United States Patent

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Continuation-in-part of application Ser. No. 875,229, Nov. 10, 1967, now abandoned. This application Nov. 9, 1970, Ser. No. 87,717

[54] EDGE-MOUNTED LOCK FOR A DOOR

16 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** **70/120,** 16/111, 70/451, 292/139, 292/140, 292/337, 292/DIG. 56, 292/DIG. 57

[51] **Int. Cl.** **E05b 9/00,** E05b 63/14, E05b 65/02

[50] **Field of Search** ..... 70/79, 82, 100, 116, 120, 123, 127, 134, 139, 156, 370, 451, DIG. 60, DIG. 63; 292/34, 37, 139, 166, 167, DIG. 56, DIG. 57

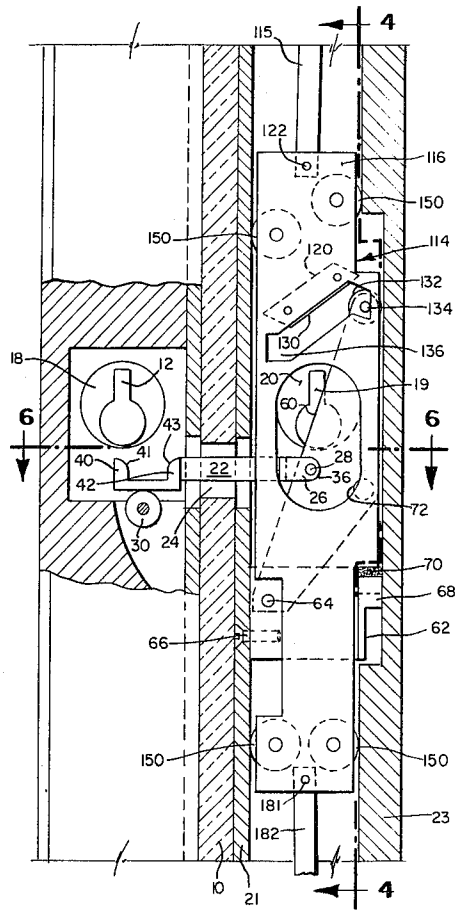
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ABSTRACT: A lock mechanism for a door comprises a plurality of lock cylinders which are mounted on edge rather than flush with the door and which are interconnected through the door by means of a slide bar. The slide bar actuates a lever in response to appropriate movement of tabs on the lock cylinders, to lock or unlock the door by extending or retracting one or more bolts.



