

July 12, 1966

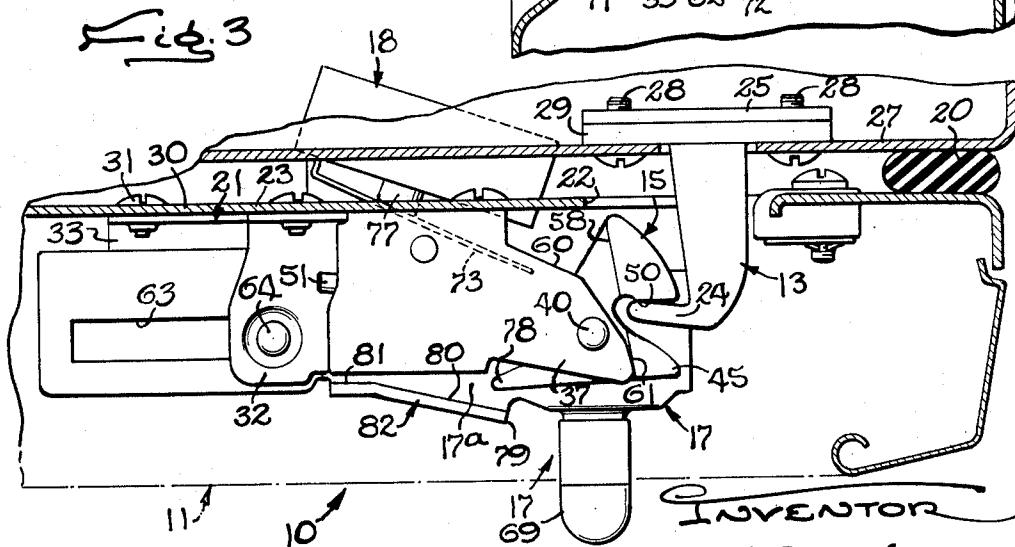
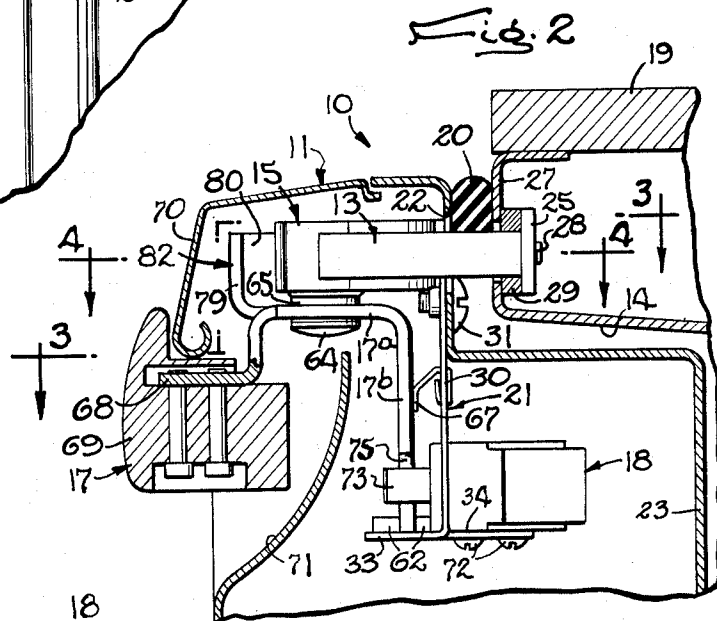
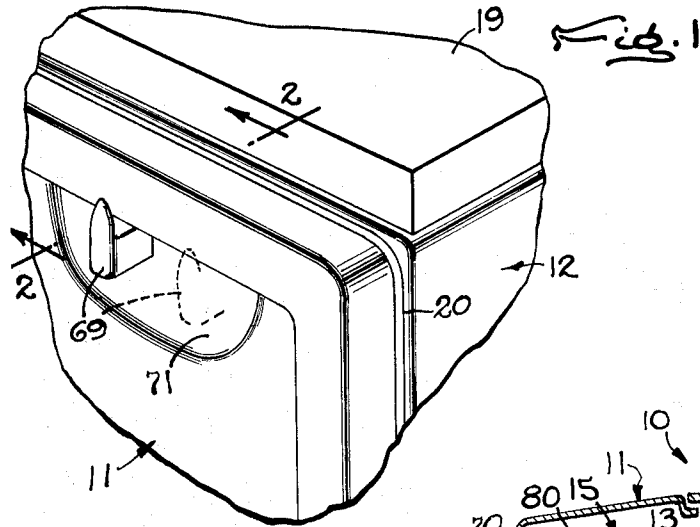
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3,260,813

