

[54] ACTUATING MECHANISM FOR DOUBLE BAR LOCK

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[58] Field of Search **70/118, 119, 120, 151 R, 70/DIG. 64; 292/34, 37, 140, 150, 169.15, 169.16, DIG. 52, 39, 142**

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[57] **ABSTRACT**

An improved actuating mechanism for a double bar lock of the type having first and second bars slidably mounted in a housing for movement between a locked position wherein each of said bars extends outwardly from opposite sides of the housing and an unlocked position wherein the bars are moved inwardly towards each other. Driving means effective to move one of the bars in a given direction in response to the movement of the other of the bars in the opposite direction is provided such that the movement of one bar between the locked and unlocked positions moves the other bar between these positions. The improvement comprises moving means consisting of a pair of spaced cams rotatable in the same plane. Each of the cams is operably connected to the first bar and effective when rotated to move the first bar between the locked and unlocked positions. A recess is present on the first bar and a deadlocking means, external to the first bar, is provided which is movable between a first position wherein the recess is operably engaged by the deadlocking means to prevent the movement of the first bar and a second position wherein the recess is operably disengaged from the deadlocking means to permit movement of the first bar. The deadlocking means is provided with a pair of cam follower elements each of which operably communicates with the surface of a different one of the rotatable cams. The rotation of either of the cams is effective to move the deadlocking means between the first and second positions.

