July 15, 1958 F. J. RUSSELL 2,842,952

CAMMING LOCK MECHANISM

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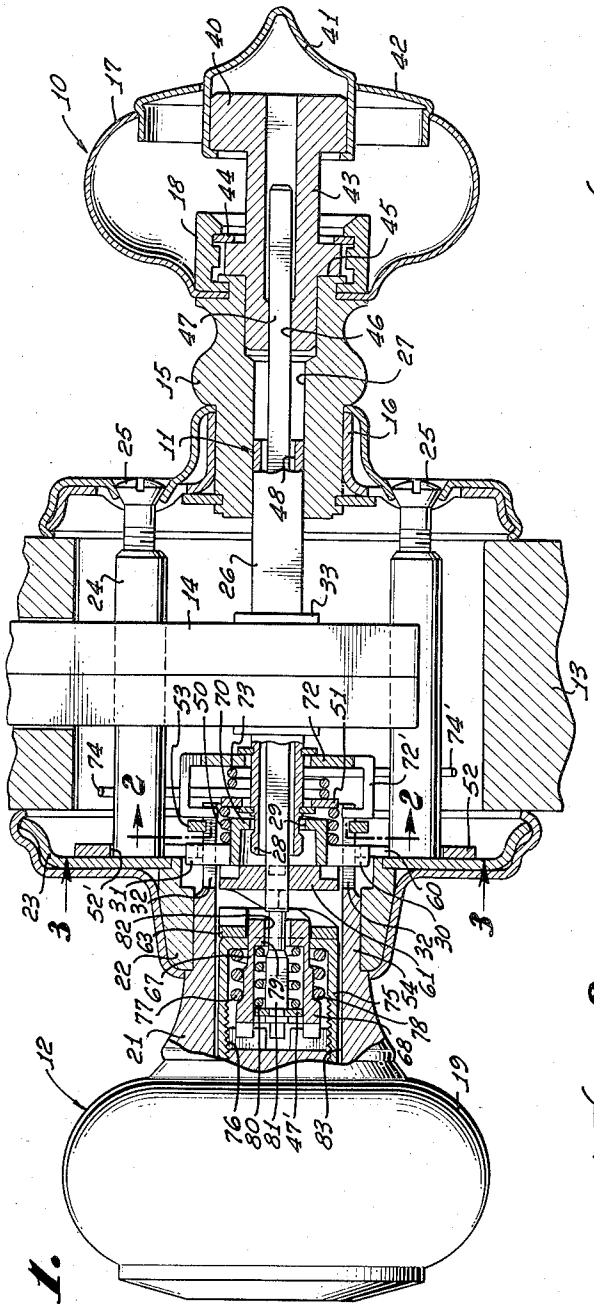


Fig. 1.

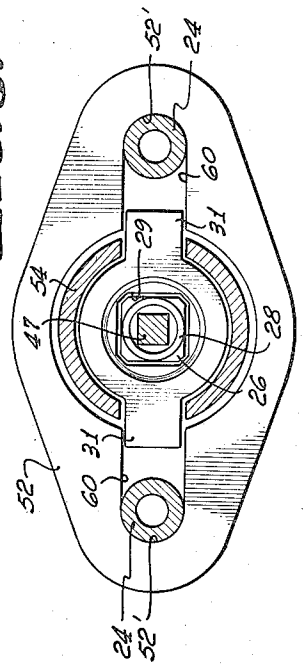


Fig. 3.

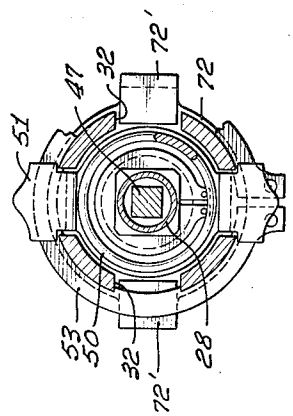


Fig. 2.

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FIG. 4.