DOOR LATCHING AND LOCKING DEVICE

Filed July 1, 1964

3 Sheets-Sheet 1



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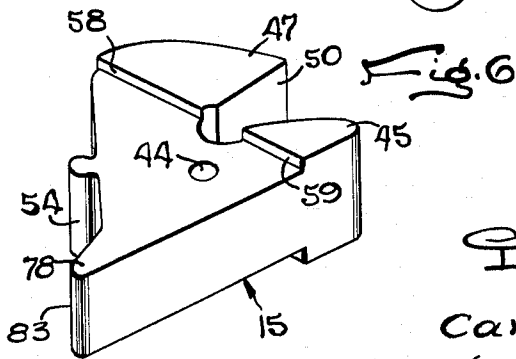
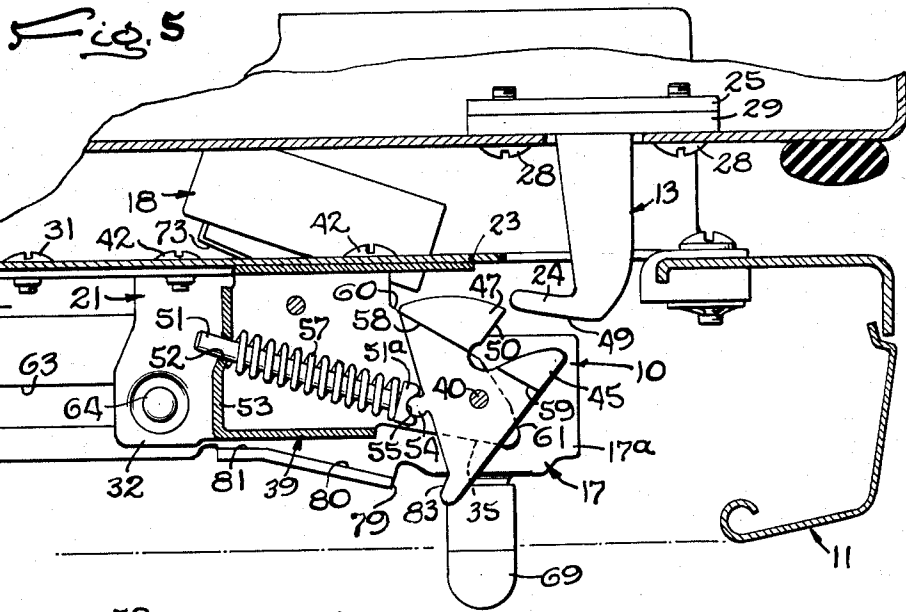
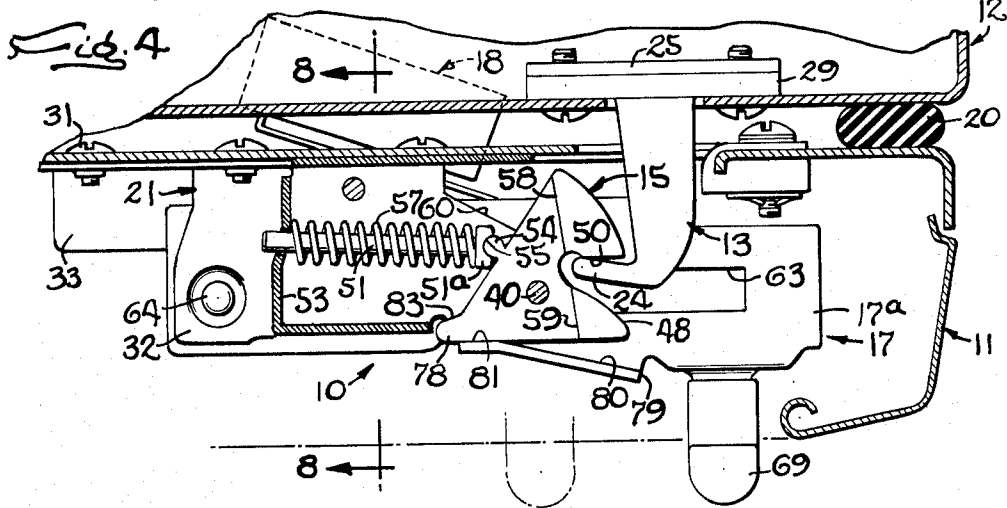
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DOOR LATCHING AND LOCKING DEVICE

