June 27, 1961 R. P. MILLER 2,990,208

LATCH ASSEMBLY FOR CLOSURES

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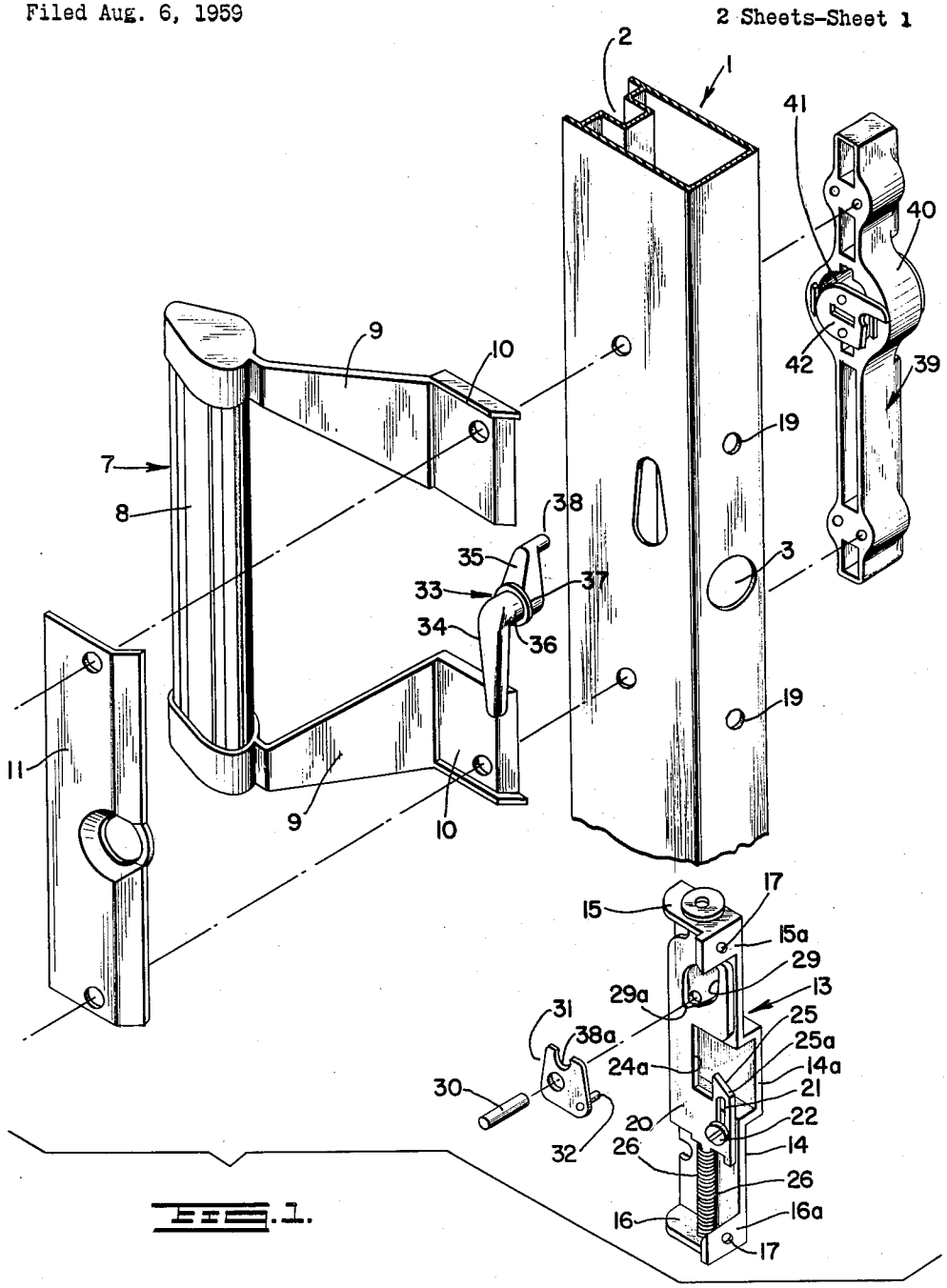


FIG. 1.

