

March 17, 1970

P. M. HAWKINS

3,500,670

LOCK MECHANISM AND ALARM

Original Filed March 15, 1967

5 Sheets-Sheet 1

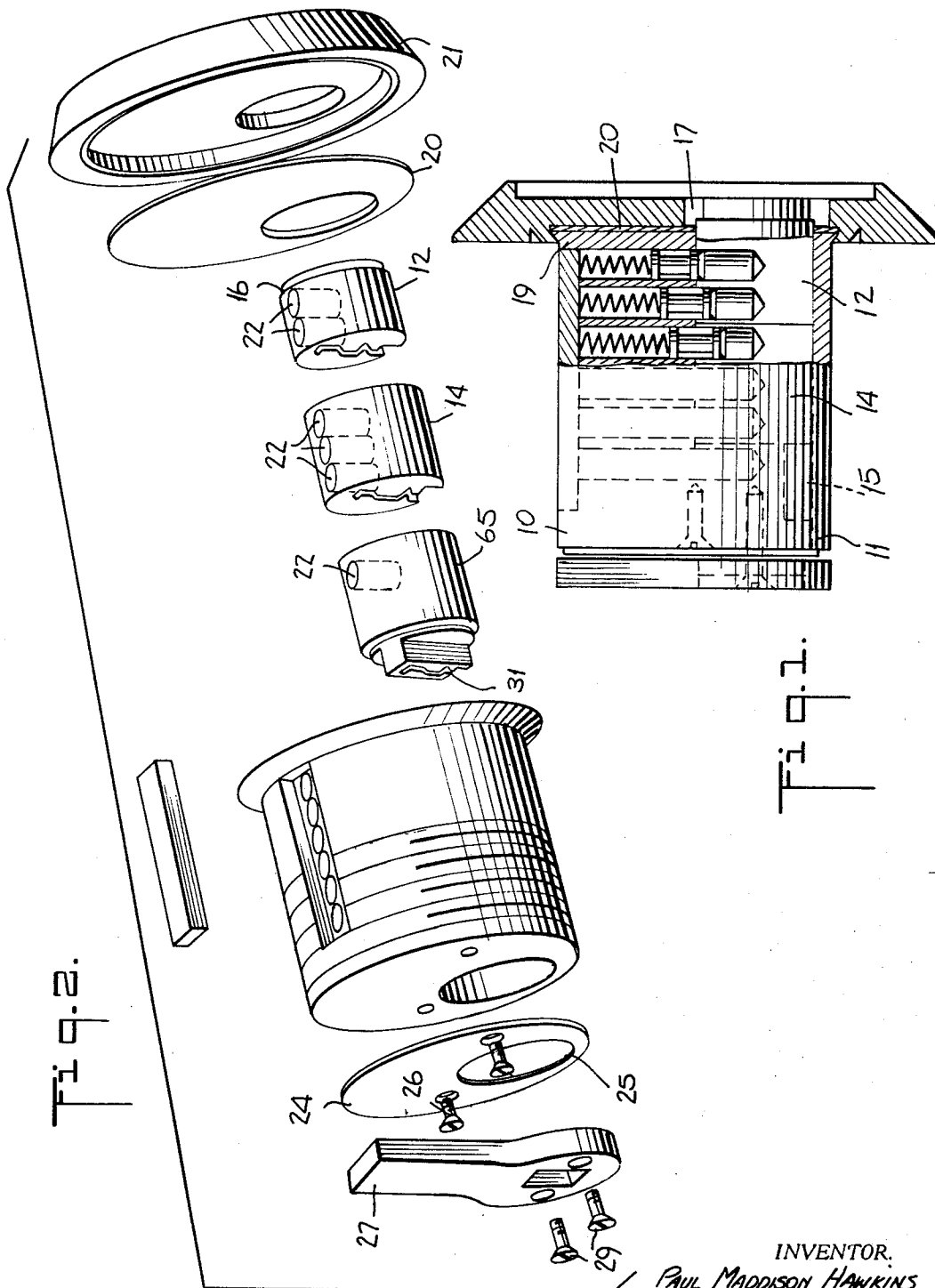


Fig. 2.

Fig. 1.

INVENTOR:  
PAUL MADDISON HAWKINS  
BY  
Ward, McElannan, Brooks & Schipatic  
ATTORNEYS

