THUMB TURN LOCK MECHANISM

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ABSTRACT

A thumb lock mechanism for mounting on a panel having a bore in which a rotatable bolt driver may be mounted includes a mounting plate having a bearing and fixed over one end of the bore by fasteners entering the bore and usually engaging a similarly mounted, key-operated device overlying the other end of the bore. A driver bar connects the key-operated device, the rotatable bolt driver and the hub of a rotor plate disposed in the mounting plate bearing. A turn piece peripherally engages the rotor plate and is formed with an extending turn and pull grip having a usually closed port overlying the fasteners. A yielding, axial retainer between the hub and the mounting plate urges detent on the mounting plate and rotor plate into engagement. A hold-back is optionally provided.

12 Claims, 21 Drawing Figures
THUMB TURN LOCK MECHANISM

In many environments, particularly in connection with a door panel hinged about a vertical axis to swing into and out of engagement with a door frame, it is the practice to install a manually operable locking device. For this purpose the door panel is provided with a relatively large through bore extending from one side of the panel to the other. This bore is intersected by a somewhat smaller bore extending into the panel from the free edge thereof. In the smaller bore there is mounted a bolt, usually a dead bolt, which can be retracted into the door panel and projected from it to lie within a strike device mounted in the door frame. Customarily the bolt is a dead bolt urged into its extreme projected position or into its extreme retracted position by an over-center spring. It is also customary to provide on one side of the door, usually the exterior side thereof, a key-operated, pin tumbler lock mechanism for projecting and retracting the dead bolt. On the other side of the door panel, usually the interior, another key-operated mechanism may be provided, but more frequently it is preferred to have a keyless interior operating mechanism actuated directly by manual rotation. This type of device is often referred to as a thumb turn even though the user’s thumb and fingers are utilized in manipulating it. In some installations, something more than the facility to rotate the thumb turn is desired because there is no other projection or grip on that side of the door panel. Furthermore, the thumb turn mechanism may be utilized with a normally spring-projected latch bolt as well as a dead bolt. With a spring-actuated latch it is helpful to have closely associated with the thumb turn some ready mechanism for holding the latch bolt in its retracted position against the normal urgency of its spring.

It is therefore an object of the invention to provide a thumb turn lock mechanism effective to produce the normal functions of a thumb turn and also to serve as a grip or handle to maneuver the door panel toward open or closed position.

Another object of the invention is to provide a thumb turn lock mechanism that can be incorporated with the customary lock mechanism ordinarily provided in a door panel.

A further object of the invention is to provide a thumb turn lock mechanism in which the mounting mechanism, although readily accessible for installation and removal, is ordinarily concealed and protected.

A further object of the invention is to provide a thumb turn lock mechanism having an enhanced ability to transmit operating torque.

A further object of the invention is to provide a thumb turn lock mechanism in which the thumb turn is yieldingly restrained in one or more of its positions of operation.

A further object of the invention is to provide a thumb turn that is readily grasped for operation, is comfortable to the touch and does not tend to catch clothing.

A further object of the invention is to provide a thumb turn lock mechanism that is generally an improvement over thumb turn mechanisms heretofore available.

Other objects together with the foregoing are attained by means of the embodiments of the invention described in the accompanying description and illustrated in the accompanying drawings, in which:

FIG. 1 is an elevation of the obverse side of a door panel and frame with the structure of the present invention mounted therein, portions of the figure being broken away to reduce its size;

FIG. 2 is an elevation of the reverse side of the door panel and thumb turn mechanism associated therewith;

FIG. 3 is an exploded view showing in cross-section on a vertical, axial plane normal to the door panel of FIG. 1 various components of the instant mechanism;

FIG. 4 is a view showing the structure as it appears in horizontal plan with the parts assembled, certain portions being broken away to disclose the interior construction generally in cross-section on horizontal planes;

FIG. 5 is an isometric view of a pin tumbler lock unit usable with the thumb turn lock mechanism of the invention, a portion being shown in exploded position;

FIG. 6 is an inside end elevation of the structure of FIG. 5 without the pin tumbler lock unit therein;

