

- [54] **DOOR LOCK**
- [75] Inventor: **Leon Yulkowski**, Pontiac, Mich.
- [73] Assignee: **General Lock Company**, Pontiac, Mich.
- [22] Filed: **June 12, 1972**
- [21] Appl. No.: **261,586**

- [52] U.S. Cl. .... **70/107, 70/148, 70/151 R**
- [51] Int. Cl. .... **E05b 59/00, E05b 55/00**
- [58] Field of Search..... **70/107, 110, 111, 70/146, 147, 148, 151**

[56] **References Cited**

**UNITED STATES PATENTS**

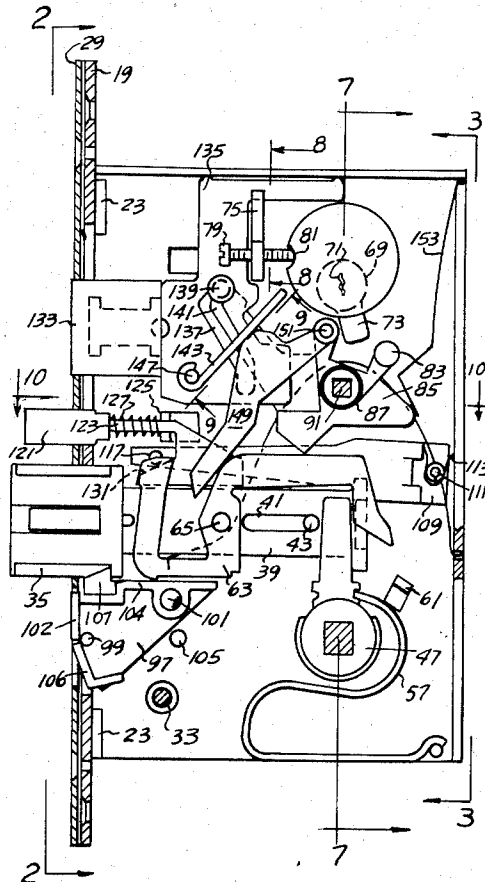
562,204	6/1896	Sparks .....	70/107
1,508,668	9/1924	Prinzler .....	70/151 R
3,148,524	9/1964	Yulkowski .....	70/107
3,242,706	3/1966	Check .....	70/110
3,266,276	8/1966	Yulkowski .....	70/110

*Primary Examiner*—Marvin A. Champion  
*Assistant Examiner*—Richard P. Tremblay  
*Attorney*—Robert A. Sloman

[57] **ABSTRACT**

In a door lock which has a casing, a face plate, a lock cylinder with rotatable cam, a spring-biased retractible latch bolt, and inner and outer manually rotatable hubs with the inner hub in operative engagement with said latch bolt for retracting the same, the improvement which includes a clutch pivoted upon the latch bolt and normally spring-biased to a position disengaged from the outer hub. An upper transmission bar is pivotally mounted within the casing adapted for operative engagement with a lower transmission bar pivoted within the casing with the latter in operative engagement with the clutch. The upper transmission bar is normally positioned in the path of rotation of the cylinder cam so that when engaged thereby acting through the lower transmission bar and the clutch is adapted to retract the latch bolt, and is also adapted to rotate the clutch for operative engagement by the outer hub.

