

[54] KEY-CONTROLLED LOCKS

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[22] Filed: Dec. 8, 1969

[21] Appl. No.: 886,211

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[30] Foreign Application Priority Data

Sept. 24, 1969 Argentina 224,306

[52] U.S. Cl. 70/129, 70/352, 70/405

[51] Int. Cl. E05b 63/08, E05b 19/14

[58] Field of Search.....70/129, 145, 150, 350, 352,
70/405, 406, 409

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ABSTRACT

A key-operated combination lock having a locking latch operated by a pivotable handle. Movably secured to the handle is a slidable bolt control element which constitutes the main closing element. The bolt control element is locked by the penetration of a number of bolt pins through the bolt control element and into perforations which house drive pins of varied sizes in a fixed base. The bolt control element may only be moved after the insertion of a key having a plurality of grooves which coincide with the drive pins into the keyway between the clasp and the fixed frame.

12 Claims, 6 Drawing Figures

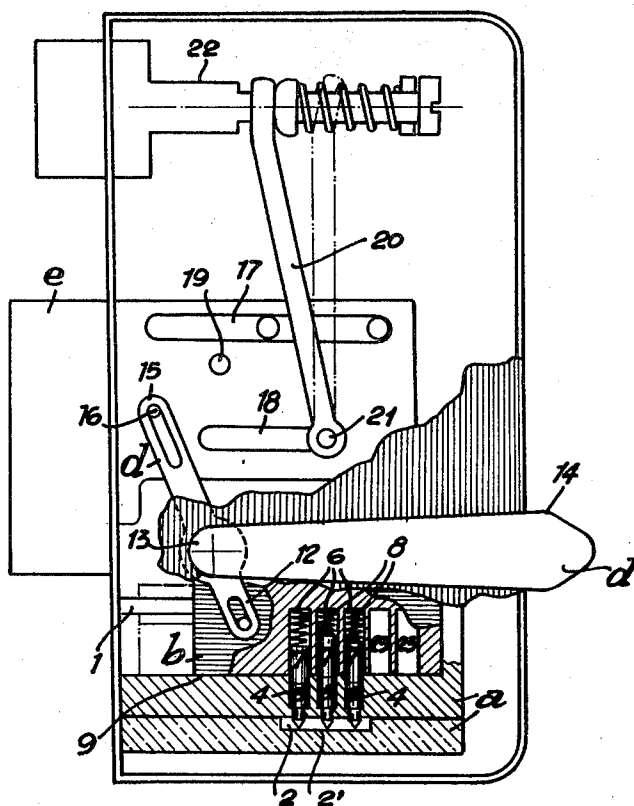


FIG. 2

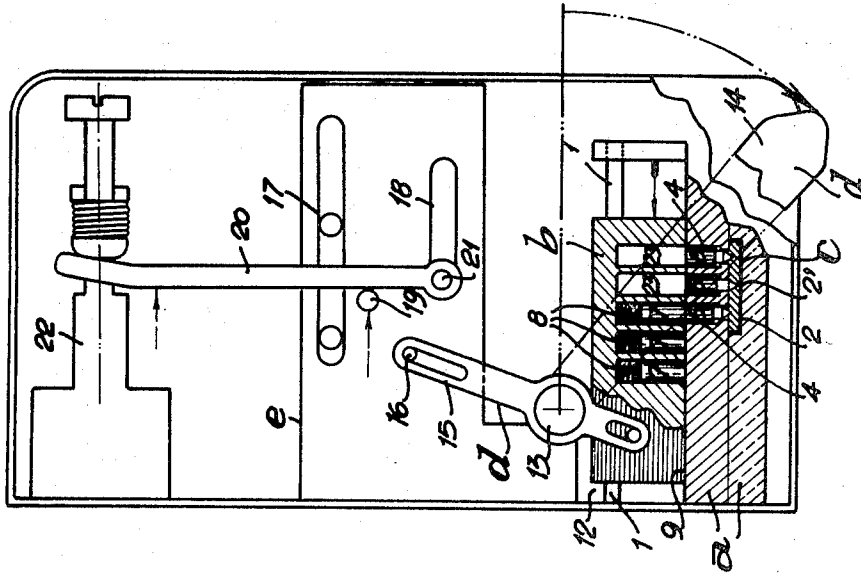
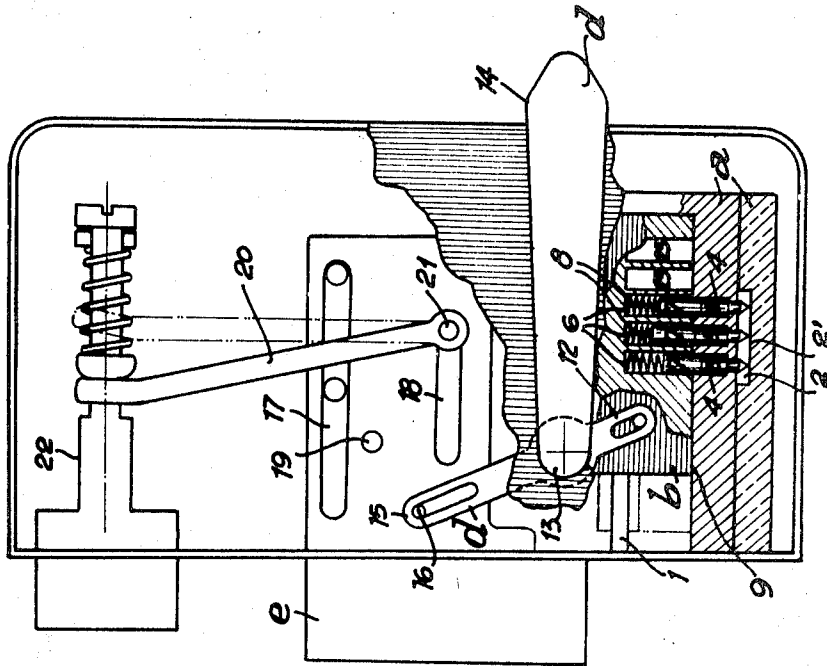
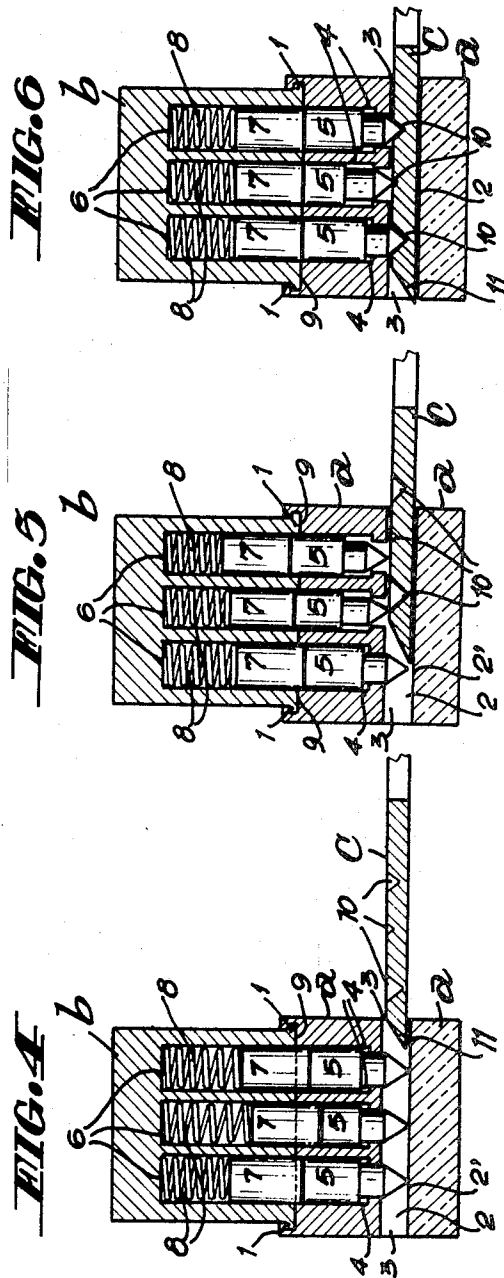
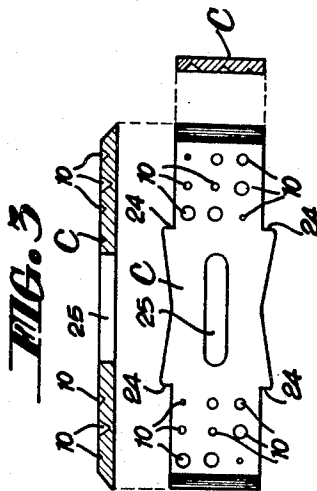


FIG. 1



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KEY-CONTROLLED LOCKS

BACKGROUND OF THE INVENTION

The present invention relates to a key-operated lock which provides a new locking principle and means for accomplishing this principle. The system offers an ideal device for locking various types of doors, safes and the like. The locking operation of this invention may be classed as impenetrable.