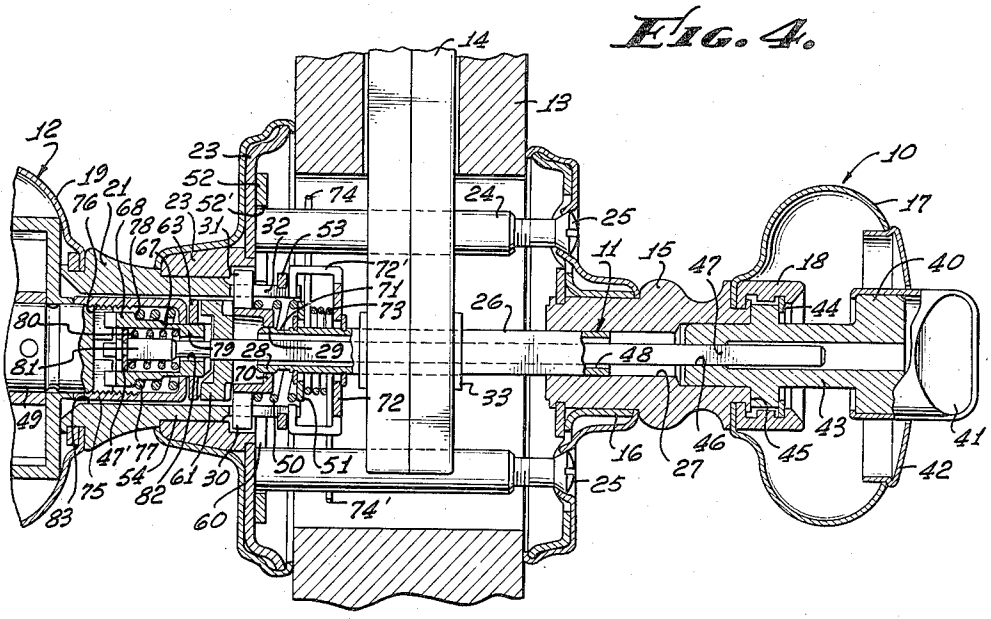
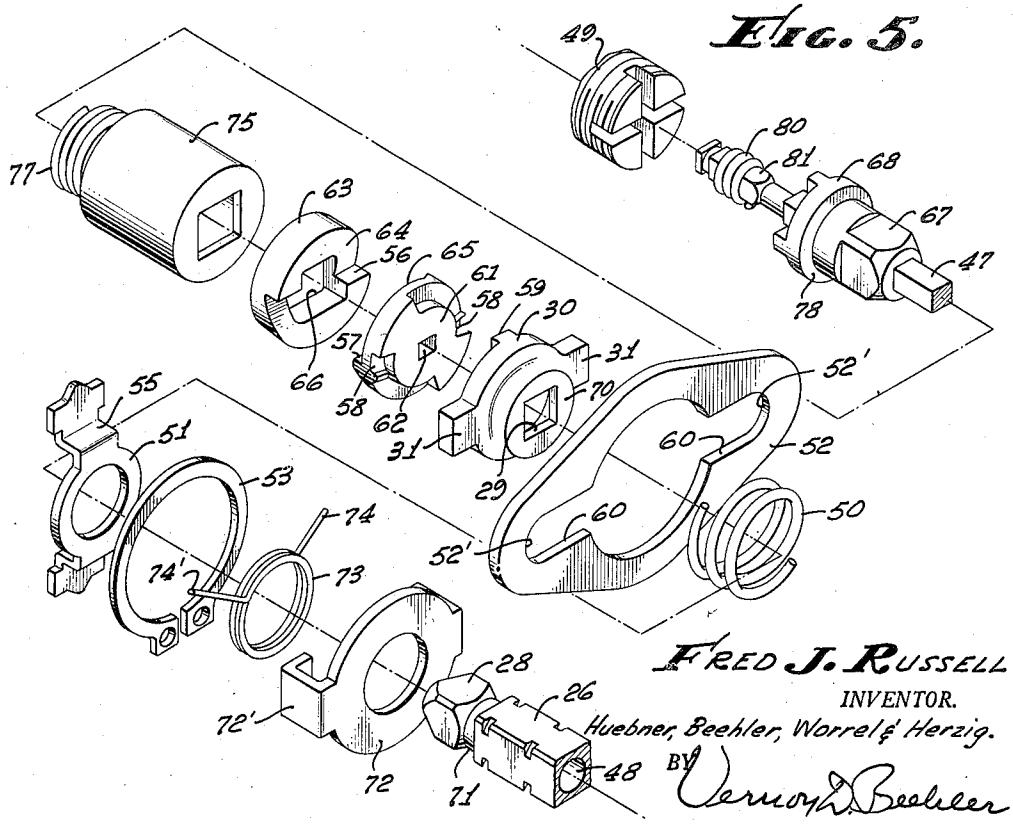