March 17, 1970

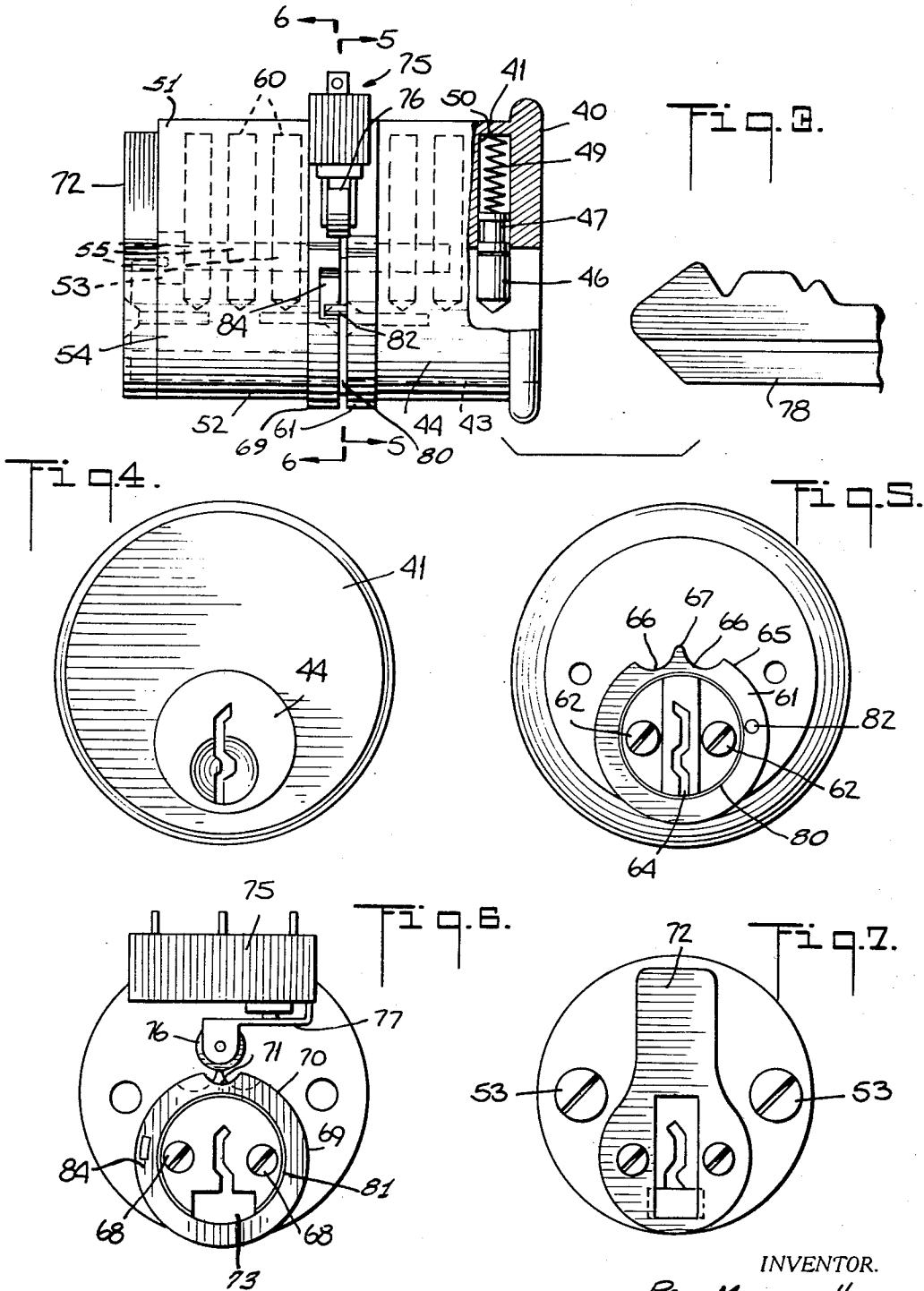
P. M. HAWKINS

3,500,670

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5 Sheets-Sheet 2



INVENTOR.

PAUL MADISON HAWKINS

BY

Ward, McElmanon, Brooks & Fitzpatrick  
ATTORNEYS

March 17, 1970

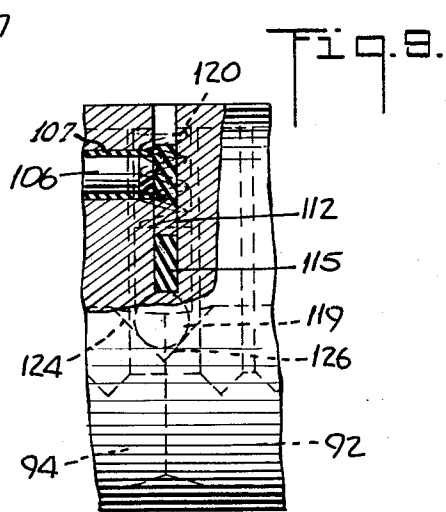
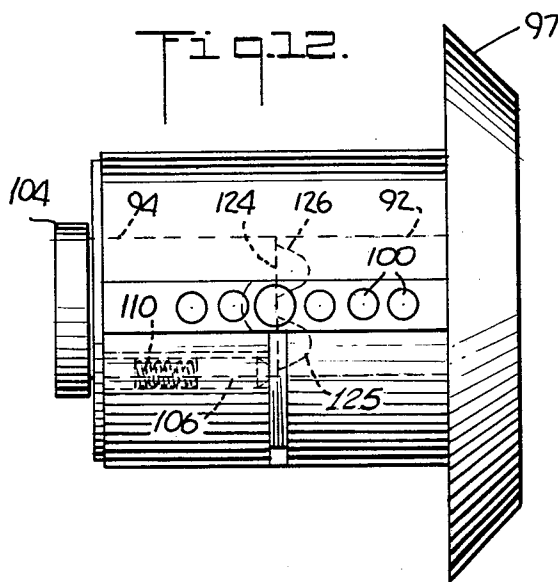
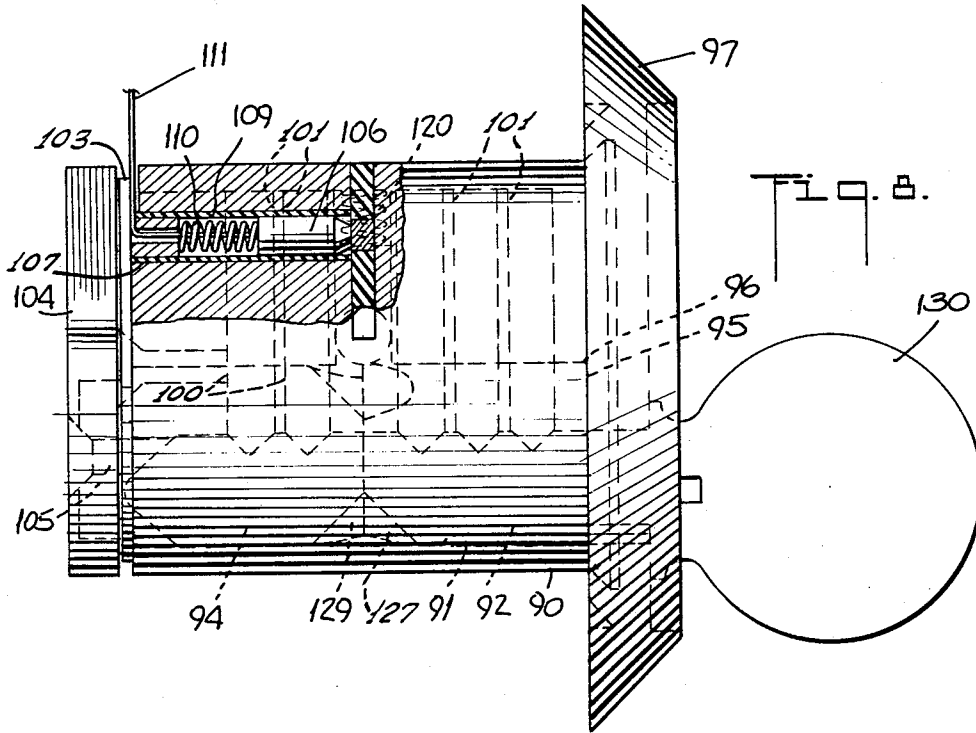
P. M. HAWKINS

3,500,670

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5 Sheets-Sheet 3



INVENTOR.

