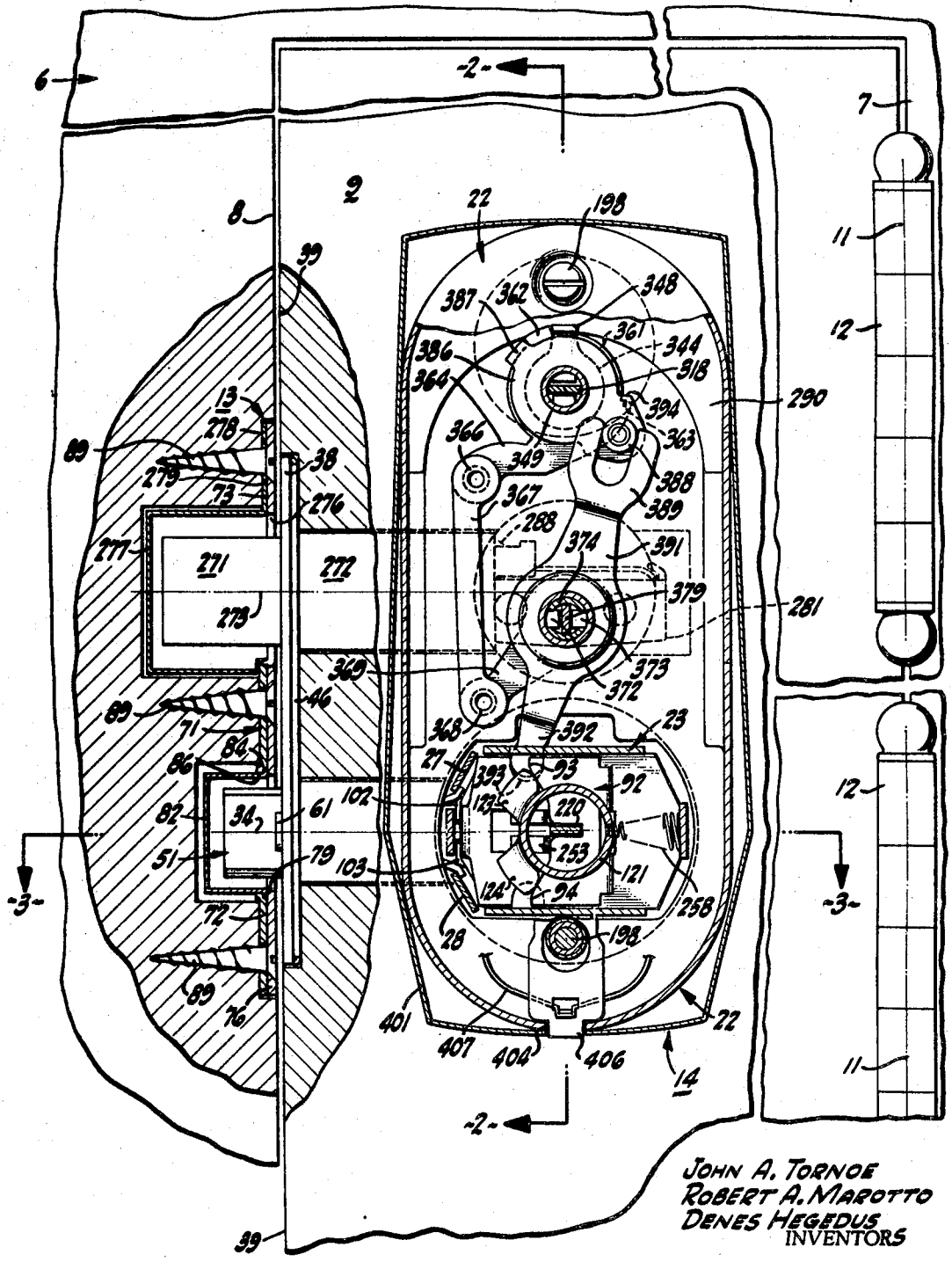
July 2, 1968 J. A. TORNOE ET AL 3,390,558

HIGH SECURITY LOCK

Filed Aug. 9, 1965 6 Sheets-Sheet 1



JOHN A. TORNOE
ROBERT A. MAROTTO
DENES HEGEDUS
INVENTORS

FIG. 1

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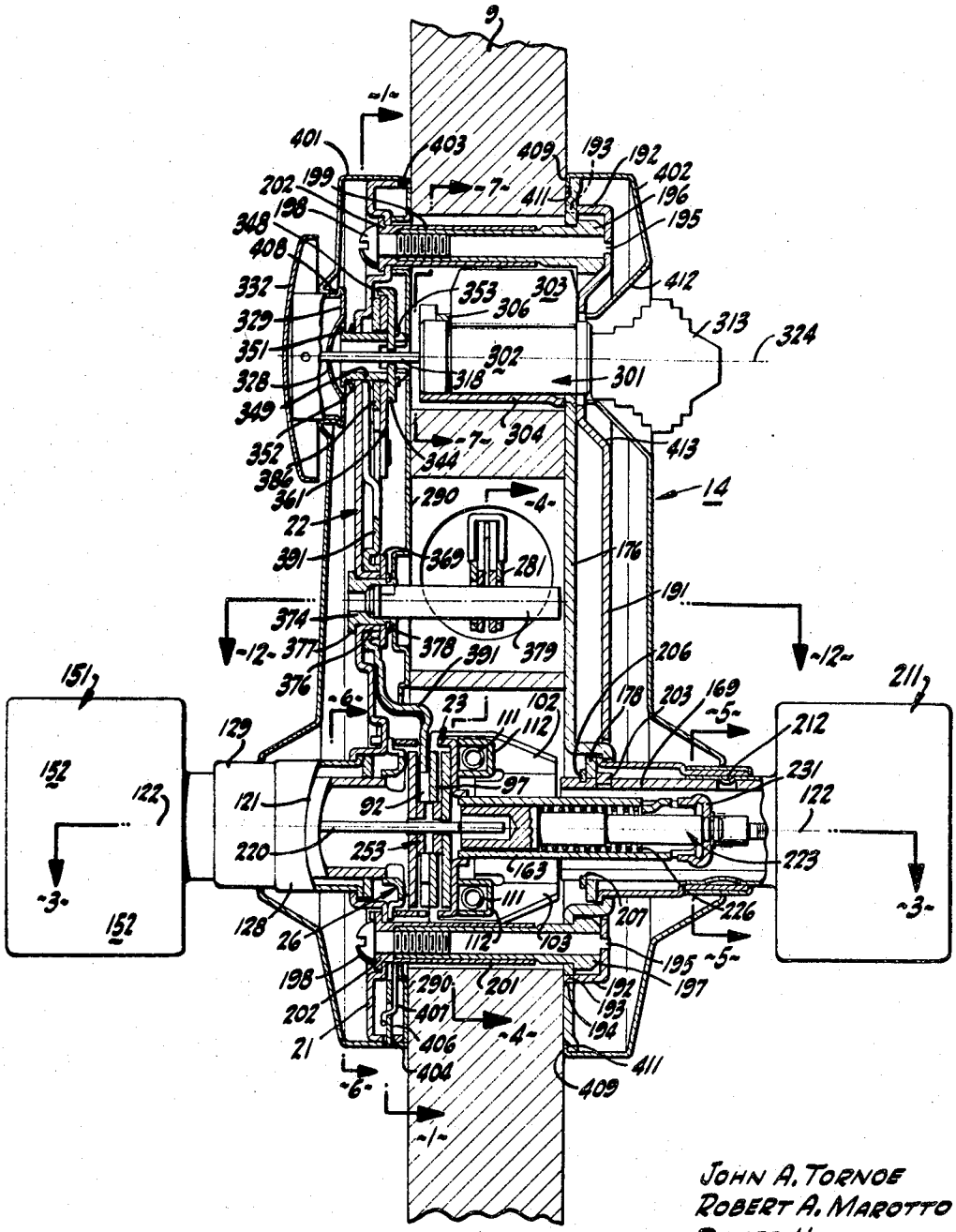