FIG. 7 is a side elevation of the retainer shown in FIG. 5;

FIG. 8 is a view, like FIG. 2, showing a modified form of thumb turn lock mechanism in normal position;

FIG. 9 is a view similar to FIG. 8 showing the thumb turn lock mechanism in hold-back position;

FIG. 10 is an inside end elevation of a modified form of rotor plate and turn piece utilized in the structure of FIG. 8;

FIG. 11, in the upper half, is a cross-section, the plane of which is indicated by the line 11—11 of FIG. 10, and, in the lower half, is a side elevation of the structure of FIG. 10;

FIG. 12 is an elevation of a hold-back ring;

FIG. 13 is a cross-section, the plane of which is indicated by the line 13—13 of FIG. 12;

FIG. 14 is an elevation of a mounting plate for use with the modification of FIG. 8;

FIG. 15 is a cross-section, the plane of which is indicated by the line 15—15 of FIG. 14;

FIG. 16 is an elevation of an assembled thumb turn with a hold-back as indicated in FIG. 8;

FIG. 17 is a cross-section, the plane of which is indicated by the line 17—17 of FIG. 16;

FIG. 18 is a detail showing a portion of the structure of FIG. 17, the plane of section being indicated by the line 18—18 of FIG. 16;

FIG. 19 is a plan view, the surrounding door panel being in horizontal cross-section, of a modified form of mounting for a thumb turn mechanism;

FIG. 20 is a cross-section, the plane of which is indicated by the line 20—20 of FIG. 19; and

FIG. 21 is an isometric view of an anchor block, as used in FIGS. 19 and 20.

In most installations of the device the environment includes a stationary door frame having an upright surface 7 in which a strike device 8 is installed. Cooperating with the frame 6 is a door panel 9 mounted to operate about an upright hinge axis parallel to the surface 7. Extending entirely through the panel 9 is a cross bore 11.

Intersecting the bore 11 is another bore 12 extending inwardly from the panel surface 13 parallel to the surface 7 and normal to the bore 11. Lying within the bore 12 and within the bore 11 is a bolt mechanism 16 of a customary sort; for example, as shown in Walter R. Schlage U.S. Pat. No. 2,042,021 issued May 26, 1936.
The present dead bolt mechanism is operated by a rotatable bolt driver 17 appropriately connected to a bolt 18. The mechanism 16 includes an over-center spring for holding the dead bolt 18 in fully projected position or in fully retracted position. This bolt motion is usually produced by approximately a ninety-degree rotation of the bolt driver 17.

Alternatively, the bolt mechanism may incorporate a latch bolt (not shown) normally urged into its projected position by an appropriate spring and temporarily retracted against the spring urgency by rotation of the bolt driver 17. In the usual construction the bolt driver 17 has a non-circular portion rotate about an axis 19 and interrelated in an axially slideable fashion with a driver bar 20 extending from the rotary plug 21 of a pin tumbler cylinder unit 22.

To support the cylinder unit 22 there is provided a housing 23 of formed metal provided with a front opening 24 concentric with the axis 19.

A rotary plug portion of the cylinder unit 22 occupies the opening 24 and presents a keyway 25 for use in the usual fashion. The housing 23 is preferably covered with a decorative skin or scalp 26 appropriately cramped in place. By a number of spaced in-pressed lugs 27 and 28 a closure plate 29 is located and held in position. If relative rotation of the plate 29 and the housing 23 is not wanted, a lug 31 and notch 32 in inter-engagement prelude such motion.

As particularly shown in FIGS. 4, 5 and 6, the closure plate 29 is centrally dished and has an opening 33 contoured to receive the circular and radial portions of the cylinder unit 22. The opening 33 in this case has an enlarged upper end 34 and also has side extensions 36 and 37. This special configuration is arranged to cooperate with a particular clip or retainer 40, FIGS. 5 and 7. This is a U-shaped piece of springy material having its opposite legs 41 and 42 cut to leave end shoulders 43 and in an intermediate location in their upper periphery cut to provide opposite, upwardly opening notches 44 and 46. In addition, the lower periphery of the clip legs is provided with a pair of staggered, downwardly opening, opposite notches 47.