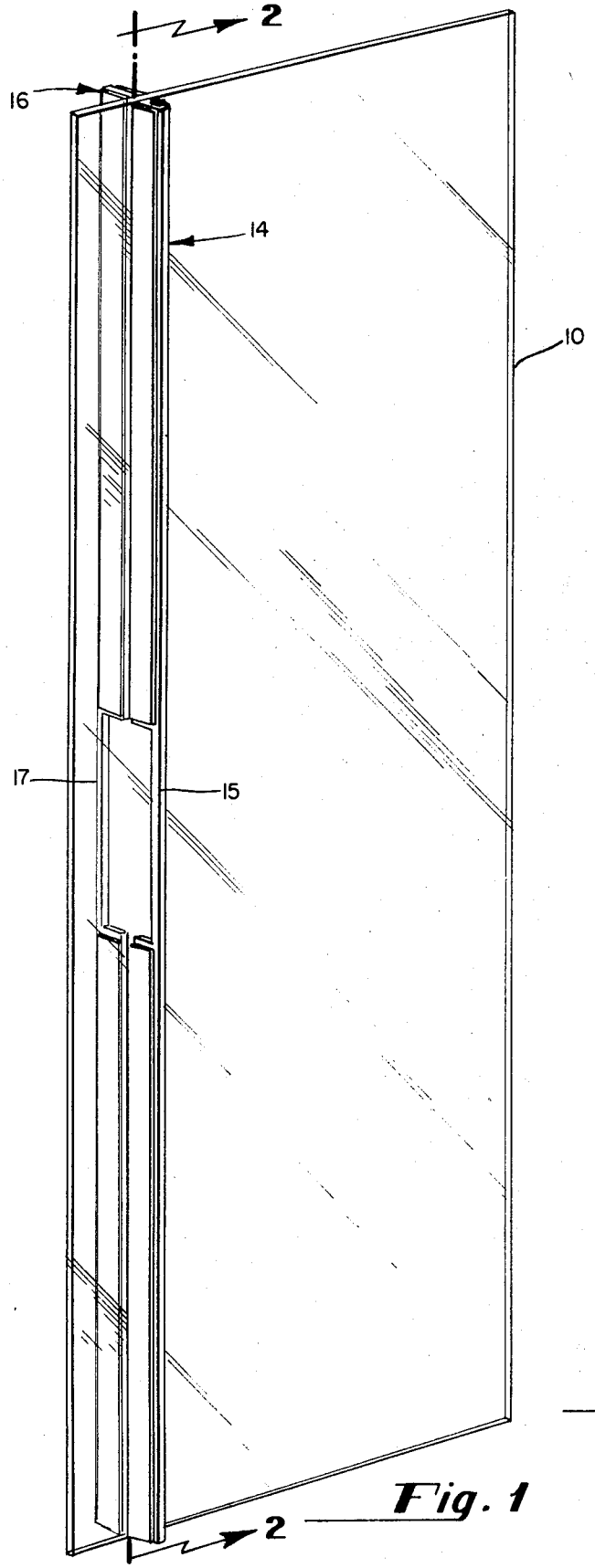


Fig. 1

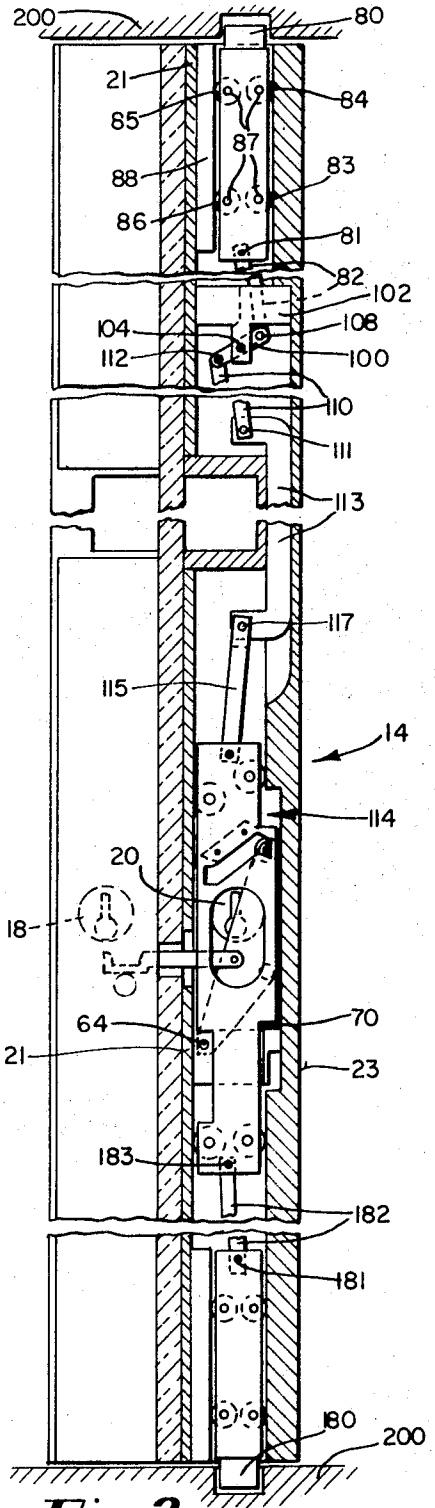


Fig. 2

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Fig. 3