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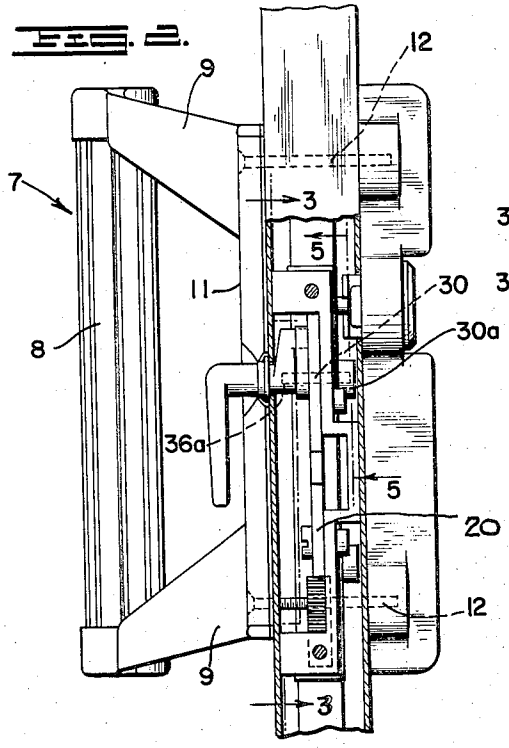
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Fig. 2.



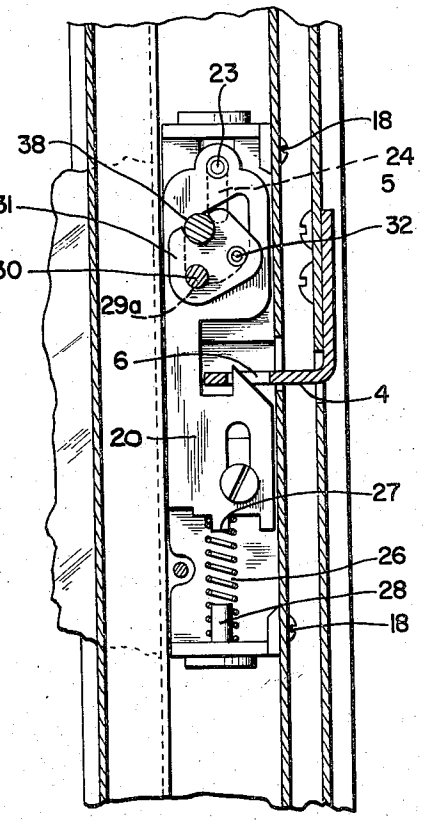


Fig. 4.

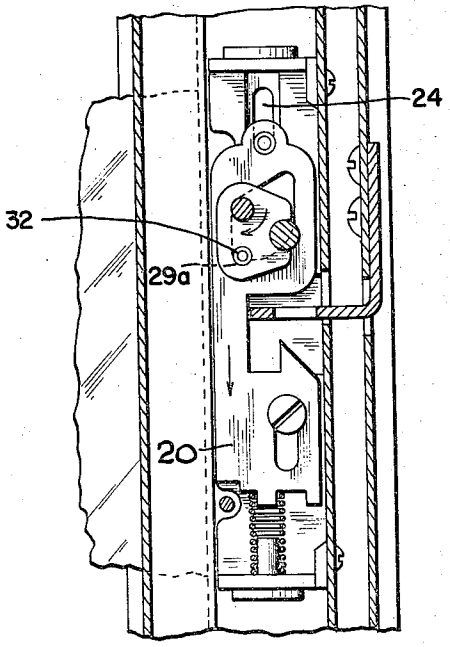


Fig. 3.

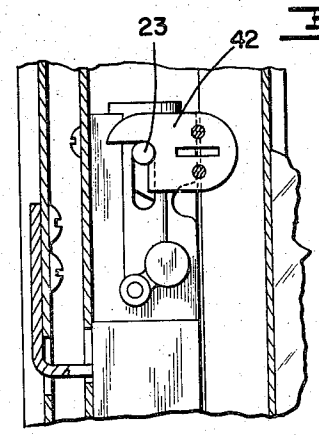


Fig. 5.

