, because the lock bar attachment structure is inaccessible from the interior also when the bar is horizontal. As noted, the pivot bolt comprises a press-fit capping bolt, 18, FIG. 5, forced on assembly into a tubular pivot bolt part 16. Spring washer 20 takes up all slack in the assembly, so that not even the edge of a knife blade can be inserted at the interfaces, and also adds friction to make operation of the bar safer, as will be noted later.

FIG. 3 shows an embodiment 300 generally similar to that described, except that a "Z" angle 336 adjustably secures wall W, engagement of bar extension 324 with jamb structure C. The angle has an offset length 338 parallel to the plane of the doorway which extends considerably beyond the pivot bolt, to which it is secured, and overlaps the wall. This member is even less accessible from the exterior than the end bolt extension previously described, and engages sturdier structure, the wall, rather than the jam. The angle 336 does not swing with the bar 322 but remains securely against the wall while the bar pivots. The "A" dimension (FIG. 1) is taken into account by where the hole is placed in the offset angle 336. Spacers 340 can be added to adjust the "B" dimension; i.e., the effective length of the offsetting arm 342 of the angle. The bar 322 shown is solid strap material, like the offset angle, and has an aligning spacer collar 344 between the fixed panel F and the bar, in place of the pedestal previously described. The pivot bolt 316 shown may have a carriage-head 346 on the exterior of the fixed panel F and if so, preferably has a hardened head. The lock mechanism 330 being exposed more than in the previous embodiment, preferably has a hardened casing. The lock mechanism 330 is attached to the end of the bar 322 by screws or other conventional means, and the keeper 334 is fastened to the edge E of the sliding door as before.

These arrangements make the FIG. 3 embodiment more economical than the embodiment previously described in reference to FIGS. 2 and 5.

FIG. 4 shows an embodiment 400 which is in some respects more economical than that of FIG. 3, although generally similar as to the solid type structure of the bar 322 and the pivot structure. Where the "A" and "B" dimensions (FIG. 1) are the same for a large number of units to be equipped with the invention, the bars 422 can be bent to form the offsetting arm 442 and the parallel offset length 338 integral with the bar, as shown, for maximum economy, for strength, and for appearance. In this embodiment the offset portions do not touch the wall in normal use, as they pivot freely with the bar. A further feature illustrated in FIG. 4 is the arrangement of the lock 430 which is screwed or otherwise suitably affixed to the sliding panel S. The keeper 434 is a simple recessed plate screwed to the side of the end of bar 422. This arrangement shields the lock mechanism from the exterior and may be employed with other embodiments of the invention.

FIG. 5 was discussed in conjunction with FIG. 2.

FIGS. 6, 7, 8, 9 and 10 illustrate an embodiment 600 of the invention especially well suited for use in installations in which no center member is available on the fixed panel, represented by F1 or F2, FIGS. 6 or 7, or in which drilling holes through the fixed member would be undesirable. As best shown in FIGS. 6 and 7, a latching "Z" section, channel 648 is welded, or is cemented by epoxy adhesive 650, or otherwise is suitably attached to the fixed member. The ordinary weather-seal T between the panels makes room for this to clear the sliding panel. The rectangular tubular bar 622 in this embodiment is provided at an intermediate portion of the length with a complementary, longitudinal, hook-shaped extension 650 which engages the latching channel when the bar is horizontal. Preferably the latching channel faces up and the hook-shaped channel down so that gravity engagement holds the two together. According to provisions employed in analogous security arrangements, an anti-saw strip 654, preferably of bluetemper spring steel, is loosely positioned in the tubular bar 622 so that sawing the bar breaks saw teeth and is extremely difficult.

FIG. 8 shows how the bar 622 is held when pivoted up by a stowage bracket 656 secured to channel C. The bracket has a hole 658 engaging the lock controlled bolt 628 in the free end of the bar in the up position. The bar has a similar locking arrangement to that of FIG. 2.