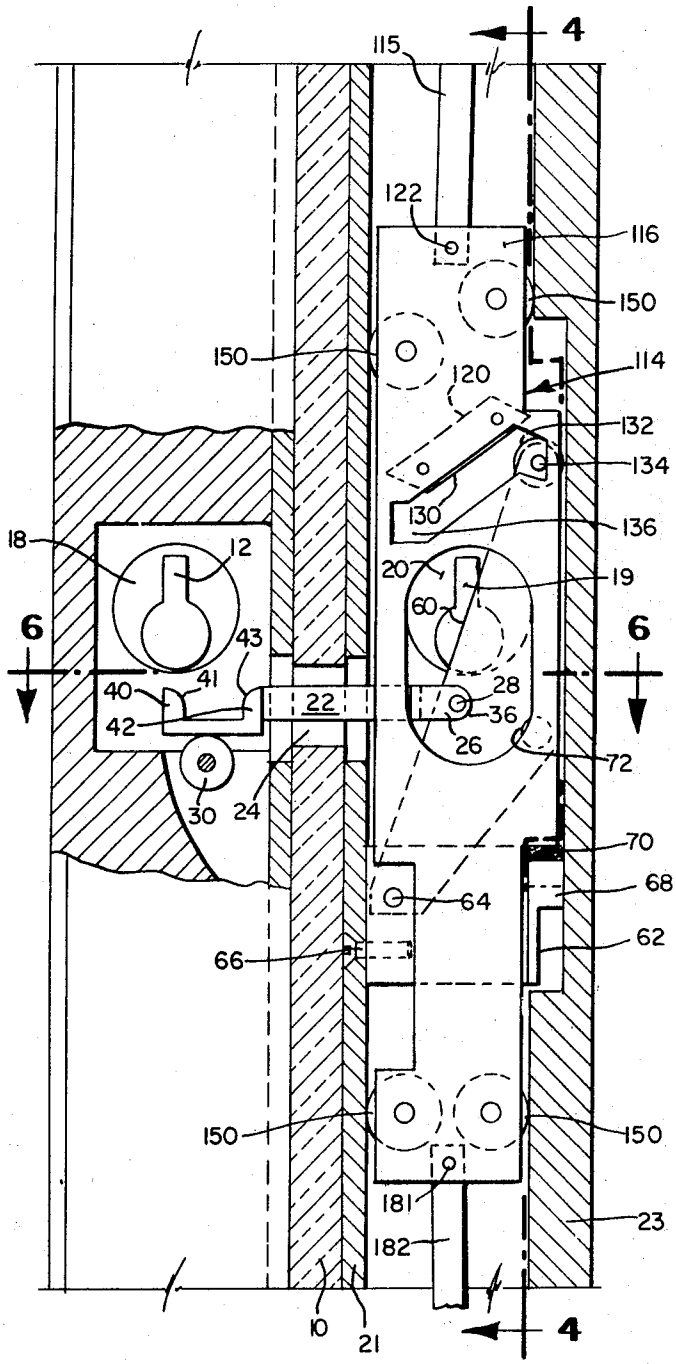
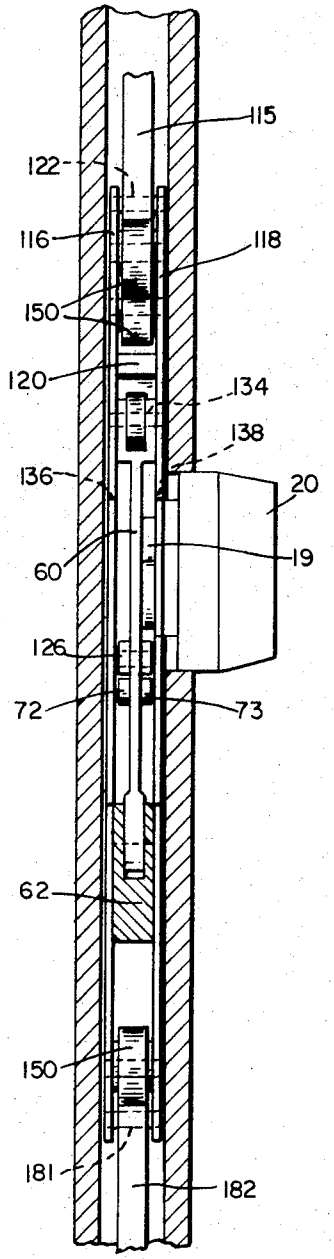


Fig. 4



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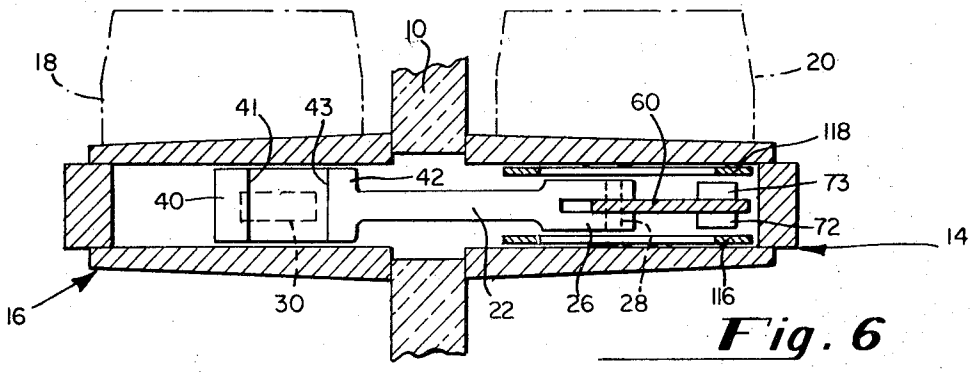