**13 Claims, 10 Drawing Figures**





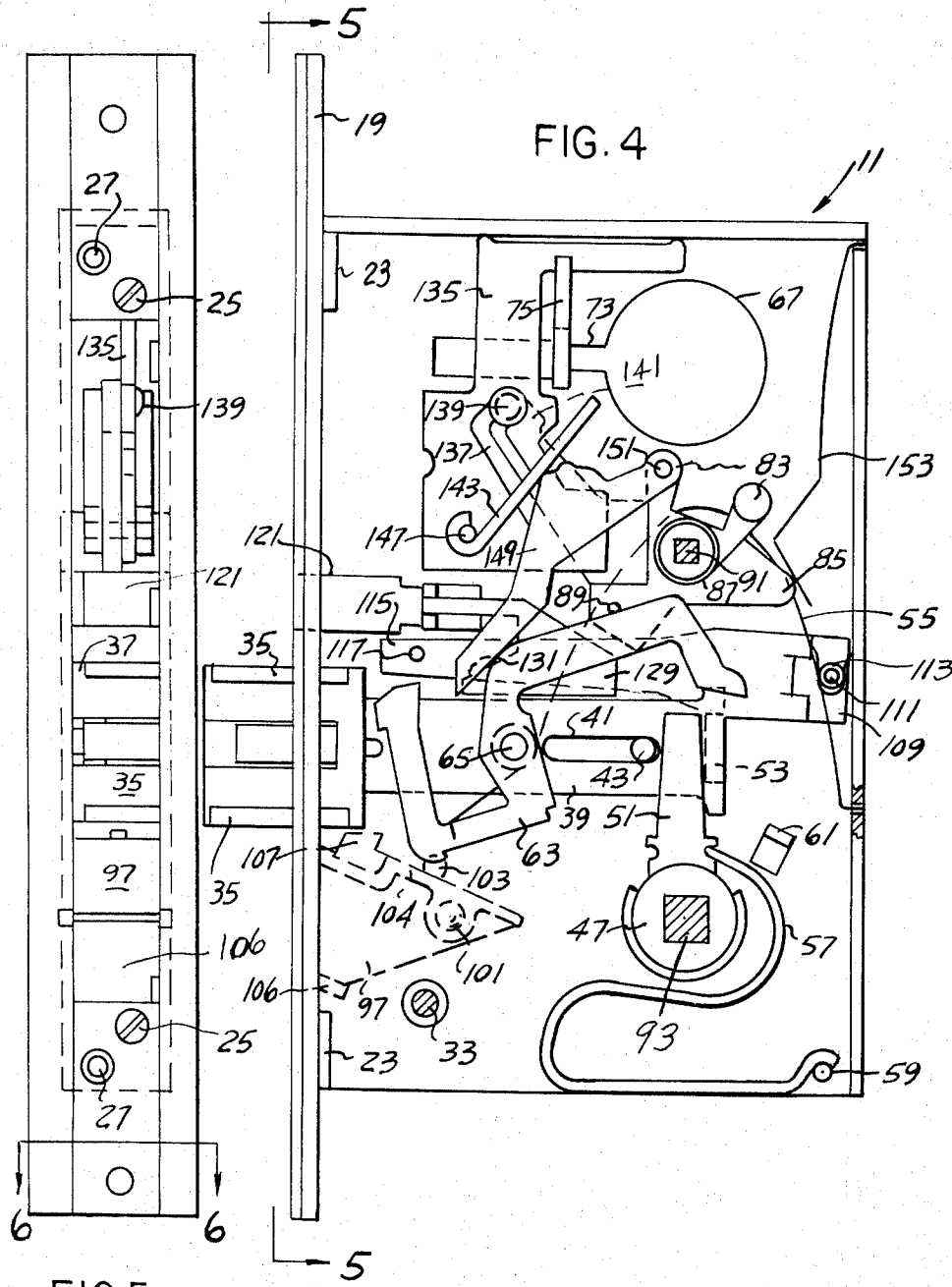


FIG. 4

FIG. 5

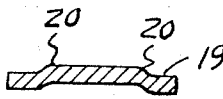
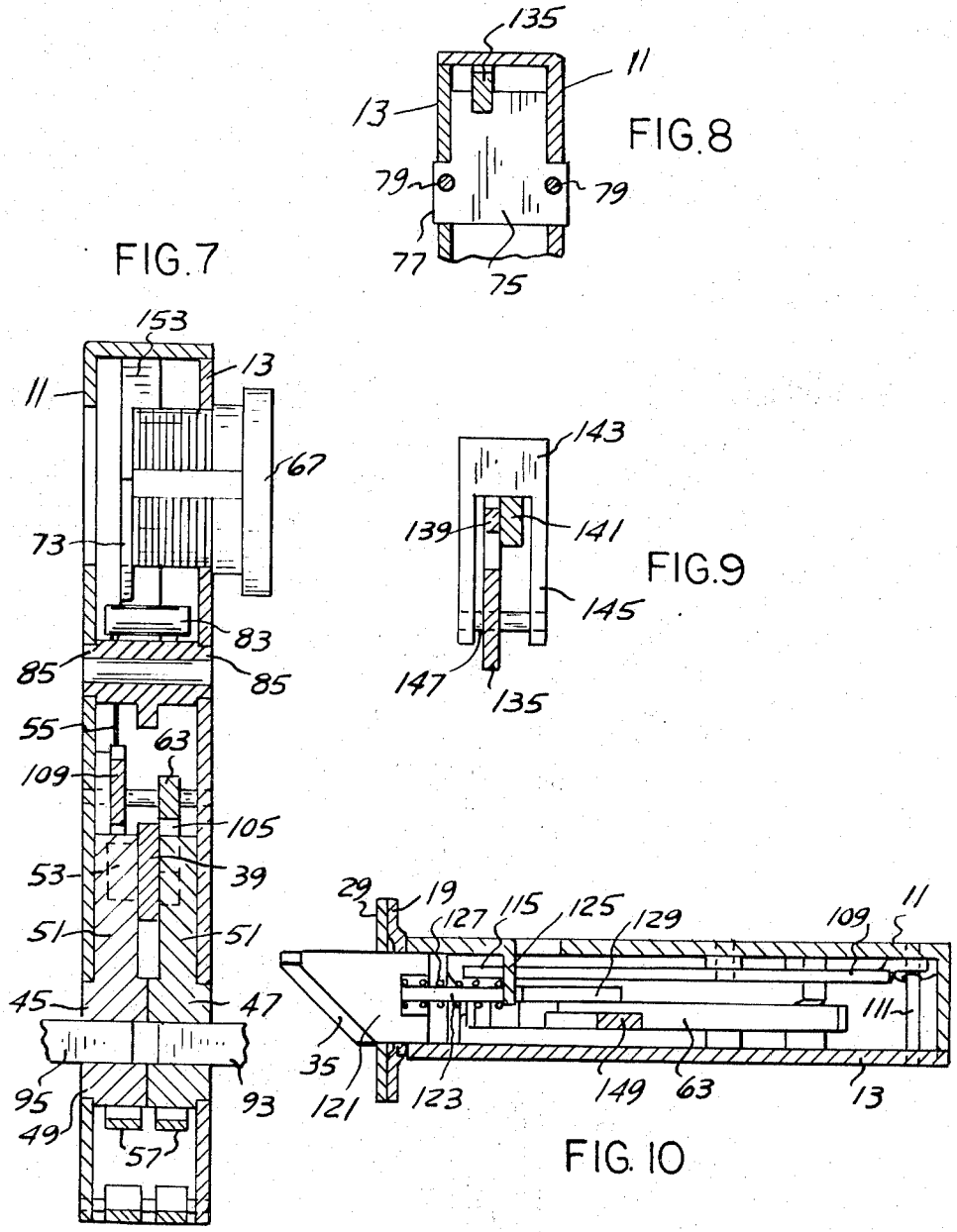


FIG. 6



## DOOR LOCK

A lock button is pivotally mounted upon the casing and in unlocked position, is pivoted so as to supportably engage the clutch in a clockwise rotated position in operative engagement with the outer hub, and in an unlocked position, permits the clutch to be normally spring-biased to disengagement from the outer hub. A locking lever is pivoted within the casing and normally spring-biased to a position blocking retraction of the latch bolt and mounts a lateral pin which upon clockwise rotation of the clutch, lifts the locking lever to a non-blocking position.

Also included is a stop button normally biased outwardly but retracted when the door is closed and which mounts a cam adapted to supportably engage the locking lever when the door is open to assume a non-blocking position with respect to the latch bolt but which when retracted, is disengaged from said locking lever.