As best shown in FIGS. 6, 8, 9 and 10, the pivot structure of this embodiment combines jamb and wall engagement with smooth appearance and inaccessible fastenings. A means for pivotally securing the bar at a position intermediate the width of the fixed panel is shown as comprising a generally "J" shaped bracket 660 with perforations 662 in the squared loop 664 of the "J" shape through which anchor bolts 666, FIG. 10, are secured. The anchor bolts pass through the jamb channel C and into the wall W. The end bolt 624, FIG. 10, protrudes into the squared loop 664 of the "J" shape and thus into the channel between flanges C1, C2 of the jamb also, making the installation extremely rigid and strong. The pivot bolt 616 secures to the upper arm 668 of the "J" shape in similar manner to that described in reference to FIG. 2. Both the upper
arm and the end bolt may be offset for clearance as shown.

It can be seen that the area of adhesive attachment of the "Z" channel can be enormous, as the channel can extend entirely across the door, if desired.

FIG. 11 illustrates details of a keylock installation in a tubular bar 1122 in an embodiment 1100 making the bolt-to-keeper engagement self-aligning, self-concealing, massive, and pleasing in appearance. A tubular bolt 1128 having a sliding engagement with the interior of the tubular bar 1122 has a cavity 1170 in the end which accepts a protrusion 1172 of a keeper 1134 which is screwed to the moving panel using screw holes 1174. The cavity has pyramidal sides and the protrusion is in complementary truncated pyramid shape so that they tightly self-align on engagement both in the vertical and in the horizontal direction.

FIG. 12 illustrates an embodiment 1200 having the same mechanism as FIG. 11 except for the paralleled-sided protruding keeper 1234 which has grooves 1276 receiving the tubular end-shape of the bolt 1228, double securing the engagement. The grooves preferably extend entirely around the end portion.

FIG. 11 and FIG. 12 show the following provisions, described in the reference numeral system of FIG. 11.

When the bolt 1128 is retracted by thumb lever 1132, which screws into tapped hole 1178 in the bolt through slotted holes 1180 in the bar, spring 1182 is compressed by the end 1184 of the bolt and tends to force the bolt 1128 outward. Obviously the thumb lever could be pressed fitted to save costs in production. Spring 1182 is held by spring plate 1186 which is welded or otherwise suitably affixed to tubular bar 1122. Lock 1130 has a conventional U-shaped lock clamp 1188 which engages groove 1190 in the lock when the lock is inserted through hole 1192 in the bar, and secures the lock in place. Lock bolt plate 1194 rotates to lock the bolt 1128 in the extended position. 1196 is a clearance notch in the bolt. In the locked position, the lock bolt plate 1194 engages ramp 1198 in the bolt.

Structure not illustrated in FIGS. 11, 12 and 13 may be like that of preceding embodiments employing tubular bars.

FIG. 13 shows an embodiment 1300 having a more conventional lock arrangement with solid bolt 1328 protruding into recessed keeper 1334 which is affixed to sliding panel S. The entire assembly of the lock is contained in a tubular housing 1300 which fits inside bar 1328 and has an outward terminal flange 1302 at the end of the bar. Lock cylinder 1330 passes through hole 1392 in the bar and hole 1304 in the housing and is held in place by interference press fit on assembly.

Lock pin 1394 protrudes eccentrically from the rear of lock 1330 and engages the sides of a recess 1306 in the bolt 1328 to lock the bolt in extended position.

From the foregoing it can be seen that this invention in the various embodiments provides numerous advantages.

The locks themselves may be any of various small cylindrical locks commercially available, such as those extensively used on vending machines, security cabinets and small safes and sold by the Illinois, Yale, Corbin companies, etc. The "ACE" lock sold by the Chicago Lock Company is a specific lock which exemplifies the type and size illustrated in FIG. 13; a "cam lock" type is shown in FIG. 12.