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3 Sheets-Sheet 2



INVENTOR  
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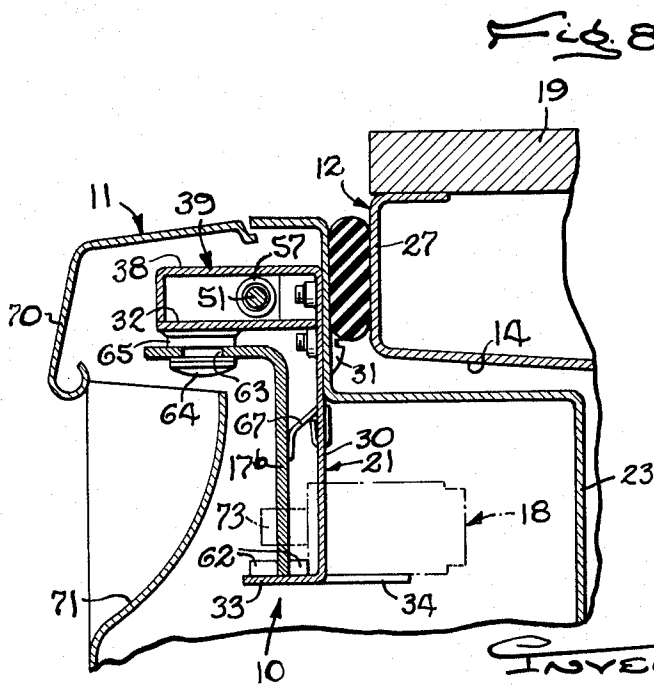
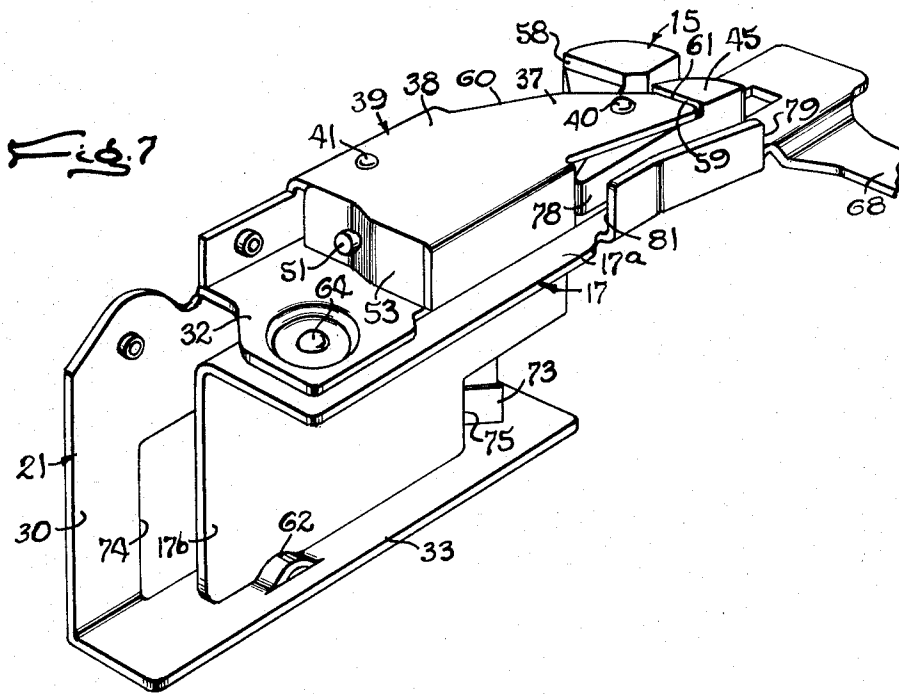
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DOOR LATCHING AND LOCKING DEVICE

Filed July 1, 1964

3 Sheets-Sheet 3



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1

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3,260,813

**DOOR LATCHING AND LOCKING DEVICE**

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 7 Claims. (Cl. 200-61.64)

This invention relates to devices for latching and locking the door or a cabinet for an automatic dishwasher or the like in tightly closed condition prior to initiation of the dishwashing cycle, and including generally a strike mountable on the cabinet for latching engagement with a bolt mountable on the door, and a manual operator accessible from outside the door for locking the closed door and actuating a control switch to condition the dishwasher for operation.