6 Claims, 10 Drawing Figures

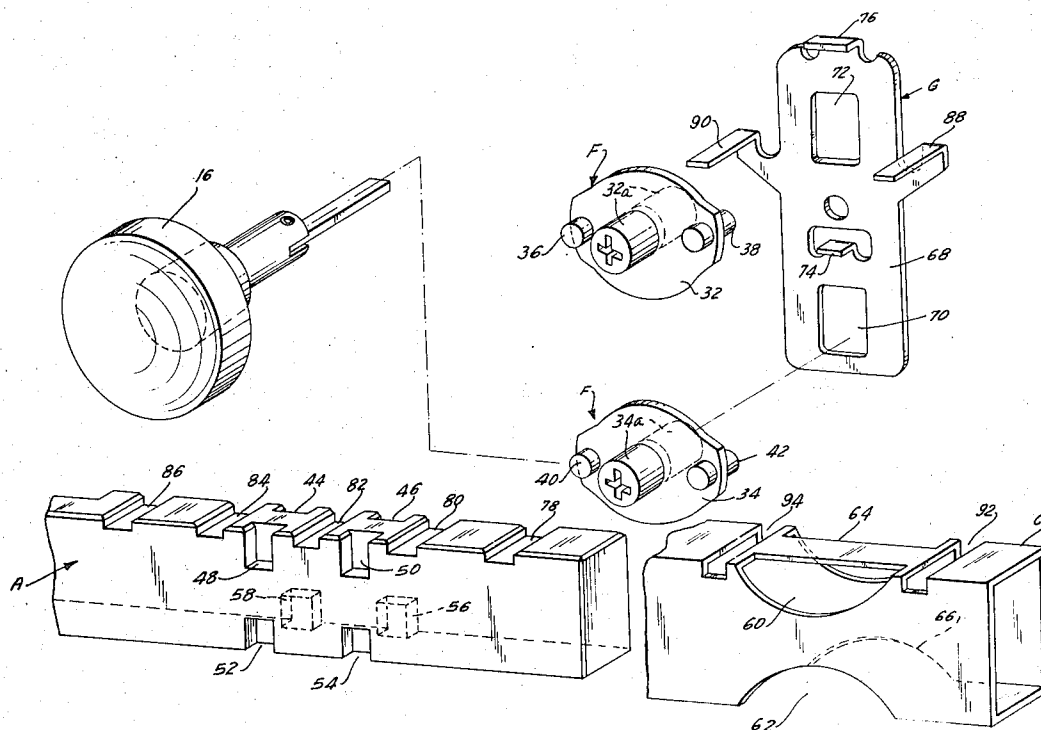


FIG. 7

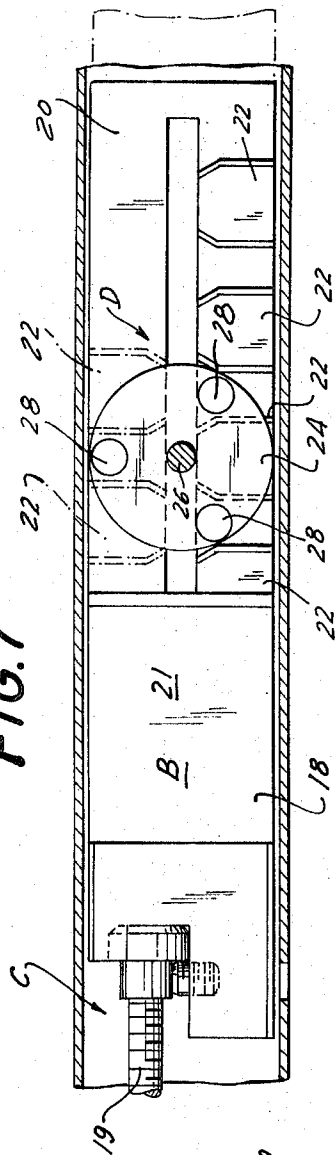


FIG. 1

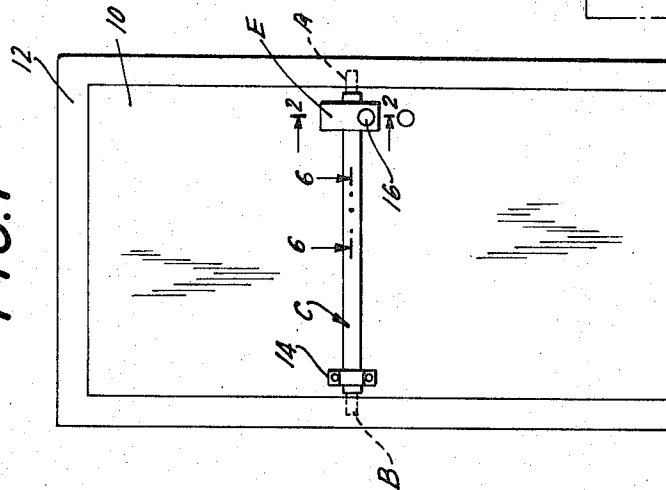