This retainer is used after the cylinder unit 22 has been set into the position shown in FIGS. 3 and 5 and occupies most of the opening 33. The clip is used upright, as illustrated, for relatively short cylinder units and is used inverted for relatively long cylinder units. The normally divergent legs 41 and 42 of the upright clip 40 are manually pinched toward each other and are introduced into the upper portion of the opening 33 straddling the radial portion of the cylinder unit 22. As soon as the lower notches 47 of the advancing clip (the notches 44 and 46 when inverted) come opposite the closure plate 29, the clip 40 is manually displaced vertically downwardly so that the walls of the pair of notches 47 hook over and interengage with the closure plate 29. The transverse pinch of the retainer 40 is manually released and the legs 41 and 42 spring outwardly to occupy the extensions 36 and 37. Whether upright or inverted, the hooked portions of the clip, when in engagement with the closure plate, firmly hold the cylinder unit 22, whether short or long, in position against accidental dislodgment.

The key-actuated unit is mounted against the panel 9 over the bore 11, usually on the exterior or obverse side, and is held in position by fastening screws 51 and 52 in threaded engagement with appropriately tapped holes 53 and 54 in the closure plate 29 and extending through the bore 11 also to retain an interiorly mounted thumb turn mechanism 56. Included in this mechanism is a mounting plate 57 spanning the bore 11 on the interior side of the panel 9 and having a pair of openings 58 and 59 to receive the screws 51 and 52. When these screws are tightened, the exterior unit and the interior unit are mounted firmly on the door panel. The screws 51 and 52 also pass through openings in the bolt mechanism 16, so that all of the assemblies are held in appropriate operating position.

The mounting plate 57 is a generally planar structure at its center having an inturned bearing flange 61 concentric with the axis 19. Cooperating with the mounting plate 57 is a rotor plate 62 having an elongated central hub 63 rotatable within the bearing 61 and project through and well beyond the bearing opening. The rotor plate 62 is yieldingly retained for a predetermined axial displacement by a lock clip 64 also retaining a marcel spring 66 interposed between the clip and the mounting plate 57. The inner end of the hub 63 is a web pierced to provide a non-circular, cross opening 67 slidably receiving the driver bar 20 upon assembly, as particularly shown in FIG. 4.

Rotation of the key plug of the cylinder unit 22 not only actuates the bolt driver 17 but likewise produces a corresponding rotation of the rotor plate 62. Conversely, rotation of the rotor plate 62 rotates the bolt driver 17. Usually there is a lost motion connection between the driver bar 20 and the cylinder unit 22, so the cylinder unit is not necessarily rotated when the rotor plate 62 is turned.

Assembled with the rotor plate 62 is a turn piece 68 or shell conventionally formed of relatively thin metal having its periphery 69 embracing and tightly urged against a circular peripheral flange 71 of the rotor plate 62. The turn piece 68 has surfaces of revolution including relatively flat conoidal portions 72 and also includes an outstanding grip portion 73. This extends diametrically across the piece and has a reduced or reentrant neck portion 74. The configuration and proportions are such that the outstanding portion 73 in effect is a flared cross bar. A user's thumb and fingertips can readily grasp the bar 73 not only for producing rotation about the axis 19 but also as a grip for pulling the door panel 9 open or as a convenient point for hand engagement in pushing the door panel closed. The contours are all smooth to afford a rounded envelope so that the user's clothing is not likely to be caught by the piece 68. Should the turn piece 68 tend to slip on the rotor plate 62, lugs 75 struck out from the plate 62 in forming the access holes for the screws 51 and 52 extend into the interior of the cross bar 73 and prevent all but minor relative turning.

The outstanding grip portion 73 has an indented panel 76 extending substantially across it and has a port formed by one or more perforations 77 in the turn piece to expose the ends of the fasteners 51 and 52. During installation the port 77 is left open so that the fasteners can be introduced therethrough can be turned home. Following installation the port is blocked or closed by the positioning of an ornamental closure plate 78. This is designed to fill the depressed panel 76.
The plate has springy tangs 79 snapped through the port 77 to engage the piece 68 to hold the closure 78 in position. One portion of the plate 78 is contoured or notched. With a tool engaging the notch, the central portion of the closure 78 can be bowed outwardly, thus moving the tangs 79 toward each other and permitting ready withdrawal of the closure plate 78. This affords access to the fasteners 51 and 52 when the mechanism is to be detached or dismantled.