The general object of the present invention is to provide a new and improved latch of the foregoing character which latches and unlatches automatically in response to closing and opening motions of the door, tightly locks and seals the door preparatory to activation of the dishwashing apparatus, and effects a positive lockout of the control switch in a novel and simple manner whenever the door is unlocked.

A more specific object is to latch and unlatch the bolt as an incident to its engagement with the strike during closing and opening of the door, and to lock the bolt in the latched position with a simple slide operator movable back and forth on the door between locking and unlocking positions.

Another object is to utilize the unlatched bolt as a stop for preventing locking and switch-actuating movement of the slide when the door is open.

A further object is to utilize the locking motion of the slide to insure tight sealing of the door before the dishwashing apparatus is activated.

Other objects and advantages of the invention will become apparent from the following detailed description taken in connection with the accompanying drawings, in which

FIGURE 1 is a fragmentary perspective view of a dishwasher equipped with a latching and locking device embodying the novel features of the present invention.

FIG. 2 is an enlarged fragmentary cross-sectional view taken substantially along the line 2-2 of FIG. 1.

FIG. 3 is a fragmentary cross-sectional view taken substantially along the line 3-3 of FIG. 2.

FIG. 4 is a fragmentary cross-sectional view taken substantially along the line 4-4 of FIG. 2.

FIG. 5 is a view similar to FIG. 3 with the parts in moved positions.

FIG. 6 is an enlarged perspective view of the bolt.

FIG. 7 is a fragmentary perspective view of the latching and locking mechanism.

FIG. 8 is a fragmentary cross-sectional view taken substantially along the line 8-8 of FIG. 4.

As shown in the drawings for purposes of illustration, the invention is embodied in a device 10 for latching the door 11 of a cabinet 12 for an automatic dishwasher or the like releasably in a closed position relative to the cabinet frame and locking the door in a tightly sealed condition prior to operation of the dishwashing apparatus (not shown). In general, the device comprises a strike 13 herein mounted on the cabinet along one side of the access opening 14 for engagement with a bolt 15 on the door, and an operator 17 accessible from outside the door and manually movable back and forth between two positions to lock and unlock the door. To prevent actuation of the dishwashing apparatus when the door is open or free to open, a switch 18 in the control circuit of the apparatus is controlled by the operator and conditions

the circuit for operation only when the door is closed and tightly sealed.

In this instance, the latching device 10 is applied to a dishwasher cabinet 12 mounted under a counter 19 and having a front opening, hollow sheet metal door 11 which, in the closed position shown in the drawings, engages and seals against a resiliently compressible gasket 20 extending around all sides of the cabinet opening. The bolt 15 is pivoted for rotation in a plane perpendicular to the plane of the door on a base or frame 21 mounted inside the door adjacent the top edge of the latter, and the strike 13 is mounted on the cabinet along the top of the cabinet opening and projects into the door through an opening 22 in the sealing portion of the inner panel 23 of the door.

Herein, the strike 13 is a zinc die casting having a hook-shaped outer end 24 disposed in the plane of the bolt 15 when the door is closed and supported on a base 25 disposed inside the flange 37 (see FIG. 2) forming the rim of the dishwasher tub which defines the top of the cabinet opening 14. The strike is secured to the rim by means of screws 28 inserted through aligned holes in the rim and a spacer 29 between the base and the rim, and threaded into aligned holes in the base (see FIG. 3).

The present invention contemplates a new and improved device 10 of the foregoing character which latches and unlatches automatically in response to closing and opening motions of the door 11, tightly locks and seals the door preparatory to activation of the dishwashing apparatus, and effects a positive lockout of the control switch 18 in a novel and simple manner whenever the door is unlocked. For these purposes, the bolt 15 is pivoted for rotation between angularly spaced latched and unlatched positions as an incident to engagement with the strike 13 during closing and opening motion of the door, and the operator 17 is a slide including means for insuring that the door is tightly closed, locking the bolt in the latched position, and actuating the control switch as the slide is moved in one direction relative to the latched bolt. Moreover, when the door is open, the unlatched bolt blocks locking movement of the slide and thus positively prevents actuation of the control switch.