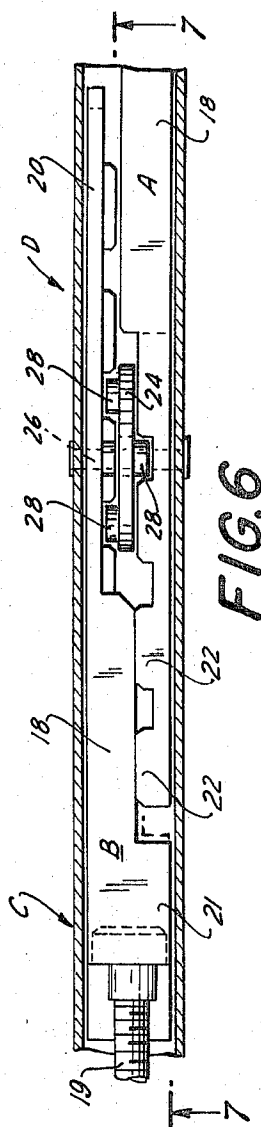


FIG. 6

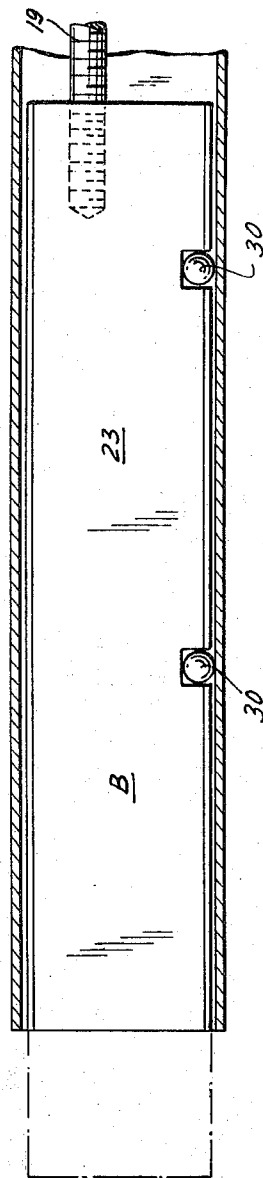


FIG. 8

FIG. 2

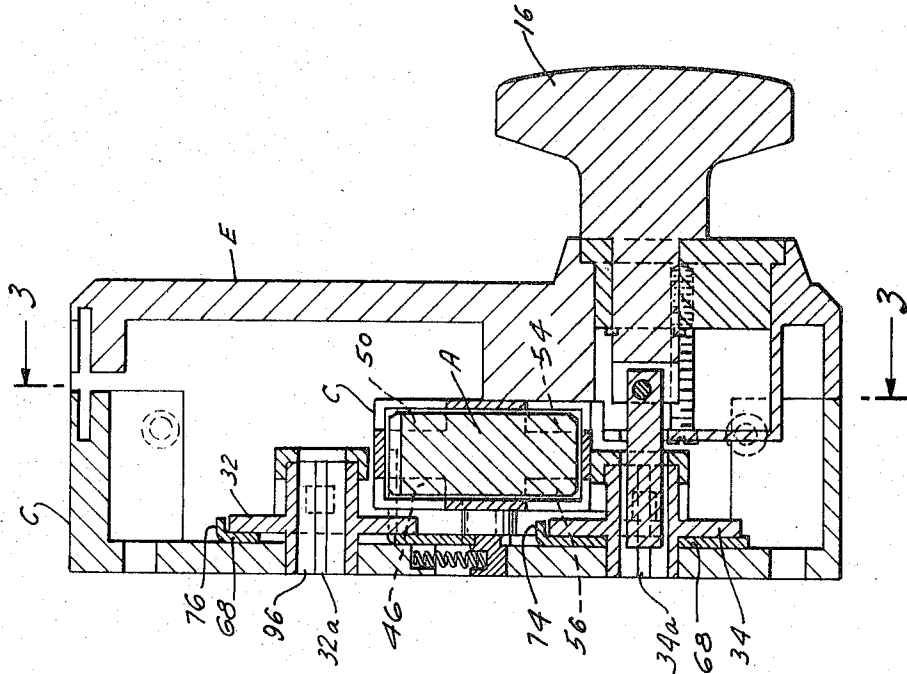
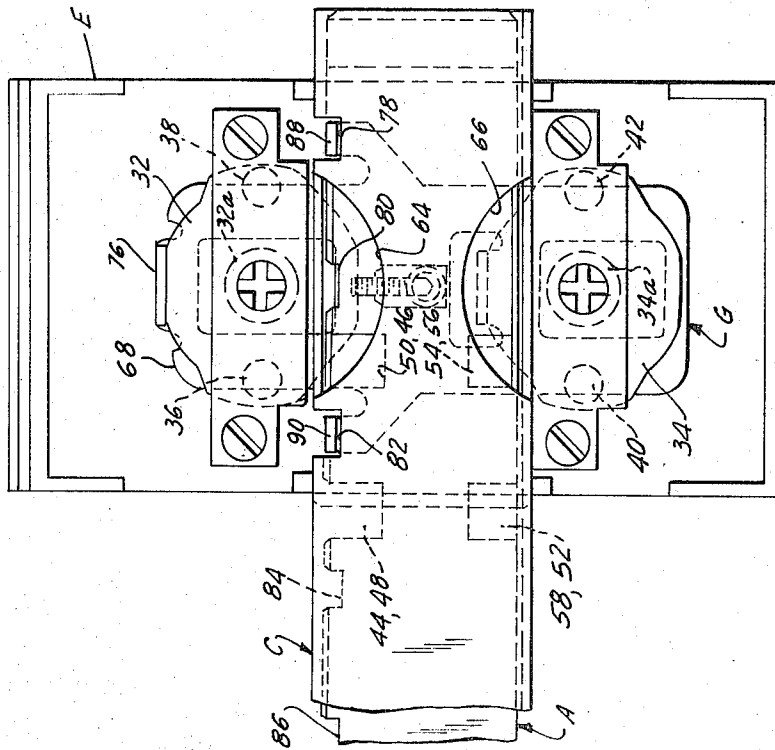


