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This invention relates to improved latching mechanism adapted for use in both metal and wood doors, and while particularly adapted for use with metal screen doors, I wish it understood that it may be used in such other connections to which it may be adapted.

The present invention is an improvement over that disclosed in my copending application Serial No. 350,681, filed April 23, 1953, now Patent No. 2,764,014, issued September 25, 1956.

One of the important features of the present invention is the impossibility of the operator locking himself or herself out accidentally, as for example when accidentally setting the mechanism to lock, and then going out and slamming the door shut. However, the mechanism is so made that it can be locked from the inside against anyone opening the door from the outside. The latching mechanism can be locked by setting the mechanism in locked position from the inside and the operator either staying inside or going out some other door, and, when a key operated lock is provided, the door can be locked and unlocked by a key from the outside. A further important feature is a novel compact arrangement of the parts such that the latching mechanism can be factory assembled, can be quickly and easily installed in operative position to the door, is reliable in operation, economical to manufacture, and of pleasing appearance.

Among the objects of the present invention are: to provide a new and improved latching mechanism; to provide latching mechanism in which it is impossible to lock oneself out accidentally; to provide latching mechanism having locking means that can be set in locked position when the door is ajar and which will be moved to unlocked position when the door is slammed shut; to provide latching mechanism in which the door may be locked shut from the inside and which may be unlocked only from the inside or by a key from the outside; to provide latching mechanism especially adapted for the reception of key-operated means accessible from the outside, or such key-operated means may be omitted if desired; to provide latching mechanism having unique interlocking features between the bolt and the striker plate; to provide latching mechanism having a novel construction and arrangement of latch bolt and associated parts; to provide latching mechanism having novel means for securing the knob to a square shaft; to provide latching mechanism that may be factory assembled, has automatic latching, turns left or right, may be applied to left and right hand doors of either metal or wood, and that has surface mounting with no mortising required; and such further objects, advantages and capabilities, inherently possessed by my invention, will later more fully appear.

My invention further resides in the combination, construction and arrangement of parts illustrated in the accompanying drawings, and while I have shown therein preferred embodiments I wish it understood that the same are susceptible of modification and change without departing from the spirit of my invention.

In the drawings:

Fig. 1 is a fragmentary horizontal transverse section through a metal screen door and an adjacent portion of a door frame, and showing applied to the door a latching mechanism embodying my invention.

Fig. 2 is a side elevation of my latching mechanism, looking toward the inside turning handle, and showing the inner configuration of the latch bolt in dotted lines.

Fig. 3 is a side elevation of my latching mechanism, looking toward the outside knob having a key-operated lock cylinder secured therein.

Fig. 4 is a vertical section on the line 4—4 of Fig. 1.

Fig. 5 is a vertical median section through the outside knob and adjacent portions of the door, showing the lock cylinder as having been removed from the knob, and a cover plate fixed in position in the lock cylinder hole.

Fig. 6 is a vertical median section through the latching mechanism of Figs. 1-3, showing the lock cylinder secured in the outside knob and extending inwardly for operation of the locking mechanism by a key.

Fig. 7 is a vertical transverse section on the line 7—7 of Fig. 6.

Fig. 8 is a horizontal section, partly in elevation, taken on the line 8—8 of Fig. 6.

Fig. 9 is a side elevation of the latching mechanism housing plate, showing its interior end construction in dotted lines.

Fig. 10 is an edge view looking toward the right hand edge of Fig. 9.

Fig. 11 is a detail side elevation of the latch bolt.

Fig. 12 is an edge view looking toward the right hand edge of Fig. 11.

Fig. 13 is a view similar to Fig. 6, but omitting the lock cylinder, and showing the outside knob secured to a square shaft which in turn is fixed to rotate with the inside handle.

Fig. 14 is a horizontal section, partly in elevation, taken on the line 14—14 of Fig. 13.

Fig. 15 is a transverse section on the line 15—15 of Fig. 13.