While the mechanism as so far described is in itself completely useful to serve as a thumb turn mechanism for actuating the driver bar 20 and actuating the bolt 18, it is often preferred to provide a special detent.

For that reason the mounting plate 57 is provided with one or more offsets 81 designed to interfit, in certain rotary locations, with corresponding depressions 82 at proper intervals in an annular rib 83 formed in the rotor plate 62. The Marcel spring 66 urges the projections 81 toward the depressions 82. When the projections and depressions are engaged, the thumb turn is movable only after overcoming an initial resistance. The turning movement is accompanied by a slight axial displacement, distorting the spring 66, so that when the thumb turn has arrived at another position in which the projections 81 and depressions 82 can interengage, the spring 66 displaced the thumb turn axially inwardly and permits a resumed interengagement of the mounting plate and of the rotor plate. The slight axial movement of the rotor is readily accomplished since the driver bar 20 has a loose sliding fit in the cross opening 67. When the detent mechanism is provided, the cross bar 73 is readily centered in any one of several predetermined positions. The effect is to prevent the parts moving out of their preferred, preselected positions by vibration or other minor forces.

In a modified form of the thumb turn lock mechanism, much of the structure as previously described is utilized, but the interior thumb turn unit is augmented to afford a hold-back feature. This is especially useful with a spring-projected latch bolt. At the user’s option, the hold-back keeps the latch bolt retracted against the urgency of the spring. As illustrated in FIGS. 8 and 9, the environment is as previously described, the installation usually being on the interior or reverse side of the door panel 9. In this instance there is an additional element in the form of a ring 91 movable by the user between a free position and a hold-back position.

As particularly shown in FIG. 17, there is disposed against the door panel 9 on the interior or reverse face thereof a mounting plate 92 held in position against the door by fastenings 93. The mounting plate 92 is offset to provide a circular shoulder 94 and also is offset to afford a flange 96 constituting a bearing.

Projecting through the bearing is an elongated hub 97 of a rotor plate 98. The hub has a cross opening 99 to engage the driver bar 20. The rotor plate 98 has an annular ridge 101 concentric with the hub 97 and extending into contact with the mounting plate 92. The parts are held together by a securing clip 102 engaging appropriate apertures in the projecting portion of the hub 97. A Marcel spring 103 is interposed between the clip 102 and the stationary mounting plate 92, so that the parts are held in rotary interengagement with limited axial movement.

Engaging the rotary plate 98 is a turn piece 106 having its periphery 107 overlying and firmly united with a peripheral flange 108 on the rotor plate 98. The parts are appropriately held in assembled relationship. The turn piece 106 is shaped as previously described. It has a port 109 for the fasteners 51 and 52 and has an overlying port closure 111 removable snapped into position.

The rotor plate ridge 101 is provided with a deep radial recess 116 within which slides a radial projection 117. This is part of a block 118 extending radially inward from an approximately annular web 119 of the operator ring 91. The web is disposed between the mounting plate and the rotor plate to project outwardly of both of them. The shape of the thumb ring 91 is semicircular at both ends and between the ends has a short straight portion. In opposite, transversely shifted, extreme positions, it is nearly flush with the adjacent circular boundary of the mounting plate and of the rotor plate. The opposite end of the ring extends radially outward from the opposite side of those plates. The thumb ring slides transversely with only light friction and can easily be moved in a diametrical direction between one extreme position and the other.