PAUL MADISON HAWKINS  
BY

Ward, McClannan, Brooks & Lutzpatrick  
ATTORNEYS

March 17, 1970

P. M. HAWKINS

3,500,670

LOCK MECHANISM AND ALARM

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Fig. 10.

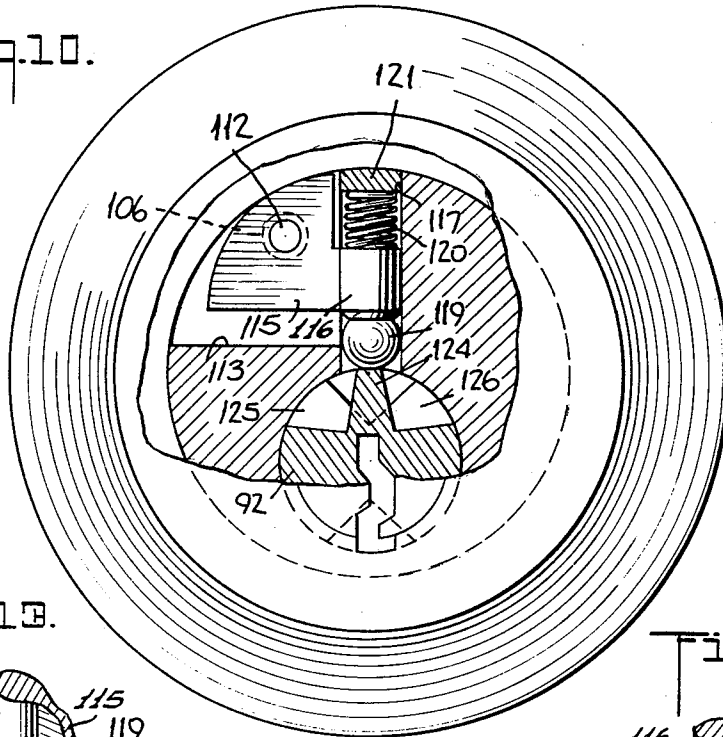


Fig. 13.

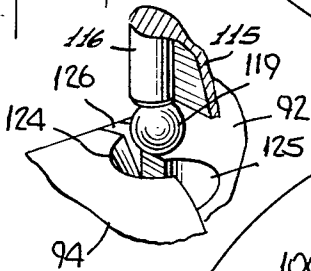


Fig. 14.

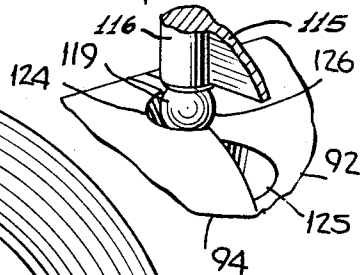
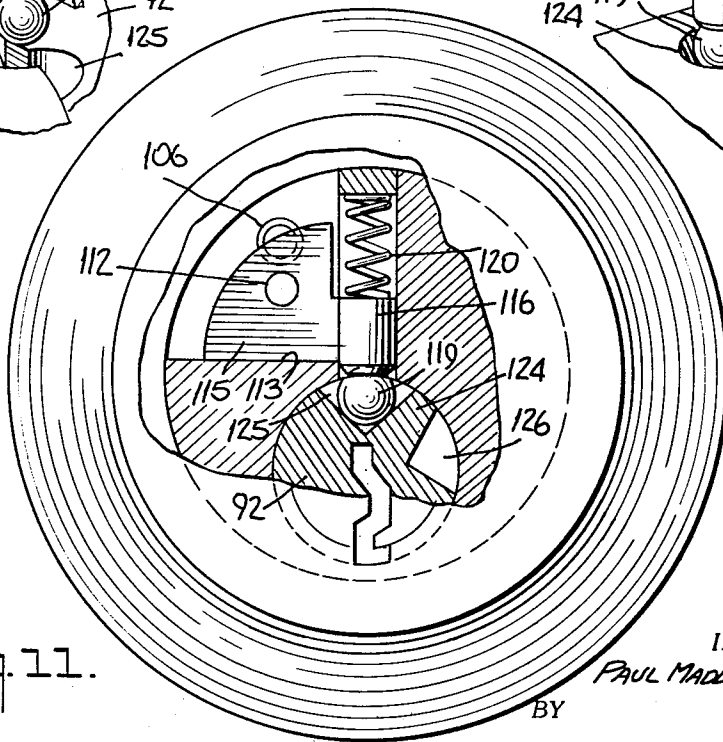


Fig. 11.



INVENTOR.

PAUL MADISON HAWKINS

BY

Ward, McElroy, Crocker & Patrick  
ATTORNEYS

March 17, 1970

P. M. HAWKINS

3,500,670

LOCK MECHANISM AND ALARM

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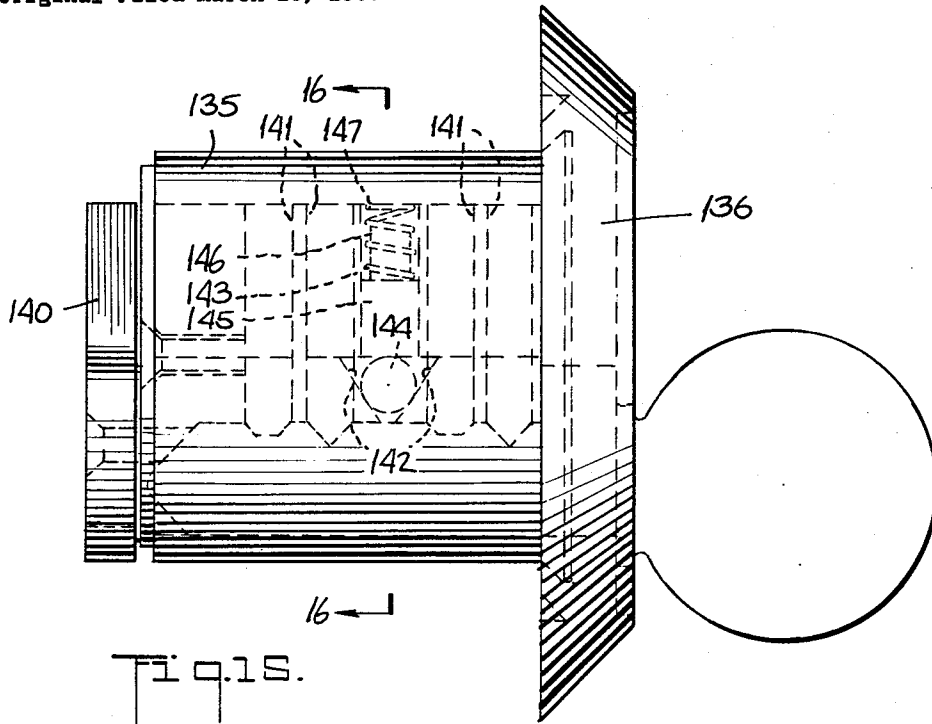