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LATCH ASSEMBLY FOR CLOSURES

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The present invention relates to a latch assembly of the general type in which a bolt is mounted for reciprocating movement and has a hook-shaped portion for latching engagement with a companion keeper on a door jamb to maintain the closure in fastened condition.

An important object of the invention is to provide a latch assembly of the above character which is so simple and compact in construction as to be readily assembled and mounted as a unit in a relatively restricted space, such for example as in a narrow stile of a door or window frame of the type that is commonly made of extruded metal.

Another object of the invention is to provide a latch assembly of the above character in which the components of the assembly are reversible so that the assembly may be mounted upon the closure for either right-handed or left-handed orientation, as circumstances may require.

Still another object of the invention is to provide a closure assembly of the above character in which the latch-operating mechanism will automatically maintain the latch in hold-open position when the operating handle is rotated to latch releasing position, thereby rendering the latch ineffective for latching the closure.

Yet another object of the invention is to provide a latch assembly for closures of the above character in which the bolt comprises a slidable plate, with a spring normally urging the plate to latching position, and an operating handle for retracting the plate against the action of the spring, the construction and arrangement being such that the increase in spring pressure resulting from turning the handle to release position is compensated for by an increase in effective lever arm as the handle is rotated.

foolproof, long lasting and dependable, easy to operate, vide a latch for closures which is simple in construction, foolprof, long lasting and dependable, easy to operate, easy to install, easy to repair, compact, reversible for installation in various manners, and otherwise well adapted for the purposes for which the latch is intended, and which is generally inexpensive to manufacture.

The foregoing and other objectives, advantages, and features of construction will become apparent from a consideration of the following detailed description and when considered in connection with the accompanying drawings, in which:

FIGURE 1 is an exploded, group perspective view of the components of a latch assembly for a sliding door and illustrating the components thereof in separated relation;

FIGURE 2 is an edge view of the latch assembly, illustrating the latch installed in a door stile with the edge of the stile removed to show the relationship of the parts of the latch;

FIGURE 3 is a vertical sectional view taken substantially upon a plane along line 3—3 of FIGURE 2 illustrating the relationship of the latch assembly to the keeper, and illustrating structural details of the operating mechanism for the latch;

FIGURE 4 is a view similar to FIGURE 3, but illustrating the bolt in its released hold-open position; and

FIGURE 5 is a detailed sectional view taken substantially upon a plane passing along a line 5—5 of the latch assembly of FIGURE 2, and illustrating the manner in which the bolt is operated by a key-operated lock.

The latch assembly illustrated in the drawings is adapted to be mounted upon a stile 1 forming part of a frame of

a sliding glass door. The stile is made of extruded aluminum and is of comparatively narrow width, being formed along its inner edge with a channel 2 for holding a pane of glass (not shown). The outer or jamb-engaging edge of the stile is provided with an enlarged opening 3 for receiving a horizontally-projecting leg of an L-shaped keeper 4 secured to a door jamb 5, and at its outer end the keeper is provided with an aperture 6 for engagement with the bolt of the latch assembly, as will later be described.

As viewed in FIG. 1, the stile 1 is provided with a door handle 7 including a hand-grip 8 and a pair of inclined parallel supporting legs 9 having flattened ends 10 that are attached to the side wall of the stile that faces inside the room. A supporting plate 11 overlies the side wall and extends between and rests upon the flattened ends 10 of the legs, the handle and plate being secured to the stile by fasteners 12 (FIG. 2) passing through suitably provided openings in the flattened ends 10 of the legs and the two opposite side walls of the stile.