Fig. 16 is a transverse section on the line 16—16 of Fig. 13.

Fig. 17 is a side elevation of the shiftable actuator bar of Fig. 13.

Fig. 18 is an edge view looking toward the right hand edge of Fig. 17.

Fig. 19 is a side elevation of a washer for positioning between the actuator bar and the hub of the inside turning handle and having dentent means for cooperating with complementary dentent means in the actuator bar.

Fig. 20 is an edge view looking toward the right hand edge of Fig. 19.

Fig. 21 is a side elevation of a slip washer for straddling a groove in the square shaft and bearing against the side of the actuator bar opposite from the side contacted by the washer of Fig. 19.

Fig. 22 is an edge view looking toward the right hand edge of Fig. 21.

In the present invention I have provided a latching mechanism that can be equipped with a key-operated lock cylinder as in Figs. 1-3 and 6-8, or in which the lock cylinder can be omitted as in Figs. 5 and 13-16. However, in both forms, with and without the lock cylinder, the latch housing, the latch bolt, and the inside operating mechanism, are of the same construction.

The general construction includes an inside turning handle, an outside knob, and latch mechanism, with either a tubular shaft or a square shaft extending through from the outside knob and through the latch mechanism, depending on whether, or not, a lock cylinder is to be incorporated in the assembly. The main control portions of the latching mechanism are housed in a latch hous-
ing 1, being operatively held therein by a cover plate 2 formed at each of its two ends with an integral ear 3, which ears are seated in end notches 4 in the lock plate 20 and fastened therein by springing or bending after the control parts have been properly assembled in the housing. The latch housing 1 has at each end an offset portion 7, the amount of such offset from the main portion of the housing being such as to provide for the reception of the moving parts and permit of their movement within the space 8 formed within the outer wall of the housing between said outer wall and the cover plate 2. The latch housing plate 1 has a central circular hole A to rotateably receive the tubular shaft 20.

At each of the four corners of the housing space 8, the housing wall is formed with an inwardly extending short flange 9 for purposes later more fully explained. The offset end portions 7 of the housing 1 are each formed with a central hole 10, and the cover plate 2 at each end is formed with a hole 11 respectively in registry with holes 10, to receive screws 12, or other suitable means, for securing the housing to the inner face of the door 13. Slidable mounted in the space 8 within housing 1 is a flat latch bolt member 14 formed centrally at one end with an upward standing ear 15 formed with a latch lip 16 inclined at an angle toward the plane of the door. As seen in Fig. 12 the ear 15 for a short distance from where it joins the flat body of the latch bolt is narrow and the latch lip 16. This narrower neck portion is slidable mounted in the recess 17 formed in the adjacent edge of the housing 1, so as to slidable mount the latch lip 16 outside of the housing and the flat body portion of the latch bolt 14 inside of the housing.

The flat latch bolt member 14 is of a length snugly but slidable move laterally in the housing in a direction toward the right (latching direction) as viewed in Fig. 7, by the compression springs 18 seated between the adjacent corner flanges 9, and the shoulders 19 formed by cutting out portions of the latch bolt flat body to receive the springs 18. Movement of the latch bolt member 14 in a direction toward the left (unlatching direction) as viewed in Fig. 7, is effected by rotation of either the inside handle 5 or the outside knob 6, which, in the form shown in Figs. 1–8, are connected together by the tubular shaft 20 which at one end is either integral with or fixed to the hub of the inside handle 5, and to the other end of which tubular shaft the outside knob is secured both by the threads 21 and the set screw 22. As seen in Fig. 7, the flat latch bolt member 14 is formed in its portion inside of the housing with an irregularly shaped opening 23 through which the tubular shaft 20 extends.

