

Sept. 22, 1964

J. R. FOSTER

3,149,864

LATCH MECHANISM

Filed Aug. 13, 1962

3 Sheets-Sheet 1

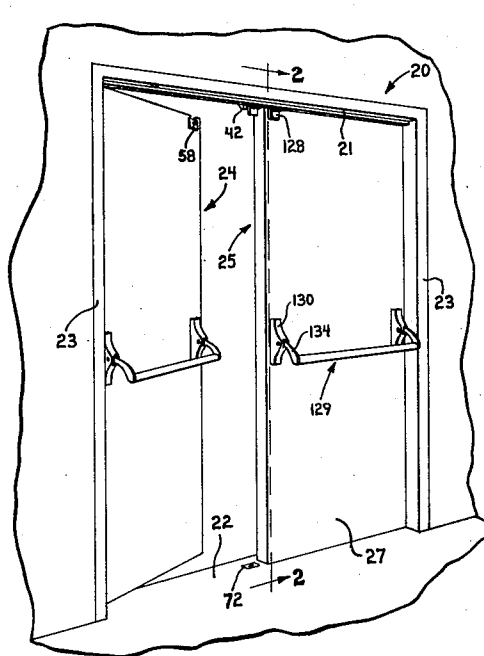


Fig. 1.

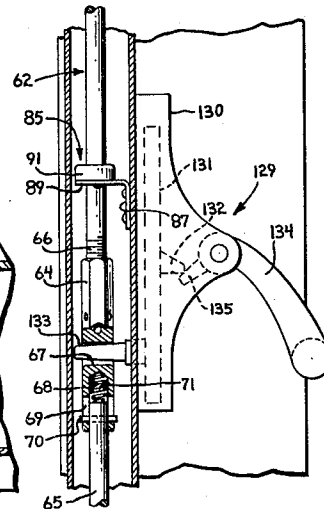
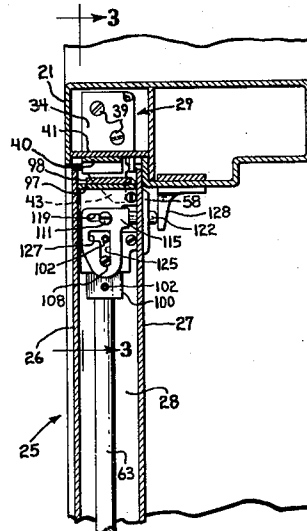


Fig. 2.

INVENTOR
JOHN R. FOSTER

BY

Hood, Gust & Irish
Attorneys

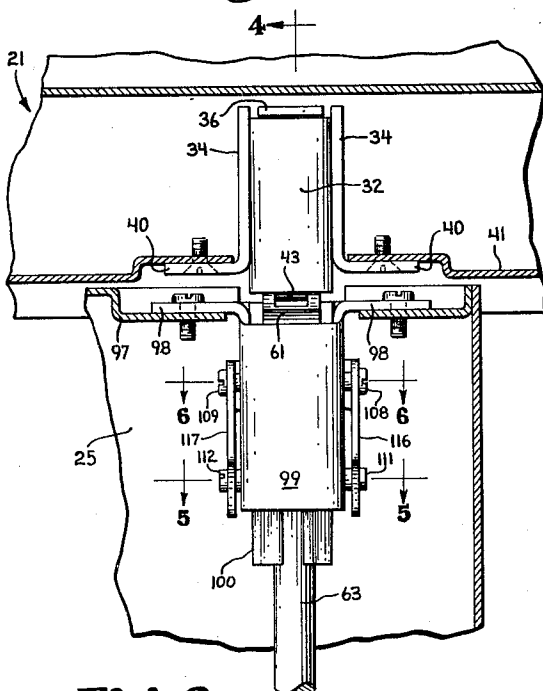


Fig. 3.

Sept. 22, 1964

J. R. FOSTER
LATCH MECHANISM

3,149,864

Filed Aug. 13, 1962

3 Sheets-Sheet 2

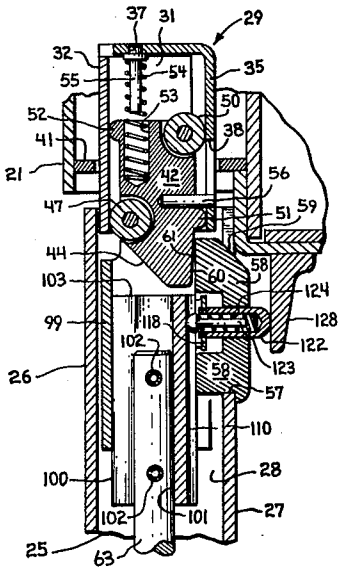


Fig. 4.