In this instance, the base or frame 21 (see FIG. 7) on which the bolt 15 is pivoted is a sheet metal stamping having a vertical body portion 30 fastened to the adjacent portion of the inner panel 23 of the door by screws 31 and formed with two horizontal flanges 32 and 33 projecting outwardly from the top and bottom edges of the body portion. The upper flange 32 supports the bolt and its spring-loading mechanism while the lower flange 33 cooperates with the upper flange in supporting and guiding the locking slide 17. An integral extension 34 of the lower flange projects inwardly toward the inner panel of the door in the plane of the lower flange to provide a support for the control switch 18.

Herein, the bolt 15 is disposed above the right end portion 35 (FIG. 5) of the upper flange 32 between the latter and the similarly shaped end portion 37 of the top wall 38 of a box-like spring housing 39 mounted on the upper flange and having an open side facing toward the bolt. The housing is secured to the upper flange by two rivets 40 and 41 (FIG. 7) extending through aligned holes in the flange and the top housing wall, and is fastened to the door panel 23 by screws 42 (FIG. 5) threaded into the inside wall 43 of the housing. The shank of the rivet 40 extends through a hole 44 (FIG. 6) in the bolt and thus defines the pivotal axis of the bolt.

The bolt 15 is a generally triangular block of suitable material such as Delrin and is notched on the side that faces toward the strike in the unlatched position (FIG. 5) to form a heel 45 on one side of the notch and a toe 47

on the other side. The wall 48 of the notch forming one side of the heel is positioned for engagement with the outer end 49 of the strike 13 as the door 11 is closed and is shaped to rock the bolt clockwise about its axis upon continued inward movement of the door after the heel engages the strike, thereby swinging the toe and the notch wall 50 clockwise toward their latching positions behind the hook 24 on the end of the strike. Similarly, when the bolt is latched and the door is pulled outwardly, the hook coacts with the notch wall 50 to rotate the bolt counterclockwise and back toward the unlatched position.

The bolt 15 is held yieldably in both the latched position and the unlatched position by means of a spring-loaded plunger comprising a guide rod 51 projecting loosely at one end through a hole 52 in the side wall 53 of the housing 39 opposite the bolt, and carrying a head 51<sup>a</sup> on the other end of the rod pivotally connected to the bolt by means of a joint comprising a generally cylindrical lug 54 formed on the adjacent side of the bolt and rotatably received in a vertically elongated groove 55 of semi-circular cross-section in the plunger head. A coiled spring 57 telescoped over the rod and compressed between the housing wall 53 and the plunger head urges the latter generally to the right as viewed in FIGS. 4 and 5.

It will be seen that the spring-loaded plunger and the pivoted bolt 15 cooperate to form a so-called toggle latch in which the effective direction of the spring force on the bolt reverses as the latter passes in either direction through an intermediate angular position in which the bolt axis, the pivot joint, and the pivotal axis defined by the hole 52 and the guide rod 51 are aligned with the longitudinal axis of the spring 57. When the joint is offset in one direction from this angular position as shown in FIG. 5, the spring urges the bolt counterclockwise toward the unlatched position, while in the other direction of offset (FIG. 4), the spring urges the bolt toward the latched position.

To limit rotation of the bolt in each direction, stop surfaces 58 and 59 are formed on the bolt to abut against opposed stop surfaces 60 and 61 on the frame. Herein, the bolt surfaces comprise shoulders formed on both the top and bottom sides of the bolt, conveniently in a common plane perpendicular to the plane of rotation of the bolt by reducing the thickness of the bolt as shown in FIG. 6. The frame surfaces 60 and 61 are formed by angularly offset edges of the end sections 35 and 37 straddling the bolt. In the unlatched position of the bolt, the spring 57 holds the shoulders 58 against the vertically aligned edges 60 of the walls 37 and the upper flange 35. After the bolt is rotated clockwise from this position past the intermediate angular position, the spring urges the bolt clockwise toward the position in which the shoulders 59 engage the aligned edges 61 of the housing wall and the upper flange.

