The present invention relates to a novel screen door latch and lock assembly in which the latch bolt may be locked from the inside and, when locked, the outer knob is prevented from turning and retracting the latch bolt except upon inserting and turning of the proper key and thereby unlocking the latch bolt, after which turning of the knob causes the latch bolt to be retracted and the door may be opened to gain entry.

Among the objects of the present invention is the provision of a novel latch and lock combination for a screen door and the like, including novel means for locking the latch bolt from the interior and in which access may be had from the outside only by one having a proper key for unlocking the latch bolt and permitting its retraction.

A further object of the present invention is the provision of a novel locking mechanism for a latch construction for screen doors and the like, comprising a manually-operable locking member for locking the latch bolt against retraction from the outside except by the insertion and turning of the proper key to release the locking member, after which the latch bolt may be retracted by turning the knob or handle at the exterior of the door. In this novel assembly, the screen door may also be locked from the outside upon one leaving the premises to prevent unlawful entry while the premises are unoccupied.

In the disclosed embodiment, the novel latch and lock assembly comprises a knob assembly mounted at the exterior of the door and provided with a key-actuated lock, a latch assembly mounted at the interior of the door and provided with a spring-loaded latch bolt, and novel means for locking the latch bolt in its latched position with said locking means being released from the outside only by the insertion and turning of this key in the lock, the turning of this key rotating a cam shaft and locking cam to release the locking means after which the latch bolt may be retracted by turning of the knob.

Further objects are to provide a construction of maximum simplicity, efficiency, economy and ease of assembly and operation, and such further objects, advantages and capabilities as will later more fully appear and are inherently possessed thereby.

In the drawings:

Figure 1 is a view in front elevation of the knob assembly mounted at the exterior of a screen door and the like and showing in dotted outline the position of the housing at the interior of the door.

Fig. 2 is a top plan view of the combined latch construction applied to the door, including the knob and lock assembly at the exterior of the door, and the latch assembly with its locking means and operating handle at the interior of the door.

Fig. 3 is a view in front elevation of the latch assembly mounted at the interior of the door and showing its operating handle and the locking means in inoperative position.

Fig. 4 is a view in horizontal cross section taken in a plane represented by the line 4—4 of Fig. 1 and viewed in the direction of the arrows.

Fig. 5 is a fragmentary view in vertical cross section taken in a plane represented by the line 5—5 of Fig. 1.

Fig. 6 is a view in rear elevation of the latch assembly detached from the door and viewed on the line 6—6 of Fig. 2.

Fig. 7 is a view in horizontal cross section through the latch assembly taken in a plane represented by the line 7—7 of Fig. 2 when viewed in the direction of the arrows, but with the housing shown in rear elevation.

Fig. 8 is a view in rear elevation of the escutcheon and associated parts of the outer knob assembly and viewed on the line 8—8 of Fig. 5.

Fig. 9 is a view in vertical cross section through the inner housing when viewed on substantially the line 9—9 of Fig. 2 but with the housing shown in rear elevation.

Fig. 10 is a fragmentary enlarged view of the rear of the latch bolt housing but with parts removed to show the locking plate projected to locking position.

Fig. 11 is a view in rear elevation of the locking plate of Fig. 10 with the associated locking cam and its locking shaft rotated in the channel of the U-shaped shaft or spindle to unlocked position.

Fig. 12 is a view in end elevation of the locking plate of Fig. 11.

Fig. 13 is an enlarged view in rear elevation of the latching bolt.

Fig. 14 is a view in horizontal cross section through the latching bolt, the view being taken on approximately the line 14—14 of Fig. 13 and viewed in the direction of the arrows.

Fig. 15 is a view in end elevation of the assembled cam shaft and locking cam viewed from the outer end of this shaft.

Fig. 16 is a top plan view of the cam shaft and locking cam of Fig. 15.

Referring more particularly to the disclosure in the drawings and to the novel illustrative embodiment therein selected to illustrate the present invention, the novel latch construction comprises a knob assembly 10 mounted at the exterior of a closure or screen door 11, a latch assembly 12 mounted at the interior of the door and a strike 13 mounted on a stop 14 on side of a door frame 15 for retaining the door closed when in locking position.