Fig. 6

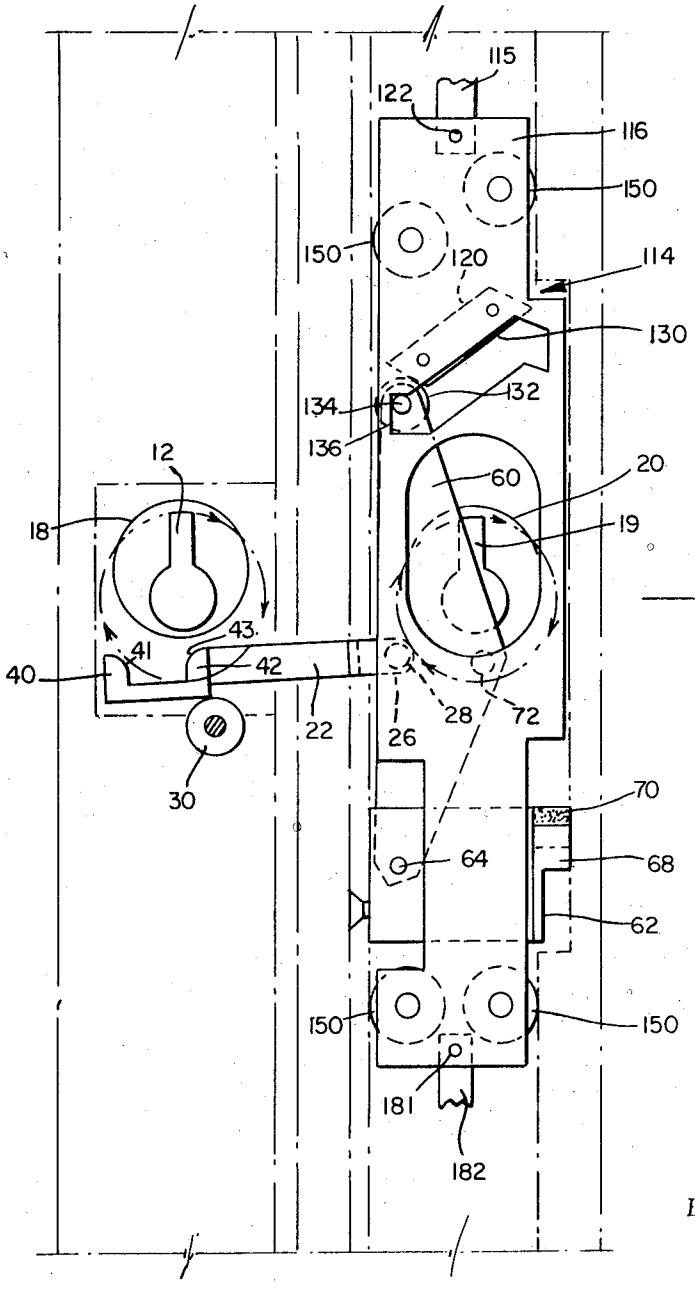


Fig. 5

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EDGE-MOUNTED LOCK FOR A DOOR

CROSS-REFERENCE TO RELATED APPLICATION

This application is a continuation-in-part of my prior copending application Ser. No. 875,229 filed Nov. 10, 1969, now abandoned, and discloses and claims in part the subject matter disclosed and claimed in that application.

BACKGROUND OF THE INVENTION

This invention relates to locks particularly adapted for use with glass doors, and in particular, to locks of the type having vertically operative lock bolts.

In the prior art such bolt mechanisms were generally disposed within the door frame itself. With solid glass doors this is practically impossible unless the door frame supporting the glass is bulky enough to accommodate the bolt mechanism. Further, the heavy bolts were difficult to actuate.

I have developed a number of lock mechanisms utilizing lock housings mounted on the plane surface of the glass door intermediate the vertical edges of the door, and preferably having a lock cylinder on both sides of the door.

One of the concepts which I have originated is that of mounting the hardware inwardly from the edge of the door in a separate lock housing which can be integrated with the handle of the door, said housing accommodating a lock which is edge mounted rather than flush mounted with respect to the door. This concept was disclosed in my prior copending application referred to above. Because of the heavy bulky bolt mechanism, it is desirable to have some means of lightening the load so that the mechanism can be readily actuated by a single key in a single lock cylinder. Accordingly, my invention also makes provision for a lock mechanism which meets this desirable end.