Fig. 15.

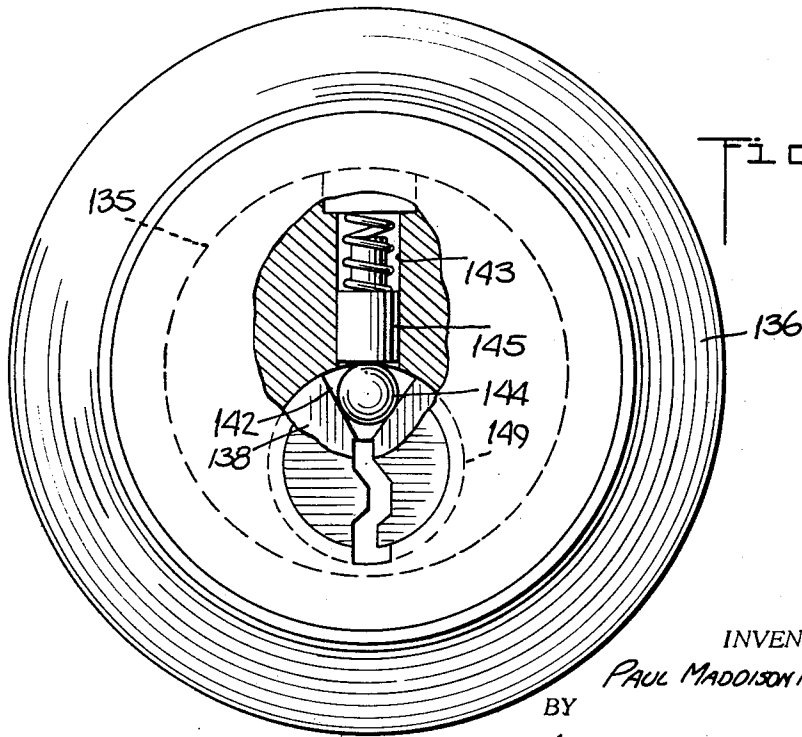


Fig. 16.

INVENTOR.

PAUL MADISON HAWKINS

BY

Ward, McElmurray, Brooks & Liffittick  
ATTORNEYS

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3,500,670

**LOCK MECHANISM AND ALARM**

Paul Maddison Hawkins, Brookville, N.Y., assignor to General Alarm Corporation, New York, N.Y., a corporation of Delaware

Original application Mar. 15, 1967, Ser. No. 623,333, now Patent No. 3,427,413, dated Feb. 11, 1969. Divided and this application Mar. 8, 1968, Ser. No. 729,852

Int. Cl. E05b 17/00, 45/08, 63/14

U.S. Cl. 70—375

6 Claims

**ABSTRACT OF THE DISCLOSURE**

A lock mechanism employing cylinder means, a plurality of key slotted plugs supported for rotation in the cylinder means in tandem disposition and at least one pin tumbler and driver means associated with each plug and the cylinder means normally to maintain same against relative rotation but shiftable to a position to permit such rotation; and, if desired, the combination therewith of an alarm actuating switch and means normally maintaining the switch in one position and shifting same to a second position upon rotation of one of said plugs.

This invention relates to a lock mechanism, and more particularly, to a tamper-proof pin tumbler cylinder lock mechanism with which cooperating means for actuating an alarm upon attempted unauthorized manipulation of the mechanism may be associated.

This application is a continuation-in-part of my copending application Ser. No. 596,840 filed Nov. 25, 1966, now abandoned and a division of application Ser. No. 623,333 filed Mar. 15, 1967, now United States Patent No. 3,427,413 issued Feb. 11, 1969.

Various types of alarm actuating mechanisms are known whereby unauthorized entry into a locked premises is sensed and indicated by the operation of an alarm. However, all too often mechanisms of this type have been able to be defeated so that the alarm is not actuated upon the occurrence of an unauthorized entry; and, even where the alarm is actuated, this usually occurs after the entry has taken place. As the security technology has advanced, the development of means to nullify the improvements has also advanced. Thus, there has been a long standing need for a tamper-proof lock mechanism which, while operable to permit authorized entry, resists unauthorized entry and may be combined with means to actuate an alarm upon attempted unauthorized entry.

The present invention contemplates a key actuated lock mechanism of the class described which is exceedingly difficult, if not impossible, to manipulate without a proper key and which may be associated with alarm actuating means so that, if even partially manipulated, it will actuate an alarm.

Accordingly, an important feature of the invention resides in apparatus of the class described comprising: cylinder means, a plurality of key slotted plugs supported for rotation in the cylinder means in tandem disposition relatively to one another, and at least one pin tumbler and driver means associated with each of the plugs and the cylinder means normally to maintain the same against relative rotation and shiftable to a position to permit such rotation. It will be understood by those persons skilled in the art that the term "cylinder means" as used herein, comprises separate, aligned cylinders containing one or more plugs, or a single cylinder containing all the plugs.

In one embodiment of the present invention wherein means to actuate an alarm are associated with the cylinder means, there are utilized cylinder means comprising first and second key actuated pin tumbler cylinder and

key-slotted plugs supported for rotation therein in tandem disposition relatively to one another, an alarm actuating switch, means under the respective control of the plugs normally maintaining the switch open, and means shifting the switch to closed position upon rotation of one of the plugs.