FIG-2

JOHN A. TORNOE
ROBERT A. MAROTTO
DENES HEGEDUS
INVENTORS

BY

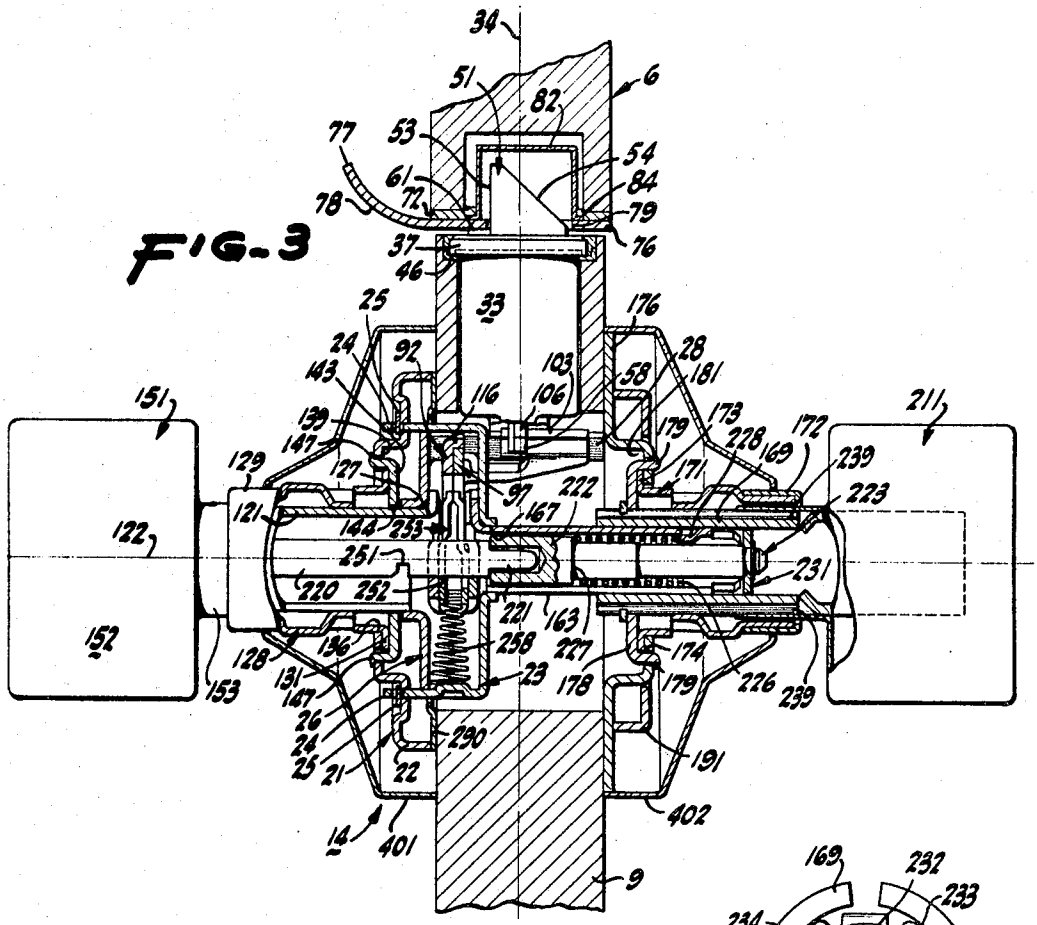
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ATTORNEYS

July 2, 1968 J. A. TORNOE ET AL 3,390,558

HIGH SECURITY LOCK

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FIG-3



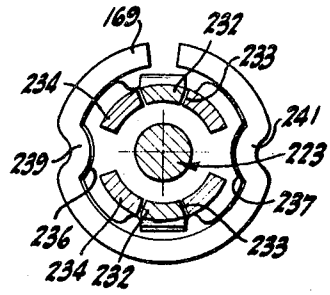


FIG-5

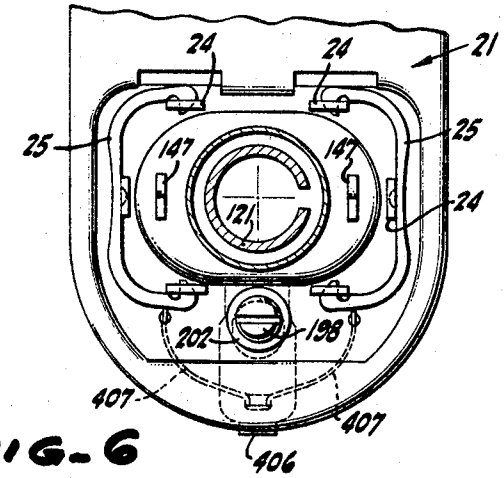


FIG-6

JOHN A. TORNOE
ROBERT A. MAROTTO
DENES HEGEDUS
INVENTOR.

BY

Lothrop & West
ATTORNEYS

July 2, 1968 J. A. TORNOE ET AL 3,390,558

HIGH SECURITY LOCK

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FIG. 7

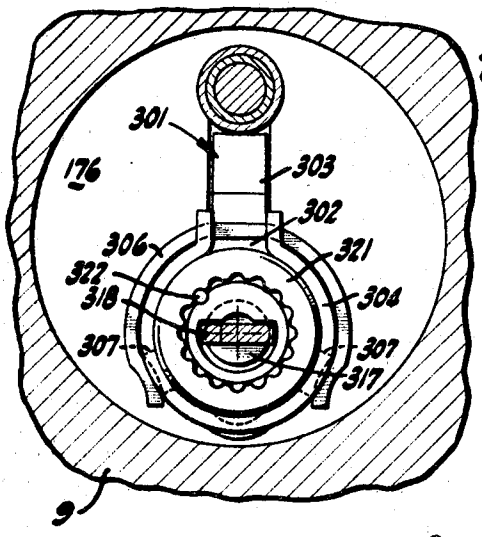
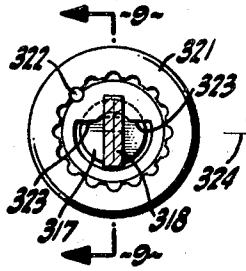