With the bolt enclosed in the hollow door structure, there is no danger of movement of the bolt except as a result of engagement with the strike 13 projecting through the opening 22 in the inner panel of the door. The bolt latches and unlatches automatically as an incident to closing and opening of the door and, when latched, holds the door releasably in the closed position with the inner sealing surfaces of the door pressed against the sealing gasket 20 with a force determined by the spring 57.

As shown most clearly in FIG. 7, the lock slide 17 is a one-piece sheet metal stamping of L-shaped cross-section formed by a flat horizontal upper section 17<sup>a</sup> immediately beneath the upper flange 32 of the frame and a flat vertical section 17<sup>b</sup> extending downwardly adjacent the frame body 30 to the top of the lower flange 33. The lower edge of the vertical section rests on top of the lower flange and is slidable on the latter along a path parallel to the plane of the door. The lower edge of the slide is guided in a slot formed between two eyebrows 62 bent upwardly from the lower flange on opposite sides of the slide, and the horizontal section is guided by two pins aligned longitudinally of the slide and extending

downwardly from the upper frame flange through two aligned slots 63 extending longitudinally of the slide. Herein, one of the pins is the shank of a rivet 64 having a head below the horizontal slide section and an upset end above the upper frame flange 32, and the other pin is the depending lower end portion of the rivet 40 pivoting the bolt 15 on the frame. Two bushings 65 (FIG. 8) are telescoped onto the guide pins and formed with center portions that fit snugly in the slots 63 and integral annular flanges overhanging the top of the slide. Plastic washers telescoped onto the guide pins below the horizontal section fit snugly against the underside of the horizontal section.

To prevent rattling and objectionable looseness of the slide 17 in service use, a spring wire 67 (FIGS. 2 and 8) is disposed between the frame body 30 and the vertical slide section 17<sup>b</sup> with its free ends fastened to the body and its generally V-shaped outer end portion pressed against the adjacent side of the slide to urge the slide outwardly against the outer eyebrow 62 and the inner sides of the bushings 65. Thus, the spring produces frictional resistance to back and forth movement of the slide.

Integral with and projecting outwardly from the slide 17 adjacent its right end as viewed in FIG. 7 is a lug 68 which carries a knob 69 disposed outside the door and providing a hand grip for manual operation of the slide. As shown in FIG. 2, the lug is offset downwardly from the plane of the horizontal slide section 17<sup>a</sup> and projects outwardly beneath the depending outer flange 70 of the door structure at the top of a recess 71 in the outer door panel. The depending flange masks the opening into the door at the top of the recess. With this arrangement, the slide is movable back and forth relative to the bolt 15 by means of the knob 69, from the unlocking position in which the right ends of the slots 63 abut against the associated guide bushings 65 to the locking position in which the left ends of the slots abut against the bushings.

The control switch 18 is enclosed in a box-like case fastened to the inwardly extending lower flange 34 of the frame 31 by screws 72 (FIG. 2), and is provided with an operating arm 73 in the form of a flat spring plate projecting through the opening 74 (FIG. 7) in the frame body 30 and inclined across the path of the vertical slide section 17<sup>b</sup>, in the path followed by the vertical wall 75 of a notch in the lower right-hand corner of the vertical section as the slide moves from left to right along the frame. The notch wall cams the arm inwardly as it slides along the arm, and this inward movement of the arm depresses the switch button 77 (FIG. 3) to activate the dishwashing apparatus. As the slide is returned to the left, the arm is permitted to spring back to its initial position thereby releasing the button to deactivate the apparatus.

The important action of the bolt 15 and the slide 17 in sealing and locking the door 11, and also in preventing actuation of the switch 18 when the door is not sealed, is achieved through the coaction of opposed surfaces on the slide and the bolt for preventing movement of the slide toward the locking and switch-actuating position whenever the bolt is unlatched, camming the latched bolt into a tight-sealing latched position as the slide is shifted toward its locking position, and positively locking the bolt in this position when the bolt is disposed in the locking position. For these purposes, a lug 78 is formed on the bolt in position to project outwardly into a blocking position across the path of an abutment surface 79 on the slide when the bolt is unlatched. As the bolt swings toward the latched position, the lug swings out of the path of the abutment surface and comes to rest in the path of a cam surface 80 on the slide shaped to cam the lug and the bolt clockwise about the bolt axis and thereby lift the bolt farther in the latching direction beyond the latched position determined by the sealing force exerted by the spring 57. Finally, a locking surface 81 on the slide is brought into a position blocking rotation of the bolt out of the tight-sealing position.