As seen in Figs. 6–8, the shaft 20 is formed in its opposite walls with rectangular openings in that portion of the shaft within the interior of the latch housing 1, through which opposite openings is slidable mounted an actuator bar 24. Fixed in each of the opposite end portions of bar 24 is a laterally extending pin 25, which pins extend respectively through arcuate slots 26 formed in the outer housing wall, for sliding movement therein, to permit limited rotation of shaft 20 in either direction. Pins 25, after passing through slots 26, also pass through registering openings in the lock plate 27 which is provided with a central opening 28 through which shaft 20 passes, opening 28 being of a substantially larger diameter than the shaft in the direction of the actuator bar 24, so that when the pins 25 are in the center longitudinally of the arcuate slots 26, they may be moved downwardly, as viewed in Fig. 6, thus forming the notches 29 to lock the shaft against rotation with relation to the housing as later more fully explained. As will be understood in Fig. 6, pins 25, on the outer face of lock plate 27 are rounded to form a head 30, whereby the lock plate 27 on the outside of the housing, and the actuator bar 24 on the inside of the housing, will move together as a unit for both rotational and radial movement as the pins move appropriately in the arcuate slots and the notches 29. At the opposite ends of the lock plate 27 are formed outstanding flanges 31 to serve as finger rests so that the lock plate can be pushed upwardly for locking and unlocking purposes respectively, as desired.

As viewed in Fig. 7, the midportion of the left hand edge of the actuator bar 24 is formed with a pair of spaced apart notches 32 and 33 to serve as detents to yieldably receive the small projection 34 on the spring member 35 which is slidable mounted in the rearwardly opposite end of the actuator bar 24 and the ends of the openings in the shaft. This permits the actuator bar 24 to be pushed radially through the shaft in one direction or the other by a push in the appropriate direction on the outside lock plate 27 and be held in such position by the spring detent 34. A force is excited against the lock plate to move the actuator bar in the opposite direction. When the actuator bar 24 up in the position shown in Fig. 7, the pins 25 will ride in the arcuate slots 26, and enable the bar 24 to be rocked with the tubular shaft 20, and move the latch bolt 14 to retracted position when the shaft is rotated in either direction.

For illustration, when the shaft 20 is rotated in a clockwise direction as viewed in Fig. 7, the lower end of the actuator bar 24 will push against the adjacent edge portion of the opening 23 in the latch bolt 14 and retract the latch bolt to the left against the compression of springs 18. When the turning force on shaft 20 is released, springs 18 will return the latch bolt to the left to the retracted or spring locked position when the shaft is released.

It is thus seen that the latch bolt may be retracted by turning the inside handle or outside knob in either direction.

The configuration of opening 23 in the latch bolt plate 14 is such as to give the necessary play to the top and bottom portions of the actuator bar 24 while the latch bolt is being retracted as described above, and also to form a cam portion 36 so positioned that when the actuator bar 24 is in its downward position with detent projection 34 engaged in detent notch 33, the bottom end of bar 24 will be opposite said cam portion 36 and approximately in contact therewith. At the same time pins 25 will have been drawn downwardly into notches 29 which is locking position and will lock actuator bar 24 against turning or rocking with relation to stationary housing as shown in Figs. 6–8, from rotating, which in turn will prevent the latch bolt 14 from being retracted from the outside of the door. However, should the door be slightly ajar, and the lock plate 27 be accidentally moved downwardly into locking position, it would be impossible for the operator to lock himself out by slamming or otherwise forcing the door shut, because the latch lip 16 would be cammed inwardly by the inclined stationary lip 37 of the striker plate 38 which is fixed to the door frame 39. This would force the latch bolt inwardly and cause the cam portion 36 on the latch bolt to push against the curved bottom end of the actuator bar 24 and force the latter outwardly to move the pins 25 out of the locking notches 29, thus unlocking the shaft and permitting normal operation of the latch bolt by rotation of the shaft. This action will be understood by referring to Figs. 7 and 8. As seen in Figs. 7 and 16, when the latch bolt is in fully projected position under the action of compression springs 36 to lock the pins 25, edges of the actuator bar 24 will be in contact with the rear vertical edges of the latch bolt opening 23 to act as a stop for the latch bolt to limit the amount of projection.