SUMMARY OF THE INVENTION

In the preferred embodiment, my invention comprises an edge mounted plural cylinder lock mechanism which can be mounted inwardly from the extreme vertical edge of the door. The mechanism comprises a plurality of housings, one disposed on each side of the door. Mounted in each housing is a lock cylinder. The lock cylinders are interconnected through a hole in the door by means of a slide bar. The slide bar actuates a lever in response to appropriate movement of tabs on either one of the lock cylinders. The lever in turn actuates a bolt mechanism to raise or lower one or more bolts for locking and unlocking the door respectively.

Accordingly, it is an object of my invention to provide a new and novel lock mechanism for use particularly with glass doors.

It is another object of my invention to provide a new vertical bolt lock mechanism for glass doors, which need not be mounted in the frame of the door.

It is a further object to provide a bolt mechanism of the type described which provides a means for edge mounting the lock cylinders so that the entire lock mechanism housing can be utilized to better advantage from a design standpoint.

It is a further object to divide a readily operable vertical bolt mechanism which can be easily manually actuated by means of a single key in an edge mounted lock cylinder.

These and other objects of my invention will become apparent from the following description with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a glass door having associated therewith handles and lock housings of a type using vertical bolts;

FIG. 2 is a foreshortened enlarged section taken as indicated by the lines and arrows 2—2 in FIG. 1 showing the bolt mechanism in extended position so that the bolts are disposed in the structure surrounding the door;

FIG. 3 is a further enlarged sectional view partially broken away of a portion of the mechanism shown in FIG. 2;

FIG. 4 is a sectional view taken as indicated by the lines and arrows 4—4 in FIG. 3;

FIG. 5 is an enlarged elevation of a portion of the apparatus shown in FIGS. 2 and 3 showing the parts in an alternate position with the overall housing shown in phantom for the sake of clarity; and

FIG. 6 is a view taken as indicated by the lines and arrows 6—6 in FIG. 3 with the lock cylinders shown in phantom.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Although specific forms of the invention have been selected for illustration in the drawings, and the following description is drawn in specific terms for the purpose of describing these forms of the invention, this description is not intended to limit the scope of the invention which is defined in the appended claims.

Referring to FIG. 1, a glass door 10 includes a glass panel without any frame. I have provided a lock mechanism of the vertical bolt type which in this embodiment comprises a plurality of housings designated generally 14 and 16. The housings are oppositely disposed on either side of the glass door spaced intermediate the vertical edges thereof and are integrated with the handles 15 and 17 respectively. In this embodiment the housing 16 serves as a means for mounting one lock cylinder 18 (FIG. 2) in what I describe as an edge mounted condition, that is, the cylinder is disposed with its axis parallel to the plane of the face of the glass door and its cylindrical surface lying substantially on edge with respect to the main plane of the door and thus the tab of the cylinder operates in a plane which is substantially parallel to the vertical edge of the door. This differs from a flush mounted condition wherein the back of the lock cylinder would be disposed flush against the face of the door and the tab would operate in a plane which is parallel to the plane of the vertical face of the door.

The housing 14 is composed of a plurality of members including the handle 15. The entire housing 14 is fixedly connected to the door and to the housing 16 in any suitable manner, such as, by bolts passing through the glass (not shown). The housing 14 comprises a rigid member 21 which is interfitted with a cover 23. The housing 14 contains the vertical bolt lock mechanism and a lock cylinder 20.

To actuate the bolts I have provided a pivotally mounted lever means. This lever means comprises a pivot arm 60 (FIG. 3) which is pivotally mounted at one end to a bracket 62 by means of a spring pin 64 passing through the bracket and the pivot arm. The bracket is held in place in the housing by any suitable means such as the screw 66 passing through the member 21. The bracket 62 extends across the width of the channel formed between the sidewalls of the cover portion 23 and terminates in a relieved channel-shaped portion 68 which supports a T-shaped insert 70. The insert is preferably made of a hard rubber material such as Butyl rubber.