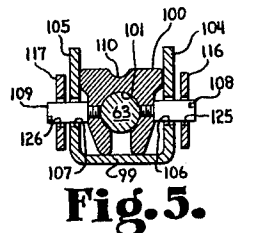


Fig. 5.

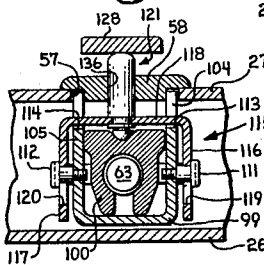


Fig. 6.

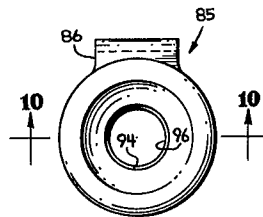


Fig. 9.

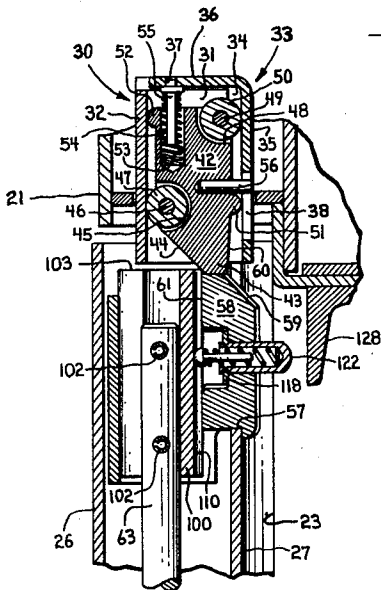


Fig. 8.

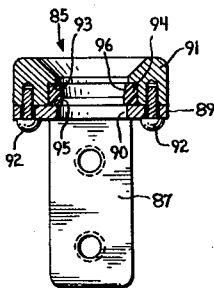


Fig. 10.

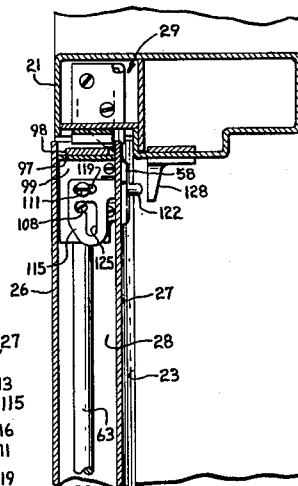


Fig. 7.

INVENTOR
JOHN R. FOSTER

BY

Hood, Gust & Irish
Attorneys

1

3,149,864

LATCH MECHANISM

John R. Foster, Indianapolis, Ind., assignor to Vonnegut Hardware Company, Indianapolis, Ind., a corporation of Indiana

Filed Aug. 13, 1962, Ser. No. 216,351

13 Claims. (Cl. 292-21)

The present invention relates to an improved form of latch mechanism which is primarily useful in connection with panic exit devices, but may be used in other environments. A primary object of the invention is to provide latch mechanism which will be readily effective to release a door for opening movement in spite of the exertion of heavy opening pressure against the door, which will be unusually effective to maintain the door in closed condition in spite of warping or wracking and which is highly adaptable for use in an environment in which both the top and the bottom ends of the door are affirmatively retained against opening movement so long as the manually-manipulable actuator means is not operated.

A further object of the invention is to provide an improved latch bolt assembly.

Another object of the invention is to provide a latch mechanism in which the primary latch bolt assembly is carried by the door frame but in which retraction of the latch bolt is effected by actuator means carried by the door. A corollary objective is to provide, in such a mechanism, actuator means for the latch bolt which is biased toward a position in which said latch bolt is projected, and in which said actuator means itself cooperates with a keeper at the door sill to retain the bottom end of the door.

Still another object of the invention is to provide, in connection with such an actuator means, retainer means which, once the actuator is moved to cause retraction of the latch bolt and the door is moved even slightly toward open position, will retain such actuator against return until, as the door attains substantially fully closed condition, such retainer is automatically caused to release the actuator.

Another object of the invention is to provide, in latch mechanism of the character under consideration, actuator means which may be readily shifted by manually-manipulable means, which may be readily adjusted in length in order to compensate for variable spacing between such a latch bolt and such a keeper or for variations in the effective dimension of such spacing which may arise during use, and which will automatically accommodate itself to slight variations in such spacing. Still another object of the invention is to provide improved guide means for such an actuator.

Another important object of the invention is to provide, in such a latch mechanism, actuator means of such character that it may be readily adapted for manual manipulation by a panic bar, by a door knob or thumb lever, or by a flush lever.

Still further objects of the invention will appear as the description proceeds.

To the accomplishment of the above and related objects, my invention may be embodied in the forms illustrated in the accompanying drawings, attention being called to the fact, however, that the drawings are illustrative only, and that change may be made in the specific constructions illustrated and described, so long as the scope of the appended claims is not violated.

