DOOR LOCK WITH AUTOMATIC DEADLOCK ACTION

Filed Aug. 26, 1963

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INVENTOR
ERNEST A. BEHRMANN

BY
Knox & Knox
The present invention relates to locks and more specifically, to a door lock having automatic deadlock action.

The primary object of this invention is to provide a lock having a deadlock mechanism which can be preset while the door is open. Then, the next time the door is closed, the lock will automatically deadlock and secure the door until intentionally released.

Another object of this invention is to provide a lock which cannot be forced open from the deadlock position by the usual method of sliding the bolt back with a blade or similar tool, since the bolt is positively held against movement when deadlocked.

Another object of this invention is to provide a lock which is adaptable to conventional door actuating means and which can be locked or unlocked at any time with the door closed or open.

A further object of this invention is to provide a lock which is compact and will fit into a door in the same or less space than a simple more conventional lock and which is adapted for manufacture primarily with low cost stamped parts.

The invention consists in the novel combination and arrangement of elements and parts as described in the specification, pointed out in the claims and illustrated in the drawings, in which:

FIGURE 1 is an end elevation view of the lock;
FIGURE 2 is a sectional view taken on line 2--2 of FIGURE 1, the mechanism being in the free operating position;
FIGURE 3 is a sectional view taken on line 3--3 of FIGURE 2;
FIGURE 4 is a sectional view taken on line 4--4 of FIGURE 2;
FIGURE 5 is a sectional view taken on line 5--5 of FIGURE 2;
FIGURE 6 is a sectional view taken on line 6--6 of FIGURE 2;
FIGURE 7 is a sectional view taken on line 7--7 of FIGURE 2;
FIGURE 8 is a sectional view taken on line 8--8 of FIGURE 3;
FIGURE 9 is a sectional view similar to FIGURE 3, but with the mechanism set to go into deadlock position;
FIGURES 10, 11 and 12 are similar to FIGURES 5, 6 and 7, respectively, but with the mechanism in the position illustrated in FIGURE 3;
FIGURE 13 is a top plan view, on a reduced scale, of the lock installed in a door;
FIGURE 14 is a sectional view taken on line 14--14 of FIGURE 13;
FIGURE 15 is an end elevation view as taken from the right end of FIGURE 13, portions being cut away for clarity; and
FIGURE 16 is a sectional view taken on line 16--16 of FIGURE 2.

Similar characters of reference indicate similar or identical elements and portions throughout the specification and throughout the views of the drawing.

LOCK STRUCTURE

The lock is contained in a hollow shell or casing 20 having a barrel portion 22, a reduced width front guide portion 24 and a reduced width rear box portion 26. The casing 20 can be made in two or more parts for ease of assembly and servicing of the internal mechanism, but the specific divisions and fastening means have been omitted for clarity, since these can vary considerably and various configurations are well known in conventional locks. Slidably mounted in the guide portion 24 is a bolt 28 having the usual curved striker face 30, and fixed into said bolt is a frame 32 having spaced parallel bars 34 extending longitudinally through barrel 22 into the box portion 26. Within box portion 26 is a slidable retractor 36 having flanges 38 at the forward end which engage lugs 40 on the rear ends of bars 34. Mounted transversely through box portion 26 is a rotatable sleeve 42 having a non-circular bore 44 to receive an actuating stem 46, which is fitted with suitable hand knobs 48. Sleeve 42 carries arcuate cams 52 which engage ramps 54 on retractor 36, so that rotation of stem 46 causes the retractor to slide rearwardly, pulling with it the bolt 28. Retractor 36 is biased forwardly by a suitable return spring 56. This bolt retracting mechanism in the box portion 26 is substantially conventional and is included merely to make a complete operational lock assembly.

Mounted in barrel 22 adjacent the rear end thereof is a fixed bulkhead 58 held by lugs 60 extending through the sides of said barrel, and journaled in the bulkhead is an axial shaft 62. Bulkhead 58 has slots 64 through which arms 34 are slidable, said slots having sufficient clearance to permit limited rotation of the arms. In the portions passing through the bulkhead 58 arms 34 have under cut notches 66 defining stop shoulders 68 at the forward ends thereof. Fixed on the forward end of shaft 62 is a lock disc 70 having slots 72 through which arms 34 can slide, said slots having laterally offset reduced portions 74 which will clear the undercut notches of said arms but not the full depth of the arms. Thus if lock disc 70 is rotated slightly, the bolt will be prevented from retracting rearwardly by the stop shoulders 68 striking said lock disc, said stop shoulders being disposed just forward to the lock disc when the bolt is fully extended.