FIG. 8



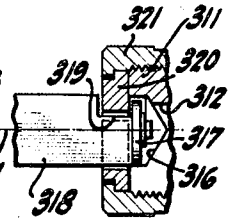


FIG. 9

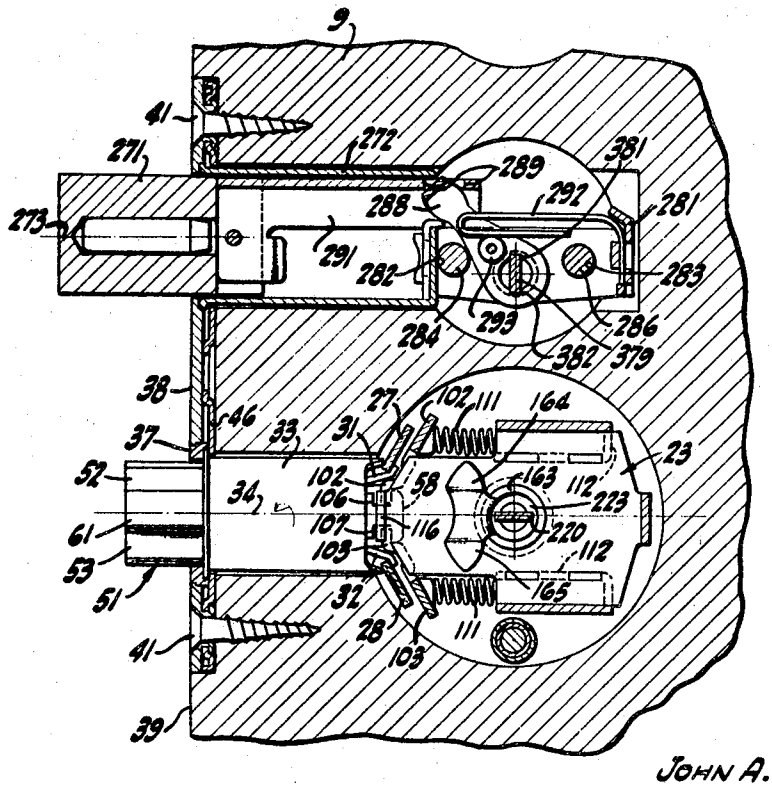


FIG. 4

JOHN A. TORNOE
ROBERT A. MAROTTO
DENES HEGEDUS
INVENTORS

BY

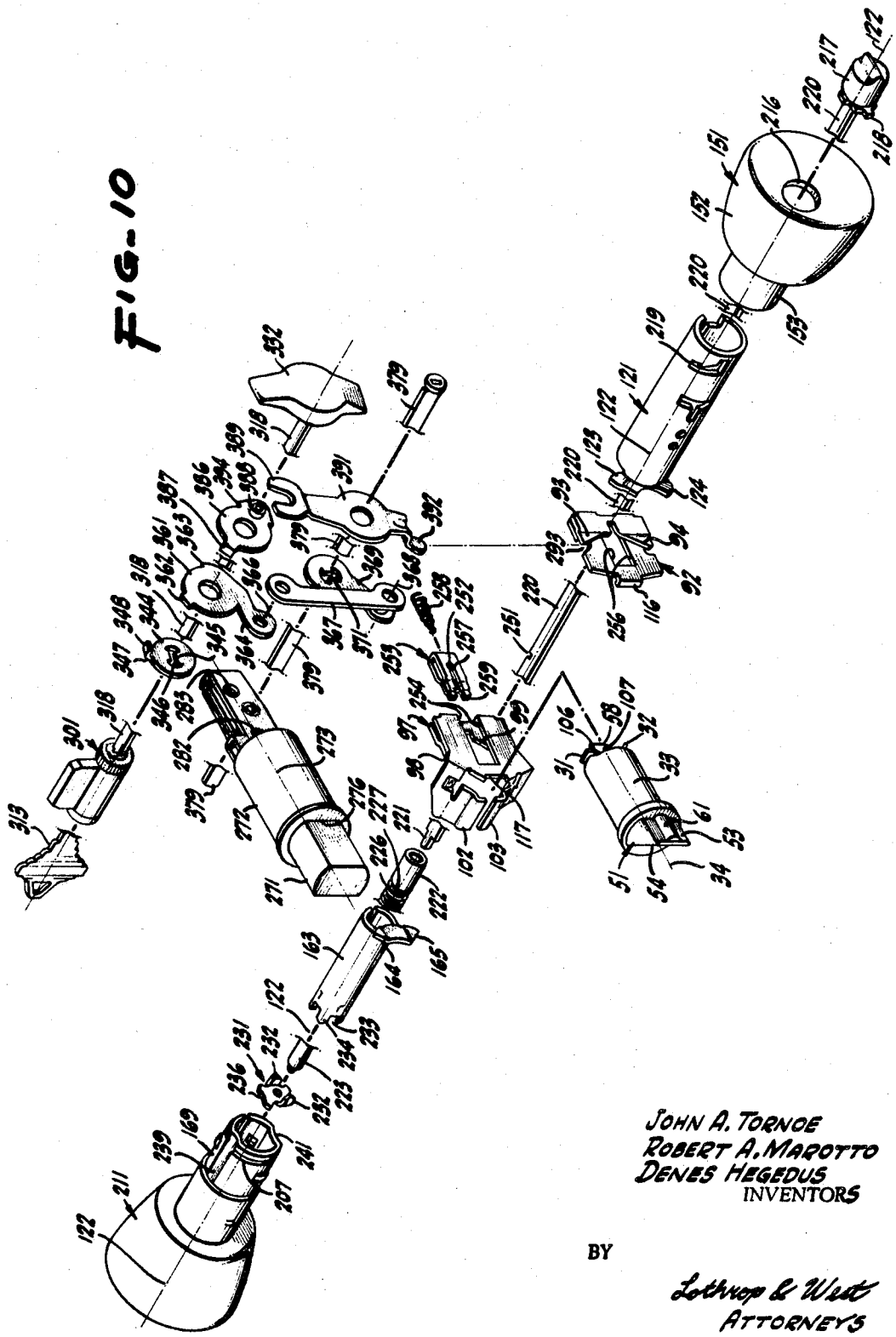
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ATTORNEYS

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FIG. 10



JOHN A. TORNOE
ROBERT A. MAROTTO
DENES HEGEDUS
INVENTORS

BY

Lothrop & West
ATTORNEYS

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FIG. 11

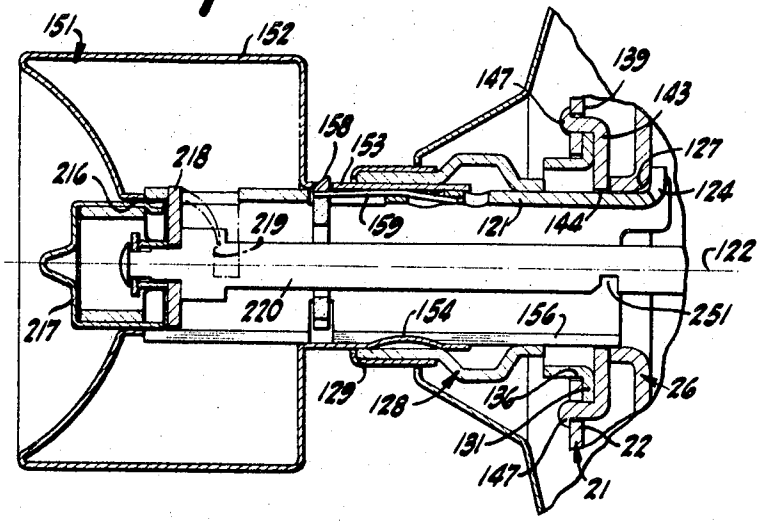
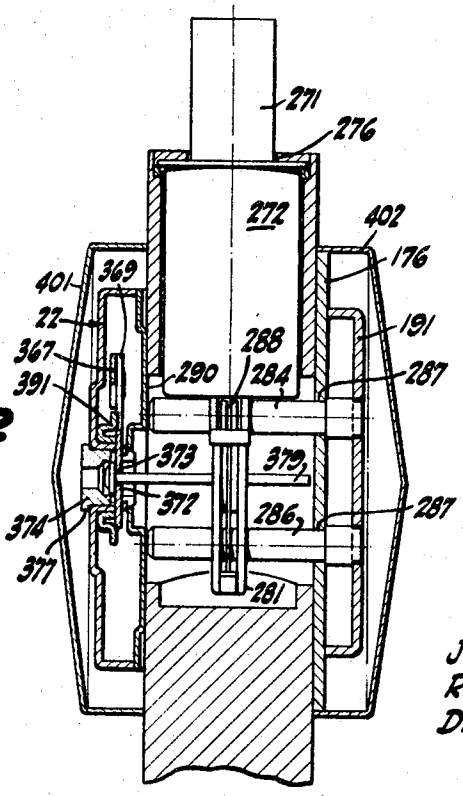


