

May 5, 1970

J. F. REGAN ET AL

3,509,749

LOCK

Filed April 13, 1964

3 Sheets-Sheet 1

FIG. 1

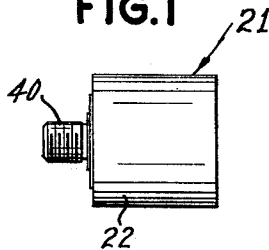


FIG. 2

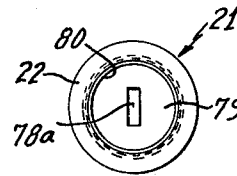


FIG. 3

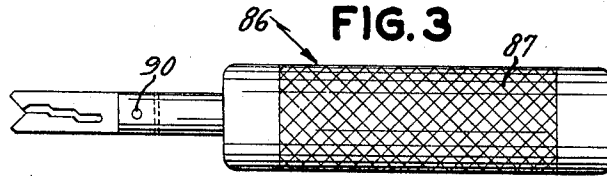


FIG. 4

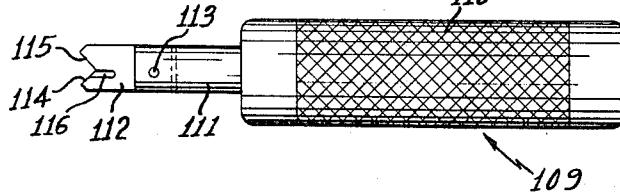


FIG. 11

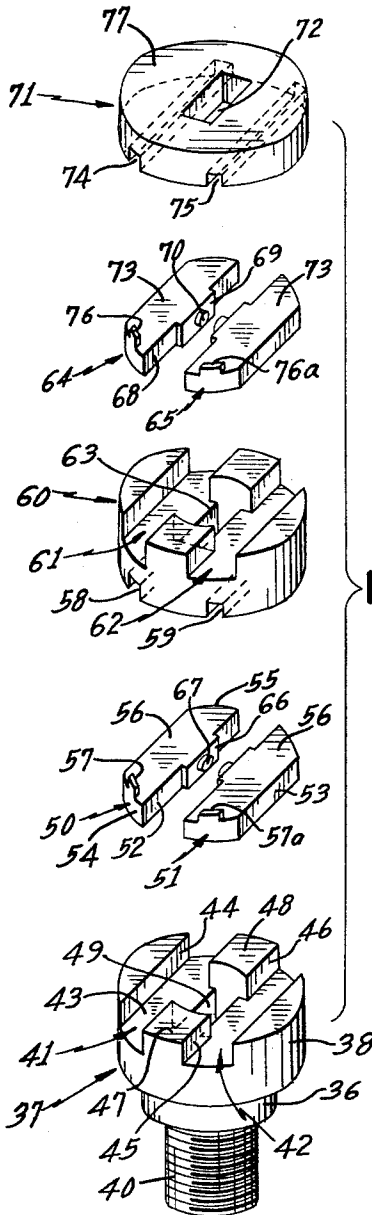
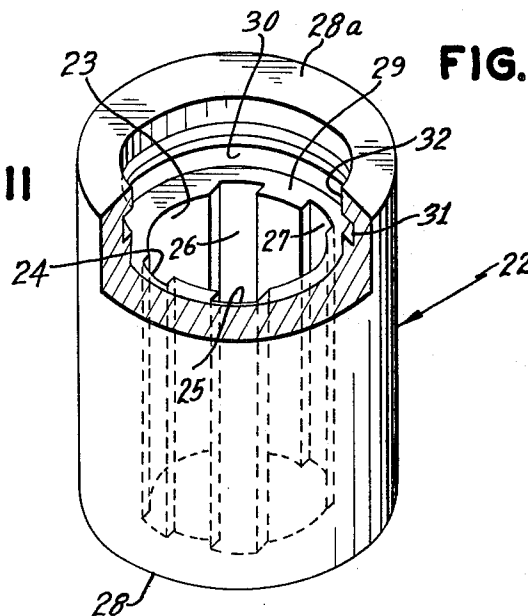


FIG. 12



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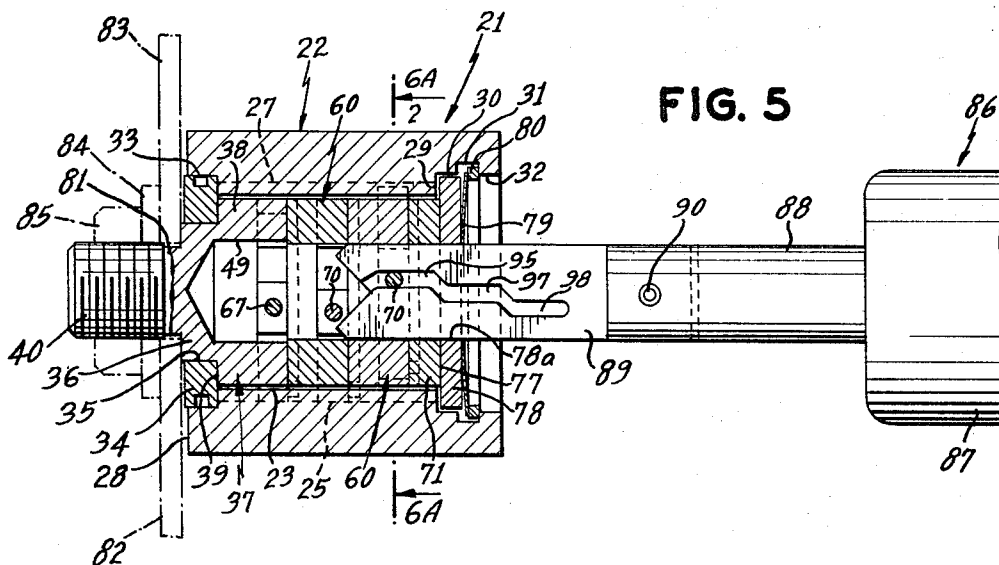