The knob assembly at the exterior of the door comprises an outer knob 16 formed as a hollow casting with the knob encased by a cover or shell 17 and provided with a recess 18 receiving a tumbler lock 19 operable by a key 21, and a shank 22 having its inner end received and rotatable in a collar 23 on the exterior of a substantially rectangular escutcheon 24. As shown more clearly in Figs. 4, 5 and 8, the escutcheon 24 houses an escutcheon plate 25 having an elevated portion 26 through which projects the inner end of the shank 22, and a split retaining ring 27 retaining the reduced end 28 of the shank within the escutcheon and the escutcheon plate but permitting the shank and its knob to be rotated relative thereto.

The escutcheon plate 25 is conformably received within the escutcheon 24 and retained therein by detents 29 in each of the longitudinally extending sides of the escutcheon and these detents each overlying an indentation 31 at the corners of the opposite ends 32 of the escutcheon plate 25. Each of these ends 32 is provided with an offset and a laterally projecting and internally threaded sleeve or stud 33 for receiving an anchoring screw 34 projected through one of the countersunk openings 35 in the opposite ends 36 of a housing 37 for the latch assembly 12.

The housing 37 is provided with a centrally arranged
3 raised portion 38 conformably receiving and slidably mounting therein a latch bolt 39 the details of which are shown more clearly in Figs. 13 and 14. This latch bolt 39 is provided with a long oblong elliptical slot 41 through a substantially U-shaped peripheral flange 42 provided with spaced transverse shoulds 43 and a ledge 44 projecting to the inclined latching end 45 of the latch bolt 39. The flanged inner end of the latch bolt is also provided with a recess 46 adapted to receive a coil spring 47 for biasing and projecting the latch bolt to an extended position and latching engagement with the strike 13. This spring seats at one end against a wall 48 on the latch bolt and at its opposite end against an end wall 49 of the housing 37.

The latch assembly 12 mounted at the interior of the door 11 includes a handle 51 to which is affixed or formed integral a substantially U-shaped or channelled operating shaft 52 projecting through the housing 37, through the elliptical slot 41 in the latch bolt 39 and the associated parts, through an opening in the door and conformably received in a polygonal opening 53 in the shank 22 of the outer knob 16 whereby rotation of the handle 51 and its shaft 52 also rotates the outer knob 16 for retraction of the latch bolt 39 except when the latter is locked in position by a locking plate 54. To retract the spring-biased latch bolt 39 from its latching position by rotation of the shaft 52 through rotation of the handle 51 in its neutral normal or horizontal position shown in Figs. 2 and 3, there is provided a cam member 55 disposed upon the ledge 44 of the latch bolt and provided with laterally projecting and oppositely disposed wings 56 engaging the shoulders 43 of the cam member 55, as shown particularly in Fig. 9, is provided with a substantially U-shaped slot 57 through which projects the shaft 52 whereby this cam member upon rotation of the shaft causes either of its laterally projecting wings 56 to engage against a shoulder 43 on the latch bolt to retract the latter against the coil spring 47. Disposed adjacent to but spaced from the cam member 55 and the flange 42 of the latch bolt 39 is the locking plate 54 shown more particularly in Figs. 10, 11 and 12. The inner end of this locking plate is provided with spaced arms or bifurcation 58 and 59, a laterally projecting slot 61 and a longitudinally extending slot 62 which conformably receives the shaft 52 when the locking plate is moved inwardly to locking position as shown in Fig. 10. At its outer end this locking plate is provided with a lip or tongue 63 whereby it may be pushed inwardly to locking position or pulled outwardly to unlocking position as shown in Figs. 6 and 7. Intermediate its length and outwardly of the arms 58 and 59 the locking plate is reduced in width at 64 and on each of its longitudinal edges provided with an inwardly formed lip or projection 70 and an adjacent thereto provided with an opening 66 and an outwardly formed lip 67. An inwardly formed lip or projection 70 is also provided on the outer marginal edge of each bifurcation 58 and 59.

Positioned within the channel of the U-shaped shaft 52 is a cam shaft 68 having its one end flattened at 69 (Figs. 4, 15 and 16) and at its other end provided with a locking cam 71 having a projection or offset 72. This locking cam is preferably welded or otherwise rigidly affixed to the cam shaft and rotates therewith. As the cam shaft is rounded throughout the greater portion of its length, it is capable of rotating within the channel of the shaft 52, with the projecting end 72 of the locking cam conformably received in a U-shaped slot 73 in the U-shaped shaft 52 and capable of movement therein from the locking position of Fig. 10 to the unlocked position of the locking plate 54 of Fig. 11.