The cylinder means, when it comprises several cylinders as in the illustrated embodiment, when disposed in a closure such as a door, will be in tandem in a line perpendicular to the planes of the inner and outer surfaces of the door so that the cylinders may be regarded as outer and inner cylinders.

The means under the respective control of the plugs may take the form of a first cam positioned at the rear of the outer plug and rotatable therewith, and a second cam positioned at the front of the inner plug and rotatable therewith. The switch is equipped with a follower that is spring biased toward the cam surfaces of both cams.

The first cam is contoured normally to maintain the switch in open position, but to allow the switch to close upon rotation of the outer or first plug in either direction.

The second cam is contoured normally to allow the switch to close upon rotation of the first plug from its normal position but to maintain the switch in open position upon rotation of the second plug.

Thus it will be seen that rotation of the outer or first plug will cause the switch to close, whereas, simultaneous rotation of both plugs will maintain the switch open.

A bolt operating cam is rotatable with the inner or second plug so that the closure cannot be unlocked without rotation of that plug. Authorized entry, therefore, requires rotation of both plugs and an authorized key is able to pass through both plugs and cams, the latter having aligned matching key slots for the purpose, to set the tumblers of both plugs for rotation.

Thus, if an attempted unauthorized entry is made by picking the lock, if only the first or outer plug is picked and rotated, the alarm will be actuated without retraction of the bolt. Should an attempt be made to pick both plugs, it would be necessary to pick the second one first since only the slightest movement of the first plug alone would actuate the alarm, and since conventional picking tools used in picking a plug must be left in the key slot after picking the tumblers of that plug in order to maintain them in release position while the other plug is picked. In the event that the inner plug is successfully picked, the picking tools must remain in the key slot of both plugs so that no room is left for tools to pick the first plug.

In picking a pin tumbler cylinder plug, as each pin is raised to release position, a rotation force or torque must be exerted on the plug to retain the last picked tumbler in release position until the final one is picked, at which time, a further torque is necessary to rotate the plug. A further feature of the invention resides in the formation of the lower portion of the key slot of the second plug of a width greater than that of the first key slot so that no fulcrum is available in the second key slot against which to bear the picking tool to achieve the necessary torque.

Another feature of the invention contemplates the use of one cylinder plug to prevent unauthorized rotation of the adjacent plug. To this end, the second cam is formed with a recess facing the first cam, and the latter has a fixed pin extending into the recess. The pin and recess are arranged so that the second plug, if successfully defeated, cannot be rotated in a direction to retract the bolt, due to interference of the pin with the side of the recess.

Still further features of the invention reside in formation of the outermost tumbler and its spool driver of

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drill resistant material such as hardened steel so that drill cannot be used to penetrate the tumblers and support them in release position. The first cam is similarly formed also to resist drilling, as is a plate covering the inner end of the inner key slot. This plate may actually be a part of the bolt operating cam attached to the inner plug.

Additionally, a sleeve surrounding the key slot openings in the cams is provided to prevent the injection of fluid into the space between the cams to insulate the wick contacts or to harden and prevent movement of the cam follower. This sleeve may be integral with one cam and extend into a groove formed in the other cam.

Where the alarm actuating means are not used, if the first plug only is picked, nothing happens, i.e. the door cannot be opened as the bolt cam is still locked. If in some way additional plugs, and particularly the inner or last plug is picked, the bolt operating cam still cannot be rotated because of the enlarged portion of the key slot already referred to, and because the foremost plugs prevent rotation of the tools so that these foremost plugs must also be picked, but while the tools for each earlier picked plug remain in the key slot.

In another embodiment of the invention, I contribute an alarm actuating mechanism comprising: pin tumbler cylinder means, a plurality of key slotted plugs supported for rotation therein in tandem disposition relatively to one another, two of the plugs having surfaces respectively contoured mutually to cooperate to form a recess when the two plugs are in selected annular positions respectively, a follower adapted to engage a surface of the plugs and to be maintained in a first position by that surface and to shift into the recess when same is formed opposite the follower, an alarm actuating switch having contact means, means normally maintaining the switch contact means in a first relative position, and means shifting the contact means to a second relative position upon movement of the follower into the recess.

Actually, the switch may have a pair of contacts and a movable insulating member mounting one of the contacts, and the insulating member may be maintained normally in a position wherein the contacts are in or out of electrical contact, as desired, and may be shiftable under the influence of a spring or the like to a position whereby the contacts are out of or in electrical contact when the follower moves into the recess. For this purpose, the insulating member may have a part bearing against the follower and spring means may urge the insulating member towards the second position so that the contact carried by the insulating member moves with the member relatively to the other contact when the follower shifts. The other contact is preferably biased towards the contact carried by the insulating member when in one of its positions for good electrical contact. The contacts are, of course, part of an alarm actuating circuit, and for this purpose one of them may be grounded to the lock cylinder which may become part of the circuit.

As a feature of this embodiment of the invention, I utilize as a follower a ball and I may form the contours on the appropriate plugs so that the recess is frustoconical, or it may be cylindrical and of a depth greater than the radius of the ball so that the ball cannot be forced out of the recess by turning one of the plugs after the alarm is actuated. Where the alarm actuating means are not used, or should they become inoperative, the follower or ball will nevertheless fall into its recess if the plugs are picked and rotated, or if just the first plug is picked and rotated; and because the recess is dimensioned so that the ball cannot fit entirely in the recess, the upper part of the ball will engage the cylinder and prevent further rotation of the plugs. Utilization of a cylindrical recess obviates employment of a rotating force on the plugs, or one of them, to force the ball out of the recess. Thus, this arrangement, with or without the alarm means provides a

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positive locking feature against unauthorized manipulation of the lock.

In another modification of the present invention, the recess is frustoconical and is formed by a semi-frustoconical contour on each of two adjacent plugs, the arrangement being such that when the plugs are in normal position, the follower for which I prefer to use a ball, is spring loaded down into the recess and is dimensioned to be completely contained within the recess. Thus, an authorized key will not interfere with the ball and can rotate both plugs in the cylinder; however, any attempt to pick either plug, necessarily involves some slight rotation of that plug to maintain the picked pins in unlocking condition, and such rotation will cam the ball in a direction out of the recess, the walls of which are sufficiently inclined to achieve that result. Partial projection of the ball from the recess will cause the ball to interfere with the cylinder thus preventing further rotation of either plug. Additionally, any momentary relaxation of the torque on the picked plug will permit the ball, acting under the force of its spring to cam the plug back to normal position causing the picked pins to drop back into locking condition.