The thumb-turn hub within the casing and manually operated from inside or outside the door may mount a pin whereby, upon rotation of said hub rotates the clutch to a clockwise position and cams the locking lever from latch bolt blocking position.

A dead bolt is slidably mounted on the casing and is adapted for projection through the face plate and includes a hub having a cam slot operatively engaged by pin on the thumbturn hub for projection and retraction of said dead bolt. Spaced cams on the thumb-turn hub are adapted to be engaged by the door lock cam upon activation thereof from the exterior of the door for retraction of the dead bolt and on successive rotation of said cam for engagement with the upper and lower transmission bars and clutch for retracting the latch bolt.

## BACKGROUND OF THE INVENTION

The present invention is an improvement over the lever lock for doors disclosed in my earlier issued U.S. Pat. No. 3,148,524 dated Sept. 15, 1964.

There has long existed the need for an improved general purpose door lock which may be adapted for schools, hotels or other buildings or for residences or apartments and, wherein, the lock may be normally maintained in a locked condition, but wherein, the latch bolt may be retracted by a key-operated locking cam.

Heretofore, the conventional latch bolt may be manually retracted by a flexible strip of plastic inserted between the armor plate and the door jam.

It is an object of the present invention to provide an improved locking lever which is normally spring-biased within the casing to a position to block unauthorized retraction of the latch bolt but, which under normal key-operated functioning of the lock will be moved to a non-blocking position.

It is a further object to provide a stop button which is normally spring-biased outwardly when the door is open and which retracts on engagement with the door jam on door closing and which mounts a cam which supports the locking lever out of blocking position when the door is open and which disengages the locking lever when the door is closed to permit the same to bias to latch bolt blocking position.

It is another object to provide an improved dead bolt assembly and associated key-operated lock cylinder cam whereby said cam is adapted for effecting from the

outside of the door projection and retraction of the dead bolt and on further rotation of the cam is adapted to effect manual retraction of the latch bolt.

It is another object to provide an improved door lock which may be used for schools and, wherein, there is no requirement for a dead bolt.

It is another object to provide an improved face plate mounting for the lock casing by which said face plate may be positioned at an angle for approximately  $3\frac{1}{2}^\circ$  more or less from the normal in one direction and upon readjustment of the fastening assembly would be adjusted at a complementary angle of approximately  $3\frac{1}{2}^\circ$  from the normal or upon the use of all fastening mechanisms may be set for any intermediate angle within the range of  $7^\circ$  approximately.

These and other objects will be seen from the following specification and claims in conjunction with the appended drawings.

## THE DRAWINGS

FIG. 1 is a side elevational view of the door lock with the cover plate removed for clarity of illustration and with the locking button shown placing the lock in unlocked condition.

FIG. 2 is a left end elevational view taken in the direction of the arrows 2—2 of FIG. 1.

FIG. 3 is a right end elevational view taken in the direction of arrows 3—3 of FIG. 1.

FIG. 4 is a view similar to FIG. 1 but with the dead bolt omitted. The lock button normally omitted with no dead bolt is shown in dotted lines merely to show its locked position relative to FIG. 1.

FIG. 5 is a left end elevational view taken in the direction of arrows 5—5 of FIG. 4.

FIG. 6 is a fragmentary plan section taken in the direction of arrows 6—6 of FIG. 5.

FIG. 7 is a vertical section of the door lock taken in the direction of arrows 7—7 of FIG. 1.

FIG. 8 is a fragmentary section taken in the direction of arrows 8—8 of FIG. 1.

FIG. 9 is a section taken in the direction of arrows 9—9 of FIG. 1 showing the mounting of the upper transmission bar.

FIG. 10 is a plan section taken in the direction of arrows 10—10 of FIG. 1.

It will be understood that the above drawings illustrate merely a preferred embodiment of the invention, and that other embodiments are contemplated within the scope of the claims hereafter set forth.