FIG. 5.



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CAMMING LOCK MECHANISM

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8 Claims. (Cl. 70—216)

The invention relates to lock sets for doors and has particular reference to a lock set which is adapted to be locked from the inside so as to prevent opening of the door from the outside except by use of a key.

Considerable development has taken place within relatively recent years to improve lock sets wherein locking and latching devices are embodied within and in axial alignment with the knobs or operating mechanisms. Although lock sets of this general description are economical of space and material and are productive of relatively simplified installation in a door, they do on the other hand present certain obstacles and problems by reason of their very compactness. All variations of lock and latch manipulation are expected of hardware sets of this nature without, however, permitting any appreciable increase in size of the parts of the device. The current trend in hardware of this nature insists upon means being provided in the inside operating assembly or knob capable of locking the door against opening from the outside except by means of a key but the mechanism on the inside is such as to always permit locking or unlocking from the inside without some special instrument to unlock being employed.

It is therefore among the objects of the invention to provide a new and improved lock set which is capable of being manipulated to lock the door from the inside against opening by ordinary means from the outside, the locking being accomplished by a compact simplified mechanism capable of smooth and easy operation by use of the fingers but which assures positive application of the mechanism to a locking operation.

Another object of the invention is to provide a new and improved lock set capable of being locked from the inside operating assembly against opening in the ordinary way by use of the outer operating assembly but which at the same time is permissive of opening from the outside by use of a key, after which upon retraction of the key the lock set resumes locked condition.

Still another object of the invention is to provide a new and improved lock set which employs a simplified, positive-acting, and relatively inexpensive cam actuated mechanism capable of shifting or allowing the movement of a blocking member in an axial direction to provide a positive block against outer operating assembly rotation and/or to permit operating assembly rotation.

Still further among the objects of the invention is to provide a new and improved lock set adapted to be locked from the inside against opening from the outside and which is so constructed that one of the operating mechanisms and chiefly the outer operating mechanism is capable of containing all of the operating parts associated with the locking or blocking mechanism except for a single shaft extending centrally through the spindle assembly to the inner knob or operating assembly.

The objects of the invention further include the provision of a lock set of the inside locking type wherein virtually all parts lie concentric with respect to the spindle

axis and which is so constructed that the mechanism can be readily disengaged for disassembly in the event of servicing or repair and being also permissive of ready reassembly and incorporation into the hardware on the door.

With these and other objects in view, the invention consists in the construction, arrangement and combination of the various parts of the device whereby 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 horizontal sectional view of the device installed on a door showing the parts in unlocked position.

Figure 2 is a cross-sectional view on the line 2—2 of Figure 1.

Figure 3 is a cross-sectional view on the line 3—3 of Figure 1.

Figure 4 is a horizontal sectional view similar to Figure 1 showing the parts in locked position.

Figure 5 is an exploded perspective view of parts of the locking mechanism.

In an embodiment of the invention chosen for the purpose of illustration the lock set is shown as consisting generally of an inner operating assembly 10 connected by means of an appropriate spindle assembly 11 to an outer operating assembly 12. The lock set is illustrated as being mounted in a door 13 for operation of a suitable latch bolt mechanism suggested generally by the reference character 14 but of which details have been omitted.