FIG. 3



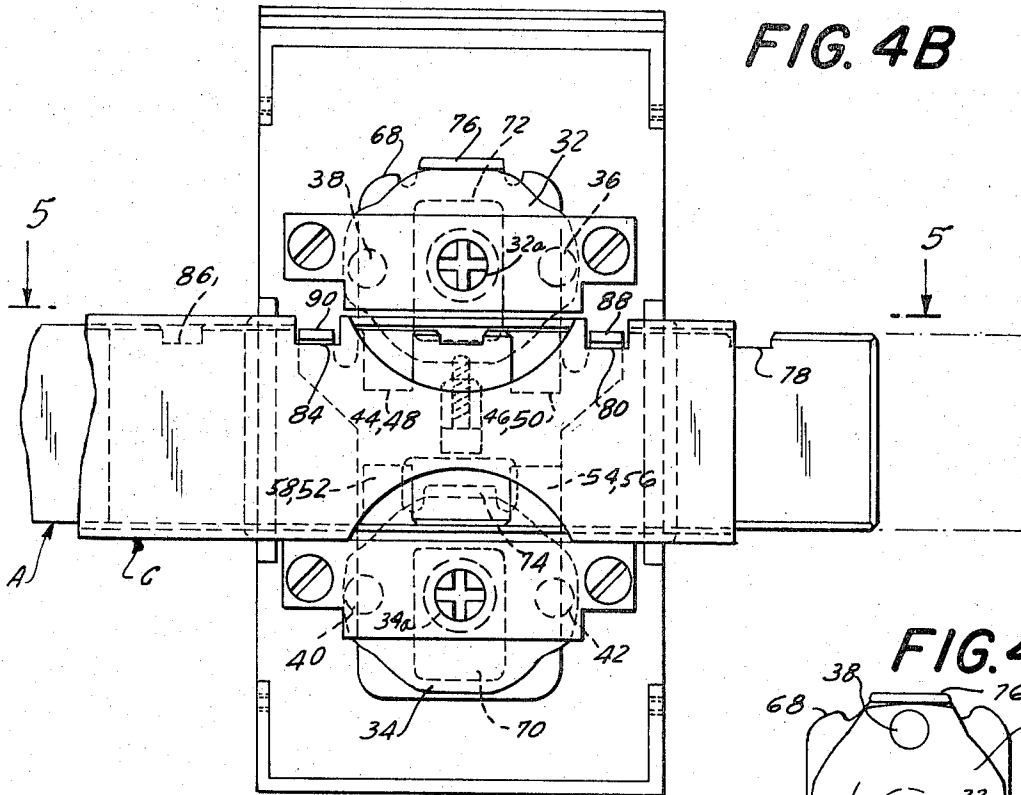
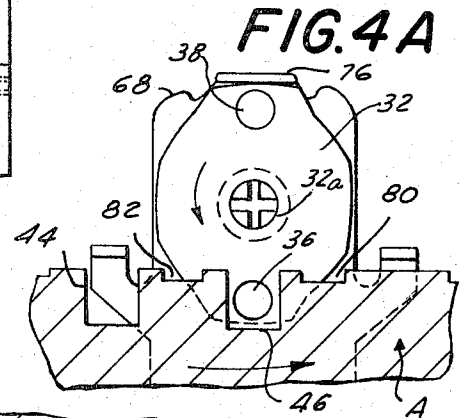
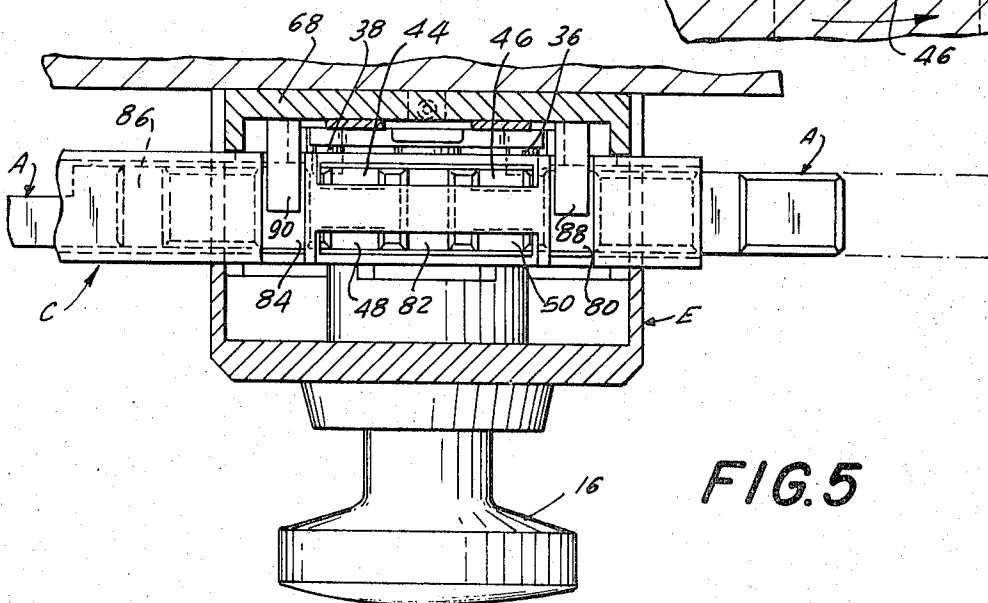
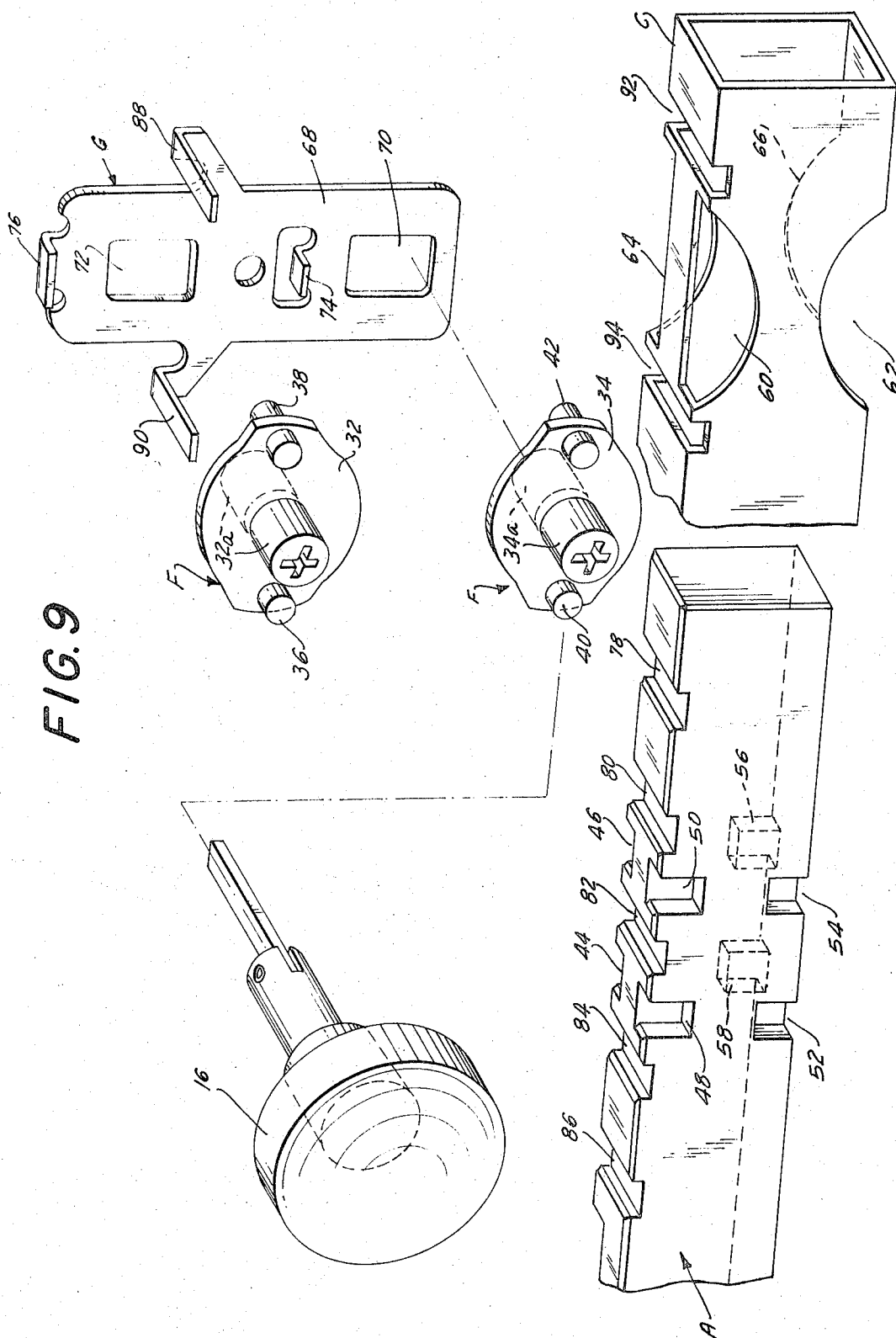


FIG. 9



ACTUATING MECHANISM FOR DOUBLE BAR LOCK

The present invention relates to police locks of the double bolt type and more particularly to an improved actuating mechanism for locks of this type.