Referring to the drawings, the present door lock includes a hollow rectangular casing 11 with removable cover plate 13 having a series of laterally projecting tabs 15 adapted for interlock positioning within corresponding slots 17 formed in the casing and face plate 19 and wherein no fasteners are required. However a single fastener 33 may be used to prevent accidental disassembly of the cover plate from within said casing.

Face plate 19, apertured as shown in FIG. 6, includes a body and with the upright outer edges thereof forwardly displaced as at 19 to provide upon the rear surface of said face plate a pair of parallel laterally spaced fulcrums 20 adapted for supported engagement with the end plates 23 of the casing and secured thereto by a pair of vertically spaced fasteners 25.

Employing the fasteners 25 it appears that the face plate acting through the adjacent fulcrum 20 would be inclined at an angle of approximately  $3\frac{1}{2}^\circ$  from the nor-

mal in one direction. By the alternate and selective use, a separate pair of laterally spaced fasteners 27, the alternate fulcrum 20 is employed as shown in FIG. 6 whereby the face plate is tipped at an opposite complementary angle of  $3\frac{1}{2}^\circ$  from the normal as is often desired in lock assemblies.

With the selective use of all four of the fasteners 25 and 27, there may be an angular adjustment of the face plate with respect to the normal through an arc of  $7^\circ$  approximately.

The horizontally disposed spring-biased latch bolt 35 under the action of leaf spring 55, FIG. 4, is normally biased to the door locking position shown in FIGS. 1 and 4 extending through face plate 19 and the adjacent armor plate 29, FIG. 2, which is secured to the face plate by fasteners 31.

As shown in FIG. 2, said latch bolt has a series of projections 37 which are movably positioned within corresponding apertures in the face plate and armor plate. Said latch bolt includes an elongated hub 39 having a transverse slot 41 which receives the transverse latch bolt guide and support pin 43 anchored within the casing and its cover plate.

Inner and outer manually rotatable hubs 45 and 47 are positioned face to face within said casing, with portions of their bodies journaled within corresponding apertures in the casing and cover plate as at 49. Each hub includes an upright arm 51 so that upon activation of the corresponding handles 93 and 95 shown fragmentarily in FIG. 7 may be rotated clockwise limited by the stop 61 and against the action of the corresponding formed leaf springs 57 anchored at 59.

The latch bolt 39 at its inner end has an inwardly projecting right angular tab 53 which normally lies in the path of rotation of the inner hub and its associated arm 51 by which upon rotation of the inner handle or door knob 95, the latch bolt may be retracted at all times for opening the door.

An S-shaped clutch 63 is pivotally mounted intermediate its ends at 65 upon the latch bolt and is normally biased by the leaf spring 55 to the normal lock condition, i.e., in a counterclockwise direction so as to be disengaged from the arm 51 of the outer hub 47 when the door is locked as in a situation shown in FIG. 4. The door lock is shown unlocked in FIG. 1 and here it is noted that the clutch 63 has been rotated clockwise so that a portion thereof is in the path of rotation of the outer hub by which the latch bolt may be retracted from the outside.

Conventional cylinder lock 67, FIG. 7, is projected through the corresponding aperture in the cover plate and includes a cylinder 69 with key hole 71, FIG. 1, and a rotatable cam 73 secured to said lock cylinder.

Transverse apertured plate 75 within said casing and cover plate as shown in FIG. 8 includes lateral bosses 77 nested within corresponding apertures in said casing and cover plate is adapted to receive the screws 79 which project within an exterior longitudinal slot 81 in the lock cylinder for anchoring the cylinder in position, once it has been threaded through the cover plate as shown in FIG. 7.

The lock cylinder cam 73 is primarily intended upon rotation of said cylinder for effecting projection and retraction of the dead bolt 133 and is also adapted for key operated retraction successively of the latch bolt 35 when the door is in a locked condition as in FIG. 4.