The inner operating assembly 10 as to its conventional aspects comprises a shank 15 rotatably mounted upon a bushing 16 and having a knob 17 mounted thereon and retained in position by means of a knob housing 18. Similarly standard portions of the outer operating assembly include a knob 19 secured to a shank 21 by the swedging of the end of the shank 21. The shank in turn is rotatably mounted in a bushing 22 attached to which is an anchor plate 23 from which posts 24 extend inwardly through the door to a position opposite the rose at which point the posts may be secured to the bushing 16 by suitable screws 25. The parts described up to this point follow substantially standard practice which varies only in degree in different lock sets from the general arrangement described. The spindle assembly indicated generally by the reference character 11 previously referred to interconnects the outer and inner operating assemblies and serves to engage some appropriate movable portion of the latch bolt assembly 14 so that when either of the operating assemblies are rotated, a latch bolt of conventional design (not shown) is withdrawn to permit the door to be opened.

In the chosen embodiment the spindle assembly 11 consists of a hollow square spindle part 26 which fits non-rotatably within a squared aperture 27 in the shank 15.

In order that the inner operating assembly and outer operating assembly may be operated simultaneously, the spindle part 26 is provided with a head 28 square in cross-sectional shape and adapted to fit non-rotatably within a squared hole 29 of a blocker or blocker plate 30. The blocker plate 30 has extensions or legs 31 lying each within its respective slot 32 in the shank 21. Hence through this chain of action featuring what may readily be termed a spindle assembly, when the inner knob 17 is rotated, the square spindle part 26 is rotated in turn rotating the blocker plate 30 and hence the shank 21 and outer knob 19. Similarly rotation of the outer knob acting through the spindle assembly and the spindle part 26 will effect rotation of the inner knob 17. Together they rotate a hub 33 of the latch bolt mechanism 14.

In order to provide means for bolting or locking the mechanism against opening from the outside, a turn button 40 having a finger-engaging projection 41 is rotatably mounted at the center of a plate 42 held on the inside face of the inner knob 17. The button 40 is non-rotatably attached to a sleeve 43 rotatably mounted in the knob housing 18 and confined against endwise displacement therein on one side by employment of a snap ring 44 and on the opposite side by the presence of a shoulder 45 of the shank 15. The sleeve 43 and the button 40 are therefore permitted to be rotated freely but cannot move in an endwise direction. The sleeve 43 has a bore 46 extending therethrough squared for reception of corners of a square shaft or tail piece 47. The square shaft 47 extends through a central opening 48 of the spindle part 26 and is free to rotate therein. The square shaft 47 extends beyond the head 28 of the spindle part 26 and has a specially constructed end terminating in a disc 47'. The disc 47' lies immediately adjacent a cylinder plug 49, a part of the cylinder lock, details of which have been omitted inasmuch as this portion of the device is well-known in the art.

For holding the blocker plate 30 in its normal extended position out of blocking engagement, a coiled spring 50 is confined by a spider 51 which serves as a springkeeper. The spider may be secured in position against a non-rotatable plate member 52 by means of a snap ring 53. The snap ring 53 may conveniently be engaged in a suitable annular groove in the outside wall of a cylindrical extension 54 of the shank 21. In the embodiment selected for the purpose of illustration the non-rotatable plate member 52 provided with an opening 52' has the opening surrounding and anchored non-rotatably to the posts 24. Constructed as shown the spider is adapted to have its legs 55 confined within the slot 32 and is therefore adapted to be rotated when the shank 21 is rotated by manipulation of the knob 19, or any time that the outer operating assembly is rotated.

To block rotation of the outer operating assembly and particularly the shank 21 thereof, recesses 60 are provided in the non-rotatable plate member 52 and are adapted to receive the extensions or legs 31 of the blocker plate 30 in certain positions of that part.

