This is an improvement of the structure described in Patent No. 3,234,763 issued Feb. 15, 1967.

The invention relates to door locks which feature a vertically positioned handle above the upper end of which is a thumbpiece for the retraction of a conventional latch bolt when the door is to be opened from the outside, a handhold being provided on the inside, usually a door knob, which is capable of retracting the same conventional latch bolt by rotation of the handle. The invention hereunder consideration includes, in addition, a locking device herein termed a blocker, by means of which the door lock can be locked from the inside. Also included is a mechanism which makes certain that, whether the lock is locked or unlocked, it cannot be inadvertently disturbed from that position.

Thumbpiece actuated door locks, in common with other kinds of door locks, have been undergoing considerable revision in the interest of simplifying and streamlining the lock mechanisms and housings for containing them, while at the same time producing a device available in suitable quantities to supply an increasing volume of trade. Thumbpiece actuated mechanisms heretofore available, although capable of withdrawing a latch bolt by manipulation of a thumbpiece, have made use of parts too numerous and complicated to be acceptable under present day circumstances and also too involved to be capable of manufacture and assembly under increasingly stringent price competition. Also, insufficient attention has been given to appropriate means for blocking manipulation of the thumbpiece actuated parts on the outside of the door by an appropriate structure. Developments directed to the creation of a blocking device have given rise to further problems, namely, the problem of making certain that the blocking device remains undisturbed from its position of adjustment by manipulation of the portions of the block.

In the construction of any type, lock security is of paramount importance. This factor is so important to the reputation of a lock that the structure must be such as to guard against all contingencies which might impair security, even though remote. In a lock of the thumbpiece actuated type here under consideration, experts have found that it may be possible, by rotating the spindle in some fashion to generate sufficient binding friction between it and the blocker, to disturb the blocker from locked position, or, on the contrary, to shift it inadvertently from an unlocked position to a locked position. When the spindle is to be assured against inadvertently disturbing the condition of the lock, the assurance must apply in either direction of rotation of the spindle.

It is therefore among the objects of the invention to provide a new and improved thumbpiece actuated lock mechanism which is relatively simple and inexpensive in its manufacture, which incorporates a simple direct acting blocking mechanism to lock the door from the inside, so that it cannot be opened from the outside except by use of a key, and which moreover includes a guard which makes certain that the lock mechanism remains in the selected (locked or unlocked) position.

Another object of the invention is to provide a new and improved thumbpiece actuated lock mechanism which incorporates a sliding plate structure for translating the thumbpiece movement to a simple rotating movement, wherein an appropriate blocker is designed and operated so as to be capable of blocking movement of the slide plate to bar the door against opening from the outside by use of the thumbpiece and which further includes a guard to make certain that the locked position is maintained.

Still another object of the invention is to provide in a simplified thumbpiece actuated lock mechanism a rotatable blocker which, if desired, can be utilized concentrically with the axis of rotation of a latch operating spindle and which is made positive in its action by virtue of placing the blocker in the path of movement of mechanism which carries motion from the thumbpiece to the spindle, thereby to physically bar the mechanism against movement, and which includes a guard arm, the guard arm being pivotally mounted and sufficiently compact in its design so that it is capable of fitting within the same space previously provided for the mechanism. The object also includes a guard arm so constructed as to be manipulated automatically upon rotation of the latch actuating spindle, thereby to make certain that when the mechanism is in locked position it stays in locked position and, also, so that when the mechanism is in unlocked position it cannot be inadvertently shifted to locked position.

With these and other objects in view, the invention consists of the construction, arrangement, and combination of the various parts of the device, wherein the objects contemplated are attained, as hereinafter set forth, pointed out in the appended claims, and illustrated in the accompanying drawings.

In the drawings:

FIGURE 1 is a side elevational view of the fragment of door showing a thumbpiece actuated door lock mounted in the usual position.

FIGURE 2 is a side elevational view of the lock of FIGURE 1.

FIGURE 3 is a longitudinal sectional view taken on the line 3—3 of FIGURE 2.

FIGURE 4 is a longitudinal sectional view taken on the line 4—4 of FIGURE 3 showing the position of parts when the lock is unlocked.

FIGURE 5 is a fragmentary longitudinal sectional view similar to the lower portion of FIGURE 4, but showing the parts of the lock in the position occupied when the latch operating spindle is partly rotated.

FIGURE 6 is a fragmentary longitudinal sectional view similar to FIGURE 5, but showing the position of the parts in locked condition.

FIGURE 7 is a fragmentary longitudinal sectional view similar to FIGURE 6, partially broken away to reveal the structure and condition of certain of the parts.

FIGURE 8 is a fragmentary sectional view with certain portions broken away showing some of the parts in the position of FIGURE 5 and others of the parts in the position of FIGURE 7.

FIGURE 9 is a cross-sectional view on the line 9—9 of FIGURE 8.