The pivot arm 60 is pivotable about the pin 64. Extending from opposite faces of the pivot arm 60 is a pair of coaxial cylindrical lugs 72, 73. The lug 73 is positional to be engaged by the tab 19 of the lock cylinder 20 as the tab rotates counterclockwise with the mechanism in the position to lock the door as will be more fully explained hereinafter. The lug would provide the same functional relationship with the tab 19 if the lock cylinder 20 was mounted on the opposite side of the housing 14 when viewed as in FIG. 2.

Between the two lock cylinders 18 and 20 is a crossover bar 22 which passes through a hole 24 in the glass panel 10. The bar 22 is a driving link between the lock cylinders and the lock mechanism. The crossover bar 22 is mounted horizontally and comprises an elongated body having a yoke 26 at one end which is pin connected to the pivot arm 60 by means of the pin 28. Other than this connection, the crossover arm is free floating in that the other end rests on a ball bearing 30 which is rotatably mounted by any suitable means in the frame of the housing 16.

Extending upwardly from this free floating left-hand end are two fingers or flanges 40 and 42. Each extends across the full width of the crossover bar and the facing terminal surfaces thereof are rounded as at 41, 43 respectively. These fingers are spaced apart from one another in such a manner that the extending tab 12 of the lock cylinder 18 will, when rotated clockwise (when viewed as in FIG. 3), pass by the tab 42 and engage the tab 40 thereby driving the crossover bar to the left (when viewed as in FIG. 3) to the position shown in FIG. 5 as the tab continues to rotate clockwise. The result of this action is shown in FIG. 5 wherein the clockwise arrows show the path taken by the tab 12. If the key in the lock cylinder 18 were turned in the opposite direction the tab 12 were to be driven in a counterclockwise direction and if parts were disposed as they are in FIG. 5, the tab 12 would pass the finger 40 and engage the finger 42 and as it continued to rotate in a counterclockwise direction would drive the crossover bar to the right, back to the position shown in FIG. 3.

Since the crossover bar 22 is pin connected to the pivot arm 60, and the pivot arm is pin connected to the bracket 62, the movement of the crossover bar just described in response to the movement of the tab 12 will cause a corresponding pivotal movement of the pivot arm 60. Thus, when the crossover bar is moved to the left the pivot arm is rotated to the left and when the crossover bar is moved to the right the pivot arm is pivoted to the right.

As will be noted from the drawings, the terminal portion of the yoke 26 is rounded as at 36 in FIG. 3. This rounded portion 36 will be engaged by the tab 19 of the cylinder 20 as it rotates in a clockwise direction to move the pivot arm to the left from the position shown in FIG. 2 to the position shown in FIG. 5. When a tab is initially rotated it will pass the lug 73 and it will continue to rotate past the final position shown in FIG. 5. When the tab is reversed in its direction of rotation it will pass the rounded portion 36 and engage the lug 73 as described hereinabove, to drive the pivot arm to the right from the position shown in FIG. 5 to the position shown in FIG. 3.

The pivotal movement of the pivot arm 60 actuates the bolt mechanism. With the full height hardware shown in the figures, this mechanism consists, most preferably, of a plurality of bolts which are vertically mounted to extend into the structure (200 FIG. 2) surrounding the door and to be retracted within the lock housing. In the embodiment shown the upper locking bolt comprises a square bolt 80. The lower end of the bolt 80 terminates in a yoke having a bar 82 pivotally connected thereto by the pin 81.

In accordance with the present invention I have provided a means whereby the bolt mechanism is made considerably easier to operate. This means comprises a plurality of bearings attached to the bolt. It is preferable to have four such bearings, as at 83, 84, 85 and 86 disposed on opposite sides of the bolt 80 and proximate to the ends thereof. The bearings are preferably ball bearings and are retained on the bolt by means of guide pins 87 which pass through and engage the inner races of the bearings and are fixedly engaged in holes in the bolt 80. It is preferable to have washers (not shown) disposed between the vertical edges of bolt 80 and the ball bearings.

The bearings and bolt ride in the channel formed by the cover 23 and a bearing block 88 attached to the member 21.

I have found that this arrangement considerably reduces the frictional resistance to movement of the bolt and in part provides an effective means for raising and lowering the bolt by the use of a single key and lock cylinder. The remaining linkage for accomplishing this result in response to pivotal movement of the pivot arm 60 comprises a link 100 which is pivotally mounted intermediate the ends thereof to a bracket 102 by means of a pin 104. The bracket is held in fixed position in the housing by any suitable means such as screws (not shown) passing through the member 21. The link 100 is pivotally connected at one end to the bar 82 by the pin 108 and is pivotally connected at the other end to the bar 110 by the pin 112. The bar 110 is pivotally connected by the pin 111 to the connecting rod 113 which passes through the handle portion of the edge-mounted housing 14 and terminates at each end in a hook-shaped portion which hooks towards the glass portion of the door so as to provide a means for such connection. The connecting rod is pivotally connected at its bottom end by the pin 117 to the bar 115. The bar 115 is pivotally connected to a slide plate assembly designated generally 114.