There has thus been outlined rather broadly, the more important features of the invention in order that the detailed description thereof that follows may be better understood, and in order that the present contribution to the art may be better appreciated. Those skilled in the art will appreciate that the conception upon which this disclosure is based may readily be utilized as a basis for the designing of other structures for carrying out the several purposes of the invention. It is important, therefore, that the claims be regarded as including such equivalent construction as do not depart from the spirit and scope of the invention.

A specific embodiment of the invention has been chosen for purposes of illustration and description, and is shown in the accompanying drawings, forming a part of the specification wherein:

FIG. 1 is a side elevational view of a lock mechanism according to my invention;

FIG. 2 is an exploded view illustrating components of the mechanism of FIG. 1;

FIG. 3 is a side elevational view of an alarm actuating lock mechanism according to the present invention;

FIG. 4 is a front elevational view of the mechanism;

FIG. 5 is an elevational section view taken along the lines 5—5 of FIG. 3;

FIG. 6 is an elevational section view taken along the lines 6—6 of FIG. 3;

FIG. 7 is a rear elevational view of the mechanism;

FIG. 8 is a side elevational view of another embodiment of an alarm actuating mechanism according to the present invention illustrating same in the normal position;

FIG. 9 is a fragmentary elevational view illustrating parts of the mechanism shown in FIG. 8 in alarm actuating position;

FIG. 10 is an end elevational view of the mechanism as shown in FIG. 8 partly broken away from purposes of illustration;

FIG. 11 is a view similar to FIG. 10 but illustrating the mechanism as shown in FIG. 9;

FIG. 12 is a top plan view of the mechanism of FIGS. 8 to 11;

FIG. 13 is an enlarged perspective view showing the relationship of the follower in normal position relatively to the recess;

FIG. 14 is similar to FIG. 13, but shows the follower seated in the recess;

FIG. 15 is an elevational view of a further modification of my invention showing in dotted outline a portion of the internal construction for clarity; and

FIG. 16 is a front view, partially broken away of the mechanism of FIG. 15.

Referring now to the drawings in detail, and more par-

ticularly to FIGS. 1 and 2 thereof, there is shown a lock mechanism according to the present invention and including a cylinder 10 bored longitudinally as at 11 for reception in tandem arrangement of key slotted plugs 12, 14 and 15. The front plug 12 is shouldered as at 16 for abutment with the inner surface of a projection 17 on the cylinder facing 19 so that the plugs must be loaded into the cylinder from the rear and cannot be removed from the front end thereof.

A hardened steel spacer 20 is positioned between the cylinder and an escutcheon 21 at the front end thereof to prevent drilling through same to hold picked pins or drivers in release position.

It will be noted that each of the plugs has one or more vertical bores 22 which align with vertical bores in the cylinder 10 in the usual way to accommodate pin tumblers, drivers and springs for locking each plug against rotation relatively to the cylinder. In the present illustration, the plug 12 is bored to accommodate two pin tumblers, the plug 14 to accommodate three and the plug 15 to accommodate one for a total of six pins.

An end plate 24 formed with a circular opening 25 is secured by screws 26 to the cylinder, and a bolt operating cam 27 is secured by screws 29 extending through the opening 25 to the plug 15 for rotation therewith to retract or protract a door bolt, or the like.

Those skilled in the art will appreciate that to open the door without an authorized key, the plug 15 must be picked and rotated; but to do this, a torque bearing is required, and as the key slot 30 of this plug is enlarged, as shown at 31, such a bearing is not available unless plugs 12 and 14 are also picked. This would be exceedingly difficult, if not impossible, since the tools needed to maintain picked plugs in picked condition, would interfere with those needed to pick the remaining plugs. Additionally, picking is rendered difficult because if one plug is picked, it is rotated slightly to maintain the pins in picked condition. Thus the area of the key slot is reduced, and will be further reduced as the next plug is picked and rotated so that the working area becomes impossibly small. Meanwhile, should any vibration or slight turning force counterrotate any of the picked plugs, its pins will fall back into locking position.

By way of example, in the arrangement illustrated in FIGS. 1 and 2, the first driver may be of hardened steel and of the straight type, while the remaining drivers may be of brass, the second and fourth being of the mushroom type while the third, fifth and sixth are straight drivers. The first pin tumbler may also be hardened steel and all the rest may be of brass.

Turning now to FIGS. 3 to 7, and particularly to FIG. 3, there is shown an alarm actuating mechanism having a face plate 40 integral with a cylinder 41 extending rearwardly thereof. A bore 43 extends through the plate 40 and cylinder 41 for supporting a rotatable plug 44 (FIGS. 3 and 4) bored as at 45 for reception of tumbler pins 46 backed by spool drivers 47 and springs 49 positioned in corresponding bores 50 in the cylinder 41. Only one tumbler pin, driver and spring are shown.

A second cylinder 51 extends rearwardly of and in tandem disposition with the cylinder 41, to which it is secured by screws 53, and is bored as at 52 for supporting a rotatable plug 54 bored as at 55 for reception of tumbler pins 46 backed by spool drivers 47 and springs 49 positioned in corresponding bores 60 in the cylinder 51.

A cam 61 is secured as by screws 62 to the inner or rear face of the plug 44, and the key slot 64 continues through the cam, as shown in FIG. 5. This cam 61 has a circular cam surface 65 formed with two adjacent reverse-curved depressions 66 separated by a rise or high point 67 positioned at the top of the cam when same is in normal position, as when the closure is locked.

A second cam 69 is secured as by screws 68 to the outer face of the second plug 54, and the key slot 64

continues on through this cam and the second plug. As shown in FIG. 6, this cam 69 has a circular cam surface 70 formed with a reverse-curved depression 71 which is positioned at the top of the cam when same is in normal position, as when the closure is locked.

Referring now to FIGS. 3 and 7, it will be seen that a bolt operating cam 72 is fixed to the end of the plug 54 for rotation therewith to protract and retract the closure bolt (not shown) upon rotation of the plug 54.