FIG. 1 is a perspective view of a doorway having installed therein a pair of doors equipped with latch mechanism constructed in accordance with the present invention and arranged for manipulation by panic bars;

FIG. 2 is a vertical, fragmental section taken substan-

2

tially on the line 2-2 of FIG. 1, and drawn to an enlarged scale;

FIG. 3 is a further-enlarged, fragmental section taken substantially on the line 3-3 of FIG. 2;

FIG. 4 is a section through the latch bolt assembly, the detent means and the upper end of the actuator means and taken substantially on the line 4-4 of FIG. 3;

FIG. 5 is a horizontal section taken substantially on the line 5-5 of FIG. 3;

FIG. 6 is a horizontal section taken substantially on the line 6-6 of FIG. 3;

FIG. 7 is a view similar to FIG. 2, but showing the door in slightly-opened position, so that the door and the parts carried thereby are shown in perspective;

FIG. 8 is a view similar to FIG. 4 but with the parts shown in the positions of FIG. 7;

FIG. 9 is an enlarged plan view of an upper actuator-guide assembly;

FIG. 10 is a section taken substantially on the line 10-10 of FIG. 9;

FIG. 11 is a perspective view of a lower rod guide assembly;

FIG. 12 is an enlarged section taken on the line 12-12 of FIG. 11;

FIG. 13 is a similarly enlarged section taken on the line 13-13 of FIG. 11;

FIG. 14 is a view similar to FIG. 1 but showing one of the doors equipped for flush lever actuation of its latch mechanism;

FIG. 15 is an enlarged vertical sectional view through the flush lever manipulating means of FIG. 14, showing the operative association of such means with an actuator rod assembly; and

FIG. 16 is a fragmental, horizontal section taken substantially on the line 16-16 of FIG. 15.

Referring more particularly to FIG. 1, it will be seen that I have illustrated a doorway or frame, indicated generally by the reference numeral 20 and comprising lintel means 21, sill means 22 which may or may not include a threshold (not shown) and opposite jamb means 23, 23. Doors 24 and 25 are respectively hinged to the jamb means 23, 23. The latch mechanisms for the two doors are identical, except for allochiral arrangement, and therefore only one has been illustrated, and will be described, in detail.

The illustrated embodiment of the present latch mechanism is shown in connection with a metal door comprising an outer wall 26 facing in door-opening direction and an inner wall 27 facing in a door-closing direction, said walls defining therebetween what may be considered as a mortise chamber 28. It will be apparent, of course, that the door 25 could be solid and provided with a mortise chamber cut into its free edge, or that the latch mechanism to be described could be carried on either exposed face of the door.

Fixed with respect to the lintel 21 is a latch bolt housing indicated generally by the reference numeral 29. As is most clearly illustrated in FIGS. 3, 4 and 8, said housing comprises a first member 30 which is U-shaped in horizontal section and comprises side walls 31 joined at their corresponding edges by a base 32. A second member 33, also U-shaped in horizontal section, comprises side walls 34 joined by a base 35, and said member 33 is proportioned to receive the member 30 telescopically to define a chamber or housing having opposed walls 32 and 35, said chamber being open at one end and being closed at its other end by a continuation 36 of the base 35, said continuation 36 being bent substantially at right angles to the base 35 as is most clearly shown in FIGS. 4 and 8. The closure 36 is formed with an opening 37 therein for a reason which will become apparent.

3

Near its lower end, the wall 35 is formed with a vertically-elongated slot 38 which is closed at both ends, for a reason which will become apparent. Screws or other equivalent fastening means 39 penetrate the side walls 34 and 31 of the elements 33 and 30 to maintain the housing assembly; and wings or flanges 40 (FIG. 3) are bent from the lower ends of the walls 34 to be suitably secured to the floor 41 of the lintel 21.

A latch bolt 42 is reciprocally received in the housing 29 and is formed at its lower or forward end with a nose 43, bevelled as at 44 on its outer surface, which is adapted, at times, to protrude significantly below the lower end of the housing 29. Adjacent its lower end, and in its outer surface, the latch bolt 42 is formed with a transversely elongated socket 45 in which is supported an axle 46 upon which a roller 47 is journaled. Similarly, near its rear end, but opening through its inner surface, the latch bolt 42 is formed with a transversely extending socket 48 in which is supported an axle 49 upon which a roller 50 is journaled. The parts are so proportioned and designed that, when the latch bolt 42 is received in the housing 29, the roller 47 bears against the wall 32 while the roller 50 bears against the wall 35. A transversely extending, rounded protuberance 51 is formed on the inner surface of the latch bolt opposite the roller 47 and a similar protuberance 52 is formed on the outer surface of said bolt opposite the roller 50. Thus, the latch bolt is firmly guided by the walls 32 and 35 for rectilinear reciprocation within the housing 29, with a minimum of friction.