FIG. 12



JOHN A. TORNOE
ROBERT A. MAROTTO
DENES HEGEDUS
INVENTORS

BY

Lothrop & West
ATTORNEYS

United States Patent Office 3,390,558 Patented July 2, 1968

3,390,558

HIGH SECURITY LOCK

John A. Tornoe and Robert A. Marotto, Redwood City, and Denes Hegedus, San Francisco, Calif., assignors to Schlage Lock Company, a corporation

Filed Aug. 9, 1965, Ser. No. 478,326
14 Claims. (Cl. 70—107)

ABSTRACT OF THE DISCLOSURE

A high security lock for mounting on a door panel having a latch bolt and a dead bolt with inner and outer knobs to reciprocate the latch bolt and an inner thumb turn and an outer key mechanism to reciprocate the dead bolt. The dead bolt may also be withdrawn simultaneously with the latch bolt by the inner knob and the latch bolt may be withdrawn simultaneously with the dead bolt by the inner thumb turn and by the outer key mechanism.

Our invention relates to means for holding in closed position a door movably mounted on a door frame and is particularly concerned with such an arrangement especially designed and adapted for installation in main entrances, hotel room doors, motel doors and all instances in which the occupants are especially concerned with more than the customary amount of security provided by the ordinary lock unit having a single latch bolt. The present high security lock unit has both a latch bolt and also a dead bolt and provides various means for operation of those bolts pursuant to different factors.

It is therefore an object of our invention to provide a high security lock in which the operation of a latch bolt and a dead bolt are coordinated to afford increased security of the lock.

Another object of the invention is to provide a high security lock in which many of the parts are relatively standard and are combined with each other in a way to provide many functions not normally available.

Another object of the invention is to provide a high security lock which can readily be manufactured and installed without substantial departure from present-day cylindrical bore-in type techniques, as opposed to the conventional mortise-type lock with its necessary and time-consuming large mortise cut-out through the edge of the door thereby leaving a very weak door section around the lock.

Another object of the invention is to provide a high security lock which is simple in its operation and highly reliable in its functioning.

Another object of the invention is to provide a high security lock, the various functions of which are readily apparent to a user and which can easily be manipulated by a user.

A still further object of the invention is to provide a high security lock which is economical to manufacture, simple to install and is capable of a protracted life.

Another object of the invention is to provide a high security lock which cannot readily be tampered with or operated by unauthorized people.

A further object is in general to provide a greatly improved, high security lock.

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

FIGURE 1 is a view showing the high security lock installed on a door, most of the view being a cross section, the plane of which is indicated by the line 1—1 of FIGURE 2 and portions of the view being in cross section on a vertical, median plane;

FIGURE 2 is a cross section on a vertical transverse plane, the plane of section being indicated by the line 2—2 of FIGURE 1;

FIGURE 3 is a cross section, the plane of which is indicated by the line 3—3 of FIGURES 1 and 2;

FIGURE 4 is a cross section, the planes of which are indicated by the lines 4—4 of FIGURE 2;

FIGURE 5 is a cross section, the plane of which is indicated by the line 5—5 of FIGURE 2;

FIGURE 6 is a cross section, the plane of which is indicated by the line 6—6 of FIGURE 2;

FIGURE 7 is a cross section, the plane of which is indicated by the line 7—7 of FIGURE 2;

FIGURE 8 is a view similar to FIGURE 7 but with the parts in a different position;

FIGURE 9 is a cross section, the plane of which is indicated by the line 9—9 of FIGURE 8;

FIGURE 10 is an exploded view in isomeric projection showing the relationship of some of the parts;

FIGURE 11 is a fragmentary view to an enlarged scale showing in cross section on an axial plane and with parts broken away the construction of, and in the vicinity of, the interior knob; and

FIGURE 12 is a cross section, the plane of which is indicated by the line 12—12 of FIGURE 2.

While the high security lock pursuant to the invention can ge embodied in a number of different ways and while its functions can be attained in various forms, it has been practically embodied as disclosed herein as one example of the invention. In this arrangement, the lock unit is installed in an environment (FIGURE 1) including a door frame 6 including a hinge post 7 and a latch engagement post 8. Controlling the door opening is a door panel 9 mounted on the hinge post 7 to swing about the axis 11 of hinges 12 in the customary fashion.

The high security lock includes two units. The first is a strike unit 13 installed in the edge of the strike post 8 and the other is a lock unit 14 installed on the door panel 9 in position so that in closed or substantially closed position of the door panel the latch bolts of the lock unit 14 and the strike unit 13 interengage. The door panel 9 is so arranged in this particular installation that the hinges 12 are on the interior, whereas the obverse side of the door is on the exterior. It can be assumed that the exterior of the door is on the hall or outside area of a hotel or motel, for example, whereas the interior of the door is on the room side or occupied side.

The lock unit 14 is made up of a number of parts and is particularly provided with a frame 21 (FIGURES 2 and 3). This is a multi-part arrangement including an edge-flanged interior plate 22 and a housing plate 23 joined to form a partial enclosure. Tabs 24 (FIGURES 3 and 6) on the housing plate 23 lie in openings in the interior plate 22 and are held by springy C-clips 25 (FIGURE 6) engaged through openings in the tabs 24. Located within the enclosure is a spacer plate 26 carrying latch fastening bars 27 and 28 extending transversely (FIGURE 4). These are designed to be transversely interengaged with ears 31 and 32 projecting from a latch housing 33 of tubular form designed to extend with its axis 34 in a horizontal plane.

The tubular housing 33 is rotatable about its axis 34 with a latch plate 37 (FIGURE 4). This is of circular form and is recessed for rotation within a face plate 38 mortised into the edge face 39 of the door panel 9 and secured by fastenings 41 in the customary way. The relative rotational motion between the latch plate 37 and the face plate 38 is accommodated by interengagement of the latch plate 37 between the face plate 38 and a backing plate 46 registering with the face plate 38 and assembled therewith. By means of this interconnection,

the tubular housing 33 is readily rotatable within the face plate 38 so that a latch bolt 51 can also be rotated about the axis 34 and can face either to the right or to the left to take into account right-hand and left-hand doors and adjust to flat and bevel edge doors (see E. L. Schlage Patent No. 2,655,030 of Oct. 13, 1953).

The latch bolt is asymmetrical and is provided with a projecting body 52 having a relatively flat face 53 on one side and an inclined flat face 54 on the other side (FIGURE 3). The latch bolt is reciprocable along the axis 34 and is connected by the customary means (see W. R. Schlage Patent No. 2,250,727 of July 29, 1941) with an actuating bar 58 (FIGURE 4). Disposed interiorly of the housing 33 are projecting springs (not shown) so that normally the latch bolt is projected, but when a superior force is exerted internally on the actuating bar 58 or externally on the latch bolt, the latch bolt can be retracted or depressed entirely within the housing 33.

Also preferably mounted on the housing 33 to cooperate with the latch bolt 51 is a reciprocable deadlatch plunger 61 which, as shown in the mentioned Schlage patent, can be interconnected with the latch bolt to preclude the depression of the projected latch bolt whenever the deadlatch plunger itself is depressed. Thus, while the latch bolt is normally free and can easily be translated in normal operation, it can upon occasion be held against depression and must remain in its projected location.