To shift the blocker plate endwise in a direction from left to right as viewed in Figure 1 a cam 61 is provided. The cam 61 is in non-rotatable engagement with the square shaft 47 by reason of being provided with a squared broached hole 62 through which the square shaft is adapted to slide but in which it is maintained in a non-rotatable condition. A second cam 63 has cam faces 64 which face and move against cam faces 65 of the first identified cam 61. The cam 63 has a square hole 66 adapted to non-rotatably engage with a square portion 67 of a link 68. The cam 63 is free to slide axially or in an endwise direction with respect to the link 68 but is non-rotatably secured thereto. Inasmuch as the cam 63 is non-rotatably attached to the link 68 and since this in turn is non-rotatably secured to the cylinder plug 49, the position of the cam 63 is relatively stationary with respect to motion in a rotating direction. Hence, when the cam 61 is rotated by rotation of the square shaft 47 and button 40, the cam faces 65 move against the relatively stationary cam faces 64, the action of which serves to shift the cam 61 in a direction from left to right, as viewed in Figure 1. Movement thus described causes the cam 61 to be forced against the blocker plate 30 against tension in the spring 50 until the legs 31 fall within the recesses 60 of the non-rotatable plate member 52. In that position the blocker plate cannot rotate. Since the legs 31 are also received within slots 32 of the shank 21, the shank 21 is blocked against rotation and hence the outer knob assembly is blocked against rotation, namely, the rotation which would be needed to manipulate the latch bolt.

At the same time an end wall 70 of the blocker plate, provided as previously described with a square hole 29 for engagement with the exterior of the spindle part 26, is moved to the position shown in Figure 1. In that position the end plate is adjacent an annular recess 71 in the spindle part 26 and hence the spindle part and the attached spindle assembly is disengaged from the blocker plate and consequently the inner operating assembly embodied in the main in the knob 17 is free to be rotated for the purpose of manipulating the latch bolt.

The door, however, can be unlocked by use of a key without disturbing the bolting relationship of the square shaft 47 and button 40 with the cam 61 and blocker plate 31. This is possible by reason of the fact that when the plug 49 is rotated by use of a conventional key, the cylinder 68 is rotated in turn causing the cam 63 to rotate. For unlocking rotation is in a clockwise direction, as viewed in Figure 3. Thus rotated the cam faces 64 are shifted to positions permitting the spring 50 to push the blocker plate 31 and the cam 61 endwise from right to left as viewed in Figure 3 a distance far enough to disengage the legs 31 from the recesses 60. Continued rotation of the key will cause shoulders 56 of the cam 63 to abut shoulders 57 of the cam 61 and thereby effect rotation of the outer operating assembly. Since at this point the end wall 70 will re-engage the head 28 of the spindle part 26, the motion will cause rotation of the spindle assembly to an amount permitting retraction of the latch bolt.

When the locking action initially takes place, temporary detent recesses 58 on the rear face of cam 61 are adapted to receive projections 59 on the blocker plate 31 from which they are readily dislodged when the key is turned or the projection 41 returned to initial position.

When the key is rotated in a reverse direction far enough to permit its being withdrawn from the cylinder plug 49, corresponding rotation of the cam 63 will cause movement of the cam faces 64 against the cam faces 65 forcing the cam 61 in an endwise direction from left to right, as viewed in Figure 1, to return the blocker plate 30 and its legs 31 into blocking engagement with the non-rotatable plate member 52. Accordingly once the key is withdrawn, the outer operating assembly featured around the knob 12 cannot be rotated in order to open the door. The mechanism, however, continues to be in a relationship permitting rotation of the inner operating assembly by use of the knob 17 to unlatch the door.

For returning the operating assemblies to initial position after the latch bolt has been drawn there is provided a torsion washer 72, legs 72' of which lie in the slots 32 within which is located a torsion spring 73. Legs 74 and 74' of the spring normally bear upon the posts 24. When the spindle is rotated, in which event the shank 21 and cylindrical extension 54 is also rotated, one side or the other of the torsion washer 72 picks up the respective leg of the spring and builds up tension which returns the shank and spindle to initial position when the operating assembly is released.