FIG. 5

FIG. 6C

FIG. 6B

FIG. 6A

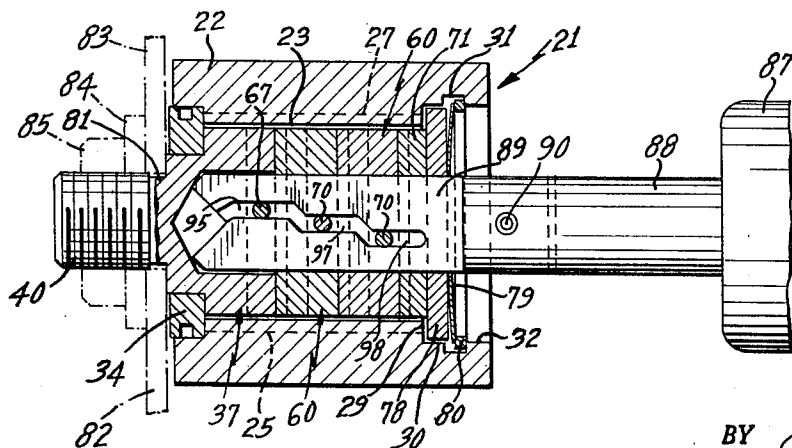
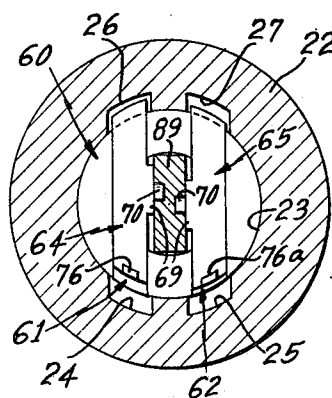
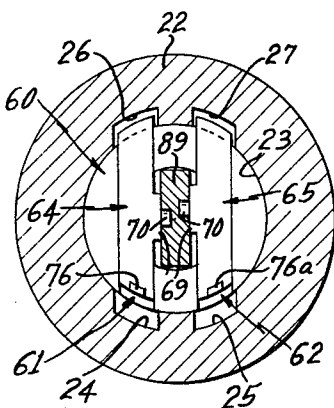
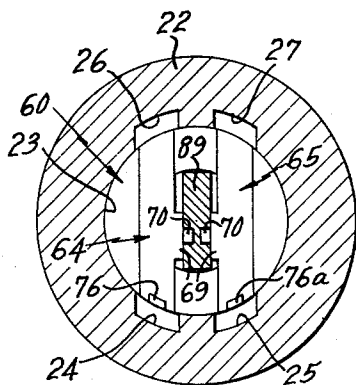


FIG. 7

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FIG. 9

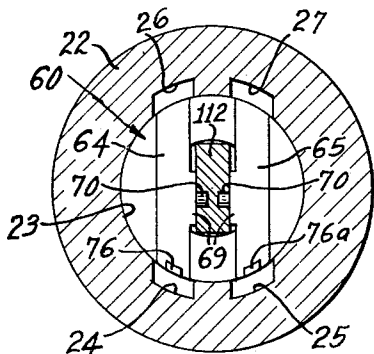


FIG. 8

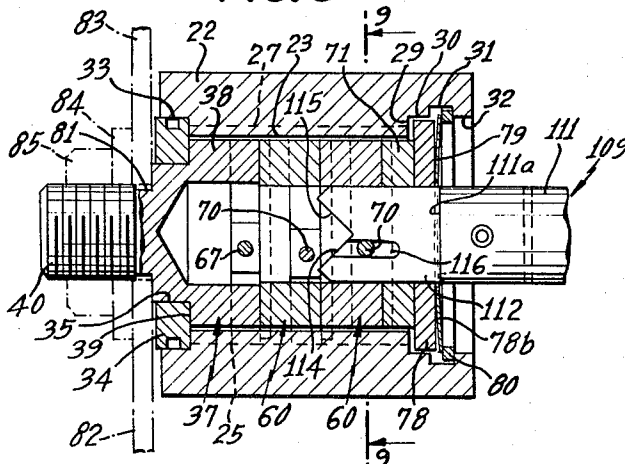


FIG. 13

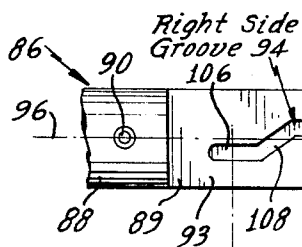


FIG. 14

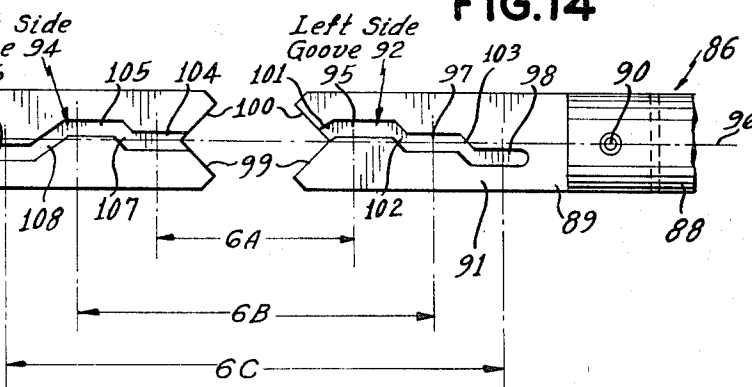


FIG. 10

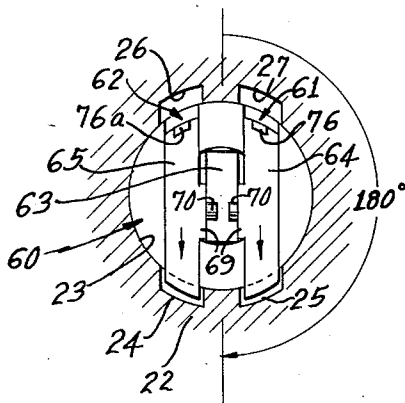
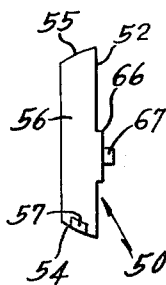


FIG. 15



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LOCK

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Int. Cl. E05b 29/10, 19/12

U.S. Cl. 70—364

21 Claims

This invention relates to locks, and more particularly, to a lock which may be reset to change the tumbler arrangement so as to require a different key to open the lock.

In many applications and devices requiring locks, it is highly advantageous to have a lock which may be quickly and easily reset so that the lock will require a different key configuration to open it. For example, in the case of locks for the coin boxes of parking meters, it too frequently occurs that burglars obtain the keys or duplicates thereof. In this event, there is not only a loss of coins before the meter operator discovers that the meters are being burglarized by stolen or duplicated keys, but a further expense is incurred by the necessity for replacing the locks.