Accordingly, the cylinder cam 73 is normally positioned between a pair of spaced cams 83 which project from and above the thumb-turn hub 85 whose axial bosses 87 journal and support the thumb-turn hub within said casing. Said thumb-turn hub has a square aperture therein adapted to receive the conventional handle 91, FIG. 4, by which the thumb-turn hub may be manually rotated from the inside of the door when it is employed for projecting or retracting the dead bolt in the manner hereafter described with respect to FIG. 1.

In the illustration shown in FIG. 4, no dead bolt is employed as in the case of a public school or other area where a dead bolt is not desired. In this situation, pin 89 projects laterally from the thumb-turn hub, FIG. 4, and upon manual rotation of the thumb-turn hub from the inside of the door in a clockwise direction, will in turn, rotate the clutch 63 in a clockwise direction so that its left end FIG. 4, is adapted to lift the locking lever to a non-blocking position as hereafter described and wherein thus the inner handle is capable of retracting the latch bolt. With the dead bolt omitted, the lock button 97 is also omitted. It is shown in FIG. 4 in dotted lines merely to show its "locked position" with respect to the "unlocked position" in FIG. 1.

Additionally, as hereafter described, rotation of the cylinder cam 73 by the use of a key in the lock cylinder is adapted to operatively engage upper transmission bar 143 which, in turn, engages lower transmission bar 149 and which in turn, engages the clutch 63 for retracting the latch bolt 35. Here also the lower transmission bar 149 rotates the clutch from the position shown in FIG. 4 to the position shown in FIG. 1 to disengage the locking lever 109 from its normal blocking position relative to the latch bolt as further described in detail.

The present lock may be provided with a pivotal lock button 97 which is nested within the housing and pivoted thereto at 99 and which includes a spring-biased ball detent 101 registerable with one of a pair of casing apertures 105 and 103 when the lock button is in unlocked condition, FIG. 1, or in locked condition, FIG. 4.

The lock button includes front actuating plate 102 used for tilting the lock button to the lock position, FIG. 4, and an additional front face 106 which is used for rotating the lock button to the unlocked position shown in FIG. 1. Here the top plate 104 of the lock button is supportably engaging the clutch and has rotated the same in a clockwise direction so that it engages the outer hub and lifts the locking lever. Thus, the door is unlocked and rotation of the outer door knob 93 will retract the locking lever.

It is noted in FIG. 4 that the top plate 104 is out of engagement with the clutch which is, thus, normally spring-biased to the door lock position and condition of FIG. 4.

As shown in FIG. 1, the catch 107 projects upwardly from the lock button 97 rearwardly of plate 104 and interlocks with an undersurface portion of the latch bolt.

Accordingly, in order to shift the lock button 97 from the unlocked condition, FIG. 1, to the locked condition of FIG. 4, it is first necessary to manually retract the latch bolt 35.

#### LOCKING LEVER

Locking lever 109 is horizontally disposed within the casing and at one end is pivotally mounted thereon at

111 and is normally spring-biased as at 113 so that its forward stop end 115 is positioned directly behind the latch bolt 35 normally blocking the same against retraction as in FIG. 4. This will prevent unauthorized manual retraction of the latch bolt. It is seen in FIG. 4 that the clutch is in an inactive position when the lock is locked. Thus, manual rotation of the outer hub will not retract said latch bolt.

Pin 117 is mounted on and projects laterally of the locking lever 109 so that it is engaged by the clutch 63 when the clutch has been in one manner or another rotated to the control position shown in FIG. 1. In FIG. 1, the clutch has been rotated so as to lift the locking lever 109 so as to be non-blocking with respect to the latch bolt 35.

Stop button 121 has a tapered front face so that when the door is closed with respect to the door jam, the stop button will be projected inwardly to the position shown in FIG. 4. Said stop button 121 includes an axial shank 123 which is slidably positioned within the guide 125 disposed within said casing, there being a suitable coil spring 127 normally biasing the stop button 121 to the outer-most position through the face plate as shown in FIG. 1. The stop button 121 and its connected shank 123 includes the depending hub 129 which has a forwardly inclined cam 131. When the stop button 121 is in its normal position with the door open, said cam 131 supportably engages pin 117 on the locking lever so as to position said locking lever in a non-blocking condition to facilitate retraction of the latch bolt 35.