The typical double bolt police lock comprises a lock housing secured to the inner surface of the door and a pair of elongated bars extending therefrom. The bars are movable in to and out of the housing between two positions in response to the rotation of a lock cylinder or the like by suitable drive means, typically in the form of a rack and pinion arrangement. In the locked position, the free ends of the bars are received in recesses in opposite sides of the door frame, or in the vertical type in recesses in the upper door frame and in the floor. In the unlocked condition the free ends of the locking bars are retracted inwardly of the respective door interfaces so as to allow free swinging movement of the door. Locks of this type may be locked or unlocked from the outside of the premises, usually by means of a key inserted into the lock cylinder. The key positions a set of tumblers to allow the cylinder to be rotated between the locking and unlocking positions. From the interior of the premises, the police lock may be locked and unlocked by moving the bars into the desired position, a handle or knob operably connected to the mechanism being utilized for this purpose.

The great advantage of a double bolt police lock is that it affords considerable protection against forcible entry and therefore affords extra protection. This is especially true as compared to the conventional bolt lock which is perhaps the most common type used today. An experienced thief confronted with a common bolt lock will usually completely bypass the locking mechanism and attempt to gain entry at the hinge side of the door either by removing the hinge pins, if they are accessible, or by simply forcing the door, causing the hinge or lock bracket to fail. For this reason, it is generally agreed that maximum protection is afforded by locks of the double bar variety.

In our copending application, Ser. No. 169,685, filed Aug. 6, 1971, now U.S. Pat. No. 3,792,885, issued Feb. 19, 1974, entitled "Improved Double Bar Lock," we disclose a double bar lock of simple compact construction which is versatile and provides a pleasant appearance, as well as adapted to provide maximum security through the use of an arrangement which permits deadlocking of the locking bars.

The present invention relates to an improved actuating mechanism for a double bar lock. The mechanism is designed to more simply and reliably provide for the movement of the bars between the locked and unlocked positions as well as to incorporate a deadlocking means of simple construction which functions effectively to provide maximum security. Further, the mechanism is designed to have an intermediate position between the normal locked and unlocked positions to enable the locking bars to extend beyond the housing at two distinct positions for use with doors of different sizes without altering the length of the locking bars. The bars are deadlocked in this intermediate position also so that security is assured in all modes of operation.

It is therefore the prime object of the present invention to provide an improved actuating mechanism for a double bolt police lock of the type described which

is of simple, compact and reliable construction and which, through the use of a deadlocking mechanism, provides maximum security.

It is another object of the present invention to provide an improved actuating mechanism for a double bar lock in which a third position, intermediate the unlocked and locked positions, is provided such that a lock incorporating this mechanism can be utilized with doors of different sizes without altering the length of the locking bars.

It is a further object of the present invention to provide an improved actuating mechanism for a double bar lock which incorporates deadlocking means effective to deadlock the bars at each of the unlocked, intermediate and locked positions.

It is yet another object of the present invention to provide an actuating mechanism for a double bar police lock which is lightweight, easy to install, extremely versatile and, in addition, has a longer trouble-free operating life than conventional police locks.

In accordance with the present invention, moving means operably connected to one of the bars of the double bar lock and effective when actuated to move the bar between the locked and unlocked positions is provided. The moving means generally consists of a pair of spaced cams rotatable in the same plane. Each of the cams may be designed to be actuated from a different side of the door. For example, one of the cams may be rotated from the inside of the door by the turning of a knob or handle operably connected thereto. The other cam may be rotated from the outside of the door through the turning of a key in a lock cylinder which is operably connected to rotate this cam. Each of the cams is operably connected to the bar such that rotation of either will move the bar between the locked and unlocked positions. Partial rotation of either of the cams will move the bar to an intermediate position between the locked and unlocked positions. The rotation of either of the cams also actuates deadlocking means external to the bar to move between a first position wherein the deadlocking means operably engages a recess on the bar to prevent the movement of the bar and a second position wherein the recess is operably disengaged by the deadlocking means to permit movement of the bar.

To the accomplishment of the above and to such other objects as may hereinafter appear, the present invention relates to an improved actuating mechanism for a double bar lock as defined in the appended claims and as described herein with reference to the accompanying drawings in which:

FIG. 1 is a front elevational view of a door upon which a double bar lock incorporating a preferred embodiment of the improved actuating mechanism of the present invention has been installed;

FIG. 2 is a cross-sectional view taken along line 2—2 of FIG. 1 showing the improved actuating mechanism of a preferred embodiment of the present invention;

FIG. 3 is a cross-sectional view taken along line 3—3 of FIG. 2 showing the actuating mechanism in the unlocked position;

FIG. 4A is a cross-sectional view of a portion of the actuating mechanism showing one of the cams as it is rotated;

FIG. 4B is a cross-sectional view of the actuating mechanism of the present invention showing the lock in the intermediate position;

FIG. 5 is a cross-sectional view taken along the line 5—5 of FIG. 4B;

FIG. 6 is a cross-sectional view of the drive mechanism of the present invention;

FIG. 7 is a cross-sectional view taken along line 7—7 of FIG. 6;

FIG. 8 is a cross-sectional view of one of the bars showing the means employed to facilitate movement of the bars within the housing; and

FIG. 9 is an exploded view of the improved actuating mechanism of the present invention.