In its rear end, the latch bolt 42 is formed with an axially extending socket 53 in which is received one end of a coiled spring 54, the other end of said spring being sleeved on a guide pin 55 whose rearmost end is supported in the opening 37. Thus, the latch bolt 42 is yieldably biased toward the projected position illustrated in FIG. 4, but may be moved, against the bias of the spring 54, to the retracted position illustrated in FIG. 8. A pin 56 is seated in the inner surface of the latch bolt and projects into the slot or guideway 33 so that projection of the latch bolt is limited by engagement of said pin with the lower closed end of the slot 38, and retractive movement of the latch bolt is limited by engagement of said pin with the upper end of said slot.

The inner wall 27 of the door 25 is formed with a notch 57, opening through the upper end of the door, to accommodate a detent 58 which, at the upper end of its inner surface, is bevelled as at 59. The position of the detent 58 is such that, as the door moves from open to closed position, the detent crosses the path of the latch bolt 42; and because of the bevelled surfaces 44 and 59 of the latch bolt and the detent, the latch bolt will be cammed to retracted position by such movement. In fully closed position of the door, the detent is located between the latch bolt and the outer plane of the jambs 23 so that the substantially vertical surface 60 of the latch bolt engages the substantially vertical surface 61 of the detent to hold the upper end of the door against opening movement. This condition is illustrated in FIG. 4.

Latch actuator means, indicated generally by the reference numeral 62, is shown in FIG. 2 in its normal position to which it is yieldably biased by gravity. Said latch actuator means comprises an upper rod 63, a turnbuckle 64 and a lower rod 65. The lower end of the upper rod 63 is threaded as at 66 for reception in a threaded, axial socket in the upper end of the turnbuckle 64. Intermediate its ends, the turnbuckle is formed with a transaxial opening 67; and in its lower end the turnbuckle is provided with an axially extending socket 68 which is penetrated by a transaxial slot 69, axially elongated and closed at both ends. The upper end of the lower rod 65 is reciprocally received in the socket 68 and carries a transaxial pin 70 which extends into the slot 69 to limit the degree of axial movement of the rod 65 relative to the turnbuckle 64, a spring 71 being confined within the

4

socket 68 to urge the rod 65 downwardly relative to said turnbuckle.

Suitable keeper means 72 is stationary relative to the sill 22 and, when the door is fully closed and the actuator 62 is in its normal position, the lower end of the rod 65 is engaged with the keeper 72 to retain the lower end of the door 25 against opening movement. It will be seen that the specific relationship between the turnbuckle 64 and the rod 65 automatically compensates for foreign matter which may accumulate in the keeper 72 or for slight variations in the relative positions of the door and sill which may arise after installation as a result of warping or wracking.

The lower end of the rod 65 is guided for reciprocation in a lower guide assembly indicated generally by the reference numeral 73 and illustrated in detail in FIGS. 11, 12 and 13. Such guide assembly comprises a plate 74 having a thickened portion 75, which is formed with a bore 76 which flares oppositely from its median portion 77. The median portion of the bore 76 is proportioned snugly to receive the rod 65. At a point closely adjacent the thickened plate portion 75, said plate is formed with a perforation 78, and spaced outwardly from said perforation is a tapped bore 79 for the reception of a fastening screw 80 whereby a leaf spring 81 is mounted on the plate. As is clearly shown, said spring penetrates the perforation 78 and, at its distal end, is formed to provide a curved toe 82 which, in the equilibrium condition of the spring, overlies the bore 76. Thus, when the rod 65 is mounted in the bore 76, the spring 81 will be flexed and the toe 82 will bear resiliently against said rod to minimize rattling.

At its end remote from the bore 76, the plate 74 is formed with a plurality of holes 83 for the accommodation of fastening means whereby said plate may be secured to the bottom surface of the bottom plate 84 of the door, said plate being formed with an opening therethrough penetrated by the thickened portion 75 and the spring 81.

The lower end portion of the upper rod 63 is guided in an upper guide assembly indicated generally by the reference numeral 85. Said assembly comprises a bracket 86 consisting of a vertical arm 87 which may be secured to the internal surface of the door wall 27 by rivets, screws or equivalent fastening means 88, and a horizontal arm 89 which is formed with a suitable opening 90 therethrough (FIG. 10). An annular cap 91 is secured to the upper surface of the bracket arm 89 by screws 92 or other equivalent fastening means, said cap being formed to provide an internal shoulder 93 spaced from and facing the bracket arm 89. An anti-friction bushing 94, which may preferably be formed of "Teflon," is confined between the bracket arm 89 and the shoulder 93 in registry with the opening 90, the internal surface of said bushing comprising a cylindrical portion 95 and an upwardly flaring portion 96. The portion 95 snugly receives the rod 63.