In order that the latch bolt 51 and the deadlatch plunger 61 may operate, there is provided in the strike unit 13 a frame plate 71 (FIGURE 1) which has an offset configuration to provide a lower planar portion 72 and an upper planar portion 73. Overlying the lower planar portion 72 is a strike plate 76 (FIGURE 3) of regular configuration. This includes an extended lip 77 having a curved end portion 78 and in horizontal with an opening 79. A closure box 82 is mounted on the lower planar portion 72 and is confined between the strike plate 76 and the frame plate 71. This is accomplished by lugs 84 on the box 82 which rest within recesses 86 in the lower portion 72. When the offset frame plate 71 is mounted in an appropriate recess in the latch engagement post 8, securing fasteners 89 hold the assembly together (FIGURE 1).

Since the strike lip 77 is in the path of closing movement of the latch bolt 51, the inclined flat face 54 cams against the lip and the latch bolt is reciprocated along the axis 34 in the usual way. When the latch bolt projects through the opening 79 and occupies part of the box 82, the door is latched in closed position. Also, the deadlatch plunger 61 then rests against the face of the strike plate 76 and, being thus held depressed, precludes depression of the latch bolt. This is a degree of security provided to prevent "carding" or the depression of the latch bolt by insertion between the door and the latch engagement post 8 of a thin tool pressed against the inclined flat face 54. Because of the deadlatch plunger, the latch bolt cannot in that unauthorized fashion be depressed and the door panel opened.

To afford means for withdrawing the latch bolt 51, there is provided within the frame 21 an interior slide 92 (FIGURES 3 and 10) arranged for reciprocation near the spacer plate 26 and having a pair of abutment lugs 93 and 94 on the interior side thereof (FIGURE 10). There is also provided for reciprocation within the frame 21 an exterior slide 97 (FIGURES 3 and 10) having abutment lugs 98 and 99 (FIGURE 10) thereon on the exterior side thereof. The exterior slide 97 is also formed with transversely extending lips 102 and 103 designed to interfit with the walls of notches 106 and 107 (FIGURES 4 and 10) formed in the actuating bar 58. The exterior slide 97 is urged forwardly by a pair of helical springs 111 (FIGURE 4) acting against boxes 112 (FIGURE 2) mounted on the housing plate 23. The interior slide 92 is provided with a transversely extending lug 116 (FIGURES 3 and 10) overlying and adapted in one relative position to interfit with an abutting face 117 forming the bottom of a notch in the exterior slide 97. With this arrangement, when the exterior slide 97 is reciprocated inwardly, the interior slide 92 is left stationary but the latch bolt 51 is withdrawn. When the interior slide 92 is reciprocated inwardly, it takes the exterior slide 97 and the latch bolt 51 with it since the lug 116 abuts the surface 117. The two slides then are retracted as a unit and are returned as a unit by the springs 111 (FIGURE 2) when the withdrawing force is removed.

For actuating the interior slide 92 (FIGURE 10), we provide a tubular interior spindle 121 arranged to rotate about a transverse axis 122 intersecting the axis 34. The tubular spindle 121 at one end carries projecting ears 123 and 124 designed when rotated in one direction to move the ear 123 into abutment with the lug 93 and when rotated in the other direction to move the ear 124 into abutment with the lug 94. Thus, rotation of the tubular spindle 121 in either direction produces a corresponding, withdrawing reciprocation of the interior slide 92.

The interior spindle 121 passes through a flanged opening 127 in the spacer plate 26 and is journalled in a bearing hub 128 (FIGURE 11) carrying a finishing sleeve 129 and having an outstanding elliptical flange 131. The hub 128 seats on the rim of an opening 136 formed in the interior plate 22 with the elliptical flange 131 seated within a correspondingly shaped recess 139 formed in the plate 22. To secure the bearing hub 128 in position, a thrust washer 143 having a central opening 144 therein overlies the flange 131. A pair of tabs 147 on the washer 143 pass through appropriate openings in the interior plate 22 and are clinched to form an appropriate securing means for the bearing hub (FIGURE 11).

The hollow spindle 121 is of sufficient length to extend some distance from the interior face of the door panel 9 and at its projecting end receives a manually operable interior knob 151. The knob has a grasping portion 152 and also has a reduced neck 153 of generally circular form which slides over the spindle 121. To hold the knob and the spindle nonrotatable with respect to each other and free for relative sliding engagement, the neck 153 has an inwardly extending dimple 154 and the spindle is provided with a longitudinally extending slot 156 the edges of which are engaged by the sides of the dimple. Thus, when the knob 151 is rotated, the spindle 121 is similarly rotated. The knob is held in axially selected position by a knob catch 158 mounted to move transversely within the spindle 121 and urged outwardly into a slot in the neck by a spring 159 (FIGURE 11) as shown in Schlage Patent No. 1,971,580. In this fashion, the properly positioned inner knob 151 when manually rotated in either direction through a fraction of a turn is effective to retract the latch bolt 51.

Somewhat similarly, means are provided for making it possible to actuate the structure from the exterior of the door. Disposed coaxially on the axis 122 is a central spindle 163 of relatively small diameter and tubular form having projecting ears 164 and 165 (FIGURES 4 and 10) thereon designed to interengage with the abutment lugs 98 and 99 on the exterior slide 97. The spindle 163 (FIGURE 3) extends through and bears on the rim flange of an appropriate opening 167 in the housing plate 23 and extends telescopically into an exterior spindle 169 of relatively large diameter and hollow form and carried by a bearing hub 171. The hub at one end has a trim sleeve 172 and at the other end has a flange 173. The hub passes through an opening 174 in an exterior plate 176 forming part of the lock unit frame 21 and mounted on the exterior of the door panel 9. The hub 171 is retained in position by a thrust washer 178 having tabs 179 thereon passing through openings in the plate 176 to hold the

elliptical flange 173 in an appropriate elliptical depression 181 in the plate.

The plate 176 (FIGURE 2) is reinforced and stiffened and held firmly in location against the outside face of the door panel by an exterior retaining plate 191. This is formed with a peripheral, inturned flange 192 carrying lugs 193 extending into appropriate openings 194 in the exterior plate 176 and riveted. The plates 166 and 191 (FIGURE 2) also serve as confining mounts for the heads of a pair of hollow screw posts 196 and 197 nonrotatably held in place by diametrical ribs 195 disposed in slots in the plate 191. The posts 196 and 197 are internally threaded to receive fastening screws 198 passing through an upper bushing 199 and a lower bushing 201 telescoping with the screw posts 196 and 197 for alignment and having heads 202 resting against the interior plate 22. When the fasteners 198 are tightened, the interior plate 22 and the exterior plate 176 are urged against the sides of the door panel 9 (FIGURE 2). There is thus afforded an appropriate rotational mounting for the interior spindle 121 and for the exterior spindle 169. The exterior spindle 169 is held in position against detachment and against axial translation by a lug 203 (FIGURE 2) resting against one side of the washer 178 and by a retaining ring 206 resting against the other side of the washer 178. The ring 206 lies within an appropriately formed peripheral groove 207 in the exterior spindle 169.

Unlike the interior spindle 121, which at one end receives the interior knob 151 and at the other end directly actuates the interior slide 92, the exterior spindle 169 is not directly connected. Also unlike the interior spindle, the exterior spindle 169 carries a manually operable exterior knob 211 similar in appearance to the knob 151 but firmly fixed on the spindle 169 by reason of permanently arranged interconnections 212. Once assembled, the knob 211 cannot be removed from the exterior spindle 169, but is held in axial position thereon and against rotation relative thereto.

Pursuant to the invention, means are provided for releasably coupling the exterior spindle 169 and the central spindle 163. The interior knob 151 has a central opening 216 (FIGURE 11) through which projects a diametrically ribbed actuating button 217 guided within the interior spindle 121 for axial translation. The actuating button can simply move axially with respect to the spindle 121, but preferably can be turned with respect thereto and latched in position to turn therewith. A projection 218 (FIGURE 10) on the button 217 can be depressed, turned and released to interengage with a notch 219 in the interior spindle 121.