Located within the stile and intermediate its two side walls is a latch assembly generally designated by the numeral 13. This assembly includes a mounting plate 14 having a laterally offset portion 14*a* approximately midway of its length providing a gap in line with the aperture 3 in the edge of the stile. The opposite ends of the mounting plate are formed with upstanding flanges 15 and 16 disposed parallel with each other, and these flanges are formed with side extensions 15*a* and 16*a* respectively, both skirting a lateral edge of the mounting plate. The extensions 15*a* and 16*a* abut the inner face of the edge of the stile and have threaded openings 17 by which the latch assembly is secured to the stile by screws 18 (FIGS. 3 and 4) which latter pass through openings 19 in the edge of the stile. As will be apparent from FIGS. 1 and 2, the offset portion 14*a* of the mounting plate abuts one side wall of the stile while the edges of the extensions 15*a* and 16*a* of the flanges 15 and 16 abut the opposite side wall of the stile. The latch assembly is thus firmly and snugly confined and concealed within the narrow space between the opposite side walls of the stile.

Slidable on the mounting plate 14 in bridging relation to the gap defined by the offset portion 14*a* is a latching member, or bolt 20. The bolt is in the form of a flat plate having adjacent one end a guide slot 21 disposed parallel to the side edges of the bolt in which slot is received a headed pin 22 secured to and projecting up from the surface of the mounting plate 14. The other end of the bolt is provided with a pin 23 which projects into a guide slot 24 in the mounting plate and which slot is parallel to the slot 21. By virtue of the two guide pins 22 and 23 traveling in their slots the bolt is guided in a longitudinal direction.

The edge of the bolt facing the opening 3 in the edge of the stile is formed as an enlarged notch 24*a* in the vicinity of the offset 14*a* having an upstanding, hook-shaped projection 25 with an inclined surface 25*a* leading from the outer edge to the inner edge of the projection. This inclined surface acts as a cam which, upon closing the door, engages the keeper 4 and causes the bolt to be moved downwardly against the action of a coiled compression spring 26, interposed between the lower end of the bolt and the flange 16 on the mounting plate 14, whereupon the compression spring urges the hook 25 upwardly into the aperture 6 of the keeper to fasten the door. For maintaining the coil spring against buckling, a tail-piece 27 integral with the lower end of the bolt projects downwardly into the upper end of the spring coil, while a pin 28 secured to the flange 16, projects upwardly into the lower end of the coil.

At an elevation above the notch 24*a* the bolt is formed with an enlarged cam-track opening 29 generally in the

shape of a slanted parallelogram with rounded corners, two sides of the parallelogram extending approximately parallel to the direction of length of the slots **21** and **24** and the two other sides of the parallelogram being inclined with respect to lines drawn at right angles to the direction of length of such slots. A pin **30** removably inserted in a socket **30***a* in the mounting plate **14** projects through the cam-track opening **29** and serves as a pivot for a bolt-actuating plate **31** adapted to overlie the bolt. The bolt-actuating plate **31** carries a projection in the form of a cam-engaging pin **32** extending from one surface thereof into the cam-track opening **29** and arranged to bear against and travel along the edge of the opening when the bolt-actuating plate **21** is rotated.

For rotating the bolt-actuating plate **31** there is provided a finger-operated handle **33**. The handle **33** comprises two longitudinal, offset arms, one arm constituting a finger grip **34** and the other arm a crank lever **35**, the two arms being intermediately connected by an offset portion **36** encircled by an annular flange **37**. The offset portion **36** passes through suitably provided openings in the supporting plate **11** and a side wall of the stile **1** and is bored axially to define a centering socket **36***a* into which fits an extended end of the pivot pin **30**. The offset portion has its circumferential flange **37** snugly retained between the supporting plate **11** and the stile **1** in such manner that the handle **33** is free to turn in response to pressure exerted upon the finger grip **34** but is held in association with the stile by means of the supporting plate. At the outer end of the crank lever **35** there is a laterally-projecting cylindrical lug **38** which engages a semi-circular notch **38***a* on the perimeter of the bolt-actuating plate **31**.