Referring to Figs. 3 and 6–8, the present latching mechanism may have a lock cylinder 40 secured in place in the tubular shaf 20, so that the door may be locked from the inside by the lock plate 27 against being opened.
from the outside, and unlocked from the outside only by a key. It may of course be unlocked from the inside by manual operation of said lock: plate 27. As the lock cylinder 40 is of conventional design, it need not be described in detail except to point out that it is provided with an extension 41 rotatably mounted in the interior of tubular shaft 20, which extension at its inner end is formed with a cylindrical head 42 provided in its inner end face with an axially extending eccentrically located pin 43 located in an enlarged recess 44 formed centrally in the edge of the actuator bar toward the latch lip 16. Recess 44 is enough larger than the diameter of pin 43 to provide for the necessary movement of the pin in moving the actuator bar into and out of locking position during rotation of the lock cylinder from the outside of the door by a key, and to permit the key to be returned to its central removal position, as will be understood in Fig. 7, in which the actuator bar is shown in unlocked position, and the pin 43 in position ready to move the actuator bar into locked position upon rotation of the key in the lock cylinder in the appropriate direction. Also as will be understood in Fig. 7, the length of the recess 44 is sufficient to permit of movement of the actuator bar into either locked or unlocked position by manual operation of the lock plate 27 from the inside, independently of the lock cylinder and key, and yet permit such movement of the actuator bar by the key and lock cylinder from the outside when desired.

If Figs. 1-4 of Figs. 1-6, the lock cylinder 40 may be omitted, and the hole in the outer end of the tubular shaft 20, in the center of the outer knob 6, may be covered up by the closure cap 45 having resilient fingers 46 that will hold the cap in place when driven into said hole, as shown in Fig. 5. Cap 45 may be removed if it is desired at a later date to install a lock cylinder 40 in the tubular shaft. This gives the user the selection of using or omitting the lock cylinder as desired.

In the form shown in Figs. 13-22, there is no tubular shaft or lock cylinder, but instead, a square shaft 47 is rigidly fixed to the hub of the inside handle to extend through the latching mechanism, through a hole in the door, and part way into a square hole in the outside knob 6. In this form the actuator bar 24' is of slightly different form in that the square shaft 47 passes through an elongated rectangular opening 48 in the actuator bar, see Figs. 16 and 17, and the detent means for releasably holding the actuator bar 24' in its locked and unlocked positions are arranged somewhat differently. Otherwise the latching mechanism is the same as in the previously described form shown in Figs. 1-12.

In the form of Figs. 13-22, a washer 49, of copper, brass, or other suitable material, and formed with a centrally located square hole 50 of a size to snugly fit over square shaft 47, is slid along the square shaft into contact with the inner face of the hub of the inside handle 5 to bear thereagainst, and on its opposite face to bear against the adjacent face of the actuator bar 24', this being made possible by the inner end of the hub of the inside handle 5 passing through the central hole A in the housing plate 1. On opposite sides of hole 50 the washer 49 is formed below its horizontal center line, as viewed in Fig. 19, with two indentations 51 which are punched therein so as to emerge from the side next to the actuator bar 24' as a pair of spaced detent projections 52, see Fig. 20. The actuator bar 24' on its face next to washer 49 is formed with two vertically spaced pairs of small recesses 53 and 54, so that when this bar is pushed upwardly by the lock plate 27 the pair of projections 52 on the washer 49 will enter the pair of detent recesses 53 in the actuator bar and hold the pins 25 in line with the arcuate slots 26 to permit normal movement of door to which it is attached. When the bar is pushed downwardly by the lock plate 27 the pair of projections 52 on the washer 49 will enter the pair of detent recesses 54 in the actuator bar and hold the pins 25 in the notches 29 to lock the latch bolt against movement in the housing until the actuator bar is again moved upwardly either by the lock plate 27 being manually pushed upwardly, or by the cam shoulder 36 as explained above.