The button 217 is rotatably mounted on the interior end of an actuating bar 220 extending along the axis 122 and passing through the interior structure so that an axial finger 221 (FIGURES 3 and 10) at one end of the bar interfits for relative rotation with an annular hub 222 formed on one end of a plunger 223 also located on the axis 122. The plunger 223 lies within the central spindle 163 (FIGURE 3) and is urged inwardly with respect thereto by a coil spring 226 at its inner end abutting a shoulder 227 on the plunger and at its other end resting against inturned lugs 228 on the central spindle 163. With this arrangement, the bar 220 and the plunger 223 and the button 217 (FIGURE 10) are normally spring urged in a direction to make the button project through the opening 216 to a substantial extent. Manual force to depress and turn the button 217 easily moves the assembly into a depressed position wherein it is latched and held.

At its outermost end the plunger 223 is reduced to serve as a mounting for a clutch plate 231 (FIGURES 3, 5 and 10). This plate has inturned axial lugs 232 slidably movable into and out of slots 233 in the central spindle 163 defined between axially extending lugs 234. Spaced about the periphery of the clutch plate 231 are concavities 236 and 237 slidably but nonrotatably interfitting with internally extending, longitudinal ribs 239 and 241 formed as part of the exterior spindle 169. In this fashion, the clutch plate 231 can slide axially along the inside of the exterior spindle 169 but cannot rotate with respect thereto. In one axial position of the clutch plate when the spring 226 is extended, the lugs 232 are interengaged with the walls of the slots 233, and the concavities 236 and 237 between the lugs 232 remain in engagement with the ribs 239 and 241 of the exterior spindle 169. This affords a driving rotary connection between the exterior knob 211 and the central spindle 163 and occurs only when the button 217 is projected from the interior knob under the action of the spring 226.

When the button 217 is depressed, the bar 220 and the plunger 223 are translated to move the clutch plate 231 axially toward the exterior of the door. This movement disengages the lugs 232 from the slots 233 between the lugs 234. In this condition, while the exterior knob 211 can readily be rotated about the axis 122, and while the clutch plate 231 rotates therewith, no rotation is transmitted to the central spindle 163 and the latch bolt 51 is not retracted. While the plunger 223 rotates with the clutch plate 231, it also rotates on the finger 221 on the bar 220 so that the button 217, even if not notched in position, is not rotated. The button 217, as an alternative or additional mode of operation, can be arranged so that it need not be turned to latch when pressed. The button can latch simply upon being pushed in and can release when the interior knob 151 is turned. For this operation, the bar 220 is provided with a notch 251 (FIGURES 3 and 10) positioned to be free when the button 217 projects, but when the button is depressed to be occupied by a lip 252 of a latch clip 253 reciprocable on ledges 254 of the exterior slide 97 and on ledges 256 of the interior slide 92. The latch clip 253 has a central slot 257 within which the bar 220 is freely reciprocable and which holds the flat bar from turning. A conical spring 258 resting against the housing plate 23 urges the latch clip 253 toward the bar 220.

When the button 217 is pressed in and forces the bar 220 to move accordingly, the notch 251 is occupied by the lip 252 and the bar 220 is held in position with the clutch plate 231 disengaged and the exterior knob 211 inactive. Thereafter, when the interior knob 151 is turned and the interior slide 92 and the exterior slide 97 are thereby withdrawn, they bear against the end 259 of the latch clip 253 and withdraw it also. This removes the lip 252 from the notch 251 and the spring 226 then causes reengagement of the clutch plate 231, rendering the exterior knob 211 again effective and causing the button 217 again to project.

With either of the button structures, when the user leaves the button 217 in projected position, he affords an interconnection between the exterior knob 211 and the exterior slide 97 so that rotation of the exterior knob in either direction is effective to retract the latch bolt 51. However, if the user depresses the interior button 217, he simultaneously disengages the clutch plate from the central spindle 163. The exterior knob 211 is thus isolated from the exterior slide 97. The exterior knob 211 can then be rotated freely in either direction, in fact "free wheels" indefinitely, without having any effect whatsoever to retract the latch bolt 51. In this way, added security is provided since the occupant of the interior of the room simply by depressing the button 217 can completely inactivate the function of the exterior knob 211.

As so far described, there is afforded a structure which actuates the deadlatching latch bolt under the control of an interior knob as well as under the control of an exterior knob control being subject to regulation by a button available to a person on the interior.

Particularly pursuant to the invention, additional security means are provided to supplement and cooperate with the latch bolt.

The supplemental means is in the form of a dead bolt 271 (FIGURES 1, 4 and 10) arranged to reciprocate

within a tubular dead bolt housing 272 along an axis 273 parallel to the axis 34 and substantially displaced therefrom, usually being located above the axis 34. The dead bolt 271, although symmetrical on both sides of a vertical plane containing the axis 273, is not rotatable within the face plate 38, but is confined to rectilinear translation. The amount of motion of the dead bolt 271 along its axis 273 is preferably made considerably greater than the amount of translation of the latch bolt 51 along the axis 34. This is to afford extra protection, particularly in installations in which there may be shrinkage or warpage between the door panel 9 and the door frame 6. If this warpage partially retracts the latch bolt from its strike opening 79, the degree of security is reduced, but since the dead bolt 271 has considerably greater length and travel, any partial retraction is not of substantial consequence.

The dead bolt 271 in reciprocating moves from a retracted position substantially flush with the face plate 38 and an extended position in which the dead bolt passed through a dead bolt opening 276 in the upper portion of the strike unit 13 and extends into a dead bolt recess within the latch engagement post 8. The recess is bounded by an enclosure 277 designed to abut the interior face of the upper portion 73 of the frame plate 71. The enclosure 277 is held in position by an extending tab 278 having a perforation 279 therein occupied by the fastener 89 which hold the plate 71 in position. The dead bolt, not having any laterally inclined faces, is not subject to "carding" and needs no device comparable to deadlatch plunger 61 (FIGURE 1).

In order appropriately to reciprocate the dead bolt within the housing 272 between its extended and retracted positions, the housing 272 carries a frame extension 281 (FIGURES 4 and 12) in the form of a loop having perforations 282 and 283 adapted to receive a pair of posts 284 and 286 non-circularly keyed in the plate 191, passing through appropriate openings 287 in the plate 176 and terminating short of a guard plate 290. The guard plate underlies the edge flange of the interior plate 22, having interlocking notched engagement therewith. When the screws 198 are tightened, the guard plate 290 distributes the pressure so that the edges of the interior plate 22 do not dig into the material of the door panel 9. The posts 284 and 286 serve as locating and supporting structures for the frame extension 281.

Located between the posts 274 and 286 and journalled on the frame extension 281 is a crank 288 rotatable through approximately ninety degrees. At its radially outer end the crank is contoured to bear against transverse walls 289 of a slide bar 291 secured to and forming part of the dead bolt 271. A spring 292 mounted on the frame extension abuts a toggle pin 293 on the crank is urged toward the closest one of its extreme positions whenever it is out of central position. When the crank 288 is manually moved from its central position toward retracted position, the spring 292 urges the crank to move the dead bolt 271 to its withdrawn, innermost position. When the crank departs from its central position toward projected position, the spring 292 is then effective to urge the crank 288 and the dead bolt 271 toward extreme projected position.