In one extreme position shown by solid lines in FIG. 18, the block 118 is in only sliding engagement with the adjacent mounting plate 92. The projection 117 is and remains in engagement with the walls of the recess 116 in the ridge 101 of the rotor plate 98. When the thumb ring 91 has been moved to and is in its opposite extreme position, as shown by dotted lines 121 in FIG. 18, the projection 117 is still in engagement with its groove 116 in the rotor plate, and the block 118 has moved radially and projects into and interengages with the side walls 122 and 123 of either one of two rectangular apertures 124 piercing the mounting plate 92 and traversing the circular shoulder 94 thereof. In this position, the block 118 effectively locks the mounting plate and the rotor plate together.

The apertures 124 are used individually in right-hand and left-hand installations and are so positioned that locking takes place only after the thumb turn grip has been rotated to retract the spring-pressed latch bolt. When the ring 91 is radially displaced to locking position, the plates 92 and 98 are kept from relative rotation and the latch bolt is held back. The tendency of the spring to urge the latch bolt outwardly puts sufficient strain on the interrelated parts so that there is some side friction between the projection 117 and the walls of the groove 116 and between the block 118 and the aperture side walls 122 and 123. This avoids accidental dislodgment by vibration and the like.

When grasping the grip to rotate the bolt retracting mechanism, the user can easily, with the same hand, displace the ring 91 to cause the block 118 to enter its adjacent groove and hold the parts in position. When the latch bolt is to be released, it is simple to displace the ring 91 by a finger touch in the opposite direction, thus removing the block 118 from interengagement with the walls 122 and 123 of the opening 124 and permitting the latch bolt spring to return the latch bolt to projected position.

There are installations in which only one operating mechanism is needed. As shown in FIGS. 19, 20 and 21, this may be accomplished by having a large bore
from one side go only partway through the door panel 9, leaving the opposite side undisturbed. In some instances the bore is put through the door panel with the unused end blocked off by a plate. Designed to fit into a portion of a smaller edge bore 127 intersecting the bore 126 is an anchor block 128. This has an accurate surface 129 to abut the wall of the bore 127 and has a flat surface 131 in the central portion. On the opposite side from the flat surface a pair of bosses 132 project from the flat inner face 133 of the block. These bosses are of a diameter and extent to enter into standard holes in the bolt mechanism 134. Extending through the block, including the bosses 132, are tapped openings 136 into which the fasteners 51 and 52 are screwed.

The arrangement is mounted by inserting the anchor block 128 and the bolt mechanism 134 simultaneously into the bore 127 with the bosses 132 interlocked with the bolt mechanism. Thereupon the thumb turn unit is mounted, with the fasteners being screwed into the threaded openings 136 and tightened until the door panel is firmly gripped. During this time the driver bar 20 is properly inserted into the bolt mechanism. Finally, the closure plate 78 is positioned. The parts are thus interlocked and interengaged and are ready for operation.

What is claimed is:

1. A thumb turn lock mechanism for mounting on a panel having a bore in which a rotatable bolt driver may be disposed comprising a mounting plate having a central bearing therein, means for holding said mounting plate against said panel over said bore, a rotor plate, a hub on said rotor plate extending through said central bearing, means for limiting axial motion of said hub in said bearing, a turn piece, and means for engaging the periphery of said turn piece with the periphery of said rotor plate.

2. A device as in claim 1 including grip means outstanding from and extending substantially diametrically of said turn piece.

3. A device as in claim 2 in which said grip means includes a window overlying said holding means.

4. A device as in claim 3 including removable means for blocking said window.

5. A device as in claim 1 including means in said hub for non-rotatably and slidably engaging a driver bar also engaging said bolt driver.

6. A device as in claim 1 in which said mounting plate and said rotor plate include interengageable rotary positioning means.

7. A device as in claim 1 in which said axial motion limiting means includes a spring urging said rotary positioning means into engagement.

8. A device as in claim 1 in which said axial motion limiting means includes a retainer engaging said hub on the side of said mounting plate opposite said rotor plate.

9. A device as in claim 1 including a ring interposed between said mounting plate and said rotor plate, and means controlled by said ring for interengaging said mounting plate and said rotor plate.

10. A device as in claim 9 in which said ring is shiftable transversely of said bore.

11. A device as in claim 9 including means on said ring slidably engaging said rotor plate.

12. A device as in claim 9 including means on said ring slidably movable into and out of engagement with said rotor plate.

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