As shown in FIG. 4, when the door has been closed, the stop button has been retracted by the door jam to a position shown with the result that the said cam 131 no longer supportably engages the pin 117 and, thus, the locking lever has been spring-biased downwardly into blocking position with respect to the latch bolt 35.

The horizontally disposed dead bolt 133 is slidably nested within said casing and projects through a corresponding aperture in the face plate 19 and connected thereto rearwardly thereof is the hub 135, an upper portion of which is slidably mounted relative to transverse plate 75 within said housing as best shown in FIGS. 1, 4 and 8 for guiding forward movements and retraction of said dead bolt within said casing.

Provided through the dead bolt hub is an irregularly shaped cam slot 137.

Cantilever arm 141 forming a part of the thumb-turn hub 85 mounts at its end transverse pin 139 which is nested and retained slidably within the dead bolt hub slot 137 whereby upon rotation of the thumb-turn hub 85 in one direction, i.e., clockwise from the interior of the door, the dead bolt 133 will be projected to a locking position. Upon rotation in the opposite direction of said thumb-turn hub, acting through the pin and slot the dead bolt 133 will be retracted to the unlocked position shown in FIG. 1.

Upper transmission bar 143, of inverted U-shape, as shown in FIG. 9, includes a pair of depending legs 145 which are positioned upon opposite sides of the dead bolt hub and pivotally connected thereto at 147.

The lower transmission bar 149 underlies a portion of the upper transmission bar, and at its upper end, is pivotally connected as at 151 to the thumb-turn hub 85 which is biased in a counterclockwise direction as viewed in FIG. 1 by the leaf spring 153 within said casing.

## OPERATION

In operation, it is seen that the upper free end of the upper transmission bar 143 lies in the path of rotation of the cylinder cam 73 when it has been manually rotated by the key-operating said cylinder to the position shown in FIG. 4. Here said cam operatively engages the upper transmission bar, pivoting the same around its pivot 147 which, in turn, operatively engages the lower transmission bar moving it about its pivot 151. The lower transmission bar at its lower portion operatively engages the clutch 63. This accomplishes two things.

First, the clutch is rotated to the clockwise position shown in FIG. 1 so that its left end engages and lifts the pin 117 on the locking lever 109. Additionally, the lower transmission bar is effective for retracting latch bolt 35 since the clutch, when rotated as shown in FIG. 1 has lifted the locking lever out of blocking position.

Ordinarily, therefore, utilizing a key to rotate the lock cylinder 69 from the outside of the door, the cam 73 is first effective for retracting the dead bolt if it has been projected forwardly, to an unlocked condition. Still the door may not be opened until the cylinder 69 has been further rotated in a counterclockwise direction as shown in FIG. 1 to engage the upper end of the upper transmission bar 143. This pivots the lower transmission bar downwardly so as to cause retraction of the latch bolt 35 and at the same time, positioning the clutch 65 in such position as to lift the locking lever 109 to a non-blocking position.

When it is desired to retain latch bolt 35 in retracted position, as in FIG. 4, after retraction, the lock button is rotated counterclockwise to the position shown in FIG. 1. The inner end of plate 104 retainingly engages clutch 63 holding the latch bolt retracted.

Having described my invention, reference should now be had to the following claims.

I claim:

1. In a door lock having a casing, an apertured face plate, a lock cylinder with rotatable cam, a spring-biased retractible latch bolt guidably mounted on said casing and face plate, and opposed inner and outer manually rotatable spring-biased hubs journaled within and upon said casing, the inner hub being in operative engagement with said latch bolt; the improvement comprising:

an S-shaped clutch within said casing pivotally mounted intermediate its ends upon said latch bolt; a spring anchored in the casing normally biasing said clutch counterclockwise to a position disengaged from said outer hub;

a lower transmission bar at its upper end pivoted within said casing with its lower end in operative engagement with said clutch;

and an upper transmission bar at its lower end pivoted within said casing operatively engaging the lower transmission bar, with its upper end normally positioned in the path of rotation of said cam and when operatively engaged thereby, pivotally rotating the lower transmission bar, in turn, operatively engaging said clutch, adapted to retract said latch bolt.