The improved actuating mechanism of the present invention is primarily designed for use with a double bar lock of the type having a pair of locking bars, generally designated A and B, slidably mounted within a housing, generally designated C. Driving means, generally designated D, is effective to move one of the bars in a given direction in response to the movement of the other of the bars in the opposite direction. Thus, if one of the bars, for example bar A, is moved to project outwardly from the housing, drive means D is effective to move bar B in the opposite direction such that it also is moved to project outwardly from the housing on the opposite side of the housing from which bar A extends. In this way, both of the bars A and B are simultaneously moved between the locked, intermediate and unlocked positions. In the unlocked position, bars A and B are contained within housing C and therefore do not interfere with the opening of the door. In the locked and intermediate positions, bars A and B extend outwardly from housing C at opposite ends. The locked position is the position in which the bars extend farthest from the housing C. In the intermediate position the bars extend only part of the way outside the housing C. However, as explained below, the bars are secured in either of these positions. Therefore, either can be used depending upon the size of the door. Recesses are positioned in the door frame opposite the ends of housing C such that when bars A and B are moved outwardly beyond the housing C they are accepted within these recesses. In this way, the door is secured against unauthorized entry.

The actuating mechanism itself is situated in a housing, generally designated E, on one side of housing C such that the actuating mechanism is in operable communication with one of the bars. Within housing E is situated moving means, generally designated F, which is operably connected to one of the bars, for example, bar A, and is effective when actuated to move bar A between the locked, intermediate and unlocked positions. Because of the operation of driving means D, the movement of bar A will also serve to move bar B simultaneously therewith. Also within housing E is situated deadlocking means, generally designated G, which is operably connected with moving means F, to move between a first and a second position. In the first position, deadlocking means G will operably engage bar A to prevent the movement thereof. In the second position, deadlocking means G will be operably disconnected from bar A such that movement of bar A is permitted.

Moving means F may be actuated from either side of housing E. Generally, a rotatable handle or knob is provided on the inside of the door such that moving means F may be actuated from the inside to move deadlocking means G to the second position wherein movement of bar A is permitted. Moving means F may also be actu-

ated from the outside of the door. Generally, a lock cylinder, preferably of the "pick proof" variety is provided such that the rotation of the appropriate key from the outside of the door actuates moving means F to move deadlocking means G and therefore permit movement of bar A by moving means F. Although primarily designed for use in a double bar type lock, the actuating mechanism of the present invention may also be utilized in a conventional single bolt lock. The operation of the mechanism in this application will be precisely the same as described below except for the absence of the second bar and drive means.

Referring to FIG. 1, door 10 is illustrated having a double bar lock mounted thereon. A door frame 12 is shown and upon door 10 is situated an elongated, narrow housing C in which bars A and B are slidably mounted. Housing C is secured transversely on door 10 by means of a bracket 14 at one end and a lock casing or housing E at the other end. Recesses in door frame 12 are situated in alignment with each end of housing C such that bars A and B may extend therein. Locking bars A and B are mounted within housing C for sliding movement therein between an unlocked position entirely in the interior of housing C and a locked position (shown in broken lines) in which they extend outwardly of the housing at opposite ends thereof into the opposing recesses in door frame 12. Mounted on the locked housing E is a knob or handle 16 adopted to control the bar action in the manner hereinafter described.

Within housing C is situated the drive means D which are effective to move one of the bars in a given direction in response to the movement of the other of the bars in the opposite direction such that the movement of one bar between the locked, intermediate and unlocked positions moves the other bar between these positions. As best seen in FIGS. 6 and 7, which show driving means D in top and front views respectively, bars A and B are provided at their innermost ends interior of the housing C with cutaway step sections positioned in overlapping relationship. Each of the bars A and B has a first step 18 of about half the width of the bar and a second step 20 of approximately a third of the original width and less than half the original height of the bar. Each of the sections 20 is provided with a plurality of teeth 22 which form vertically opposing overlapped gear surfaces. Disposed between the opposing gear surfaces and meshingly engaged therewith in driving relationship is a disk 24 which is rotatably mounted on housing C by means of shaft 26. Section 20 of bar B extends from the lower portion of housing C to a point below shaft 26 such that shaft 26 does not interfere with the sliding movement thereof. Portion 20 of shaft B is situated behind disk 24 as seen in FIG. 7. In a similar manner, portion 20 of bar A extends from the top of housing C down to a position just short of shaft 26 such that shaft 26 does not interfere with the movement of this bar. Bar A is situated in front of disk 24 as shown in FIG. 7.

Disk 24 has three cylindrical protrusions 28 each of which extends perpendicularly outward from both sides of disk 24. The protrusions 28 on front of disk 24 are adapted to engage the teeth 22 situated on bar A. Likewise protrusions 28 on the rear of disk 24 are adapted to engage teeth 22 on bar B. As can be seen from FIG. 7, each of the teeth 22 has a beveled upper portion and is spaced from the neighboring teeth such that the bev-

els form a funnel shaped groove between each of the teeth. The shape and size of each of these grooves facilitates the entrance of protrusions 28 therein. As bar A is moved in one direction, the movement of section 20 bearing teeth 22 tends to rotate disk 24 in a manner such that section 20 of bar B is moved in the opposite direction. In this way, driving means D is effective to move bar B in a given direction in response to the movement of bar A in the opposite direction such that as bar A is moved between the locked, intermediate and unlocked positions, bar B is likewise moved between these positions.

Adjustable member 19 forms an operable connection between sections 21 and 23 of bar B. The adjustment of member 19 regulates the space between sections 21 and 23 and thus the length of bar B. This provides additional facility for adapting the lock to different sized doors.

In order to facilitate a smooth sliding engagement of bars A and B within housing C, bars A and B are provided with a plurality of ball bearings 30 on the lower surfaces thereof (see FIG. 8). The bearings 30 are in rolling engagement with housing C to provide smooth movement of the bars within the housing.