Forward of lock disc 70 is a clutch plate 76 having slots 78 for arms 34 and in the clutch plate are rearwardly projecting dimpled detents 80 which engage in corresponding sockets 82 in the lock disc when the mechanism is in unlocked position. Clutch plate 76 is contained within an annular flange 83 extending axially from bulkhead 58 and is rotatable therein but prevented from lateral movement, thus keeping the bolt assembly in proper axial alignment. The fixed bulkhead 58 serves as a mounting and alignment means for the lock mechanism. Slidably mounted on the frame 32 is a safety plate 84 having tabs 86 which extend through longitudinal slots 88 in barrel 22, said slots terminating adjacent the guide portion 24 at the shoulders 90 against which the tabs bear. Between safety plate 84 and clutch plate 76 is a primary compression spring 92 which holds the clutch plate detents 80 in place and biases the safety plate against shoulders 90. Between the safety plate 84 and bolt 28 is a lighter secondary spring 94 which biases the bolt forward to its extended position. Safety plate 84 has opposed inclined edges 96 which, when the plate is rotated slightly and tabs 86 are disengaged from shoulders 90, allow the safety plate to move forwardly into the guide portion 24, as will be evident from FIGURE 4.

At the rear of bulkhead 58 is a rotor plate 98 rotatably mounted on shaft 62, said rotor plate having slots 100 with reduced offset portions 102 through which arms 34 pass. Extending forwardly from rotor plate 98 are coupling bars 104 which engage in notches 106 in the lock disc 70, so that the rotor plate and lock disc move together. Behind the rotor plate 98 is a latch plate 108.
also rotatable on shaft 62 and having latch arms 110 extending rearwardly therefrom alongside box portion 26. The latch plate 108 has a stop lug 112 which retains one end of a torsion spring 114 wound around shaft 62, the other end of the spring being held by a lug 116 on rotor plate 98. Spring 114 biases the latch plate 108 toward the unlatched position, as will be apparent in the description of the lock operation and relative rotation of the latch plate and rotor plate 98 is limited by a limit stop 118 on the rotor plate, against which the stop lug 112 rests, as in FIGURE 7. The rotatable assembly is held on shaft 62 by a retaining pin 120 fixed transversely in the shaft.

The forward end of guide portion 24 has laterally extending flanges 122 which hold the shell 20 to a back plate 124 by which the lock is secured in a door. Back plate 124 is covered by a face plate 126 which is held by screws 128 passing through said face plate and the back plate into the structure of a door, indicated in broken line at 130 in FIGURE 2. Face plate 126 has a generally rectangular opening 132 through which bolt 28 slides, the bolt entering the slot 134 of striker plate 136 which is secured to the door jamb 137, indicated in FIGURE 13. The slot 134 has inwardly protruding upper and lower alignment tongues 138 which engage longitudinal grooves 140 in bolt 28 to hold the bolt in vertical alignment in the slot, said tongues having curved faces 141 to enter the grooves and guide the bolt smoothly into place. Bolt 28 has inclined side walls 142 and 144 which allow the bolt to be rotated slightly in the opening 132, and inside the guide portion 24 are inclined ramps 146 which enable the inclined walls and rotate the bolt to vertical position whenever the bolt is retracted.

The latching mechanism may be operated in various ways, one suitable arrangement being illustrated in FIGURES 13–15. The escutcheon or rose 148 which is attached to the door at the base of hand knob 48 is provided with a latch lever 150 carrying a cam 152 on the inside of the rose. The rose 148 and the corresponding rose 154 on the other side of the door are secured by screws 156, two of which are positioned to pass above and below the lock mechanism closely adjacent to the box portion 24. This serves to align the lock mechanism with the latch operating means to ensure proper engagement. Within the rose 148 is a rotatable actuating plate 158 having a tab 160 against which cam 152 rides, the actuating plate being biased by a suitable spring 162 to hold said tab firmly against the cam. Extending from actuating plate 158 is a fork 164 which engages the latch arm 110, so that rotation of the actuating plate moves the latch arm and causes a rotation of the latch plate 108. Since the mechanism as illustrated has two opposed latch arms 110, the latching mechanism may be installed on either side of a door as required by the direction of opening of a particular door.