Several means are provided for actuating the crank 288 in order to operate the dead bolt 271. One of the means is a key-actuated pin tumbler mechanism 301 accessible from the exterior. The pin tumbler mechanism 301 is substantially a standard arrangement and includes a body 302 (FIGURES 7 and 9) of the usual kind having a radial projection 303. The body is disposed within a slotted sleeve 304 fixed on the plate 176. The extension 303 occupies the slot in the sleeve 304. The body 302 is thus nonrotatably held. The body 302 is held against axial translation by a U-shaped spring retainer 306 having ends snapped into depressions 307 in the sleeve 304 and lying against the projection 303.

The cylinder body 302 carries a cylinder plug 311 having the customary keyway 312 and rotatable within the body 302 by a key 313 (FIGURE 2) disposed in the keyway. Rotation of the plug 311 is transmitted with a lost motion connection. The interior end of the plug 311 has a recess 316 receiving a disk 317 (FIGURE 9) fixed on the end of a driver bar 318 adjacent a notch 319 therein. A characterized plate 320 is held on the plug 311 by a screw cap 321 locked in place by a pin 322 (FIGURE 8). The plate 320 partly occupies the notch 319 and has chordal walls 323 abutting the driver bar 318 when the plug is turned in either direction and after some lost motion. This structure provides an arrangement according to which the plug 311 may make a complete rotation of approximately three hundred sixty degrees, but the lost motion customarily provided is such that the driver bar 318 then makes only a half turn of approximately one hundred eighty degrees.

The driver bar 318 extends along an axis 324 to and above the axis 122 (FIGURE 2) and also passes through the plates 290 and 22 into a non-circular opening 328 in a coupling cup 329 carrying and fastened to an interior turn control 332 of non-circular configuration. The turn control and the coupling 329 are slidably united with the end of the driver bar 318 so that rotation of the turn control 332 or rotation of the key 313 actuates the driver bar.

This arrangement is used to afford actuation of the dead bolt 271 between its extreme projected position and its extreme retracted position and to afford actuation of the latch bolt 51 between its projected and retracted positions by rotation of the key and plug 311 or by rotation of the interior turn control 332 (FIGURE 2). This is accomplished by providing means for transmitting the motion of the driver bar 318 to various other parts of the mechanism.

The driver bar 318 engages a driver disk 344 having drive lugs 345 (FIGURES 2 and 10) defining a non-circular central opening 346 and having a radial arm 347 with an axially extending tip 348. The disk 344 is carried by a bushing 349 journalled in the interior plate 22 and having arcuate portions passing through part of the opening 346. A flange 351 on one end of the bushing lies against a spring washer 352 and a retaining ring 353 on the other end of the bushing holds the parts in place for rotation about the axis 324. Situated alongside the disk 344 and freely journalled on the bushing 349 is a crank 361 having a radial lug 362 and peripherally spaced therefrom another radial lug 363, so that both of the lugs are in the rotational path of the tip 348. This affords a rotational lost motion connection between the driver disk 344 and the crank 361. The crank has an arm 364 connected by a pivot pin 366 (FIGURE 1) to a link 367 at its lower end connected by a pivot pin 368 to one end of a parallel plane arm 369 having a non-circular central opening 371 (FIGURE 10) partly defined by lugs 372 and 373 (FIGURE 1). The crank arm 369 rests upon the notched end of a hollow bushing 374 with the lugs 372 and 373 extending into the interior of the bushing. A hub 376 (FIGURE 2) formed on the inside plate 22 supports the bushing 374. A flange 377 at one end and a lock ring 378 at the other end confine the bushing axially.

A flat bar 379 at one end is seated in the bushing 374 between the lugs 372 and 373 and so turns with the bushing and the arm 369. At the other end, the flat bar 379 passes through and engages the walls of a pair of notches 381 and 382 (FIGURE 4) partly defining a non-circular hole in the hub of the crank 288. By this motion train, whenever the key 313 or the turn control 332 is rotated, the driver bar 318 turns the driver disk 344 and, with intervening lost motion, the tip 348 engages either the lug 362 or 363 on the crank 361 and through that crank and the link 367 correspondingly turns the arm 369. This rotates the flat bar 379 and turns the crank 288 to actuate

the dead bolt **271**. The dead bolt can thus be thrown in either direction by the user of a proper key **313** or by the user of the turn control **332**.

In addition to the foregoing, means are provided for actuating the dead bolt **271** by the knob **151** and for actuating the latch bolt **51** by the key **313** and the turn control **332**. Freely journalled on the bushing **349** (FIGURES 1 and 2) is a crank plate **386** having a tip **387** extending axially into the path of the radial lug **362** on the crank **361**. Also extending axially from the crank plate **366** is a crank pin **388** arranged to operate within the end forks **389** of a rocker **391** journalled on the bushing **374**. The other end **392** of the rocker **391** is offset and rounded to engage with the walls of a notch **393** formed in the upper edge of the interior slide **92**.

With this linkage, whenever the key **313** or the turn control **332** is properly rotated to swing the tip **348** clockwise against the lug **363** on the crank **361** and also to swing the tip **348** against a shoulder **394** on the crank plate **386** and in the rotational path of the tip **348**, the pin **388** in engagement with the forks **389** rotates the rocker **391** about the bushing **374** and causes the rocker end **392** in engagement with the walls of the notch **393** to withdraw the interior slide **92**. This, in turn, by engagement of the lug **116** against the exterior slide **97** withdraws that slide also and with it the latch bolt **51**. In this manner, either the key **313** or the turn control **332** can withdraw the latch bolt **51**.

While the exterior knob **211**, when connected through the clutch plate **231**, can withdraw the exterior slide **97** and so retract the latch bolt **51**, the exterior knob **211** is not effective to withdraw the dead bolt **271** because the exterior slide **97** in withdrawing does not carry the interior slide **92** with it and so does not move the rocker **391** (FIGURES 2 and 10). But the interior knob **151** can always be turned to retract the latch bolt **51** and the dead bolt **271** as well. When the knob **151** is rotated, the interior slide **92** is withdrawn and the walls of the notch **393** engage the end **392** of the rocker **391**. When the rocker rotates about the bushing **374**, the forks **389** in engagement with the crank pin **388** rotate the crank plate **386**. The tip **387** on the crank plate engages the lug **362** on the crank **361**. Through the link **367**, the crank **361** swings the arm **369** to turn the flat bar **379** and so to withdraw the dead bolt **271** (FIGURE 1).

To make it simple to change the styling and for mechanical reasons, the device is provided with an interior cover plate **401** and an exterior cover plate **402**. The interior cover plate is a flanged shell. At its upper end it is provided with a central, downturned lip **403** engaged behind the rim of the interior plate **22**. At its lower end it is provided with an opening **404** receiving a catch plate **406** (FIGURES 2 and 6) urged downwardly by a spring **407**. The interior cover plate is thus detachably held in position and encloses the working parts. Adjacent the bearing hub **128**, the cover plate **401** is preferably enlarged into a conical form, and adjacent the cup **329** the cover plate is formed with an inturned flange **408** acting as a bearing for the cup **329** and the turn control **332**. When the interior cover plate is removed or assembled, the cup and turn control move with it, the cup **329** slidably disengaging from or engaging the driver bar **318**.

The exterior cover plate **402** is similarly arranged, but is provided upon initial assembly with crimped flanges **409** lodged in recesses **411** in the exterior plate **176**. In the vicinity of the key **313**, the exterior cover plate **402** is formed with a conical depression **412**. This acts in part as a key guide and also, with a similar depression **413** in the exterior retaining plate **191**, guards against the application of a wrench to the pin tumbler mechanism **301**.