It is, therefore, an object of the present invention to provide a novel lock construction wherein the tumbler arrangement may be quickly and easily changed or reset so as to require a different key to open the lock. This permits the tumbler combination to be changed regularly or at frequent intervals so that in the event a key is stolen or duplicated, the key is soon rendered ineffectual and any thefts from the meter can take place for only a short period. Furthermore, the expense of replacing the burglarized lock with a new lock is obviated and instead it is merely necessary to change the tumbler arrangement of the lock, thereby rendering the stolen or duplicated key ineffectual to open the lock.

This object is achieved in the preferred disclosed embodiment by a novel lock construction comprising a cylindrical casing having a horizontally extending cylindrical bore formed with longitudinal grooves along a portion of its internal surface. A plurality of plugs are rotatably mounted within the casing bore for angular displacement to either of two angular orientations disposed approximately 180° from each other. Tumblers are slidably mounted to each of the plugs for movement into and out of locking engagement with the grooves at each of the angular orientations of the plugs. The tumblers are normally maintained by gravity in locking engagement within the grooves so as to prevent rotation of the plugs. Each of the tumblers is provided with a lug actuable by a key to move the tumbler out of locking engagement with its respective groove so as to permit rotation of the plug by the key. Each of the lugs is eccentric to the casing axis so as to assume a different position when the plug is rotated from one angular orientation to the other angular orientation. It will thus be seen that by rotating one or more, but less than all of the plugs 180°, the positions of the lugs of several tumblers are changed with respect to the lugs of the other tumblers so as to require a key having a different configuration in order to properly engage the tumbler lugs to open the lock.

The present lock construction is also provided with a novel arrangement which prevents rotation of any of the plugs without simultaneous rotation therewith of all the other plugs located forwardly thereof. This prevents changing the tumbler lug arrangement in an improper sequence and also prevents picking of the lock. The preferred embodiment of this arrangement is disclosed as having a detent on each of the tumblers and adapted to engage within a channel formed in the adjacent plug when the tumbler is moved out of locking engagement, thereby

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constituting a clutch which prevents relative rotation with respect to each other of all plugs located forwardly of the rearmost unlocked plug.

A further object of the present invention is to provide a novel lock which is durable and reliable in operation, simple in construction, economical to manufacture, and considered burglar-proof.

Other and further objects of this invention reside in the structures and arrangements hereinafter more fully described with reference to the accompanying drawing in which:

FIG. 1 is a side elevational view of a preferred embodiment of a lock in accordance with the present invention,

FIG. 2 is an end elevational view as seen looking at the front end of the lock,

FIG. 3 is a side elevational view of an operating key for opening the lock,

FIG. 4 is a side elevational view of a change key for changing the tumbler arrangement of the lock as to require a different operating key to open the latter,

FIG. 5 is a longitudinal sectional view of the lock and shows the operating key partially inserted so as to engage the forward pair of tumbler lugs,

FIG. 6A is a transverse sectional view taken substantially on the line 6—6 of FIG. 5 and shows the first pair of tumblers in raised positions when the operating key is partially inserted into the lock as shown in FIG. 5,

FIG. 6B is a transverse sectional view similar to FIG. 6A and shows the succeeding positions of the forward pair of tumblers as the operating key is further inserted into the lock,

FIG. 6C is a transverse sectional view similar to FIGS. 6A and 6B but shows the forward pair of tumblers in their respective final positions when the operating key is fully inserted into the lock as shown in FIG. 7,

FIG. 7 is a longitudinal sectional view similar to FIG. 5 but shows the key fully inserted into the lock,

FIG. 8 is a longitudinal sectional view of the lock and shows the change key inserted in order to rotate the first plug 180° so as to change the tumbler arrangement,

FIG. 9 is a transverse sectional view taken substantially on lines 9—9 of FIG. 8,

FIG. 10 is a transverse sectional view similar to FIG. 9 but showing the positions of the first pair of tumblers after the first plug has been rotated 180° by the change key and after removal of the latter,

FIG. 11 is an exploded perspective view of a lock which for simplicity in illustration is shown as having only two pairs of tumblers,

FIG. 12 is a perspective view of the casing shown partially broken away,

FIG. 13 is an enlarged view of the right-hand side of the operating key blade,

FIG. 14 is an enlarged view of the left-hand side of the blade of the operating key, and

FIG. 15 is a detail view of one of the tumblers.

Referring now to the drawings in more detail, and first to FIGS. 1 and 2 thereof, the reference numeral 21 indicates generally a preferred embodiment of lock in accordance with the present invention. Lock 21 comprises an outer housing or casing 22. As best seen in FIGS. 5, 6A and 12, the casing 22 is substantially of cylindrical configuration and is provided with an internal cylindrical bore 23 having formed in its internal surface four longitudinally extending grooves 24, 25, 26 and 27. These grooves extend throughout the length of bore 23 which in turn extends from adjacent the rear end 28 of casing 22 to an annular shoulder 29 spaced rearwardly from the front end face 28a thereof. Forwardly of annular shoulder 29 is a counterbore or annular recess 30. Adjacent to and located forwardly of the latter is an annular groove 31

having its forward side formed by a radially inwardly projecting annular flange 32.

Adjacent the rear end face 28 of casing 22 is a counterbore or annular recess 33 (FIG. 5). Fixedly secured within counterbore 33, by welding or other conventional means, is a retainer plate 34 having a central bearing opening 35 extending therethrough. Projecting rearwardly through bearing opening 35 and rotatable therein is the intermediate journal portion 36 of a rear plug indicated generally by the reference numeral 37 and best seen in FIG. 11.

Rear plug 37 comprises an enlarged cylindrical portion 38 of somewhat larger diameter than journal portion 36 so as to form therebetween an annular shoulder 39 (FIG. 5) adapted to bear against retainer plate 34 to limit axial movement of rear plug 37 in the rearward direction. A threaded stud 40 extends rearwardly from journal portion 36. Cylindrical portion 38 of rear plug 37 is provided with a pair of parallel vertically extending slideways 41 and 42 (FIG. 11) each having a rear end wall 43, an outer side wall 44, and a pair of coplanar inner side walls 45 and 46. The latter constitute the lateral surfaces of two upwardly projecting blocks 47 and 48 which are spaced vertically from each other. As best seen in FIG. 5, a recess 49, rectangular in cross-section, extends rearwardly into cylindrical portion 38.