The top plate 97 (FIG. 3) of the door 25 is perforated to pass a U-shaped frame 99 whose side walls 104 and 105 are bent outwardly to provide wings or flanges 98, 98 which are suitably secured to the upper surface of said top plate 97. Guided in said frame 99 for reciprocation is a block 100 formed with an axial bore 101 sleeved upon the upper end of the rod 63 and adjustably held in position thereon by means of one or more set screws 102. As is most clearly shown in FIGS. 4 and 8, said block 100 is slightly offset, in a door-opening direction, from the detent 58 so that, when the door 25 is in fully closed position, said block is in registry with the latch bolt 42.

As is most clearly to be seen in FIG. 6, the inner ends of the arms 104 and 105 are seated in the notch 57 symmetrically with respect to the detent 58.

Vertically extending slots 106 and 107 are formed in the arms 104 and 105, respectively, and pins 108 and

5

109, fixedly carried by the block 100 and projecting in opposite directions therefrom, extending into, and are guided in, said slots. In its inner face, the block 100 is formed with a longitudinally extending channel 110 for a reason which will become apparent.

Fixedly mounted on the arms 104 and 105 respectively, are headed pins 111 and 112 projecting laterally oppositely from the frame 99. At their inner edges, the arms 104 and 105 are formed, respectively, with notches 113 and 114 for the accommodation of a retainer, indicated generally by the reference numeral 115.

The retainer 115 is U-shaped in horizontal section, comprising arms 116 and 117 joined by a base 118, and the retainer is so proportioned that, when its base is accommodated in the notches 113 and 114, its arms will straddle the frame 99. Near their outer ends, said retainer arms are formed with horizontally-elongated slots or guideways 119 and 120 through which the pins 111 and 112 respectively extend, whereby the retainer 115 is supported from the frame 99 for limited movement inwardly and outwardly relative to the door walls 26 and 27. Biasing means, indicated generally by the reference numeral 121, comprises a shell 122 fixed at its outer end to the retainer base 118, reciprocally extending through a bore 136 in the detent 58, and opening outwardly to accommodate a plunger 123 which, at its outer end, is formed as a rounded nose to ride in the channel 110 of the block 100. A spring 124 is sleeved on the shank of the plunger 123 and is confined within the shell 122, whereby the shell is yieldably biased to move in a door-closing direction and to carry with it the retainer 115.

The arms 116 and 117 of the retainer 115 are formed, respectively, with longitudinally extending slots or guideways 125 and 126 (FIG. 5) and at its upper end, each of said guideways is formed with a horizontal, outwardly extending branch 127 (FIG. 2). The pins 108 and 109 extend into said guideways 125 and 126, as is most clearly to be seen in FIG. 5.

An abutment 128 is carried on the lintel 21 in such a position as to be engaged by the shell 122 as the door 25 achieves fully closed position. It will be seen that, by engagement with such abutment, the shell 122 will be moved to the position of FIGS. 2 and 4, wherein the slots 125 and 126 will register with the pins 108 and 109 and, by gravity, the actuator means 62 will move downwardly to the position of FIG. 2.

Manually-manipulable means for moving the actuator means 62 is indicated generally by the reference numeral 129. In the illustrated form of the invention, such means comprises conventional panic exit mechanism comprising a housing 130 in which is reciprocally confined a plate 131 having an abutment 132 on its inner surface and having a finger 133 projecting from its outer surface and cooperatively received in the transaxial opening 67 through the turnbuckle 64. A panic lever 134 is pivotally mounted on the housing 130 and is provided with an actuating finger 135 within said housing which cooperatively engages the abutment 132. Thus, when pressure is exerted against the conventional panic bar fixed to the lever 134, the plate 131 and the finger 133 will be raised to lift the turnbuckle 64. The rod 65 will be entrained with the turnbuckle by means of the pin 70 so that its lower end will be withdrawn from the keeper 72. At the same time, the rod 63 will be elevated; and the block 100 is so positioned on the upper end of the rod 63 that such elevation will cause the upper end 103 of the block 100 to engage the nose of the latch bolt 42 and force said latch bolt upwardly against the tendency of the spring 54. As the nose of the latch bolt clears the upper end of the detent 58, the door 25 will start to move in an opening direction, whereby the shell 122 will be withdrawn from the abutment 128 and the spring 124 will urge said shell toward the right as viewed in FIG. 4. Such eleva-

6

tion of the block 100 will have moved the pins 108 and 109 into registry with the guideway branches 127, whereby the retainer 115 will have been released to move, under the influence of the spring 124, toward the right, whereby the retainer will achieve the position illustrated in FIG. 7 in which the pins 108 and 109 are disposed within the branches 127 of the guideways 125 and 126 and the actuator means 62 will thus be retained in elevated position.