As a further expedient permissive of ready assembly and disassembly of parts of the device a housing 75 is threadedly engaged by means of threads 76 with the cylinder plug 49. In assembled position a spring 77 presses against a shoulder 78 of the link 68 pushing it into non-rotatable but endwise freely moving engagement with the cylinder plug 49. Another lighter spring 80 acting between the disc 47' of the square shaft 47 and a bottom wall 79 of the link 68 serves to hold the square shaft 47 in its normal and usual position. Should it be desired to disassemble the device particularly upon removal of the mechanism from a door, the square shaft 47 can be moved in a direction from left to right, as viewed in Figure 1, against compression of the spring 77 until a square head 81 of the shaft engages a square hole 82 in the bottom wall 79. Thereafter by rotating the square shaft 47 in an unscrewing direction, the link 68, being disengaged from the cylinder plug 49 and being in non-

rotatable engagement with the housing **75**, will compel rotation of the housing in an unscrewing direction, thereby disengaging the housing from the cylinder plug **49**. Thereafter the operating parts contained as they are within a chamber **83** of the shank **21** can be pulled endwise in a direction from left to right out of the chamber and the parts thereafter readily disengaged one from another for repair or replacement. Also the cylinder plug can then be removed in accordance with the standard rekeying practice.

When the mechanism is installed in a door, the parts will normally have the position illustrated in Figure 1. In this position when either the outer knob or inner knob is rotated, the spindle part **26** will be rotated to manipulate the latch bolt. When it is desired to lock the door against operation by the outer knob **12**, it is necessary only to rotate the button **40** a distance of about ninety degrees, depending on the shape of the cams. The cam **61** will be rotated by this operation far enough not only to push the blocker plate **31** into blocking position within the non-rotatable plate member **52** but also far enough so that flat lands on the cam faces move into positions opposite each other, thereby to hold the cams extended from each other and the blocker plate in blocking engagement. The spindle part in this last position of adjustment is free from the blocker plate and consequently can be rotated by manipulation of the inner knob **17**. The outer knob, however, cannot be moved.

By manipulation of the key as previously described, the position of cam **61** is permitted to change under the urging of spring **50** until continued rotation of the key causes both the outer operating assembly and the spindle part **26** to rotate through an unlatching operation. The position of the button **40**, however, and the attached square shaft remains in a position such that the cams will work against each other when the key is rotated in a reverse direction sufficient to permit its being withdrawn. Consequently even though the door has been opened by use of the key, when it is closed again it will be locked from the inside against the outside without any further manipulation of parts being necessary. Unlocking of course is accomplished by returning the button **40** to initial position which in turn returns the cam **61** to initial position at which position the cam faces are in an arrangement permitting the spring **50** to disengage the blocker plate **31** from blocked position in the non-rotatable member **52**.

While I have herein shown and described my invention in what I have conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope of my invention, which is not to be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to embrace any and all equivalent devices.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a lock mechanism comprising an inner operating assembly, an outer operating assembly including a cylinder lock member and a spindle means of a plurality of parts adapted to connect said assemblies for operating a latch bolt device, the combination of a non-rotatable member in fixed position having a non-circular opening therein, a blocker normally in endwise releasable engagement with a part of said spindle means operatively associated with the inner operating assembly and having extensions adapted to be received in said non-circular opening, said blocker having a non-rotatable sliding engagement with said outer operating assembly and being biased to a position disengaged from said non-circular opening, a shaft extending from the inner operating assembly through said blocker into the outer operating assembly, a cam having a cam face non-rotatably and slidably mounted on the shaft, a cam carrying means having a cam face non-rotatably mounted on the lock member in camming engagement with said cam face and adapted upon rotation of either cam face to shift said cam in axially moving engagement with said blocker whereby to move said extensions into the non-circular opening of the non-rotatable member and block rotation of the outer operating assembly, said blocker having a central non-circular recess therein, a spindle shaft on the inner operating assembly extending through said non-circular recess, said spindle shaft having a head within said blocker adapted to engage said non-circular recess and having a neck of reduced diameter adapted to be received in and to rotate freely within said non-circular recess whereby to effect connection and disconnection of the spindle shaft with the blocker.