The flattened end 69 of the cam shaft 68 is conformably received in a longitudinal slot 74 in the inner end of the knob 16. This slot is withdrawn to its inoperative position, the knob 16 may be rotated in either direction to rotate the shaft 52 and thereby retract the latch bolt 39. In the event the locking plate is moved to locking position as in Fig. 10, the shaft cannot be rotated by turning the knob 16, but the locking plate 54 is rotated to unlocked position and this can only be effected by inserting and turning of the proper key to effect turning of the cam shaft 68 through turning of the tumblers lock 19. This turning of the cam shaft 68 carries with it the locking cam 71, the end 72 of which retracts the locking plate 54.

In contact with the adjacent surface of the locking plate 54 is a cup washer or member 75 (Figs. 4, 5, 6 and 7) having an elevated hub 76, oppositely disposed and outwardly projecting arcuate flanges 77 on its periphery, and a radial projection 78 having an outwardly projecting arcuate flange 79 on the outer end of this projection. The hub 76 of this cup member is provided with a substantially U-shaped slot 80 which conformably receives and through which projects the operating shaft 52 whereby rotation of this shaft carries therewith the cup member 75. A coil centering spring 81 encompasses the hub 76 and has its opposite ends engaging over an end anchored onto the ends of the arcuate flange 79 for returning the shaft 52 to its normal latching position.

When the locking plate 54 is moved inwardly into locking position, the arcuate flange 79 and the ends 82 of the centering spring 81 are conformably received between the flanges 62 of the locking plate 54 whereby the cam member 75 and the operating shaft 52 are held by the locking plate 54 against rotation when the latter is moved to locking position. When the locking plate 54 is retracted, the cup member 75 and the operating shaft 52 are free to rotate upon turning of either the outer knob 16 or the inner handle 51 in either direction whereupon a wing 56 of the cam member 55 engages one of the shoulders 43 of the latch bolt 39, depending upon whether the knob or handle is turned in a clockwise or counterclockwise direction, and retracts the latch bolt.

Forming a closure for the rear of the above assembly in the housing 37 is a back plate 83 (Figs. 4 and 6) provided with a substantially channel-shaped friction spring 84 with each of its legs having an arcuate detent 85 projecting through a recess in an end wall 86 of the back plate (Fig. 10) and adapted to engage either edge of one of the marginal lips or projections 70 on the bifurcations 58 and 59. This back plate 83 is provided with an elevated portion 88 the opposite end walls 86 of which carry the spring 84 and longitudinal extensions 89, the elevated portion having a circular opening receiving and being shown in Figs. 6 and 7. Intermediate its length and outwardly of the arms 58 and 59 the locking plate is reduced in width at 64 and on each of its longitudinal edges provided with an inwardly formed lip 65, and adjacent thereto provided with an opening 66 and an outwardly formed lip 67. An inwardly formed lip or projection 70 is also provided on the outer marginal edge of each bifurcation 58 and 59.

The back plate 83 as shown in Fig. 6 is provided with a recess 92, an inturnd lip 93 projecting into the recess and an inturnd lip 94 at the end thereof to close the slotted end wall 95 of the housing 37 through which projects and is slidable movable the reduced outer end 64 of the locking plate 54.

The latch bolt 39 is spring-biased to latching position by the coil spring 47, while the operating shaft 52 and its handle 51 and the knob 16 are returned to their normal position (Figs. 4, 5, 6 and 7) by the centering spring 81 on the cup member 75, the latter being rotated with the shaft 52 when the unlocked handle 51 or the knob
When the shaft 52 is turned, the cup member 75 rotates therewith with one end 82 of its centering spring 81 being carried with the arcuate flange 79 on this cup member and the other end of the centering spring being held by its contact with the inwardly projecting lug 93 on the back plate 83.

When the locking plate 54 is pushed inwardly to locking position, the operating shaft 52 is conformably disposed within the slot 62 of this locking plate and the radial projection 78 of the cup member 75 with its arcuate flange 79 and the ends 82 of the centering spring 81 are then disposed between the spaced projecting lugs 65 on the locking plate 54 whereby the cup member 75 and its contained operating shaft 52 are retained against rotation.