It will thus be apparent, that by turning the finger-operated handle **33**, the lug **38** rotates the bolt-actuating plate **31**, which, in turn, causes the pin **32** to follow the cam-track defined by the perimeter of the opening **29** in the bolt, while the bolt under the constant urge of the spring **26** maintains the edge of the cam opening in engagement with the pin **32**. The path traversed by the pin **32** during retraction of the bolt against the action of the spring is in a direction generally vertically along one edge of the opening **29** and thence in a direction inclined downwardly and inwardly along an adjacent edge of the opening until it reaches a position approximately in line (but which may be slightly over-center) with respect to the pivot pin **30**. That is to say, the pin **32** finally comes to rest abutting a vertical edge of the cam-track opening which arrests further turning movement of the handle **33**, at which time a line connecting the pivot pin **30** with the cam-engaging pin **32** will lie parallel to the two guide slots **21** or **24** for the bolt.

In order to maintain the bolt fully retracted even when pressure is relieved from the finger-operated handle **33**, the cam-track opening **29** is formed with a slight depression **29***a* at the terminal position occupied by the cam-engaging pin **32** so that the pin **32** at the end of its travel rides into this depression and is impositively held against accidental reversal by virtue of the thrust of the spring **26** upon the bolt **20**. This is an advantageous feature since under conditions where the door is frequently being opened and closed it is desirable that it be left unlatched to avoid the annoyance of having to repeatedly release the latch every time the door is opened. Only a slight finger pressure is required to be imparted to the handle **33** to swing the pin **32** out of the depression **29***a* and allow the spring **26** to move the bolt the rest of the way to latched position.

On the side wall of the stile **1** opposite the side wall on which is carried the door handle **7**, is mounted a lock designated generally by the reference numeral **39**. The lock comprises a casing **40** housing a key-operated lock mechanism (not shown) of any suitable type. The lock includes a barrel **41** rotatably mounted in the casing the outer end of which is adapted to receive a key; the other end projects through an opening in a side wall of the stile into the vicinity of the latch assembly. The projecting end of the barrel is provided with a laterally-extending finger **42** (see FIG. 5) which, when the barrel is rotated, is oscillated up or down. When the finger swings down it abuts an end of the guide pin **23** which protrudes through and beyond the guide slot **24** in the mounting plate **14** and the finger thus depresses the bolt against the thrust of spring **26** to release the latch. When the barrel is rotated in the opposite direction, the finger allows the bolt to rise under the action of the spring to engage the bolt with the keeper.

In operation, the bolt **20** is normally in projected position under the thrust of spring **26** with the hooked-shaped projection **25** thereof engaging the keeper **4** for preventing the door from being opened. When the door is to be opened the finger-operated handle **33** is turned and the pin **32** travels clockwise down the incline of the cam-track opening **29** and forces the bolt downwardly so that the hook-shaped projection **25** disengages from the keeper.

When the cam pin **32** reaches the bottom of the cam track formed by the edge of the opening **29**, it will enter the depression **29***a* where the thrust of spring **26** against the bolt will retain the pin in the depression, thus holding the latch in released position, as illustrated in FIGURE 4. By exerting only a slight pressure on the handle **33**, this position may be overcome, permitting the bolt to return to a normal, projected latching position.

The reciprocating action of the bolt enables the entire assembly to be arranged in a compact manner for insertion into and attachment to a relatively narrow door stile. Further, the increasing force necessary to compress the spring **26** as the handle is turned to release position is compensated for by eccentric pivotal movement of the bolt-actuating plate **31** relative to the axis of pivotal movement of the handle, which will have the effect of increasing the lever arm acting on the bolt.

While this invention has been described in a specific form and as operating in a specific manner for the purpose of illustration, it is to be understood that the invention is not limited thereto, since various modifications will suggest themselves to those skilled in the art without departing from the spirit of the inventions as set forth in the following claims.