FIGURE 10 is a cross-sectional view on the line 10—10 of FIGURE 7.

In an embodiment of the invention chosen for the purpose of illustration, there is shown a fragment of door having an outside face 11, an inside face 12 and an edge face 13. A door lock structure is indicated generally by the reference character 14 and includes a front plate 15 having a perimetrical wall 16 forming a chamber 17 within which is mounted a frame 18 containing most of the mechanism. A handle 19 is located generally below the front plate 15 and in the handle 19 is a keyway 20 which gives access to a locking mechanism (not shown), adapted to being manipulated by a key, a fragment 21 of which is shown in FIGURE 3. Above the top of the handle 19 is a thumbpiece 22, pivotally mounted upon a protruding portion 23 of the front plate 15. A conven-
tional latch bolt 24 is adapted to be manipulated by suitable conventional means (not shown) which is engaged by a latch operating spindle 25.

On the inside face 12 of the door 10 is mounted a handle in the form of a knob 26, the knob 26 being appropriately and conventionally attached nonrotatably to the latch operating spindle 25. In the form of device described up to this point, it will be appreciated that the latch bolt 24 can be withdrawn either by manipulation of the thumbpiece 22 or by manipulation of the knob 26. The mechanism is such that when locked from the inside the thumbpiece 22 can no longer manipulate the latch bolt 24, but the knob 26 is capable of manipulating the latch bolt 24 by direct rotation of the latch operating spindle 25.

The frame 18, which houses most of the operating mechanism, consists of plates 27 and 28 fastened together in spaced relationship by screws 29 to form a space 30, which is relatively narrow and which extends throughout most of the area of the chamber 17. A positioning peg 31 helps locate the plates 27, 28.

A slide plate 35 is slidably mounted within the frame 18 so that it is able to move up and down in response to operation of the thumbpiece 22. In the slide plate 35 is a bushing 36 into which protrudes an actuating end 37 of the thumbpiece 22. A spring 38 retained by a keeper 40 on the 37 at one end and a keeper 40 on the slide plate 35 at the other end is biased normally to extend the slide plate 35 in a downward direction. A cam slot 41 in the slide plate 35 acting against a retaining peg 42 serves to guide movement of the slide plate 35 as it moves up and down so that a short driver 43 can be moved with a shoulder 44 with a crank 45, thereby to rotate the crank 45, and, in turn, rotate the latch operating spindle 25 which is in nonrotatable engagement with the crank 45. Through this train of action, the thumbpiece 22 is used to manipulate the latch bolt 24 into withdrawn position.

In order to lock a device of the type herein described, which is manipulated from the outside by the agency of the slide plate 35, use is made of a blocker 50 of relatively thin sheet material rotatably mounted on the frame 18 on a locking spindle 51. The locking spindle 51, being of appreciably smaller cross section than the interior of the tubular latch operating spindle 25, rotates freely within the latter. The locking spindle 51 is adapted to be rotated either by action of the key 21 or by action of an appropriate locking button 52 at the center of the knob 26. The blocker 50 has an upper arcuate edge 53 which is adapted to slide beneath a shoulder 54 on the plate 27 and a relatively straight edge 55 which is adapted to overlie a locking shoulder 56 on the plate 35. A spring 57 attached at one end to a keeper 58 on the blocker 50 and at the other end to a keeper 59 on the plate 27 helps hold the blocker 50 in one position or another of adjustment. When the straight edge 55 is in a position overlying the locking shoulder 56, the blocker 50 is in blocking relationship with respect to the slide plate 35 and prevents the slide plate 35 from being moved upwardly in response to manipulation of the thumbpiece 22. As a consequence, the latch bolt 24 cannot be withdrawn and the lock is locked from the outside. The latch operating spindle 25, however, remains free to rotate and, as a consequence, the latch bolt 24 can be withdrawn by manipulation of the knob 26 from the inside. Locked position for the blocker 50 is shown in FIGURES 6, 7, 8, and 10. Unlocked position is shown in FIGURES 3, 4, and 5.

To hold the blocker 50 either in locked position or in unlocked position, use is made of a guard arm 60, as shown in FIGURES 4, 5, 6, and 8. At one end of the guard arm 60 is a cam 62 having two cam faces 63 and 64. The cam faces 63 and 64 are adapted to cooperate respectively with cam faces 65 and 66 which constitute a cam on the crank 45. Circumferential edge portions 67 and 68, also on the crank 45, are adapted to cooperate with the cam 62.

At the opposite end of the guard arm 60 is a finger 70 which is adapted to be received within a notch 71 on the blocker 50 in one position, as shown in FIGURE 5, or to engage an oblique shoulder 72 on the blocker 50 in another position, as shown in FIGURE 8.