Slidably mounted within slideways 41 and 42 are a pair of tumblers indicated generally by the reference numerals 50 and 51 respectively. As best seen in FIGS. 11 and 15, each of the tumblers comprises an inner vertical lateral surface 52 adapted to bear against the walls 45 and 46 of rear plug 37. Each of the tumblers 50 and 51 further comprises an outer lateral vertical surface 53 adapted to bear against the respective wall 44 of plug 37. Lateral surfaces 52 and 53 are substantially planar whereas the opposite ends of each of the tumblers 51 and 52 are formed by segmentally-cylindrical surfaces 54 and 55. Both the forward surface 56 and the rearward surface parallel thereto are substantially planar and the latter slides against the rear end wall 43 of the respective slideway 41 or 42. It will thus be seen that tumblers 50 and 51 are mounted for vertical reciprocal sliding movement within the respective slideways 41, 42.

Adjacent the ends 54 of each tumbler 50 and 51 and extending forwardly from the forward surface 56 thereof is a detent 57 or 57a adapted to enter and slide within a respective one of the channels 58 and 59 formed in the rear end face of an adjacent plug indicated generally by the reference numeral 60. Channels 58 and 59 extend segmentally with respect to the circular periphery of plug 60 which is of substantially cylindrical configuration. That is, channel 58 extends parallel to and in alignment with slideway 41 and channel 59 extends in similar relationship to slideway 42.

The forward face of plug 60 is provided with a pair of slideways 61 and 62 which are identical in configuration to slideways 41, 42 respectively. Extending axially through plug 60 is an opening 63 having the same rectangular contour as and in alignment with the recess 49 of rear plug 37. Slidably mounted within slideways 61 and 62 for vertical reciprocal movement are a pair of tumblers 64 and 65 which are similar in configuration and dimensions to the respective tumblers 50 and 51.

Each of the inner lateral surfaces 52 of the tumblers 50 and 51 is provided with an inwardly projecting rectangular block or boss 66 from which extends an inwardly projecting pin or lug 67. The inner lateral surfaces 68 of each of the tumblers 64 and 65 is similarly provided with a rectangular boss 69 having a lug 70 projecting inwardly therefrom. The bosses 66 are free to reciprocate within the space between the blocks 47 and 48 which may serve as stops to limit the reciprocal movement of tumblers 50 and 51 and the bosses 69 may serve a similar function for tumblers 64 and 65.

As thus far described, tumblers 64 and 65 are identical to respective tumblers 50 and 51. The sole difference

between the two pairs of tumblers, if any difference exists, will reside solely in the locations of the respective lugs 67 and 70. More specifically, these lugs are located eccentrically with respect to the center of the cylinder defined by the cylindrical end surfaces 54 and 55. That is, each of the lugs 67, 70 is located either closer to the end 54 or closer to the end 55 rather than being located at a point midway therebetween. The purpose of this eccentricity will be described below. However, at this point, it is sufficient to note that the lugs 67 of tumblers 50 and 51 may have a different eccentricity with respect to each other as well as with respect to the lugs 70 of the tumblers 64, 65 and each of the latter lugs may also have a different eccentricity.

Although for simplicity in illustration FIG. 11 shows only one plug 60, the preferred embodiment of FIGS. 5 to 7 inclusive comprises two such plugs 60 arranged in sequence and each having slidably mounted thereto a pair of tumblers 64 and 65. Since the second plug 60 and its associated tumblers 64 and 65 are identical to the first plug and its tumblers, the repetitive structure has been omitted from FIG. 11. It will be understood that any number of plugs 60 may be added in sequence if desired, provided that casing 22 is made sufficiently long to accommodate them.

Located adjacent the forwardmost plug 60 is a front plate generally identified by the numeral 71 in the form of a substantially cylindrical disk having therethrough a rectangular central opening 72 of the same configuration as and in alignment with the openings 63 of plugs 60 and the recess 49 of rear plug 37. The openings 49, 63 and 72 together constitute a keyway. The rear surface of front plate 71 lies adjacent the forward planar surfaces 73 of tumblers 64 and 65 and is provided with a pair of parallel segmentally-extending channels 74 and 75 similar to the channels 58 and 59 formed in the rear surface of plug 60. Each of tumblers 64 and 65 is provided with a detent 76 and 76a similar to detents 57, 57a and extending forwardly from each of the forward surfaces 73 so as to be adapted to enter and slide within the channels 74 and 75 respectively.

As best seen in FIGS. 5 and 7, the forward surface 77 of front plate 71 is abutted by a keyhole plate 78 having a central rectangular opening 78a therethrough and constituting a continuation of the keyway. Keyhole plate 78 is urged rearwardly by a resilient retainer member 79 having an annular peripheral portion 80 extending within annular groove 31 and in abutment with flange 32. This retains the plugs 37 and 60, their associated tumblers, front plate 71 and keyhole plate 78 assembled against relative axial movement.

Rear plug 37 is provided, intermediate the threaded stud 40 and cylindrical journal portion 36, with a cam block 81 adapted to engage cams 82 and 83 shown in dash-dot lines. The latter are held in relation to cam block 81 by a washer 84 and nut 85 threaded upon stud 40, in the conventional manner well known in the art.

The operating key for opening lock 21 is shown in FIG. 3 and is indicated generally by the reference numeral 86. Key 86 comprises a knurled handle 87 having a cylindrical shank 88 extending forwardly therefrom. A relatively thin blade 89, substantially rectangular in cross-section, has its rear end pivotally mounted at 90 within a slot formed in the forward end of shank 88 whereby blade 89 may have limited swinging movement. Each of the opposite lateral surfaces of blade 89 is substantially vertical and planar. As shown in FIG. 14, the left-hand lateral surface 91 is provided with a groove indicated generally at 92, whereas the right-hand lateral surface 93 shown in FIG. 13 is provided with a groove indicated generally at 94. Grooves 92 and 94 may be similar or dissimilar, depending on the tumbler arrangement, as will be explained below.