Other conventional latch actuators may be used to operate the latch arm 110, such as sliding elements or push buttons, either in the rose or in the hand knob.

OPERATION

The unlocked bolt is operated in the normal manner by knob 48 which retracts the bolt through cams 52 which slide the retractor 36, the bolt being extended by spring 92 when the knob is released.

When the door is already closed and the bolt 28 engaged in striker plate 136, rotation of latch lever 150 to the position indicated in broken line in FIGURE 14 turns cam 152 and allows the actuating plate 158 to rotate. The fork 164 moves latch arm 110 and rotates latch plate 108 as indicated in FIGURE 12. Since latch plate 108 is coupled to rotor plate 98 by spring 114, the rotor plate also rotates and, through coupling bars 104, turns lock disc 70. With bolt 28 held vertically in the striker plate 136, the reduced portions 74 of slots 72 move into the notches 66 behind stop shoulders 68, as in FIGURE 10, and prevent the bolt from being retracted. When the latch mechanism is thus set in locked position, the only way the bolt can be retracted is to turn frame 32 so that the arms 34 are in the slots 72 and can slide, but rotation of the frame is prevented by the engagement of these bolt arms 34 and lock plate 136, with tongues 138 engaged in grooves 140. Even if the gap between the striker plate and face plate 126 is sufficient to permit insertion of a jimmy, knife, or other such tool, the bolt cannot be forced open.

With the door open, operation of latch lever 150 will again rotate latch plate 108 and rotor plate 98 together with lock disc 70, but since the bolt 28 is not restrained, the engagement of detents 80 in sockets 82 will cause rotation of clutch plate 76 along with said lock disc. This will turn arms 34 and rotate bolt 28 so that said arms remain in the full slots 72 and are still slidable, allowing the bolt to retract, as in FIGURE 11. Rotation of the bolt 28 also rotates safety plate 84 so that the tabs 86 are pulled out of slots 88, whereupon primary spring 92 overcomes spring 94 and drives the safety plate forward against the bolt, as illustrated in FIGURE 9, with said tabs on the inside of shoulders 90.

When the door is subsequently closed the striker face 30 of bolt 28 rides over striker plate 136 and causes the bolt to retract, as in a conventional lock. However, the bolt and associated lock disc structure are inclined from the vertical position and safety plate 84 holds the bolt in the inclined position for the initial portion of its travel, until bars 34 are sliding through slots 72. That is, the stop shoulders 68 are not stopped by the lock disc 70 during the initial retraction of the bolt. As the tabs 86 move clear of shoulders 90, the ramps 146 act on inclined walls 142 and 144 turn the bolt to the vertical position. In the retracted position of the bolt, the arms 34 have their full depth portions through slots 72, thus the rotation of bolt 28 to the vertical position will carry the lock disc 70 with it, the sockets 82 riding over detents 80 and forcing clutch plate 76 forward against spring 92. Through the coupling bars 104 the rotor plate 98 rotates with lock disc 70, against the spring 114.

When the bolt 28 comes forward again and enters the slot 134 of striker plate 136, the tongues 138 enter grooves 140 and hold the bolt positively in vertical position. As the bolt slides forward, the arms 34 move through slots 72 until the stop shoulders 68 clear the lock disc 70. Then the spring 114, acting against lug 116, rotates the rotor plate 98 until limit stop 118 strikes the stop lug 112. At the same time, through coupling bars 104, the lock disc 70 is rotated to bring the reduced slots portion 74 over the notches 66 of arms 34, said arms now being in the position indicated in broken line in FIGURES 10 and 11. In this position the bolt is prevented from retracting by the stop shoulders 68 striking against lock disc 70.

In this manner the latch mechanism can be preset with the door open. Then when the door is closed the mechanism automatically goes to deadlock position by the action of the sliding bolt and the bolt can subsequently be opened only by releasing the latch mechanism or by rotating the bolt. Rotation of the bolt is prevented by the tension and groove interlocking plate and the lever will be on the inside of the door, inaccessible from the outside. Forced entry is thus prevented, even with the usual bolt retracting tools.

One great advantage of this lock mechanism is that the clearance between the door an door jamb is not critical, as with some deadlock mechanisms, since the bolt cannot be forced even if readily accessible. No key is necessary to lock the door and no separate night latch or fastener is needed on the door. From the manufacturing standpoint, virtually all of the parts of the mechanism can be
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stamped from sheet material, machining and special forming being kept to a minimum.