It should be noted that when the latch bolt 14 is in its maximum projected position, the actuator bar 24' (or 24') is in vertical position as viewed in Figs. 7 and 16, which positions the pins 25 directly over notches 29 to be pushed thereinto by a downward push on lock plate 27, in both forms, or by turning the key in the form of Figs. 1-8, in the lock cylinder in the appropriate direction, when it is desired to lock the shaft against rotation. As will be understood in Figs. 16 and 17, the elongated rectangular opening 48 in the actuator bar 24' is of a width to be slidable radically over the square shaft 47, and of a length to permit the actuator bar to be movable downwardly, as viewed in Fig. 16, into locked position, and upwardly into unlocked position. The actuator bar is shown in Fig. 16 as being in the unlocked position.

In the form of Figs. 13-22, as well as in the form of Figs. 1-8, the control parts of the latching mechanism, are housed in the housing 1, and held in operative position therein by the cover plate 2 which is fastened to the housing by the ears 3 as previously explained. As will be understood the latching mechanism parts will be properly assembled in the housing 1, after which the cover plate will be fastened in place. This enables the parts to be assembled at the factory, and sold in assembled units ready to be applied to the inside face of the door. A suitable hole will be provided in the door for the reception of the shaft.

It is also pointed out that as soon as the washer 49 and the actuator bar 24', in the form of Figs. 13-22, are properly assembled in the housing, they will be held in such proper assembly by insertion of a slip washer 55, see Fig. 21, into a circumferential groove 56 formed on the sides of the square shaft 47 in such position to hold the hub of the inside handle, the washer 49, and the actuator bar 24', snugly together for rotation as a unit, and also permit sliding of the actuator bar into and out of locking position, see Figs. 13 and 14. The slip washer 55 will be frictionally held in the circumferential groove 56, and will be applied to the shaft before the cover plate 2 is secured to the housing.

In the form of Figs. 13-22, see Figs. 13 and 14, the outside knob 6' is formed with a central axially extending hole 57, square in cross section, to snugly receive the projecting end of the square shaft 47. Consequently the inner end of hole 57 with the outer face of knob 6' is a hole 58, round in cross section, and beveled at its outer end to receive the beveled neck of the slotted head 59 of the threaded screw stem 60 which is threadably screwed into the threaded axial hole 61 extending a distance into the square shaft. Mounted against the outer end of the square shaft 47 is a spring washer 62 sufficiently thin to permit the threaded stem 60 to be threadbare therethrough. Washer 62 on one side of the central hole therein is radially split from the hole to the adjacent outer edge, with the two portions of the washer on opposite sides of the split being slightly offset axially with relation to the screw stem 60, whereby when the screw stem is screwed into the square shaft to properly position the knob with relation to the adjacent door surface, the screw stem will be under tension so as to prevent its loosening up.

The latching mechanism described herein is an adaptable invention may be applied to any of many types of doors, and while, for illustrative purposes only, it has been shown herein as applied to a screen door having tubular metal marginal portions, to which it is well adapted, I wish it understood that it may be applied to wooden doors, and any other type of door to which it is adapted. As pointed out earlier herein, it may be provided with or without a lock cylinder, as desired. Also the present latching mechanism is so constructed as to make it impossible to accidentally lock the door from the inner side, go out, slam the door shut, and find oneself locked out. Also as pointed out
above, the control parts of the latching mechanism are mounted as a unit in the housing over which is secured a cover plate, so that the device may be factory assembled, and be quickly and easily applied to either left or right hand doors, for turning of the handle or knob in either a left or right hand direction, and for use in both metal and wood doors.

In the present invention no mortising is required to be made in the door for applying the latching mechanism thereto. Also the latch bolt and striker plate are formed with angular lips that will be in interlocking position with relation to each other when the door is closed and the latch bolt projects, because of the latch bolt lip extending at an angle toward the plane of the latch bolt and laterally outwardly of the housing, and the striker plate lip extending at an angle away from the plane of the latch bolt and laterally toward the housing, as seen in Figs. 1, 8 and 14.