As the door moves toward fully open position, the latch bolt nose 43 will drop off the upper end of the block 100 onto the upper surface of the detent 58 and then will slide down the bevelled surface 59 of said detent until, after the detent has moved wholly past the latch assembly 29, the latch bolt will again achieve fully projected position.

Of course, the actuating mechanism will be held in elevated position, whereby the lower end of the rod 65 will be held out of engagement with the floor, until the door is again closed. As the door moves toward closed position, the detent surface 59 will engage the latch bolt surface 44 to cam the latch bolt upwardly against the tendency of the spring 54; and the specific construction of the latch bolt and of its cooperative housing, as above described will restrict the latch bolt to truly rectilinear movement under the camming action of the detent. As the latch bolt nose comes into engagement with the top 103 of the block 100, the shell 122 will meet the abutment 128 and further door movement will drive the shell toward the left, relative to the detent 58 and the rod 63, to shift the retainer 115 toward the left relative to the frame 99 until, as the door achieves fully closed position, the vertical portions of the slots 125 and 126 will come into registry with the pins 108 and 109, permitting the actuator means 62 to drop, under the influence of gravity, into the position illustrated in FIG. 2. The lower end of the rod 65 will thus move into engagement with the keeper 72 and, as the block 100 moves downwardly, the latch bolt 42 will be projected by the spring 54 to the position of FIG. 4 in which its surface 60 retainingly engages the surface 61 of the detent 58.

Referring, now, to FIGS. 14 to 16, it will be seen that I have illustrated a doorway or frame 140 comprising a lintel 141, sill means 142 and jambs 143 upon which are hinged doors 144 and 145. In this instance, the door 145 is not provided with panic exit means, but instead is provided with a flush lever actuator for its latch means.

As shown, the free edge of the door 145 is formed to provide a recess 146 having a perforation 147 there-through. A flush plate 148 is suitably supported in the recess 146 and is formed with an opening 149 registering with the perforation 147. The plate 148 carries a pair of spaced ears 150 which project through the perforation 147 into the mortise chamber and support a pivot pin 151 upon which is journaled the yoked end 152 of a lever 153 whose distal end is operatively received in the transaxial opening 67' through a turnbuckle 64' which is connected between an upper rod 63' and a lower rod 65', analogous to the similarly-identified parts of the latch actuator above described.

Likewise journaled on the pin 151 is a bell crank lever 154, one arm 155 of which extends beneath, and into operative engagement with, the lever 153. The lever arm 155 is formed with a notch 156 with which is engaged one end of a coiled spring 157, the other end of which is secured to an anchorage 158 on the plate 148.

The other arm 159 of the bell crank lever 154 is so proportioned and designed that, when the parts are in their illustrated positions, said lever 159 lies flush with the outer surface of the plate 148. Near the distal end of the arm 159, the plate 148 is formed with a finger recess 160 for facilitating manipulation of the lever 159.

Obviously, when the lever 154 is manually swung in a counter-clockwise direction, the lever arm 155 will lift the distal end of the lever 153 to elevate the turnbuckle

64' and its associated parts. Whenever the lever arm 159 is released, the bell crank lever 154 will be returned to its illustrated position by the spring 157 but, since there is a one-way operative association between the lever arm 155 and the lever 153, such return of the lever 154 will not affect the lever 153 or the mechanism with which it is associated. However, when the door 145 returns to closed position, the above described operation will occur and the actuator means, including the turnbuckle 64' and the lever 153, will then be returned to the illustrated positions.

I claim as my invention:

1. In a latch mechanism, a movable latch bolt, a reciprocable actuator for said latch bolt, said actuator being yieldably biased toward one end of its stroke, frame means stationarily straddling a portion of said actuator and formed with a slot therein elongated in the direction of movement of said actuator, a pin fixed to said actuator and projecting therefrom through said slot, a further pin fixed to said frame means in spaced, substantial parallelism with said first-named pin, and a retainer formed with a guideway elongated in a direction transverse relative to the direction of movement of said actuator, said further pin being received in said guideway to support said retainer, said retainer further being formed with a further guideway elongated in the direction of movement of said actuator and having a branch generally parallel with said first-named guideway, said first-named pin extending into said further guideway, and said retainer being yieldably biased in a direction to cause entry of said first-named pin into said branch whenever said actuator is moved against its bias toward the opposite end of its stroke to bring said first-named pin into registry with said branch.

2. In a latch mechanism, a movable latch bolt, a reciprocable actuator for shifting said latch bolt between projected and retracted positions, said actuator being yieldably biased against movement toward latch-retracting position, a first projection extending transversely away from said actuator to move with said actuator, a second projection fixedly mounted adjacent the path of said actuator, and a retainer supported from said second projection and movable relative thereto in a direction transverse to the axis of said first projection, said retainer being formed with a guideway elongated in the direction of movement of said actuator and having a transverse branch elongated in the direction of movement of said retainer, said first projection extending into said guideway to register with said branch when said actuator is moved against its bias to latch-retracting position, and said retainer being yieldably biased to move said branch into retaining reception of said first projection whenever said branch registers with said first projection.