The bar assembly may have sufficient friction applied through the friction washer described to prevent the bar from falling when released, or a Belleville type or other spring washer may be used for the purpose.

Installation of the invention is extremely simple, at most requiring simple drilling for attachments such as self-tapping and anchor screws, and if desired, sawing to length before installation. The bar may be mounted at any height which allows room for the pivoted end of the bar to swing when the bar is rotated to an up-and-down position, although waist level is most convenient for ordinary installations.

The assembly consists of few parts, simply made, and all attached; there is little to malfunction and nothing to detach and become misplaced.

Materials ranging from mild steel, such as 1010, to 7075 T-6 aluminum alloy will be found suitable, since material is less critical than in more complex devices, bending loads being minimized by the design of the invention. Wall thicknesses of 0.125 inch in aluminum tubing of 1 X 2 inch sectional outside dimension will be found sufficient in all cases.

The device in the general embodiment is adapted for use without modification in lefthand or righthand installations.

Finally the quadruple-locking action of the invention locks at four places: (1) at the lock-controlled bolt at the free end; (2) at the end bolt at the pivoted end; (3) between the sliding panel and the wall or jamb; and (4) at the pivot connection with the fixed panel.

Obviously many modifications and variations of the present invention are possible in light of the above teachings.

It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed and desired to be secured by United States letters patent is:

1. In combination with building wall structure forming a rectangular doorway and a channel-shaped door jamb framing at least a portion of the doorway, a first panel fixed in the doorjamb at one side of the doorway, and a second panel slidably contained in the channel in position to slide past the first panel, the improvement comprising: a bar, means for pivotally securing the bar at a position intermediate the width of the first panel with the first end of the bar in contact with the second panel, means for engaging the second end of the bar with said building wall structure, and means for detachably connecting an intermediate portion of the bar to the first panel.

2. In the combination recited in claim 1, the means for detachably connecting comprising a downwardly disposed hook extending from the bar and an upwardly disposed hook affixed to the first panel in position to engage the downwardly disposed hook.

3. In combination with building wall structure forming a rectangular doorway and a channel-shaped door jamb framing at least a portion of the doorway, a first panel fixed in the doorjamb at one side of the doorway, and a second panel slidably contained in the channel in position to slide past the first panel, the improvement comprising: a bar, means for pivotally securing the bar at a position intermediate the width of the first panel, means for engaging the second end of the bar in contact with the second panel, means for engaging the second end of the bar with said building wall structure, means for engaging an
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7. In combination with building wall structure forming a rectangular doorway and a channel-shaped door jamb framing at least a portion of the doorway, a first panel fixed in the door jamb at one side of the doorway, and a second panel slidably contained in the channel in position to slide past the first panel, the improvement comprising: a bar, means for pivotally securing the bar to the first panel at a position intermediate the width of the first panel with the first end of the bar in contact with the second panel, and means for engaging the second end of the bar with the building wall structure comprising a generally J-shaped bracket having a squared loop between the longer and shorter arms of the "J," with a pivot member securing a portion of the bar proximate the second end thereof to the longer arm of the J-shaped bracket at a position causing the second end of the bar to extend into the squared loop of the J-shaped bracket in the horizontal pivotal position of the door jamb, and means for detachably connecting an intermediate portion of the bar with an intermediate portion of the first panel.

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8. In combination with building wall structure forming a rectangular doorway and a channel-shaped door jamb framing at least a portion of the doorway, a first panel fixed in the door jamb at one side of the doorway, and a second panel slidably contained in the channel in position to slide past the first panel, the improvement comprising: a bar, means including a pivot bolt attached to said first panel for pivotally securing the bar to the first panel at a position intermediate the width of the first panel with the first end of the bar in contact with the second panel, and means for engaging the second end of the bar with the building wall structure comprising a portion of the channel-shaped door jamb aligned with the second end of the bar and overlapping the sides of the bar with the bar in a horizontal position.