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Herein, the surfaces 79, 80, and 81 are formed on a flange 82 upstanding from the outer edge of the horizontal slide section 17<sup>a</sup> adjacent the right end of the latter as viewed in FIGS. 3, 4, 5 and 7 and movable with the slide along a path adjacent the outer side of the bolt 15. The abutment surface 79 is simply the right end of the flange and is alined with the left side surface 83 of the lug 78 when the bolt is unlatched as shown in FIG. 5. With the shoulders 58 engaging the stop edges 60, the lug cannot swing to the right and thus constitutes a positive stop for the locking slide.

As the bolt 15 is rotated toward the latching position by the strike 13 and the spring 57 during closing of the door 11, the lug 78 swings out of the path of the end 79 of the flange 82 and comes to rest when the force exerted on the strike by the spring equals the resistance exerted by the compressed sealing gasket 20, approximately in the position shown in FIG. 3 in which the end of the lug is in the path of the right end portion of the flange, the inner surface 80 of this portion being inclined outwardly and to the right relative to the direction of movement of the slide. Thus, upon movement of the slide to the right, the inclined surface engages the lug and cams it inwardly to rock the latching surface 50 of the bolt outwardly and effect a drawing-in of the door and a further compression of the sealing gasket to insure a tight seal all around the door.

After the left end of the cam surface 80 passes the end of the lug 78, the bolt 15 is in the tight-sealing latched position and thereafter is held in place by the locking surface 81 on the left end portion of the flange 82. This surface lies in flat face-to-face engagement with the outer side of the bolt adjacent the lug and thus blocks counterclockwise rotation of the bolt so long as the slide is left in the locking position. When the slide is returned to the left, the bolt is released and permitted to return to the latched but unlocked position (FIG. 3) so that an outward pull on the door will unlatch and open the latter. Of course, this motion of the slide releases the switch arm 73 to deactivate the switch 18 prior to unlatching of the bolt.

From the foregoing, it will be seen that the improved locking and latching device 10 operates with a positive action to seal and lock the door 11 prior to initiation of the dishwashing cycle. Moreover, the unlatched bolt 15 constitutes a positive stop preventing actuation of the switch 18 by inadvertent movement of the slide 17 when the door is open, and the bolt latches and holds the door independently of the slide whenever the door is closed.

I claim as my invention:

1. In a device for latching and locking a door releasably in a closed position relative to a frame, the combination of, a strike mountable on said frame and having a hooked outer end disposed in a plane perpendicular to the closed position of said door, a base mountable on said door adjacent said outer end, a generally triangular bolt pivoted on said base for rotation in said perpendicular plane in one direction from an unlatched position successively through intermediate, latching and tight-sealing positions, said bolt having a notch in the inner side thereof facing said strike as the door is closed with the bolt in said unlatched position, said notch having an inwardly facing wall forming a heel engageable with said strike and shaped to rock the bolt through said intermediate position, said notch also forming a toe on said bolt swingable in behind said hooked end into an outwardly facing position to latch the door as the bolt rocks from said intermediate position to said latched position, a spring acting between said bolt and said frame and operable to urge the bolt from said intermediate position toward said latched position and exert a predetermined outward latching force on said hooked end, a locking slide, means on said frame guiding said slide for back and forth lateral movement thereon along a first path

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parallel to the plane of said door from an unlatching position to a locking position, a switch having an operator disposed along said first path, means on said slide for engaging said operator and actuating said switch as said slide moves to said locking position, a flange on said slide movable along a second path extending along the outer side of said bolt, a lug on said bolt disposed across said second path when the bolt is in said unlatched position, thereby to block movement of the slide to said locking position, an outwardly inclined cam surface on said flange engageable with said lug when said bolt is in said latched position and shaped to cam the bolt farther in said one direction into said tight-sealing position, and an inwardly facing locking surface on said flange positioned to block unlatching rotation of said cam when said slide is in said locking position.