As disclosed in FIG. 14, the left side groove 92 comprises a horizontally extending initial portion 95 located

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above the center line 96 of key blade 89, a horizontally extending intermediate portion 97 substantially co-extensive with center line 96, and a horizontally extending final portion 98 located below center line 96. The forward edge of key blade 89 is provided with angularly extending guide edges 99 and 100 defining an entranceway converging toward an angularly extending groove portion 101 which communicates with the forward end of the initial groove portion 95. The rear end of the latter is joined to the forward end of intermediate groove portion 97 by a downwardly inclined groove portion 102, and the rear end of intermediate groove portion 97 is similarly joined to the forward end of final groove portion 98 by a downwardly inclined groove portion 103.

The right side groove 94 comprises an initial portion 104 substantially co-extensive with center line 96, an intermediate portion 105 located above center line 96, and a final portion 106 located below center line 96. An upwardly inclined groove portion 107 joins initial portion 104 with intermediate portion 105 and a downwardly inclined groove portion 108 joins intermediate portion 105 with final portion 106.

The operation of opening lock 21 with operating key 86 will now be described. In the normal locked condition of lock 21, all of the tumblers 50, 51, 64 and 65 are urged downwardly by gravity so that their lower ends project into the lower longitudinal grooves 24 and 25 respectively in locked engagement therewith. As a result, none of the plugs 37, 60 is free to rotate within casing 22. In order to open or unlock the lock 21, the blade 89 of operating key 86 is inserted into the keyway formed by openings 78a, 72 and 63 so that key blade 89 initially assumes the position shown in FIG. 5. During this inward or rearward movement of key blade 89, the lug 70 of the left side tumbler 64 mounted on the first plug 60 is guided by blade edges 99, 100 into the initial portion 95 of the left side groove 92. Simultaneously therewith, the other lug 70 of the right side tumbler 65 enters the initial portion 104 of the right side groove 94. The first pair of tumblers 64 and 65 are thus raised by the key grooves to the positions shown in FIG. 6A.

Continued insertion of key blade 89 into the keyway causes lugs 70 of the first pair of tumblers to move into the intermediate portions 97, 105 of grooves 92 and 94 while the lugs of the second pair of tumblers enter the initial portions 95, 104 of grooves 92, 94. The first pair of tumblers 64 and 65 will then assume the positions shown in FIG. 6B. Continued insertion of key blade 89 until it reaches its fully inserted position shown in FIG. 7 causes lugs 67 of the rear tumblers 50 and 51 to enter the initial groove portions 95 and 104 while the lugs of the intermediate tumblers enter the intermediate groove portions 97 and 105 and the lugs 70 of the first pair of tumblers 64 and 65 enter the respective final groove portions 98 and 106.

Assuming that the groove configuration of operating key 86 is the correct one for opening lock 21, all of the tumblers will then be in the positions shown in FIG. 6C wherein the lower ends of the tumblers are raised upwardly out of the lower grooves 24, 25 and the upper ends of the tumblers are out of engagement with the upper grooves 26 and 27. All of the plugs 37 and 60 are now free to rotate within casing 22 and may be rotated by operating key 86 to actuate cams 82 and 83 in the conventional manner.

It will be noted that in the locked condition when the tumblers have their lower ends projecting downwardly in locking engagement within lower grooves 24 and 25 of casing 22, the various detents 57, 57a, 76 and 76a do not project into the respective channels 58, 59, 74 and 75. However, when the tumblers are correctly raised by the correct operating key 86, these detents enter the respective channels and slide therein as the tumblers are moved vertically to the various positions shown in FIGS. 6A, 6B and 6C. This interengagement of the tumbler detents

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within the channels constitutes a clutch arrangement which prevents any of the plugs 37 and 60 from being rotated without simultaneously rotating therewith all of the plugs located forwardly thereof. That is, the intermediate or second plug 60 cannot be rotated independently of the first plug 60 even though the tumblers 64 and 65 of the second plug 60 are disengaged from grooves 24 and 25. Similarly, the rear plug 37 cannot be rotated without also rotating both the intermediate plug 60 and the first plug 60. The purpose of this clutching arrangement will be explained below.

In order to change the tumbler arrangement so as to require a different operating key for opening lock 21, there is provided a change key shown in FIG. 4 and indicated generally by the reference numeral 109. Change key 109 comprises a handle 110 having a cylindrical shank 111 extending from the forward end thereof and a relatively thin substantially rectangular blade 112 pivoted at 113 to the forward end of shank 111 for limited swinging movement. The forward end of blade 112 is provided with an entranceway or mouth formed by angularly extending rearwardly converging guide edges 114 and 115 and each of its opposite lateral surfaces is provided with a groove extending from the junction of said guiding edges, as indicated at 116.

The operation of changing the tumbler arrangement so as to require a different operating key for opening lock 21 will now be described. Referring to FIG. 8, the blade 112 of change key 109 is inserted into the keyway until the forward end 111a of shank 111 abuts against the front surface 78b of key hole plate 78. It will be noted that the length of change key blade 112 is sufficiently short so that blade 112 extends into only the first plug 60. During this insertion movement of blade 112, lug 70 of the left tumbler 64 of the initial pair of tumblers is urged by guide edges 114 and 115 into the groove 116 on the left side of blade 112 and the other lug of the right tumbler 65 is similarly urged into the right side groove (not shown) of blade 112. The grooves of the latter are at the proper height to raise tumblers 64 and 65 of the first plug 60 out of locking engagement with grooves 24 and 25 of casing 22 into the positions shown in FIG. 9.

The first plug 60 is then free to rotate within casing 22 and is rotated a full 180° by change key 109. The change key is then withdrawn and tumblers 64 and 65 of the first plug 60 are then urged downwardly by gravity into the positions shown in FIG. 10 wherein what were formerly the upper ends of tumblers 64 and 65 are now the lower ends thereof and are in locking engagement within the lower grooves 24 and 25. Because the lugs 70 are located eccentrically with respect to the axis of casing 22 and also the axis of rotation of their plugs 60, the lugs 70, in the rotated condition shown in FIG. 10, are now at a different height than before rotation. As a result, the final groove portions 98 and 106 of operating key 86 are no longer at the proper height with respect to center line 96 to move tumblers 64 and 65 to an unlocked position out of engagement with either the lower grooves 24 and 25 or the upper grooves 26 and 27. Hence, a different operating key having a different groove location or configuration will now be required to move the rotated tumblers to open lock 21.