In operation with the parts in the position shown in FIGURE 4, the blocker 50 is in unlocked position. The latch operating spindle 25 is in the position shown by action of a substantially conventional return spring mechanism 75. In this position, the cam 62 of the guard arm 60 is received within the recess formed by the cam faces 64 and 65 on the perimeter of the crank arm 45. In this position of the guard arm 60, the finger 70 stands clear of the upper arcuate edge 53 of the blocker 50, and the blocker 50 is free to be moved either by the key 21 or the locking button 52 to the locked position of FIGURES 6, 7, and 8. Should there then be any rotation of the crank 45 as, for example, from the position of FIGURE 6 to the position of FIGURE 8, the cam 62 would be forced out of the recess formed by the cam faces 63 and 64 on the crank arm 45, and the guard arm 60 would be tilted to the position of FIGURE 8, wherein the finger 70 falls behind the oblique shoulder 72 and prevents the movement of the blocker 50. Hence, even though there might be some fractional engagement between the crank 45 and the blocker 50, there could not be an inadvertent unlocking of the blocker 50.

In order to be able to unlock the blocker 50 by the usual action, it is necessary only to release the knob 26, permitting the return spring mechanism 75 to return the crank 45 to initial position like that shown in FIGURE 6, whereupon the cam 62 will fall into the recess formed by the cam faces 65 and 66. Then the finger 70 will be allowed to slide up the oblique shoulder 72, and then the blocker 50 can then be rotated to unlocked position.

In unlocked position, as shown in FIGURES 4 and 5, the same guarding action of the guard arm 60 also comes into play. For example, should the crank 45 be rotated by manipulation of the knob 26 from the position of FIGURE 4 to the position of FIGURE 5, the cam 62, as previously described, is forced out of the recess formed by the cam faces 63 and 64 until it rides upon the circumferential edge portion 67, thereby tilting the guard arm 60 so that the finger 70 is engaged into the notches formed by the blocker 50 and by that means anchored in unlocked position.

The same action also takes place by rotation of the crank 45 in an opposite or clockwise direction. Should this occur, the cam 62 would be forced out of the recess formed by the cam faces 63 and 64, as previously described, but this time would ride upon the circumferential edge portion 68. Consequently, even though there should be some fractional engagement between the crank 45 and the blocker 50, which would tend inadvertently to move the blocker 50 into locked position, this is prevented by the immediate engagement of the finger 70 in the notch 71. Here again, all that is necessary to free the blocker 50 for manipulation in the usual fashion is to release the knob 26, permitting the return spring mechanism 75 to return the crank 45 to the initial position previously described. This allows the cam 62 to be received again in the recess formed by the cam faces 65 and 66, freeing the finger 70 from the notch 71, after which the blocker 50 can be manipulated in the usual fashion.

While the invention has herein been shown and described in what is conceived to be the most practical and preferred embodiment, it is recognized that departures from the details disclosed may be made therefrom by one skilled in the art without departing from the spirit and scope of the invention, which is to be accorded the full scope of the claims so as to embrace any and all equivalent devices.
Having described the invention, what is claimed as new in support of Letters Patent is:

1. In a door lock structure including a frame adapted to be mounted on a door, a latch operating spindle and a locking spindle both rotatably mounted on the structure, a crank in nonrotatable engagement with said latch operating spindle, a spindle rotating slide plate having a slidable mounting in the frame and being slidable in a direction transverse relative to the axes of the spindles, and a driver on said slide adapted to drive said crank whereby to rotate said latch operating spindle, a blocker rotatably mounted on said structure and in nonrotatable engagement with said locking spindle, said locking spindle being adapted to move the blocker between a position in blocking relationship with said slide plate and a position in unblocking relationship with said slide plate, a guard arm rotatably mounted on said structure for maintaining said blocker in said selected positions during rotation of said latch operating spindle, and actuating means respectively on said guard arm and said crank adapted to tilt said guard arm between a position in locked relationship with said blocker and a position in unlocked relationship with said blocker, whereby said blocker is prevented from movement in response to rotation of said latch operating spindle.

2. A door lock structure according to claim 1 wherein said actuating means includes cam faces respectively on said crank and said arm, said cam faces having elements thereof facing in opposite rotational directions, whereby said arm is actuated by rotation of said latch operating spindle.

3. A door lock structure according to claim 1 wherein said blocker has at least one shoulder on its circumference and a complementary shoulder on said arm which, when said crank is rotated, enters into a locked relationship with one of said shoulders when the blocker is in unblocking relationship with the slide.

4. A door lock structure according to claim 1 wherein said blocker has a pair of circumferentially spaced shoulders and a complementary shoulder on said arm which, when said crank is rotated, enters into a locked relationship with one of said shoulders when the blocker is in blocking relationship with the slide and a locked relationship with the other of said shoulders when the blocker is in unblocking relationship with the slide.

5. A door lock structure according to claim 1, wherein said slide, said blocker, said crank, and said arm comprise substantially flat plate members in contiguous, parallel relationship within said frame.

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