2. In a device for latching and locking a door releasably in a closed position relative to a frame, the combination of, a strike mountable on said frame adjacent the closed position of said door, a base mountable on said door, a bolt pivoted on said base for rotation in a plane perpendicular to the plane of said door between latched and unlatched positions, latching means on said strike and said bolt operable in response to closing of the door to rotate said bolt from said unlatched position to said latched position, unlatching means on said strike and said bolt operable in response to opening of the door to rotate said bolt to said unlatched position, a manually operable locking slide mounted on said base for back and forth sliding movement along a predetermined path parallel to the plane of said door between locking and unlatching positions and remaining in said unlatching position during latching and unlatching of said bolt, a switch operator positioned along said path, means on said slide for engaging and actuating said operator as said slide moves to said locking position, an abutment surface on said bolt disposed in said path when the bolt is in said unlatched position thereby to block movement of said slide toward said locking position and prevent actuation of said operator, said abutment surface being swingable out of said path as said bolt rotates toward said latching position, and abutment surfaces on said slide and said bolt disposed in opposed relation when the bolt is in said latched position and said slide is in said locking position thereby to lock said bolt in said latched position.

3. In a device for latching and locking a door releasably in a closed position relative to a frame, the combination of, a strike mountable on said frame, a bolt mountable on said door for rotation between latched and unlatched positions, latching means on said strike and said bolt engageable as said door is closed and operable in response to closing of the door to rotate said bolt from said unlatched position to said latched position, unlatching means on said strike and said bolt engageable as said door is opened and operable in response to opening of the door to rotate said bolt to said unlatched position, a locking member manually movable back and forth along a predetermined path on said door between locking and unlatching positions, a switch having an operator positioned along said path, means on said member for engaging said operator and actuating said switch as said member moves to said locking position, first abutment surfaces on said bolt and said locking member disposed in opposed relation when said member is in said locking position and said bolt is in said latched position thereby to block rotation of said bolt out of said latched position, and second abutment surfaces on said bolt and said locking member disposed in opposed relation when said member is in said unlatching position and said bolt is in said unlatched position thereby to block movement of said locking member to said locking position and prevent actuation of said switch when said door is open.

4. In a device for latching and locking a door releasably in a closed position relative to a frame, the combination of, a base mountable on said door, a bolt pivoted

on said base for rotation between successive angularly spaced unlatched, latched and tight-sealing positions, spring means acting on said bolt when the latter is in said unlatched and latched positions, a locking slide guided on said base for back and forth manual movement between locking and unlocking positions along a path generally parallel to the plane of said door and adjacent one side of said bolt, means on said bolt for engaging a strike and latching said door when the bolt is in said latched position and the slide is in said unlocking position, a cam on said slide engageable with said bolt when the latter is in said latched position and as the slide moves toward said locking position and operable during such movement to rotate the bolt into said tight-sealing position, and means on said slide for holding said bolt in said tight-sealing position when the slide is in said locking position.

5. A device as defined in claim 4 further including abutment means on said bolt and said slide coacting when said bolt is in said unlatched position to block movement of said slide to said locking position.

6. In a device for latching and locking a door releasably in a closed position relative to a frame, the combination of, a strike mountable on said frame, a bolt mountable on said door for rotation between latched and unlatched positions, latching means on said strike and said bolt engageable as said door is closed and operable in response to closing of the door to rotate said bolt from said unlatched position to said latched position, unlatching means on said strike and said bolt engageable as said door is opened and operable in response to opening of the door to rotate said bolt to said unlatched position, a locking member manually movable back and forth on said door between locking and unlocking positions and remaining in said unlocking position during rotation of said bolt, first abutment surfaces on said bolt and said locking member disposed in opposed relation

when said member is in said locking position and said bolt is in said latched position and coacting to block rotation of said bolt out of said latched position, and second abutment surfaces on said bolt and said locking member disposed in opposed relation when said member is in said unlocking position and said bolt is in said unlatched position and coacting to block movement of said locking member to said locking position.

7. In a device for latching and locking a door releasably in a closed position relative to a frame, the combination of, a strike mountable on said frame adjacent the closed position of said door, a bolt mountable on said door for rotation between latched and unlatched positions, spring means acting on said bolt in said closed position to urge means acting on said bolt in said closed position to urge the bolt toward said latched position, said spring means reversing its direction of action as said door is opened and thereafter urging said bolt toward said unlatched position, a locking member manually movable back and forth on said door between locking and unlocking positions, first abutment means on said bolt and said locking member for blocking rotation of said bolt out of said latched position when said member is in said locking position, and second abutment means on said bolt and said locking member for blocking movement of said locking member to said locking position when said bolt is in said unlatched position.

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