Moving means F and deadlocking means G are both situated within lock casing or housing E. Referring now to FIG. 9 which shows an exploded view of these mechanisms, it can be seen that moving means F comprises a pair of cams 32 and 34 which are in spaced relation to each other in the same plane. Cam 32 has a pair of cylindrical protrusions 36 and 38 which extend perpendicular to the plane of rotation from both sides of the cam. Likewise, cam 34 has a pair of cylindrical protrusions 40 and 42 which extend therefrom in a manner similar to the protrusions on cam 32. Bar A has a plurality of indentations 44, 46, 48, 50, 52, 54, 56 and 58 thereon which take the form of rectangular notches extending from the upper and lower surfaces thereof part of the way towards the middle of bar A. The portion of housing C which is contained within housing E is provided with semicircular cutout portions 60, 62, 64 and 66. Cutout portions 60 through 66 will permit the rotation of cams 32 and 34 without interference from housing C.

Referring now to FIGS. 2 and 3 the relative position of these elements in operational assembly can be readily appreciated. Cam 32 is rotatably mounted above the upper surface of bar A. Cam 34 is rotatably mounted below the lower surface of bar A. Cams 32 and 34 are rotatable in the same plane. FIG. 3 shows bar A in the unlocked position (wherein bar A is situated to the left as shown in this figure). In order to move bar A to the locked position (to the right as shown in this figure), either cam 32 must be rotated in the counterclockwise direction or cam 34 must be rotated in the clockwise direction. For example, if cam 32 is rotated in a counterclockwise direction, protrusion 36 will be moved towards bar A and will engage indentation 46 to move bar A toward the locked position. After a 90° turn, the cam 32 will appear as illustrated in FIG. 4A where protrusion 36, because of its engagement with indentation 46, has moved bar A half way towards the intermediate position. As the rotation continues, protrusion 36 will become disengaged with indentation 46 and at a 180° position, as shown in FIG. 4B, bar A will be in the intermediate position which is between the locked and unlocked positions. A further

90° rotation of cam 32 will cause protrusion 38 to engage indentation 44 and as the second 180° rotation is completed, bar A will have been moved to the locked position wherein it extends as far out of housing C as possible. This is shown in phantom in FIGS. 4B and 5. Thus, it takes two complete 180° rotations of the cam to move the bar A between the unlocked and the locked positions. Cam 34 and its protrusions 40 and 42 work in a similar manner in conjunction within indentations 56 and 58 on the lower surface of bar A. In order to move bar A from the locked to the unlocked position (to the left as seen in FIG. 3), the process is repeated in reverse by rotating either cam 32 in the clockwise direction or cam 34 in the counterclockwise direction. In this way the rotation of either cam 32 or cam 34 in a particular direction will move bar A between the locked and unlocked positions. Of course, as described above, drive means D will cause bar B to simultaneously move in the opposite direction as bar A such that both bar A and bar B are in the locked position simultaneously and the unlocked position simultaneously.

As can be readily appreciated from the above description, bars A and B will extend from housing C in both the intermediate and locked positions. The first 180° rotation of either cams 32 or 34 will move the bar from the unlocked to the intermediate position and the second 180° rotation will move the bars from the intermediate to the locked position. When dealing with large doors it may be necessary for bars A and B to extend from housing C a considerable extent before the bars are securely within the recesses of the door frame. In order to accomplish this, while still keeping the lock casing E an acceptable size, it is necessary for the cams to be rotated twice in order to move the bars to extend from the housing C to the length desirable in this situation. However, with smaller doors, it may not be necessary to have the bars extend all the way to the locked position in order to be sufficiently imbedded within the recess. Therefore, with a smaller door, only one 180° rotation may be necessary in order to effectively secure the door. Therefore, this double rotation action is incorporated into the mechanism to accommodate doors of varying sizes and therefore impart extra versatility to the lock while reducing size requirements and thus enhancing appearance.

Referring again to FIG. 9, deadlocking means G comprises a plate-like structure 68 having two apertures 70 and 72 aligned with the shafts 32a and 34a of cams 32 and 34, respectively. Plate 68 is movably mounted within housing E such that movement in a perpendicular direction to the movement of bar A is permitted. Apertures 70 and 72 are necessary so that the shafts 32a and 34a respectively can extend through those apertures and not interfere with the movement of plate 68. Plate 68 has a pair of cam follower elements 74 and 76 which extend in a direction perpendicular to the movement of plate 68. Cam follower 74 is situated to communicate with the cam surface of cam 34. Likewise, cam follower 76 is situated to communicate with the cam surface of cam 32. The rotation of either cam 32 or cam 34 will cause plate 68 to move vertically with respect to bar A. When either of the cams is rotated 90° or 270°, the cam followers will contact the edge of the cam and plate 68 will be in its uppermost position (see FIG. 4A). When cams 32 and 34 are at the 0°, 180° or

360° positions, plate 68 will be in its lowermost position with respect to bar A (see FIG. 4B).