In order to change the tumbler arrangement by rotating two of the plugs 60 instead of merely the first plug 60 as shown in FIGS. 8 to 10, there may be provided a change key (not shown) having a blade length sufficient to extend into both the first plug 60 and the intermediate plug 60. This elongated change key blade will have the proper groove key configuration to raise the first two pairs of tumblers to an unlocked position so that the first two plugs may be rotated simultaneously through an angular displacement of 180° as previously described. It will thus be seen that various tumbler combinations may be provided by rotating one or more of the forwardmost plugs

through 180° with respect to the remaining rearmost plugs.

By reason of the clutching arrangement provided by the detents 57, 57a, 76 and 76a slidably engaged within the respective channels 58, 59, 74 and 75 as described above, it is impossible to rotate any of the plugs 37, 60 without rotating simultaneously therewith all of the other plugs located forwardly thereof. In addition to preventing an improper sequence of changing the tumbler arrangement, this clutch arrangement has the further advantage that it prevents burglarizing by picking the rear tumblers 50 and 51. That is, it is impossible for a burglar to insert a pick into the keyhole and rotate rear plug 37 so as to open lock 21 by merely urging the rear tumblers to a disengaged position. Any attempt to do so will cause the detents 57 and 57a on the rear tumblers 50 and 51 to engage within channels 58 and 59 thereby lock rear plug 37 to the next succeeding or forward intermediate plug 60 which remains locked against rotation by reason of the fact that its tumblers 64 and 65 are still in locked engagement within the bottom grooves 24 and 25. As a result, it is necessary to rotate all of the plugs 37, 60 simultaneously to open lock 21.

While there have been shown and described and pointed out the fundamental novel features of the invention as applied to a preferred embodiment thereof, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art, without departing from the spirit of the invention. It is the intention, therefore, to be limited only as indicated by the scope of the claims appended hereto.

We claim:

1. A lock comprising a casing having a cylindrical bore formed with recesses therein, a plurality of plugs each independently rotatably mounted within said casing bore for angular displacement to any one of a plurality of angular orientations, a tumbler slidably mounted to each of said plugs for movement into and out of locking engagement with a respective one of said recesses at each of said angular orientations, and a lug on each of said tumblers and actuable by a key to move the tumbler out of locking engagement with said recess to permit rotation of the respective plug, each of said lugs being eccentrically located to assume a different position in each of said angular orientations of the respective plug to change the angular orientation of one or more of said plugs with respect to others of said plugs to require difference keys for the operation of the lock.

2. A lock comprising a casing having locking means therein, a plurality of plugs each rotatably mounted within said casing for independent angular displacement to any one of a plurality of angular orientations, a tumbler movably mounted to each of said plugs for movement into and out of locking engagement with a respective one of said locking means at each of said angular orientations, and key engaging means on each of said tumblers and actuable by a key to move the tumbler out of locking engagement with said locking means to permit independent rotation of the respective plug, each of said engaging means assuming a different position in each of said angular orientations of the respective plug, whereby the lock may be set to require different keys by changing the angular orientation of one or more of said plugs with respect to others of said plugs.

3. In a combination, a lock comprising a casing having a cylindrical bore formed with recesses therein, a plurality of plugs each independently rotatably mounted within said casing bore for angular displacement to any one of a plurality of angular orientations, a tumbler slidably mounted to each of said plugs for movement into and out of locking engagement with a respective one of said recesses at each of said angular orientations and normally maintained by gravity in engagement therewith, and a lug on each of said tumblers and actuable by a key to

move the tumbler out of locking engagement with said recess to permit rotation of the respective plug, each of said lugs being eccentric to the casing axis to assume a different position having a different distance from said axis in each of said angular orientations of the respective plug, and change key means for changing the angular orientation of at least one of said plugs with respect to others of said plugs to change the tumbler lug arrangement to require a different key to open the lock.

4. A lock comprising a casing having a horizontally extending cylindrical bore formed with a pair of longitudinal grooves therein along the lower portion of the internal surface thereof, a plurality of plugs each independently rotatably mounted within said casing bore for angular displacement to either of two angular orientations mutually disposed approximately 180 degrees from each other, a pair of tumblers slidably mounted to each of said plugs for movement into and out of locking engagement with said grooves respectively at each of said angular orientations and normally maintained by gravity in locking engagement therewith, a lug on each of said tumblers and actuable by a key to move the tumbler out of locking engagement with its respective groove to permit rotation of the plug by the key, each of said lugs being eccentric to the casing axis as to be located a different distance from said axis when the plug is rotated from one of said angular orientations to the other angular orientation, whereby the lock may be set to require different keys by rotating less than all of said plugs from one of said angular orientations to the other angular orientation.

5. In combination, a lock and a change key for setting the lock to require a different operating key to open the same, said lock comprising a casing having a cylindrical bore formed with recesses therein, a plurality of plugs each independently rotatably mounted within said casing bore for angular displacement to any one of a plurality of angular orientations, a tumbler slidably mounted to each of said plugs for movement into and out of locking engagement with a respective one of said recesses at each of said angular orientations, a lug on each of said tumblers and actuable by a key to move the tumbler out of locking engagement with said recess to permit rotation of the respective plug, clutch means responsive to said disengagement of the tumbler of each plug to prevent relative rotation of said plug with respect to a plug adjacent thereto, each of said lugs being eccentric to the casing axis so as to assume a different position in each of said angular orientations of the respective plug, said change key having means for actuating one or more of said lugs to change the angular orientation of one or more of said plugs with respect to the others of said plugs to set the lock to require a different operating key to open the same.

6. A lock comprising a casing having a cylindrical bore formed with locking means therein, a plurality of plugs each independently rotatably mounted within said casing bore for angular displacement to any one of a plurality of angular orientations, a pair of tumblers slidably mounted to each of said plugs for movement into and out of locking engagement with a respective pair of said locking means at each of said angular orientations, key engaging means on each of said tumblers and actuable by a key to move the tumbler out of locking engagement with said locking means to permit rotation of the respective plug, clutch means responsive to said disengagement of the tumblers of each plug to prevent relative rotation of said plug with respect to a plug adjacent thereto, each of said key engaging means being eccentric to the casing axis so as to assume a different position at a different distance from said axis in each of said angular orientations of the respective plug, whereby the lock may be set to require different keys by unlocking one or more pairs of tumblers and changing the angular orientation of one or more of said plugs with respect to the others of said plugs.