The slide plate assembly comprises two flat plates 116 and 118 (FIG. 4) which are held in spaced relation by means of a spacer 120. The spacer is fixed between the plates in any suitable manner as by riveting. The bar 115 is pivotally engaged with the upper end of the slide plate assembly as by means of the rivet 122. The slide plate assembly also includes bearings which will be more fully described hereinafter in connection with the function of the plate assembly and its movement in the housing.

The slide plate assembly provides a means for engaging the pivot arm 60 whereby on appropriate movement of the pivot arm the slide plate assembly is raised or lowered vertically in order to raise or lower the bolt 80. This means comprises a cam and follower mechanism associated with the slide plate assembly and the pivot arm. The spacer 120 provides the cam surface 130 which is flat and is disposed on an angle to the vertical line of movement of the locking bolts. The cam surface 130 is engaged by a portion of the pivot arm 60. This portion comprises most preferably a ball bearing 132 held for rotation in the yoked end of the pivot arm 60 by means of a lock pin 134. The lock pin 134 extends beyond both sides of the yoked portion of the pivot arm 60 as clearly shown in FIG. 4 for reasons which will be more fully explained hereinafter. As the pivot arm 60 is rotated from the position shown in FIG. 3 to the position shown in FIG. 5 the surface of the ball bearing 132 will engage the surface 130 of the cam of the spacer 120 and as the bearing continues to rotate in a counterclockwise direction when viewed as in FIG. 3 the slide assembly 114 will be pushed vertically upwardly in the lock housing thereby forcing the locking bolt 80 to be retracted into the housing as shown in FIG. 5. On counterrotation of the pivot arm, the plate assembly will be pulled downwardly in the housing by gravity thereby extending the bolt 80.

The plates 116 and 118 have similar S-shaped slots 136 and 138 respectively therein. The extending ends of the pin 134 are disposed in these slots as shown in FIG. 4. The slots are so shaped that the ends of the pin 134 basically ride substantially in the center of the slot throughout the entire travel of the pivot arm. The principal function of the end of the pin is to prevent the opening of the mechanism when it is in the closed position as shown in FIG. 2 by other than a key actuating the pivot arm 60. Thus, if one were to push downwardly on the bolt 80 in an attempt to raise the rod 110 and the assembly 114, the lower portion of the right-hand terminal end of the S-shaped slots would engage the pin 134 after perhaps less than one-eighth inch of travel and prevent the mechanism from being jimmied opened. At the other end of the slot the pins do not engage the upper or lower ends of the S-shaped slots and the ball bearing 132 passes slightly over center of the corner of the spacer 120 as it leaves the surface 130. This overcenter action prevents the mechanism from accidentally extending the bolts when they are retracted.

When the mechanism is in the position shown in FIG. 2 the assembly rests on the upper cross member of the T-shaped insert 70 which, as previously stated, is preferably made of a hard rubber material. This has the effect of deadening the sound and positively stopping the action of the assembly.

The operation of the device requires minimal effort to move the slide plate assembly by virtue of the fact that the assembly is mounted for movement on ball bearings. Four such bearings 150 are shown in FIG. 3 Each of the bearings is mounted between axial spacer elements such as washers between the plates 116 and 118 so that they are freely rotatable about their axis. The bearings along the left-hand side of the slide plate assembly when viewed as in FIG. 3 bear against the member 21. The bearings along the right-hand side bear against the cover member 23.

The lower dead bolt portion of the mechanism is exactly the same as the upper dead bolt portion and the connecting bars are also exactly the same with the exception that there is no need for a link such as the link **100** or for a bracket such as the bracket **102** or the additional connecting rod and linkage around the handle. Rather, the lower bolt **180** is pivotally connected to a bar **182** by means of a pin **183**. The entire arrangement otherwise is exactly the same and includes four ball bearings arranged as described in relation to the bolt **80**.