Having described my invention, I claim:

1. Latching mechanism, comprising, a housing having a front plate, a back cover plate and an inner cavity, a latch bolt laterally slidable in said cavity and having an enlarged opening, spring means for normally urging the latch bolt to projected position, a shaft rotatably extending through said front plate, back cover plate and latch bolt opening, an actuator bar in said latch bolt enlarged opening and connected to said shaft for rotation therewith and radially slidable with relation thereto, means for selectively moving the actuator bar in one direction radially of the shaft for holding the shaft against rotation and for moving the actuator bar in the opposite direction radially of the shaft for releasing the shaft for rotation for moving the latch bolt to retracted position, and means for securing the back cover plate to the front plate.

2. Latching mechanism, comprising, a housing adapted to be secured against a side surface of a door, a flat latch bolt laterally slidable in said housing and having an enlarged opening therein, a rotatable shaft extending at right angles through the housing and latch bolt opening, an actuator bar in said housing connected with said shaft for rotation therewith and radial sliding movement with relation thereto, said actuator bar extending radially from both sides of the shaft, said latch bolt having a recess in line with the actuator bar and opening into said enlarged opening, said housing having an outer wall formed with a laterally extending slot and a notch extending at right angles to the laterally extending slot and intercommunicating therewith, a lock member on the outer face of the housing outer wall, a pin connecting the lock member and the actuator bar through said slot and notch, whereby movement of the pin into said slot will permit rotation of the shaft for retracting the latch bolt, and movement of the pin into said notch will lock the shaft against rotation at which time the end of the actuator bar will be in said recess in the latch bolt.

3. Latching mechanism as claimed in claim 2, in which the forward edge of said recess in the latch bolt is cam-shaped, whereby a strong inward force on the projected end of the latch bolt will cause the cam-shaped edge of the recess to move the actuator bar to move the pin to unlocked position so that the shaft may be rotated.

4. Latching mechanism, comprising, a shaft having turning means on each end thereof, a housing through which the shaft rotatably extends, a flat latch bolt laterally slidable in said housing and having an enlarged opening through which the shaft extends, an actuator bar in the enlarged opening of the latch bolt and connected to said shaft for rotation therewith, said actuator bar being radially slidable with relation to the shaft, a lock plate on the outside wall of the housing, said outside wall having a laterally extending arcuate slot and having in its mid-position an intercommunicating notch extending in a direction radially of the shaft, and a pin connecting the lock plate and the actuator bar and movable in said arcuate slot and notch, whereby when the pin is in the arcuate slot rotation of the shaft will retract the latch bolt, and when the lock plate is moved to carry the pin into said radially extending notch the shaft will be locked against rotation so that the latch bolt cannot be retracted by the shaft.

5. Latching mechanism as claimed in claim 4, including a second arcuate slot and notch in said outer wall, and a second pin connecting the lock plate and actuator bar and movable in the second slot and notch, said arcuate slots being on opposite sides of the shaft, and said notches being so located that a straight line passing through the centers thereof will pass through the center of the shaft.

6. Latching mechanism, comprising, a thin flat housing open at its front and rear side edges and adapted to be secured to the inside flat face of a door, a latch bolt laterally slidable in said housing and having an enlarged opening therein, a tubular shaft extending through said enlarged opening in the latch bolt and having a turning member secured to its inner end and a turning member secured to its outer end, an actuator bar radially slidable through said shaft and rotatable therewith, said actuator bar being positioned in the enlarged opening in the latch bolt, said housing having an outer wall formed with a laterally extending slot and an intercommunicating notch extending in a direction radially of the shaft, a lock member on the outer face of the housing outer wall, a pin connecting the lock member and the actuator bar through said slot and notch, whereby movement of the pin into said slot will permit rotation of the shaft for retracting the latch bolt, and movement of the pin into said notch will lock the shaft against rotation.

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