7. A lock comprising a casing having a cylindrical bore formed with recesses therein, a plurality of plugs each independently rotatably mounted within said casing bore for angular displacement to any one of a plurality of angular orientations, each of said plugs having an end face formed with a pair of slideways, a tumbler slidably mounted within each of said slideways for movement into and out of locking engagement with a respective one of said recesses at each of said angular orientations, at least one of said plugs having an opposite end face contiguous to said end face of the plug adjacent thereto, said opposite end face being formed with a pair of channels extending transversely thereacross, each of said tumblers mounted within the slideways of said adjacent plug having a detent engaged within a respective channel of said one plug to prevent relative rotation of said two last recited plugs when said last recited tumblers are moved out of locking engagement, a lug on each of said tumblers and actuatable by a key to move the tumbler out of locking engagement with said recess to permit rotation of the respective plug, each of said lugs being located to assume a different position in each of said angular orientations of the respective plug, whereby the lock may be set to require different keys by changing the angular orientation of one of said plugs with respect to others of said plugs.

8. A lock comprising a casing having a cylindrical bore formed with recesses therein, a plurality of plugs each independently rotatably mounted within said casing bore for angular displacement to any one of a plurality of angular orientations, a pair of tumblers movably mounted to each of said plugs for movement into and out of locking engagement with a respective one of said recesses at each of said angular orientations, a lug on each of said tumblers and actuatable by a key to move the tumbler out of locking engagement with said recess to permit rotation of the respective plug, each of said lugs being eccentrically located so as to assume a different position in each of said angular orientations of the respective plug, whereby the lock may be set to require different keys by changing the angular orientation of one or more of said plugs with respect to the other plugs, said plugs being arranged in sequence from front to rear of said casing bore, and means preventing rotation of any plug relative to the plugs located in a selected position with respect thereto.

9. A lock comprising a casing having locking means therein, a plurality of plugs each independently rotatably mounted within said casing for angular displacement to either of two angular orientations angularly displaced 180 degrees from each other, a tumbler movably mounted to each of said plugs for movement into and out of locking engagement with a respective one of said locking means at each of said angular orientations and normally maintained by gravity in engagement therewith, and key engaging means on each of said tumblers and actuatable by key to move the tumbler out of locking engagement with said locking means to permit rotation of the respective plug, each of said key engaging means being located to assume different positions in each of said angular orientations of the respective plug, said plugs being arranged in sequence from front to rear of said casing bore, and clutch means on said tumblers and said plugs for preventing rotation of any plug relative to the plugs located in a selected position with respect thereto.

10. In a combination, a lock comprising a casing having locking means therein, a plurality of plugs each independently rotatably mounted within said casing for angular displacement to any one of a plurality of angular orientations, a tumbler slidably mounted to each of said plugs for movement into and out of locking engagement with a respective one of said locking means at each of said angular orientations, and a lug on each of said tumblers and actuatable by a key to move the tumbler out of locking engagement with said locking means to permit

rotation of the respective plug relative to others of said plurality of plugs, each of said lugs being eccentric to the casing axis so as to assume a different position in each of said angular orientations of the respective plug.

11. A lock comprising a casing having a horizontally extending cylindrical bore formed with a pair of longitudinal grooves therein along the lower portion of the internal surface thereof, a plurality of plugs each independently rotatably mounted within said casing bore for angular displacement to either of two angular orientations mutually disposed approximately 180 degrees from each other, a tumbler slidably mounted to each of said plugs for movement into and out of locking engagement with a respective one of said grooves at each of said angular orientations and normally maintained by gravity in locking engagement therewith, key engaging means on each of said tumblers and actuatable by a key to move the tumbler out of locking engagement with its respective groove to permit rotation of the plug by the key, each of said key engaging means being eccentric to the casing axis to be located a different distance from said axis when the plug is rotated from one of said angular orientations to the other angular orientation, whereby the lock may be set to require different keys by rotating less than all of said plugs from one of said angular orientations to the other angular orientation, said plugs being arranged in sequence from front to rear of said bore, and means preventing rotation of the rear of said plugs independently of the other of said plugs.

12. In combination, a lock and a change key for setting the lock to require a different operating key to open the same, said lock comprising a casing having locking means therein, a plurality of plugs each independently rotatably mounted within said casing for angular displacement to any one of a plurality of angular orientations, a pair of tumblers movably mounted to each of said plugs for movement into and out of locking engagement with a respective one of said locking means at each of said angular orientations, key engaging means on each of said tumblers and actuatable by a key to move the tumbler out of locking engagement with said locking means to permit rotation of the respective plug, clutch means responsive to said disengagement of the tumbler of each plug to prevent relative rotation of said plug with respect to a plug adjacent thereto, each of said key engaging means being eccentric to the casing axis to assume a different distance therefrom in each of said angular orientations of the respective plug, said change key having means for actuating one or more of said key engaging means to change the angular orientation of one or more of said plugs with respect to the other plugs to set the lock to require a different operating key to open the same.

13. A lock comprising a casing formed with locking recesses therein, a plurality of plugs each independently rotatably mounted within said casing for angular displacement to any one of a plurality of angular orientations, a pair of tumblers slidably mounted to each of said plugs for movement into and out of locking engagement with a respective pair of said locking recesses at each of said angular orientations, a lug on each of said tumblers and actuatable by a key to move the tumbler out of locking engagement with said recess to permit rotation of the respective plug, and clutch means responsive to said disengagement of the tumblers of each plug to prevent relative rotation of said plug with respect to a plug adjacent thereto.

14. A lock comprising a casing having locking means therein, a plurality of plugs each independently rotatably mounted within said casing for angular displacement to any one of a plurality of angular orientations, each of said plugs having an end face formed with a pair of slideways, a tumbler slidably mounted within each of said slideways for movement into and out of locking engagement with a respective one of said locking means at each of said angular orientations, at least one of said plugs

having an opposite end face contiguous to said end face of the plug adjacent thereto, said opposite end face being formed with a pair of channels extending transversely thereacross, each of said tumblers mounted within the slideways of said adjacent plug having a detent engaged within a respective channel of said one plug to prevent relative rotation of said two last recited plugs when said last recited tumblers are moved out of locking engagement, key engaging means on each of said tumblers and actuable by a key to move the tumbler out of locking engagement with said locking means to permit rotation of the respective plug, each of said key engaging means being eccentric to the casing axis to assume a different position at a different distance therefrom in each of said angular orientations of the respective plug, whereby the lock may be set to require different keys by changing the angular orientation of one or more of said plugs with respect to others of said plugs.