Bar A is provided with a plurality of spaced recesses 78, 80, 82, 84 and 86. Plate 68 is provided with a pair of spaced parallel recess engaging elements 88 and 90 which extend perpendicular to the planar movement of plate 68. When plate 68 is in its lowermost position (FIG. 4B), elements 68 and 90 will operably engage two of the recesses 78 through 86 situated on bar A. Which of the recesses will be engaged depends upon the position of bar A. Such engagement will prevent the movement of bar A from that position. The vertical movement of plate 68, caused by the rotation of either cam 32 or 34, will cause recess engaging elements 88 and 90 to operably engage and disengage the recesses on bar A. When bar A is in the unlocked position, (FIGS. 2 and 3), elements 88 and 90 will operably engage recesses 78 and 82 respectively. In the intermediate position (FIGS. 4B and 5), recesses 88 and 90 will operably engage recesses 80 and 84 respectively, and in the locked position elements 88 and 90 will operably engage recesses 82 and 86 respectively. As can be seen from FIG. 9, housing C is provided with a pair of slots 92 and 94 which are situated in alignment with the movement of elements 88 and 90, respectively. Slots 92 and 94 permit the movement of elements 88 and 90 without interference from housing C.

As can be seen in FIG. 9, handle 16 is adopted to be mounted on the shaft of cam 34 such that the rotation of handle 16 will rotate cam 34. As can be seen in FIG. 2, the shaft of cam 32 may be connected to a lock cylinder 96 which has a keyhole which opens on the opposite side of housing C and therefore the outside of door 10. When the appropriate key is placed into cylinder 96 and rotated, actuation of cam 32 takes place. Thus, the actuating mechanism can be actuated from either side of the housing. Of course, handle 16 is for illustrative purposes only and the appropriate lock cylinder can also be placed on the inside of the door if it is desired that the door remain locked from both sides unless the proper access key is possessed.

In operation, the double bar lock may be originally in the unlocked position as shown in FIGS. 2 and 3, for instance. A key is inserted into cylinder 96 or alternatively handle 16 is rotated to rotate either cam 32 or cam 34, respectively. For example, let us take the situation where handle 16 is rotated to rotate cam 34. As cam 34 is rotated in the clockwise direction, protrusion 40 engages indentation 56 to move bar A toward the intermediate position. As this rotation is taking place, cam follower 74 is riding up the cam surface of cam 34, thus moving plate 68 away from bar A. The movement of plate 68 moves elements 88 and 90 out of recesses 78 and 82 thus permitting bar A to move. After a 180° turn of cam 34, bar A has moved to the intermediate position, protrusion 40 no longer rests with indentation 58 and plate 68 has moved downward to place elements 88 and 90 into recesses 80 and 84 respectively. As can be readily appreciated, the double bar lock is now deadlocked in the intermediate position. In order to move bar A from the intermediate position to the locked position, a further 180° turn of handle 16 and thus cam 34 is necessary.

During the second 180° turn, protrusion 42 will engage indentation 58 to move bar A and plate 68 will again be moved upward by the interaction of cam follower 74 and the cam surface of cam 34. After the sec-

ond 180° rotation of cam 34 is completed, elements 88 and 90 will rest in recesses 82 and 86 respectively. Bar A will extend outward from housing C in the extreme position. Driving means D serves to move bar B in the opposite direction in accordance with the movement of bar A, and bar B will therefore extend out the other side of housing C in its extreme position. Thus, if it is necessary, because of the size of the door upon which the double bar lock is mounted, to move the bars to the extreme position, two half rotations of one of the cams are required. However, in some cases only a single 180° rotation will be sufficient. Of course, each of the cams may serve to move the bar a single step. For instance, cam 32 may be rotated to move bar A from the unlocked to the intermediate position, and cam 34 may be rotated to move bar A from the intermediate to the locked position. This, however, is unlikely because in most situations the actuating mechanism will be actuated from either one side of the door or the other but not both.

A single preferred embodiment of the present invention has been specifically disclosed herein for purposes of illustration. It is apparent that many variations and modifications may be made upon the specific structure disclosed herein. It is intended to cover all of these variations and modifications which fall within the scope of this invention as defined by the appended claims.

We claim:

1. In an actuating mechanism for a double bar lock of the type having first and second bars slidably mounted in a housing for movement between a locked position wherein each of said bars extend outwardly from opposite sides of said housing and an unlocked position wherein said bars are moved inwardly towards each other, and driving means effective to move one of the bars in a given direction in response to the movement of the other of said bars in the opposite direction such that the movement of one bar between the locked and unlocked positions moves the other bar between said positions, the improvement which comprises moving means comprising a first and a second rotatable cam spaced from each other and rotatable in the same plane, said moving means being operably connected to said first bar and effective when actuated to move said first bar between the locked and unlocked positions, a recess on said first bar, and deadlocking means external to said first bar and movable between a first position wherein said recess is operably engaged by said deadlocking means to prevent the movement of said first bar and a second position wherein said recess is operably disengaged by said deadlocking means to permit movement of said first bar, said deadlocking means being moved between said first and second positions by actuation of said moving means, said deadlocking means comprising a movable member having a pair of cam followers mounted thereon, each of said cam followers being operatively engageable with a different one of said cams such that said member is moved between said first and second positions by rotation of either of said cams.

2. The lock according to claim 1 wherein said movable member comprises a plate having a pair of spaced openings therein and wherein said lock further comprises a pair of shafts, one of said cams being mounted on each of said shafts, each of said shafts extending through a different one of said openings.

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3. The lock according to claim 2 wherein the movement of said plate is limited by the size of said openings.

4. The lock according to claim 3 wherein the length of each of said openings is at least equal to the distance between said first and said second position of said deadlocking means.

5. The lock according to claim 2 further comprising

first and second means for rotating said first and said second cams respectively, said first cam rotating means being situated on one side of said plate and said second cam rotating means being situated on the other side of said plate.

6. The lock according to claim 1 wherein each of said cams is independently rotatable.

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