3. In a latch mechanism, a movable latch bolt, a reciprocable actuator for shifting said latch bolt between projected and retracted positions, said actuator being yieldably biased against movement toward latch-retracting position, pin means fixed to said actuator and projecting oppositely therefrom in directions transverse to the path of movement of said actuator, support means stationarily mounted at opposite sides of said actuator, and a generally U-shaped retainer having opposite arms joined by a base, each of said arms being formed to provide a guideway elongated in a direction transverse to the line of movement of said actuator and operatively receiving one of said support means so that said retainer is supported from said support means in straddling relation to said actuator and for limited movement transversely of the line of movement of said actuator, each of said arms likewise being formed with a further guideway elongated in the direction of movement of said actuator and having a branch elongated in a direction away from said base and transverse to the line of movement of said actuator, the oppositely-projecting portions of said pin means being received, respectively, in said further guide-

ways in such fashion that, when said actuator moves to latch-retracting position, said pin means registers with said guideway branches, said retainer being yieldably biased toward movement of said base away from said pin means so that, when said pin means registers with said guideway branches, said retainer will move to engage said pin means in said branches to retain said actuator latch-retracting position.

4. In a latch mechanism, a movable latch bolt, a reciprocable actuator for shifting said latch bolt between projected and retracted positions, said actuator being yieldably biased against movement toward latch-retracting position, pin means fixed to said actuator and projecting oppositely therefrom in directions transverse to the path of movement of said actuator, support means stationarily mounted at opposite sides of said actuator, a generally U-shaped retainer having opposite arms joined by a base, each of said arms being formed to provide a guideway elongated in a direction transverse to the line of movement of said actuator and operatively receiving one of said support means so that said retainer is supported from said support means in straddling relation to said actuator and for limited movement transversely of the line of movement of said actuator, each of said arms likewise being formed with a further guideway elongated in the direction of movement of said actuator and having a branch elongated in a direction away from said base and transverse to the line of movement of said actuator, the oppositely-projecting portions of said pin means being received, respectively, in said further guideways in such fashion that, when said actuator moves to latch-retracting position, said pin means registers with said guideway branches, and spring means confined between said actuator and said retainer and urging said base away from said pin means so that, when said pin means registers with said guideway branches, said retainer will move to engage said pin means in said branches to retain said actuator in latch-retracting position.

5. The latch mechanism of claim 4 in which said spring means comprises a plunger element and a receiver element arranged in telescopic association, and a spring confined between said elements, one of said elements being fixed to said retainer and the other of said elements bearing on said actuator.

6. The combination with a doorway having a sill and a lintel, and a door mounted to swing in said doorway between open position and closed position, said sill being provided with keeper means, of latch mechanism for said door comprising an actuator rod carried by said door and guided for substantially vertical reciprocation relative thereto, the lower end of said rod being retainingly engageable with said keeper means when said door is in closed position and said rod is in its lowermost position, housing means fixedly mounted at said lintel, a latch bolt guided in said housing means for movement between a downwardly-projected position in which a portion of said bolt is disposed below the lowermost end of said housing means, and an upwardly-retracted position, said latch bolt being yieldably biased toward its projected position, said door being provided with detent means at its upper edge which, as said door moves from open position to fully closed position, crosses the path of said latch bolt, the upper end of said actuator rod being offset from said detent means in a door-opening direction and being disposed, when said door is in fully closed position, in co-operative registry with said latch bolt, manually-manipulable means accessibly carried on at least one face of said door, means providing an operative connection between said manually-manipulable means and said actuator rod to lift said rod, thereby releasing said lower rod end from said keeper means and forcing said latch bolt to its retracted position, pin means fixed to said actuator and projecting oppositely therefrom in directions transverse to the path of movement of said actuator, support means stationarily mounted at opposite sides of

said actuator, a generally U-shaped retainer having opposite arms joined by a base, each of said arms being formed to provide a guideway elongated in a direction transverse to the line of movement of said actuator and operatively receiving one of said support means so that said retainer is supported from said support means in straddling relation to said actuator and for limited movement transversely of the line of movement of said actuator, each of said arms likewise being formed with a further guideway elongated in the direction of movement of said actuator and having a branch elongated in a direction away from said base and transverse to the line of movement of said actuator, the oppositely-projecting portions of said pin means being received, respectively, in said further guideways in such fashion that, when said actuator moves to latch-retracting position, said pin means registers with said guideway branches, a plunger element and a receiver element arranged in telescopic association, and a spring confined between said elements, one of said elements being fixed to said retainer and extending beyond that surface of said door which faces in a door-closing direction and the other of said elements bearing on said actuator, so that, when said pin means registers with said guideway branches, said retainer will move to engage said pin means in said branches to retain said actuator in latch-retracting position, and abutment means fixedly mounted at said doorway and engaged by said one element as said door attains fully-closed position to shift said retainer base toward said pin means to disengage said pin means from said guideway branches.