2. In a lock mechanism comprising an inner operating assembly, an outer operating assembly, and a spindle means adapted to connect said assemblies for operating a latch bolt device, the combination of a non-rotatable member in fixed position having configuration means thereon, a blocker being in releasable engagement in one position with a part of said spindle means and non-rotatably mounted with respect to the inner operating assembly, said blocker having a configuration means complementary to and adapted to be received by said first identified configuration means, said blocker having a non-rotatable axially movable engagement with said outer operating assembly and in said one position having said configuration means out of engagement, a shaft extending from the inner operating assembly into said blocker, a first cam slidably mounted on the shaft, said first cam and said shaft non-rotatable relative to each other, a second cam having a cam engaging face adapted to be retained in stationary position relative to said first cam and in camming engagement with said first cam, whereby said first cam upon rotation thereof will be shifted in axially moving engagement with said blocker to move said configuration means into mutually non-rotatable engagement and to block rotation of the outer operating assembly.

3. In a lock mechanism comprising an inner operating assembly, an outer operating assembly including a lock member and a spindle means adapted to connect said assemblies for operating a latch bolt device, the combination of a non-rotatable member in fixed position having configuration means thereon, a blocker in releasable engagement in one position with a part of said spindle means, said blocker being non-rotatably mounted in said one position with respect to the inner operating assembly and having configuration means complementary to and adapted to engage said first identified configuration means, said blocker having a non-rotatable axially movable engagement with said outer operating assembly and in said one position having said configuration means out of engagement, a shaft extending from the inner operating assembly into said blocker, a first cam slidably mounted on the shaft, said first cam and said shaft being non-rotatable relative to each other, a second cam mounted on the lock member adapted to be retained in rotationally stationary position relative to the first cam, said cams having oppositely sloping and mutually engaging cam faces acting in opposite directions, said cams being adapted upon rotation of either of them to shift one of said cams and said blocker axially to a position of engagement of said configuration means whereby a block rotation of the outer operating assembly, one of said cams being subject to rotation in a reverse direction by said lock member whereby to effect release of said configuration means and said blocker from engagement with said non-rotatable member without rotating said shaft.

4. In a lock mechanism comprising an inner operating assembly, an outer operating assembly including a cylinder lock member and a spindle means adapted to connect said assemblies for operating a latch device, the combination of a non-rotatable member adapted to be anchored on a door in fixed position having a non-circular opening therein, a blocker in releasable engagement in

one position with a part of said spindle means and adapted to be rotated by the inner operating assembly, said blocker having an extension adapted to be received in said non-circular opening, said blocker having a non-rotatable sliding engagement with said outer operating assembly and being spring biased in said one position to a position out of engagement with said non-circular opening, a shaft extending from the inner operating assembly through said blocker into the outer operating assembly, a first cam slidably mounted on the shaft, said first cam and said shaft being non-rotatable relative to each other, a second cam non-rotatably mounted on the lock member, cam tracks on said cams facing each other and in endwise camming engagement with each other, said cams being adapted upon rotation of either of them with respect to the other to shift said first cam axially into engagement with said blocker whereby to move said blocker extension into the non-circular opening of the non-rotatable member and block rotation of the outer operating assembly, said second cam being subject to rotation in a reverse direction by said cylinder lock member whereby to effect release of said blocker from engagement with said non-rotatable member without rotatably shifting the position of said first cam and said shaft.