It is understood that minor variation from the form of the invention disclosed herein may be made without departure from the spirit and scope of the invention, and that the specification and drawings are to be considered as merely illustrative rather than limiting.

I claim:

1. A door lock, comprising:
   an elongated casing;
   a bolt longitudinally slidably mounted in said casing and having a frame thereon;
   a lock disc axially rotatably mounted in said casing and having slots through which said frame is slidable in a first position relative to said lock disc;
   said bolt being rotatable to a second position relative to said lock disc;
   said frame having stop portions engageable with said lock disc in said second position to prevent longitudinal sliding of the bolt;
   a striker plate in which said bolt is engageable;
   said striker plate having alignment means engaging said bolt and holding said bolt, in said second position.

2. A door lock, comprising:
   an elongated casing;
   a bolt longitudinally slidably mounted in said casing and having a frame thereon;
   a lock disc axially rotatably mounted in said casing and having slots through which said frame is slidable;
   latch means coupled to said lock disc to rotate the lock disc and said bolt therewith to a first position;
   means engageable with said bolt as the bolt slides to rotate the bolt to a second position relative to said lock disc;
   a striker plate having alignment means with which said bolt is engaged to hold the bolt in said second position;
   said frame having stop portions engageable with said lock disc in said second position to stop sliding motion of the bolt.

3. A door lock, comprising:
   an elongated casing;
   a bolt longitudinally slidably mounted in said casing;
   a striker plate having alignment means with which said bolt is engaged to hold the bolt against rotation;
   a spring biasing said bolt outwardly from said casing;
   locking means mounted in said casing and adapted to rotate in a plane normal to the direction in which said bolt slides;
   said bolt having a frame slidable through said locking means in a first position relative thereto;
   means to rotate said locking means to a second position relative to said bolt;
   said frame having stop means engageable with said locking means in said second position to stop sliding motion of the bolt;
   and means in said casing engageable with said bolt to hold the bolt in said first position during initial retraction of the bolt into the casing.

4. A door lock according to claim 3 wherein said last mentioned means includes a reduced width guide portion of said casing, and a plate element non-rotatably attached to said bolt and being slidable but non-rotatable in said guide portion.

5. A door lock according to claim 3 wherein said locking means includes a lock disc having slots through which said frame is slidable, and latch means resiliently coupled to said lock disc to allow limited rotation of the lock disc from said second position during motion of said bolt.

6. A door lock, comprising:
   an elongated casing;
   a bolt longitudinally slidably mounted in said casing;
   a striker plate having alignment means with which said bolt is engaged to hold the bolt against rotation;
   a bulkhead fixed in said casing;
   locking means mounted on said bulkhead and adapted to rotate in a plane normal to the direction in which said bolt slides;
   said bolt having a frame slidable through said locking means in a first position relative thereto;
   latch means coupled to said locking means to rotate the locking means to a second position relative to said bolt;
   said frame having stop portions engageable with said locking means in said second position to stop sliding motion of the bolt;
   and biasing means connected to said bolt to urge the bolt outwardly from said casing.

7. A door lock according to claim 6 wherein said locking means includes a lock disc on the side of said bulkhead adjacent said bolt;
   said lock disc having slots through which said frame is slidable in said first position, said slots having offset portions to engage said stop portions in said second position.

8. A door lock according to claim 7 and including a clutch plate slidable on said frame and having detent means frictionally engageable with said lock disc;
   said biasing means including a primary spring between said clutch plate and said bolt.

9. A door lock according to claim 6 wherein said latching means includes a rotor disc rotatably mounted on said bulkhead and coupled to said lock disc;
   and a latch arm resiliently connected to said rotor plate to allow limited rotation of said rotor plate and lock disc.

10. A door lock according to claim 6 and including a reduced width guide portion in said casing adjacent said bolt;
    a plate element slidably mounted on said frame between said primary spring and said bolt, said plate element being slidable but non-rotatable in said guide portion;
    a lighter secondary spring between said plate element and said bolt;
    the end of said guide portion remote from said bolt having shoulders;
    said plate element having portions engageable with said shoulders in said second position to prevent entry of the plate element into said guide portion.

11. A door lock according to claim 10 wherein said bolt has inclined faces permitting limited rotation of said bolt from said first position within said guide portion;
    and ramp means in said guide portion to rotate said bolt to said first position during retraction of the bolt into said casing.

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