I claim:

1. A latch assembly for sliding closures having a hollow stile provided with an opening in its jamb-engaging edge adapted to pass a keeper projecting laterally from the jamb, said latch assembly comprising a mounting plate housed between the side walls of the stile, a bolt guided for reciprocating movement upon the mounting plate and having a hook-shaped latch disposed upon one edge thereof, a spring biasing the bolt in a direction for effecting engagement of the latch with the keeper, a finger-operated handle pivotally mounted in a wall of the stile including a finger grip located exteriorly of the stile and a crank arm located interiorly of the stile, a bolt-actuating member pivotally mounted in overlying relation to the bolt, the pivotal movement of the bolt-actuating member being eccentric with reference to the axis of rotation of the handle, means connecting the crank arm and bolt-actuating member for transmitting turning movement therebetween, an opening in the bolt having its edges defining a cam track, a portion of said cam track extending generally parallel to the direction of reciprocation of the bolt and having a connecting cam track portion extending generally at an inclined angle to such direction, and a projection extending from the bolt-actuating member into the cam opening and engaging the cam track under the urge of the biasing spring, whereby upon rotation of the handle the bolt-actuating member is rotated to move the projection in a path eccentric to the axis of pivotal movement of the handle and retract the bolt against the thrust of the spring to latch-releasing position.

2. A latch assembly as set forth in claim 1 wherein the cam track opening has two side edges approximately parallel to the direction of reciprocation of the bolt and a connecting edge inclined with respect to a line at right-angles to said direction of reciprocation.

3. A latch assembly as set forth in claim 1 wherein the cam track opening is of the general shape of a slanted parallelogram having two side edges approximately parallel to the direction of reciprocation of the bolt and a connecting edge inclined with respect to a line at right-angles to said direction of reciprocation.

4. A latch assembly as set forth in claim 1 wherein the cam track opening is provided with a depression for retaining the projection against accidental displacement when the bolt is moved to retracted latch-releasing position.

5. A latch assembly as set forth in claim 1 wherein the bolt is of the form of a flat plate slidable upon the mounting plate, and the mounting plate is laterally offset intermediate its length and in the vicinity of the hooked-shaped latch to provide a gap for receiving the keeper.

6. A latch assembly for slidable closures, comprising a mounting plate secured to such a closure, a bolt mounted slidably on the mounting plate and guided for straight line reciprocation thereon between a projected latching position and a retracted unlatching position, a spring interconnecting the bolt with the mounting plate and normally thrusting the bolt towards its projected latching position, an operating lever mounted rotatably adjacent to the mounting plate and having a crank arm projecting radially therefrom, a bolt-actuating link mounted pivotally on the mounting plate in engagement with the projecting outer end of the crank arm for eccentric pivotal movement with respect to the operating lever, said bolt having an interior opening defining a cam track which is in camming engagement with the bolt-actuating link, and said cam track having a straight portion extending generally parallel to the direction of straight line reciprocation of the bolt and having a connecting portion extending at an inclined angle with respect to said straight line direction, whereby the eccentric pivotal movement of the bolt-actuating link first along

the straight portion of the cam track and thence along the inclined portion thereof during movement of its operating lever to retract the bolt against the thrust of the spring provides increasing leverage to compensate for the increasing thrust of the spring as the bolt approaches its fully retracted position.

7. A latch assembly for slidable closures, comprising a mounting plate secured to such a closure, a bolt mounted slidably on the mounting plate and guided for straight line reciprocation thereon between a projected latching position and a retracted unlatching position, a spring interconnecting the bolt with the mounting plate and normally thrusting the bolt towards its projected latching position, a pivot pin mounted on the mounting plate, an operating lever mounted rotatably on the pivot pin and having a crank arm projecting radially therefrom, a bolt-actuating link eccentrically mounted pivotally on the pivot pin and in engagement with the projecting outer end of the crank arm, said bolt having an interior opening defining a cam track including a straight portion extending generally parallel to the direction of straight line reciprocation of the bolt and a connecting inclined portion extending at an angle with respect to said straight line direction, and a cam pin projecting from the bolt-actuating link into camming engagement with the cam track, whereby during movement of the operating lever to retract the bolt against the thrust of the spring the eccentric pivotal movement of the bolt-actuating link carries the cam pin first along the straight portion of the cam track and thence along the inclined portion thereof to provide increasing leverage compensating for the increasing thrust of the spring as the bolt approaches its fully retracted position.

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