5. A lock mechanism comprising an inner operating assembly, an outer operating assembly and a spindle means adapted to connect said assemblies for operating a latch bolt device, said outer operating assembly comprising a shank having a chamber therein and a slot in the shank opening inwardly toward the opposite assembly, a rotation stopping member non-rotatably mounted adjacent the inner end of the shank and having a non-circular opening aligned with said first slot, a blocking member in said chamber having an extension slidably mounted in said first slot and adapted in a blocked position to be moved into the non-circular opening of said rotation stopping member, a shaft rotatably mounted in the inner operating assembly and extending into the outer operating assembly, a pair of cam carrying means having oppositely facing cams thereon in said chamber in camming engagement with each other, one of said pair being non-rotatably mounted on the outer operating assembly and the other cam carrying means being slidably mounted on said shaft, said last named cam and said shaft being non-rotatable relative to each other whereby to effect endwise movement of one of said cam carrying means and the blocking member to a position wherein the blocking member anchors said shank to said non-rotatable member, said spindle means comprising a latch bolt operating spindle having a head in said chamber non-rotatably and endwise releasably engageable with said blocking member in said unblocked position, said spindle being operatively attached to the inner operating assembly.

6. A lock mechanism comprising an inner operating assembly, an outer operating assembly and a spindle means adapted to connect said assemblies for operating a latch bolt device, said outer operating assembly comprising a shank having a chamber therein and a slot opening inwardly toward the opposite assembly, a rotation stopping member non-rotatably mounted in a location surrounding the shank and having a non-circular opening operatively aligned with said slot, a blocking member in said chamber having an extension slidably mounted in said slot and adapted in one position to be moved into the non-circular opening of said rotation stopping member, oppositely facing cams in said chamber, one of said cams being engageable in an axial direction with the blocker and being shiftable axially in response to camming engagement of said cams with each other whereby to effect endwise movement of one of said cams and the blocking member to a position wherein the blocking member anchors said shank to said rotation stopping member, said spindle means comprising a latch bolt operating spindle having a head in said chamber non-rotatably and endwise releasably engageable with said blocking member in said one position, said spindle being operatively attached to the inner operating assembly, shaft means in said inner operating assembly extending into endwise sliding engagement with said one cam, said one cam and said shaft being non-rotatable relative to each other, and rotating means in the outer operating chamber having a non-rotating engagement with the other of said cams whereby either of said cams is adapted to shift the blocker independently of rotation of the other cam.

7. A lock mechanism comprising an inner operating assembly, an outer operating assembly including a cylinder lock member and a spindle means adapted to connect said assemblies for operating a latch bolt device, said outer operating assembly comprising a shank having a chamber therein and having a slot opening inwardly toward the opposite assembly, a rotation stopping member surrounding the shank having a non-circular opening operatively aligned with said slot, a blocking member in said chamber having an extension slidably mounted in said slot and adapted in one position to be moved into the non-circular opening of said rotation stopping member, oppositely facing cams in said chamber having sloping faces terminating in flat faces and having a progressive camming engagement with each other whereby to effect endwise movement of one of said cams and the blocking member to a position wherein the blocking member anchors said shank to said rotation stopping member when said flat faces are in engagement, said lock member being non-rotatably attached to one of said cams, and a shaft extending from the inner operating assembly and slidably attached to the other of said cams, said shaft and the other of said cams being non-rotatable relative to each other, said spindle means comprising a latch bolt operating spindle having a knob in said chamber non-rotatably and endwise releasably engageable with said blocking member in said one position, said spindle being operatively attached to the inner operating assembly.

8. In a lock mechanism comprising an inner operating assembly, an outer operating assembly and a spindle means adapted to connect said assemblies for operating a latch bolt device, the combination of a non-rotatable member in fixed position having configuration means thereon, a blocker in releasable engagement with a part of said spindle means, said blocker having configuration means complementary to and adapted to be received by said first identified configuration means, said blocker having a non-rotatable engagement with said outer operating assembly and being movable axially to positions wherein said configuration means are engaged or disengaged, a shaft extending between the inner operating assembly and the outer operating assembly, a pair of cams with cam faces thereof in camming engagement, a non-rotatable engagement between one of said cams and said shaft, said last named cam being adapted upon rotation thereof to enable axial movement of the said blocker in both directions; a cylinder located in the said outer operating assembly, said cylinder having a non-rotatable engagement with one of said cams, said cylinder being adapted when operated to enable disengagement of the configuration means and, on continued rotation, to effect operation of said latch bolt device.

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