A switch 75 (FIGS. 3 and 6) is positioned between the cylinders 41 and 51 above the cams 61 and 69 and is equipped with a follower wheel or rollers 76 biased downwardly to switch closing position by a flat spring 77 (FIG. 6).

From the description thus far, it will be seen that when the mechanism is in its normal locking position, the follower 76 is prevented from moving downwardly to switch closing or alarm actuating position by the high point 67 of the first cam 61. However, rotation of that cam in either direction after setting the tumblers of the first cylinder to release position and rotating the plug 44, will allow the switch spring 77 to urge the follower 76 into one of the recesses 66 of the first cam, as well as into the recess 71 of the second cam, thus to activate the switch and the alarm.

On the other hand, when both plugs 44 and 54 are rotated, the high point 67 of the cam 61, is shifted away from normal position, but the recess 71 of the cam 69 is also shifted from normal position so that the surface 70 of the second cam maintains the follower in switch closing position. An authorized key 78 therefore, is of a length to pass through both plugs and cams and is bitted to move all the tumblers of both cylinders to release position.

As stated, an attempt to pick the first cylinder results in actuation of the alarm without rotating the bolt cam 72 so that the closure bolt remains in locked position. An attempt to pick the second cylinder will be defeated because of the oversize keyway 73 of the lower part of the second plug key slot (FIG. 6) eliminating the possibility of a torque bearing. Additionally, should the second cylinder tumblers be set to release position, the tools in the key slot will prevent access to the first plug key slot for picking the tumblers of that cylinder. If the tools are removed from the second key slot, at least the last picked tumbler in the second plug will fall to locking position so that the plug cannot be rotated.

As has been stated, an additional security measure resides in the utilization of one plug to prevent unauthorized rotation of the other. For this purpose, the first cam 61 is provided with an integral pin 82 (FIGS. 3 and 5) extending towards the cam 69 which is formed with an arcuate recess 84 (FIGS. 3 and 6) receiving the pin 82. The pin and recess are so arranged that the inner plug 54 cannot be rotated in a direction to cause the cam 72 to retract the bolt unless the plug 44 is also free to rotate. Thus, if the plug 54 is in some way defeated, it still cannot be rotated to unbolt the door without also defeating the first plug 44.

A sleeve 80, which may be integral with the face of one cam, say cam 61 for example, extends into a recess 81 formed in the adjacent face of the cam 69 and surrounds the key opening of both cams so that no debilitating fluid may be injected into the space between the cams to interfere with the functioning of the cam follower or the switch action.

By hardening the first tumbler and driver of the first cylinder and the first cylinder cam 61, the cylinder may not be drilled to provide access to picked tumblers of the device to support same in release position.

Referring now to FIGS. 8 to 14, and initially to FIG. 8, there is shown another embodiment of the alarm actuating mechanism which includes a cylinder 90 bored longitudinally as at 91 for reception in tandem arrangement of key slotted plugs 92 and 94, although additional plugs may be employed. The front plug 92 is shouldered as at



5 for abutment with the inner surface of a cooperating shoulder 96 on the cylinder escutcheon 97 so that the plugs can only be loaded or unloaded relatively to the cylinder from the rear.

A hardened steel spacer 99 is positioned between the cylinder and its escutcheon to prevent drilling through same for the purpose already mentioned in respect of the embodiment of FIGS. 1 and 2.

It will be noted that each of the plugs 92 and 94 has several vertical bores 100 which align with vertical bores 101 in the cylinder in the usual way to accommodate pin tumblers, drivers and springs for locking each plug against rotation relatively to the cylinder. In the present illustration, plug 92 is bored to accommodate three pin tumblers and plug 94 is bored to accommodate two pin tumblers for a total of five such pins, although any desired number may be used in each plug.

An end plate 103 formed with a circular opening is secured by screws 102 to the cylinder and a bolt operating cam 104 is secured by screws 105 to the plug 94 for rotation therewith to retract or protract a door bolt, or the like.

The difficulties in attempting to manipulate the lock mechanism by unauthorized means have been explained in connection with the embodiments illustrated heretofore and need not be repeated here.

The alarm actuating mechanism of the present embodiment concerns a switch and means for shifting the switch from normal, non-alarm actuating condition to alarm actuating condition upon attempted unauthorized manipulation of the lock mechanism.

Thus, in the present illustration, the switch includes a contact 106 positioned in a horizontal bore 107 entering the cylinder 90 from its rear surface and lined with an insulating sleeve 109. A compression spring 110 urges the contact 106 to the right, as viewed in FIGS. 8 and 9, and this contact is wired as at 111 to an alarm (not shown).

Another contact 112 is shown as a circular disc, best seen in FIGS. 10 and 11, mounted in a segment 115 positioned in a segmental slot or keyway 113 in the cylinder. The segment 115 is formed of insulating material and has a leg or extension 116 projecting from the lower part of one edge thereof into a vertical bore 117 formed in the cylinder 90 and positioned so that its longitudinal axis lies in a plane passing between the plugs 92 and 94. The lower surface of the extension 116 is contoured to engage a ball 119, also in the bore 117, and its upper surface is flat to seat a compression spring 120, the other end of which bears against a set screw 121.

The adjacent regions of the plugs 92 and 94 are contoured so that when they are in certain predetermined relative annular positions, the ball 119 and segment 115 will move downwardly, as viewed, thus to separate the contacts 106 and 112 to activate the alarm. For this purpose, I choose to form a semi-frustoconical configuration 124 in the plug 94 opening towards the plug 92 and symmetrical about a vertical plane through the longitudinal axis of the plug when same is in its normal position as when the bolt 104 is in door locking position. The opposed face of the plug 92 is formed with two similar configurations 125 and 126 spaced slightly to each side of a vertical plane through the longitudinal axis of that plug when in normal position so that these configurations overlap, but do not mate with, the semifrustoconical configuration 124 when the plugs are in normal position, or in any position achieved by rotation of an authorized key since such rotation will rotate both plugs simultaneously and thus maintain the plugs in a constant relative position.

It will be appreciated that, when in normal position, the surface of the plug 92 between the configurations 125 and 126 is positioned directly below the ball 119 and maintains same, and therefore the segment 115 in position to establish electrical contact between contacts 106 and 112; and that in the event of rotation of the plugs 92

and 94 by authorized means, the surfaces of both plugs will cooperate to maintain this condition.