To permit the operating shaft 52 to be turned to retract the latch bolt 39, the locking plate 54 must be retracted to unlocked position. This can be effected from the inside of the door 11 by grasping the tongue 63 and withdrawing the locking plate. However, the outer knob 16 is prevented from being rotated except when the proper key 21 is inserted in the tumblers lock 19 and the latter is turned. This turning effort rotates the cam shaft 68 and the projecting end 72 of its locking cam 71 engages and retracts the locking plate 54, whereupon the latch bolt 39 is unlocked and the operating shaft 52 is permitted to be rotated by the outer knob 16 to retract the latch bolt 39.

The locking plate 54 is retained in its unlocked retracted position (Figs. 6 and 7) or in its locked, projected position (Fig. 10) by means of the detents 85 on the spring legs of the friction spring 84 engaging one or the other side or edge of the lips or projections 70 on the bifurcations 58 and 59. These lips or projections 70 are of such length that their ends ride on the inner surface of the housing 37 in the ends 36 thereof and retain the locking plate 54 spaced from and out of frictional contact with the latch bolt 39.

As an added safety feature to prevent locking oneself out in the event the locking plate is inadvertently pushed inward to locking position when the door 11 is open, the lip 67 is provided on the locking plate 54. When the door closes with the locking plate moved inwardly to locking position, the tapered or inclined surface on the latch end 45 of the latch bolt 39 engages the strike 13 which causes this latch bolt to be forced inwardly. In such retraction, the other end 90 of the latch bolt contacts the lip 67 on the locking plate 54 and automatically retracts the latter to its unlocked position.

The latch bolt is formed of nylon as is also an insert 95 in the outer face of the housing 37 through which projects the operating shaft 52, thus assuring a long life to these parts of the assembly as the nylon is self-lubricating.

The novel latch assembly herein disclosed provides a compact assembly which blends with the narrow styles found in most aluminum or metal screen doors, as well as with the wider frames of wooden screen doors.

Having thus disclosed the invention, we claim:

1. A combination screen door latch and lock assembly in which a latch bolt is adapted to engage a strike on the door frame when the door is moved to closed position, comprising a knob assembly mounted on the exterior of the door, a latch assembly mounted on the interior of the door and attaching means projecting through the door for joining said assemblies, said knob assembly including an escutcheon, a knob having an external recess and a hollow shank journalled in said escutcheon and provided with a polygonal opening, a key-actuated tumbler lock in the recess of said knob, said latch assembly including a housing, a substantially U-shaped shaft projecting through said housing and through an opening in the door with its outer end conformably received in the polygonal opening in said shank whereby said knob and shaft rotate together, a handle at the inner end of said shaft for rotating the latter from the interior of the door, a centering spring biasing said shaft to its normal latching position, a spring-loaded latch bolt slidably mounted in said housing and provided with spaced shoulders, a cam mounted on said shaft and having laterally spaced projections either of which is adapted to engage a shoulder on the latch bolt for retracting the latter, a locking plate in said housing movable over said shaft, a slot in said plate adapted to conformably receive said shaft when said plate is moved to locking position for retaining the shaft against rotation and retraction of the latch bolt, a cam shaft carried in said first mentioned shaft and rotatable relative thereto with one end of said cam shaft connected to and rotatable by said tumbler lock when the latter is rotated by a key, a cam arm on the other end of said cam shaft, a slot in the locking plate into which said cam arm projects with said cam arm moving the locking plate to unlocked position when said cam shaft is rotated upon turning the proper key in the tumbler lock, projections on the locking plate and a spring adapted to contact said projections and hold said locking plate in its locked or unlocked position, and a lip on the locking plate adapted to contact the inner end of said latch bolt when said locking plate is in locked position whereupon when the locking plate is in locked position while the door is open, said locking plate will be moved to its unlocked position by movement of the bolt when the door is closed thereby preventing accidental locking of the door.

2. A combination screen door latch and lock assembly as set forth in claim 1, including a cup member conformably received on and movable with the U-shaped shaft, said cup member being located between the centering spring and the door and having a projection on which the ends of the centering spring are anchored, said locking plate having a reduced portion and outwardly projecting flanges on the reduced portion of the locking plate which limit movement of the projection on the cup member when the locking plate is in locked position.

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