15. In combination, a lock and a change key, said lock comprising a casing having a horizontally extending cylindrical bore formed with a pair of longitudinal grooves therein along the lower portion of the internal surface thereof, a plurality of plugs each independently rotatably mounted within said casing for angular displacement to either of two angular orientations mutually disposed approximately 180 degrees from each other, a pair of tumblers movably mounted to each of said plugs for movement into and out of locking engagement with said grooves respectively at each of said angular orientations and normally maintained by gravity in locking engagement therewith, key engaging means on each of said tumblers and actuable by a key to move the tumblers out of locking engagement with its respective groove to permit rotation of the plug by the key, each of said key engaging means being located at a different distance from the casing axis when the respective plug is rotated from one of said angular orientations to the other angular orientation, whereby the lock may be set to require different keys by rotating less than all of said plugs from one of said angular orientations to the other angular orientation, said change key having means for rotating less than all of said plugs through an angular displacement of 180 degrees with respect to others of said plugs from one of said angular orientations to the other thereof.

16. A lock comprising a casing having a cylindrical bore formed with recesses therein, a plurality of plugs each independently rotatably mounted within said casing for angular displacement to either one of two angular orientations angularly displaced 180 degrees from each other, each of said plugs having an end face formed with a pair of slideways, a tumbler slidably mounted within each of said slideways for movement into and out of locking engagement with a respective one of said recesses at each of said angular orientations and normally maintained by gravity in engagement therewith, at least one of said plugs having an opposite end face contiguous to said end face of the plug adjacent thereto, said opposite end face being formed with a pair of channels extending transversely thereacross, each of said tumblers mounted within the slideways of said adjacent plug having a detent engaged within a respective channel of said one plug to prevent relative rotation of said two last recited plugs when said last recited tumblers are moved out of locking engagement, key engaging means on each of said tumblers and actuable by a key to move the tumbler out of locking engagement with said recess to permit rotation of the respective plug, each of said key engaging means being eccentric to the casing axis so as to assume a different position at a different distance from said axis in each of said angular orientations of the respective plug, whereby the lock may be set to require different keys by changing the angular orientation of one or more of said plugs with respect to others of said plugs.

17. A lock comprising a casing having lock means, a plurality of plugs each independently movable relative

to said casing, a plurality of tumblers, and means on said tumblers movable into engagement with and disengagement from said locking means, each of said tumblers cooperating with a respective one of said plurality of movably plugs to lock the same from movement relative to said casing when said means on said tumbler is moved into engagement with said casing lock means and to unlock its respective plug for movement relative to said casing when said means on said tumbler is moved out of engagement with said casing means.

18. A lock comprising a casing, a plurality of plugs each independently movable in said casing and relative thereto, locking means defined on said casing, a plurality of tumblers each cooperable with a respective one of said plugs and engageable with said locking means to prevent the movement of its respective plug relative to said casing and disengageable from said locking means to permit its respective plug to move relative to said casing, and connecting means on said tumblers cooperable with certain others of said plugs to connect its respective plug and said certain other of said plugs together for movement relative to said casing when said tumblers are disengaged from said locking means.

19. In a cylinder lock employing multiple tumblers and individual retainers therefor, wherein said tumblers are slidably received transversely of the axis of the lock, a barrel rotatably receiving said retainers and tumblers, means for maintaining said tumblers and retainers against movement axially of said barrel, a bolt operatively associated with the innermost retainer in said barrel and fixedly rotatable therewith the throw said bolt from a locking to an unlocking position, said barrel having axial slot means on its inner surface for engagement by said tumblers to dispose them eccentrically of their respective retainers thereby preventing rotation thereof in the barrel, a keyway extending through said retainers, and camming means on said tumblers projecting into said keyway for camming said tumblers to a position symmetrical with said retainers upon the insertion of a proper key, the improvement which comprises:

- (a) first means comprising an axial projection fast with each of said tumblers adjacent an end thereof;
- (b) cooperative second means comprising a mating groove in the opposing face of each adjacent tumbler retainer for each of said first means;
- (c) said first means being slidable into and out of engagement with said second means upon transverse sliding movement of said tumblers from positions symmetrical with the respective retainers to positions eccentric thereof as occasioned by movement of said tumblers into said barrel slot.

20. In a cylinder lock employing tumblers and retainer means therefor wherein said tumblers are slidably received, a barrel rotatably receiving said retainer means and tumblers, means for maintaining said tumblers and retainer means against movement axially of said barrel, a bolt operatively associated with the innermost retainer means in said barrel and fixedly rotatable therewith to throw said bolt from a locking to an unlocking position, said barrel having axially extending slot means on its inner surface engageable by said tumblers in non-retracted position relative to said retainer means and preventing rotation thereof, a keyway in said retainer means, and camming means on said tumblers projecting into said keyway for camming said tumblers to respective retracted positions symmetrical with their retainer means upon insertion of a proper key, the improvement comprising the structural arrangement wherein said retainer means is divided transversely of the cylindrical axis to provide a plurality of tumbler retainer sections each having a guide-way extending across one face and a tumbler slidably disposed therein substantially flush with that face, said retainer sections being rotatable relative to each other to permit one section whose tumbler is retracted, to be rotated relative to another section held stationary by a

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tumbler in non-retracted position, each of said tumblers having at one of its ends a lug projecting axially of the cylinder lock, and each of said tumbler retainer sections having a groove extending across its outer face for slidably receiving the projecting lug of the tumbler in the adjacent retainer section, said projecting lugs being movable with said tumblers to non-engaging positions relative to the respective adjacent retainer sections when the respective tumblers are disposed eccentrically of said sections by engagement in said barrel slot, whereby rotation of one retainer section and its associated tumbler relative to another may be effected by a change-key engageable with less than all of the retainer sections and tumblers in the lock.

21. A cylinder lock as defined in claim 20, wherein said tumblers are disposed in sets of two, one set for each retainer section, with the tumblers of each set located astride said keyway, each of said tumblers being of chordal extent in its respective retainer section and being slidable therein in its respective chordal axis.

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