However, in the event that the plug 92 is itself picked or rotated, one of the configurations 125 or 126, depending upon the direction of rotation, will come into mating relation with the configuration 124 to form a frustoconical recess beneath the ball 119 which will be driven downwardly into the recess while the segment 115 also shifts downwardly by the action of the spring 120 thus to separate the contacts 106 and 112 and activate the alarm notwithstanding that the door bolt is still in locking condition.

As shown in FIG. 8, the opposed faces of the plugs 92 and 94 are also formed with semi-frustoconical configurations 127 and 129, respectively, so arranged that when the plugs are in normal position, these configurations are in mating relation to present a frustoconical recess at the bottom of the plugs and symmetrical about planes through the longitudinal axes of the plugs and passing between the plugs. In the event that an unauthorized person, in some way manages to rotate both plugs simultaneously, the ball 119 will fall into the last-mentioned recess when the plugs have been rotated 180° and prior to retraction of the door bolt, at which point the alarm will be actuated.

When an authorized key 130 is inserted into the plugs through the respective key slots, the lower region of the key fills the major portion of the recess formed by configurations 127, 129 so that the ball 119 cannot fall into the recess as it passes the 180° position of rotation, and continued rotation and bolt retraction can occur without interfering with the alarm circuit.

It will be appreciated that once the ball falls into a recess, continued rotation of the plugs is not possible because, as shown in FIG. 9, the ball projects upwardly beyond the exterior surface of the plugs, and since the cylinder itself would interfere with rotation of the ball, the ball in turn interferes with further rotation of the plugs.

If desired, the recesses can be made cylindrical in shape and preferably of a depth slightly greater than the radius of the ball.

In a further modification of my invention, as illustrated in FIGS. 15 and 16, I provide the usual cylinder 135 with escutcheon 136, front plug 137 and rear plug 138 to which is secured door bolt operating cam 140, all of which is similar to those constructions already described. Both plugs 137 and 138 are grooved at 141 for reception of two pin tumblers, and each has a semi-frustoconical configuration 142 on their adjacent faces which cooperate to form a recess for reception of a ball 144, the latter being dimensioned so that it is normally fully contained in the recess. A cylindrical slug 145 in bore 143 bears against the ball 144 and has a guide stem 146 extending upwardly through the coils of a helical spring 147 which urges the ball into the recess.

It will be seen that since the ball is fully contained within the recess, an authorized key will simply rotate both plugs and the ball, the latter moving along in engagement with the cylinder wall 149 when moved out of its normal position. However, should an attempt be made to pick this lock, it would be necessary slightly to rotate the first plug picked in order to allow the picked pins to rest on the outer surface of the plug while others were picked. This rotation of one plug cams the ball, through the action of the inclined surface of the recess, against the force of the spring, into a position of partial projection out of the recess. In such position, the ball cannot rotate because of interference with the cylinder and therefore positively locks the plugs against further rotation. Furthermore, if the torque exerted on the picked plug is relaxed, even for an instant, the spring 147 drives the ball downwardly to bear against the wall of the appropriate configuration 142 to cam that plug back to normal

position at which position all the picked pins would drop back into locking condition.

From the foregoing description, it will be seen that the present invention provides a novel lock mechanism which is tamper-proof and drill-proof and which may be employed with alarm actuating means so that if even partially manipulated, an alarm will be actuated. While providing these advantageous characteristics, the lock may be operated by an authorized user in the normal way without actuating the alarm. It will also be seen that the present mechanism cannot be defeated by twisting the outer cylinder, as is sometimes done to conventional cylinder locks, since as shown in the embodiment of FIGS. 3 to 7 herein described, the torque would shear the screws 53 causing the cylinder 41 to rotate to actuate the alarm while the bolt remains locked by the second cylinder 51. The screws 53 are of a shear strength to assure this result. It will be understood that while the switch 77 has been referred to as normally open for purposes of convenience, it may be normally closed and shift to open position to actuate an alarm circuit.

It is believed that the construction and operation of the novel mechanism herein described will now be understood and that the advantages of the invention will be fully appreciated by those persons skilled in the art.

I claim:

1. Mechanism of the class described comprising: pin tumbler cylinder means, a plurality of key slotted plugs supported for rotation therein in tandem disposition relatively to one another, two of said plugs having surfaces respectively contoured mutually to cooperate to form a recess when said plugs are in selected annular positions respectively, a follower normally engaging the surface of at least one of said plugs and shifting into said recess when same is formed opposite said follower by rotation of at least one of said plugs into said respective selected annular positions, and means urging said follower into said recess thus formed opposite said follower.

2. Mechanism according to claim 1 wherein said follower is of a dimension to extend out of said recess when seated therein whereby the projecting portion thereof engages said cylinder means to prevent further rotation of either of said plugs.

3. Mechanism according to claim 2, wherein said recess is cylindrical.

4. Mechanism of the class described comprising: pin tumbler cylinder means, a plurality of key slotted plugs supported for rotation therein in tandem disposition relatively to one another, two of said plugs having surfaces respectively contoured mutually to cooperate to form a recess when said plugs are in selected annular positions respectively, a follower normally positioned in said recess, said follower and recess cooperating to shift said follower partially out of said recess upon rotation of one of said plugs relatively to the other whereby said follower engages the cylinder means to lock said plugs against further rotation.

5. Mechanism according to claim 4, wherein said recess is frustoconical and said follower is spheroid.

6. Mechanism of the class described comprising: pin tumbler cylinder means, a plurality of key slotted plugs supported for rotation therein in tandem disposition relatively to one another, two of said plugs having surfaces respectively contoured mutually to cooperate to form a frustoconical recess when said plugs are in selected annular positions respectively, a spheroid follower normally positioned in said recess, said follower and recess cooperating to shift said follower partially out of said recess upon rotation of one of said plugs relatively to the other whereby said follower engages the cylinder means to lock said plugs against further rotation, and spring means biasing said follower into said recess, the spring force acting through said follower on the recess walls urging said plugs into said selected annular positions.

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RICHARD E. MOORE, Primary Examiner

ROBERT L. WOLFE, Assistant Examiner

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