7. A latch assembly comprising a case open at one end, closed at its opposite end and having opposed walls extending from its closed end to its open end, one of said walls being formed with a guideway closed at both ends and elongated in an endwise direction, a latch bolt reciprocably mounted in said case and having a bevelled nose at its forward end disposed adjacent said open case end and a rear end formed with a longitudinally extending socket, a roller journalled in said bolt upon a transverse axis near its forward end and bearing on one of said walls, a roller journalled in said bolt upon a transverse axis near its rear end and bearing on the other of said walls, a coiled spring having one end received in said socket, pin means mounted at the closed end of said case and having a portion telescopically received in the other end of said spring, and a projection fixed with respect to said bolt and guidingly received in said guideway.

8. The latch assembly of claim 7 in which said bolt is provided adjacent its nose with a transversely-extending, rounded protuberance bearing on the other of said walls, and is provided adjacent its rear end with a transversely-extending, rounded protuberance bearing on said one wall.

9. The latch assembly of claim 7 in which said case comprises a first element, U-shaped in transverse section with its base constituting one of said opposed walls, and a second element, U-shaped in transverse section with its base constituting the other of said opposed walls and with a continuation of its base bent at right angles to constitute said closed end.

10. For use with a door having latch means including an actuator rod mounted for reciprocation relative to said door, a guide for such a rod comprising bracket means including a first arm adapted to be secured to a surface of such a door and a second arm angularly related to said first arm and formed with an opening therethrough sized to pass such a rod, an annular cap, means for securing said cap to said second bracket arm in registry with said opening, said cap being formed with an internal shoulder spaced from and facing said second bracket arm, and an

anti-friction bushing confined between said second bracket arm and said shoulder, said bushing being sized, closely adjacent said second bracket arm, snugly to receive such a rod, and internally flaring away from said second bracket arm.

11. For use with a door having latch means including an actuator rod mounted for reciprocation relative to said door, a guide for such a rod comprising support means adapted to project from a surface of said door, an annular cap, means removably securing said cap to said support means, said cap being formed with an internal shoulder spaced from and facing said support means, and an anti-friction bushing confined between said support means and said shoulder, said bushing being sized, adjacent one end snugly to receive such a rod, and internally flaring toward its opposite end.

12. For use with a door having a latch actuator rod mounted for vertical reciprocation relative to said door and projectible below the bottom of said door for cooperation with external keeper means, guide means for the lower end of such a rod comprising a plate, means for securing said plate to the bottom of such a door, said plate being provided with a bearing passage flaring oppositely from its median region and medially sized snugly to receive such a rod, and a leaf spring carried by said plate, projecting upwardly therefrom to bear resiliently, near its distal end, on that surface of such a rod which faces in a door-closing direction.

13. The combination with a doorway having a sill and a lintel, said sill being provided with keeper means, and a door mounted to swing in said doorway between open and closed positions, said door having a mortise chamber in its free vertical edge, of latch mechanism for said door comprising an actuator rod mounted in said chamber and guided for substantially vertical reciprocation therein, the lower end of said rod being retainingly engageable with said keeper means when said door is in closed position and said rod is in its lowermost position, housing means fixedly mounted at said lintel, a latch bolt guided in said housing means for movement between a downwardly-projected position in which a portion of said bolt is disposed below the lowermost end of said housing means, and an upwardly-retracted position, said latch bolt being yieldably biased toward its projected position, said door being provided with detent means at its upper edge which, as said door moves from open position to fully closed position, crosses the path of said latch bolt, the upper end of said actuator rod being offset from said detent means in a door-opening direction and being disposed, when said door is in fully closed position, in cooperative registry with said latch bolt, a flush plate at least partially closing said chamber, and having a vertical socket in its outer surface, a bell crank lever pivotally mounted on and penetrating said flush plate, one arm of said lever being movable between a position lying wholly within said socket and flush with the outer surface of said plate, and a position projecting angularly outwardly from said plate surface, the other arm of said lever being disposed within said chamber, spring means urging said lever toward said first-named position, and means providing a one-way operative connection between said other lever arm and said rod so that, as said one lever arm is moved from its first-named position toward its second-named position, said rod will be lifted.

References Cited in the file of this patent

UNITED STATES PATENTS

1,145,590	Hurd	July 6, 1915
1,844,767	Kelly	Feb. 9, 1932
2,910,857	Muessel	Nov. 3, 1959