The various control motions are so arranged that the key **313** can project or withdraw the dead bolt **271** and concurrently with the withdrawal thereof can withdraw the latch bolt **51**. The turn control **332** can project or withdraw the dead bolt **271** and concurrently with the withdrawal thereof can withdraw the latch bolt **51**. The exterior knob **211** is either disconnected entirely and freewheels with respect to the rest of the lock unit or is connected under control of the interior button **217**. When connected, the exterior knob **211** is effective when turned to withdraw the latch bolt **51** but cannot withdraw or otherwise affect the dead bolt **271**. The interior knob **151** is always effective to withdraw the latch bolt **51** and to withdraw, but not project, the dead bolt **271**.

What is claimed is:

1. A high security lock comprising a frame, a latch bolt, means for mounting said latch bolt for reciprocation on said frame, an inner knob, means for connecting said inner knob to reciprocate said latch bolt, an outer knob, means including a release mechanism for connecting said outer knob to reciprocate said latch bolt, means associated with said inner knob for actuating said release mechanism, a dead bolt, means for mounting said dead bolt for reciprocation on said frame, an inner control, means for connecting said inner control to reciprocate both said latch bolt and said dead bolt simultaneously, an outer key mechanism, and means for connecting said outer key mechanism to reciprocate both said latch bolt and said dead bolt simultaneously.

2. A high security lock as in claim **1** in which means are provided to connect said outer key mechanism and said inner control to be effective upon said release mechanism.

3. A high security lock comprising a frame, a latch bolt, means for mounting said latch bolt for reciprocation on said frame, an inner knob, means for mounting said inner knob for rotation on said frame, an outer knob, means for mounting said outer knob for rotation on said frame, a dead bolt, means for mounting said dead bolt for reciprocation on said frame, an inner control, means for mounting said inner control for rotation on said frame, an outer key mechanism, means for mounting said outer key mechanism for rotation on said frame, means for connecting said outer key mechanism and said outer knob and said inner knob to reciprocate said latch bolt, means for connecting said key mechanism and said inner control to reciprocate said dead bolt, means for releasing said outer knob from said connecting means, and means actuated by said inner knob and by said latch bolt and by said outer key mechanism for controlling said releasing means.

4. A high security lock comprising a frame, a latch bolt, means for mounting said latch bolt for reciprocation on said frame, a first actuator, means for mounting said first actuator on said frame for rotation about a first transverse axis and for reciprocation of said latch bolt, a dead bolt, means for mounting said dead bolt for reciprocation on said frame, a second actuator, means for mounting said second actuator on said frame for rotation about a second transverse axis and for reciprocation of said dead bolt, and means for connecting said first actuator and said second actuator for simultaneous rotation and for simultaneous reciprocations of said latch bolt and said dead bolt, said connecting means including lost motion.

5. A high security lock comprising a frame including a base plate adapted to lie along the inner surface of a door and including a cover overlying said base plate to define a compartment projecting from said inner surface of said door, a first actuator, means for mounting said first actuator to pass through said compartment and for rotation relative to said frame about a first axis, a second actuator, means for mounting said second actuator to pass through said compartment for rotation relative to said frame about a second axis parallel to said first axis, a latch, means connecting said latch and said first actuator for moving said latch relative to said frame, a dead bolt, means for connecting said dead bolt and said second actuator for moving said dead bolt relative to said frame, and means within said compartment for inter-

connecting said first actuator and said second actuator for rotation simultaneously.

6. A high security lock comprising a frame, a latch bolt slide plate, means for mounting said latch bolt slide plate to reciprocate on said frame, a dead bolt operator, means for mounting said dead bolt operator to rotate relative to said frame, an actuator, means for mounting said actuator for rotation on said frame, a rocker lever, means for pivotally mounting said rocker lever on said frame, a crank adapted to be rotated by said actuator, means for interengaging one end of said rocker lever with said crank, means for interengaging the other end of said rocker lever with said latch bolt slide plate, a first crank lever adapted to be rotated by said actuator, a second crank lever connected to said dead bolt operator, a link pivotally connected to said first crank lever and said second crank lever, and a rotary driver plate mounted to rotate with said actuator and adapted when rotated to turn said crank and said first crank lever.

7. A high security lock as in claim 6 including a lost motion connection between said rotary driver plate and said first crank lever and said crank.

8. A high security lock comprising a frame, a latch bolt operating device, means for mounting said latch bolt operating device for movement on said frame, a dead bolt operating device, means for mounting said dead bolt operating device for movement on said frame, an actuating device, means for mounting said actuating device for movement on said frame, a first pair of lugs outstanding from said dead bolt operating device and adapted to move in a predetermined path, a second pair of lugs outstanding from said latch bolt operating device, one of said lugs of said second pair extending into said predetermined path, and a driving lug outstanding from said actuating device and extending into said predetermined path.

9. A high security lock as in claim 8 in which said first pair of lugs and said second pair of lugs are spaced apart farther than the width of said driving lug whereby there is lost motion between said driving lug and said first pair of lugs and said second pair of lugs.

10. A high security lock comprising a frame, a latch bolt slide plate, means for mounting said latch bolt slide plate for reciprocation on said frame, a spindle, means for mounting said spindle for rotation about an axis on said frame, means interconnecting said spindle and said latch bolt slide plate for reciprocating said latch bolt slide plate when said spindle is rotated, an inner knob mounted on said frame, an outer knob, means for mounting said outer knob for rotation about said axis on said frame, a clutch including a member movable along said axis to different positions for coupling and uncoupling said outer knob and said spindle, a spring for urging said member into coupling position, and means associated with said inner knob for holding said member in uncoupling position.

11. A high security lock comprising a frame, a bolt mechanism, means for mounting said bolt mechanism for reciprocation on said frame along a path, an operating knob, means for mounting said knob for rotation on said frame about a first axis, means for interconnecting said knob and said bolt mechanism to reciprocate said bolt upon rotation of said operating knob, a rotary control, means for mounting said rotary control for rotation on said frame about a second axis, at least one of said axes being displaced from said path, a base plate included in said frame and adapted to lie against the exterior of a door, a cover plate adapted to overlie the exterior of said base plate and to act therewith to enclose a compartment on the exterior of said door, and means within said compartment for joining said rotary control to said interconnecting mechanism for operating said bolt mechanism.

12. A high security lock comprising a frame, a latch bolt, means for mounting said latch bolt on said frame for reciprocation between a retracted position and a projected position, means for urging said latch bolt toward projected position, a dead bolt, means for mounting said dead bolt on said frame for reciprocation between a retracted position and a projected position, means for urging said dead bolt toward retracted position and toward projected position, an inner control, means for mounting said inner control on said frame for rotation in opposite directions from a central position, an outer key mechanism, means for mounting said outer key mechanism on said frame for rotation in opposite directions from a central position, means for connecting said inner control to retract said latch bolt and said dead bolt when said inner control rotates from central position in one direction and to project said dead bolt when said inner control rotates from central position in the other direction, and means including a lost motion device for connecting said outer key mechanism to said inner control.

13. A high security lock as in claim 1 in which said outer knob connecting means also includes first and second hollow spindles mounted for coaxial, independent rotation, said first spindle having a non-circular inner surface and said second spindle having a configurated end, means for connecting one of said spindles to said outer knob, and means for connecting the other of said spindles to said latch bolt, and in which said release mechanism includes a clutch plate constrained to rotate with said non-circular inner surface of said first spindle and adapted for sliding motion longitudinally thereof into and out of engagement with said configured end of said second spindle.

14. A high security lock as in claim 13 in which said actuating means includes means operable from the vicinity of said inner knob for sliding said clutch plate into and out of engagement with said configured end of said second spindle.

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MARVIN A. CHAMPION, *Primary Examiner.*