2. In the door lock of claim 1, said clutch adapted to be thus rotated clockwise into operative reactive engagement with said outer hub, so that rotation of the outer hub is effective to retract said latch bolt.

3. In the door lock of claim 1, a lock button pivoted upon and within said casing having a manually operable front face within said face plate, and an inwardly extending clutch support plate in "unlocked position" supportably holding said clutch in a clockwise rotated position so that said outer hub is adapted to operatively engage said clutch to retract said latch bolt.

4. In the lock of claim 3, said lock button being manually pivoted to a "locked position" with its support plate disengaged from said clutch.

5. In the lock of claim 4, ball detent means on said lock button registerable with said casing in "unlock" and "lock" positions.

6. In the door lock of claim 1, said clutch adapted to be rotated clockwise; a horizontally disposed locking lever pivotally mounted on said casing and normally spring-biased to a position blocking retraction of said latch bolt when the door is closed; a lateral pin on said locking lever; said clutch on such clockwise rotation adapted to operatively engage said pin lifting said locking lever to a non-blocking position.

7. In the door lock of claim 6, a horizontally disposed stop button guidably mounted on said casing and normally biased outwardly of said face plate and adapted for retraction on closing of the door; cam on and depending from said stop button adapted on opening of the door and forward movement of said stop button to operatively engage said locking lever pin lifting said locking lever to a non-blocking position, said stop button when retracted disengaging said locking lever.

8. In the door lock of claim 6, a thumb-turn hub journaled upon said casing and adapted for manual rotation from the door inside, and a pin on said hub adapted on rotation thereof to engage and rotate said clutch clockwise into engagement with the outer hub and also so that one end thereof operatively engages said locking pin, lifting said locking lever.

9. In the door lock of claim 1, a dead bolt slidably mounted on and nested in said casing and adapted for projection through said face plate and including a hub having a cam slot therethrough; a thumb-turn hub journaled upon said casing adapted for manual rotation

from the door inside; a cam pin on said thumb-turn hub operatively nested in said cam slot whereby rotation of the thumb-turn hub in one direction advances said dead bolt, and in the other direction retracts said dead bolt.

10. In the door lock of claim 9, said upper transmission bar being pivotally mounted on said dead bolt hub; said lower transmission bar being pivotally mounted on said thumb-turn hub; spaced cams on said thumb-turn hub, said lock cylinder cam being normally positioned between said thumb-turn hub cams adapted for key-operated engagement with said cams selectively for advancing and retracting said dead bolt; continued rotation of said cylinder cam after retraction of said dead bolt bringing said cylinder cam into operative engagement with said upper transmission bar rotating the same, in turn, rotating the lower transmission bar engaging said clutch and retracting said latch bolt.

11. In the lock of claim 10, said clutch adapted to be rotated clockwise; a horizontally disposed locking lever pivotally mounted on said casing and normally spring-biased to a position blocking retraction of said latch bolt when the door is closed; a lateral pin on said locking lever; said clutch on such clockwise rotation adapted to operatively engage said pin, lifting said locking lever to a non-blocking position.

12. In the door lock of claim 11, a horizontally disposed stop button guidably mounted on said casing and normally biased outwardly of said face plate and, adapted for retraction on closing of the door; a cam on and depending from said stop button adapted on opening of the door and forward movement of said stop button to operatively engage said locking lever pin, lifting said locking lever to a non-blocking position, said stop button when retracted disengaging said locking lever.

13. In the door lock of claim 4, said latch bolt adapted to be retracted so that with the lock button successively returned to "unlocked position" its support plate is elevated to lie in the path of and retainingly engage said clutch, holding said latch bolt retracted.

\* \* \* \* \*

45

50

55

60

65