Thus, as the slide plate assembly is moved upwardly as the pivot arm **60** rotates to the left from the position shown in FIG. **3**, the bolt **180** is retracted as is the bolt **80**, and likewise when the pivot arm is moved back to the right to the position shown in FIG. **2** the slide plate assembly moves downwardly thereby extending the bolt **180** and through actuation of the link **100** extending the bolt **80**, thereby locking the door.

It will be noted that in my prior copending application referred to above the mechanism shown included a counterbalancing spring. No such spring is required for the mechanism shown in this application, since friction has been reduced to a minimum at all points of contact and in actual practice simple rotation of a key in a lock cylinder will cause the mechanism to be actuated either to extend or retract the lock bolts with a minimal manual effort.

It will be understood that various changes in the details, materials and arrangement of parts which have been described and illustrated in order to explain the nature of this invention, may be made by those skilled in the art within the principle and scope of the invention as expressed in the appended claims. In particular, it will be understood that the device can work with a single lock cylinder mounted on either lock housing. Further, it will be understood that the device can work with a single locking bolt either at the top or a dead bolt at the bottom.

It will further be understood that the "Abstract of the Disclosure" set forth above is intended to provide a nonlegal technical statement of the contents of the disclosure in compliance with the Rules of Practice of the United States Patent Office, and is not intended to limit the scope of the invention described and claimed herein.

What is claimed is:

1. A lock mechanism for a door, comprising:

a. a plurality of lock cylinder means having movable locking tab means connected thereto, said locking tab means being movable in planes other than parallel to the face of said door;

b. a pivot arm pivotable about its fulcrum;

c. actuating means connected to said pivot arm and engageable by said locking tab means to pivot said pivot arm in response to movement of said locking tab means; and

d. locking bolt means comprising at least one lock bolt and slide mechanism movable in response to pivotal movement of said pivot arm for extending or retracting said lock bolt with respect to said mechanism.

2. The invention of claim **1** wherein said actuating means comprises a lug attached to said pivot arm and a crossover bar mechanism attached to said pivot arm, said crossover bar mechanism passing through said door and being movable in response to movement of said pivot arm or said locking tab means.

3. The invention of claim **2** wherein said crossover bar mechanism comprises a crossover driver pivotally connected at one end to said pivot arm and extending through said door and being supported at its free end for transverse movement.

4. The invention of claim **2** wherein said crossover driver has means thereon for engaging the locking tab means of one of said lock cylinder means.

5. The invention of claim **3** wherein said support comprises a ball bearing mounted in said mechanism and disposed to support said crossover bar on its bearing surface.

6. The invention of claim **4** wherein the means on said crossover driver for engaging the tab means comprises a plurality of upwardly extending fingers.

7. The invention of claim **1** wherein said lock bolt operates vertically.

8. The invention of claim **1** wherein said lock bolt is connected to a slide assembly, said slide assembly being cam actuated in response to movement of said pivot arm.

9. The invention of claim **5** wherein said cam actuation is provided by a sloped surface on said slide assembly engaging a portion of said pivot arm.

10. The invention of claim **1** wherein said bolt is disposed at least partially within the frame of said mechanism and bearing means are attached to said bolt engaging said frame.

11. The invention of claim **10** wherein said bearing means comprises a plurality of ball bearings.

12. The invention of claim **10** wherein a plurality of said bolts are provided in said mechanism extending from opposite ends of the frame thereof.

13. The invention of claim **8** wherein said slide assembly comprises a plurality of plates fixedly positioned with respect to one another and having mounted therebetween a plurality of bearings for engagement with the frame of said lock mechanism.

14. The invention of claim **9** wherein the portion of the pivot arm engaging the sloping surface on the slide assembly comprises the cylindrical surface of a rotatable ball bearing which is rotatably attached to said pivot arm.

15. The invention of claim **8** wherein said slide assembly comprises a plurality of plates fixedly spaced with respect to one another, said plates having substantially S-shaped apertures therein, and pin means extend from said pivot arm and into said apertures, said pin means being so positioned as to provide a means for positively preventing said slide means from moving when it and the pivot arm are in a predetermined position whereby said mechanism is prevented from being unlocked without appropriate movement of the pivot arm.

16. The invention of claim **1** wherein said arm is pivoted from a fixed bracket attached to said mechanism, said bracket including a resilient portion, and said lock bolt is connected to a slide assembly, said slide assembly being cam actuated in response to movement of said pivot arm and being positioned to engage said resilient portion upon locking of said mechanism.

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