Both key- and combination-operated locks presently in use are subject to tampering by intruders. The key-operated locks may generally be opened either by the skillful manipulations of the intruder or by the use of a skeleton key which is designed to avoid the obstructions of the lock chamber.

Combination locks with tumblers may likewise be opened by an experienced "safebreaker" who listens to the sound of the tumblers as he rotates the dial of the combination lock. Highly complex combination locks with tumblers may be devised, but these are difficult and expensive to construct and remain subject to the limitations which have been described.

Either of these locking systems is adequate for obstruction the entry of an intruder, but neither system provides a fool-proof locking device. Consequently, it is desirable to provide a new and improved locking system of economical construction which is foolproof from intruders to a mathematical degree of certainty.

SUMMARY OF THE INVENTION

In a principle aspect, the present invention relates to a new and improved locking mechanism employing a movable bolt control element as the main closing element secured in a channel defined in a lock housing. When the bolt control element is unlocked, the latch may be opened by a handle secured thereto. When the bolt control element is locked, the lock cannot be opened. The bolt control element is provided with a number of bolt pins which penetrate across the plane between the bolt control element and the channel and into drive pin chambers, thus preventing movement of the bolt control element. When the key of this invention is inserted into the keyway of the housing, the grooves defined in the key fit complementary with corresponding drive pins. These grooves bias the drive pins and associated bolt pins to a point where the junctures between each drive pin and associated bolt pin are coplanar with the surface between the bolt control element and the channel so that the bolt control element may be moved.

BRIEF DESCRIPTION OF THE DRAWINGS

There is shown in the attached drawings a presently preferred embodiment to the present invention wherein like numerals and letters refer to like elements and wherein:

FIG. 1 is a side view of the lock showing a cutaway cross-sectional view of the interior of the lock in closed position;

FIG. 2 is the lock of FIG. 1 with the key inserted and with the mechanism in open position;

FIG. 3 is a top view of the key of this invention also showing longitudinal and side cross-sectional views of the key;

FIG. 4 is an enlarged cross-sectional view of the mechanism in closed position with the key positioned at the keyway entry;

FIG. 5 is the mechanism of FIG. 4 with the key inserted partially into the keyway; and

FIG. 6 is the mechanism of FIG. 4 with the key inserted fully into the keyway.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIGS. 1 and 2 show the lock of the present invention in the closed and open position respectively. The lock includes a fixed frame or housing *a* having a planar surface 9 on the housing *a*. A bolt control element *b* is positioned on the planar surface 9 for movement thereon and is secured within a set of guides 1 forming a channel as will be more fully described.

The locking function is performed by an armor latch or bolt *e*. Movement of the latch *e* is controlled by a lever *d*. The lever

d includes a handle 14 pivotally secured at axis 13 to the fixed frame *a*. The lever *d* also includes a latch arm 15 which is coupled to a control pin 16 secured to the latch *e*. A clasp arm 12, also secured at the axis 13 to the lever *d*, is coupled to the clasp *b*.

Thus, a clockwise rotation of the handle 14 from the position shown in FIG. 1 to that shown in FIG. 2 produces a movement of the clasp *b* to the left and the withdrawal of the armor latch *e* from locked position to the unlocked position. This movement also causes the pin 19 to contact the lever arm 20 which in turn withdraws the secondary latch 22 from locked position.

From the foregoing, it should be understood that when the lever *d* is pivoted by pressure on the handle 14, both the latch *e* and the bolt control element *b* are moved. Thus, movement of the latch *e* is predicated upon the ability to move the bolt control element *b*.

The fixed base or housing *a* has a keyway 2 defined in it for receiving the key *c*. The keyway 2 has a slot entrance 3 for receiving the key *c* which may be more clearly seen in FIG. 3. The cross-sectional area of the key *c* corresponds exactly with the cross-sectional area of the entrance 3 of the keyway 2 so that an object of different proportions may not be received in the keyway 2.

Perpendicular to the keyway 2 may be seen perforations 4 having flange steps at the base of each perforation. The perforations 4 house driver pins 5 having pointed ends which reach the bottom 2' of the keyway 2. Coinciding with the perforations 4, are a plurality of cells or bores 6 defined in the mobile bolt control element *b*, which house the bolt pins 7. The bolt pins 7 are biased by springs 8 which have sufficient tension to cause the bolt pins to penetrate across the plane 9 and into corresponding perforations 4 according to the length of the respective drive pins.

The drive pins 5 are provided in varied lengths so as to establish a number of different combinations for opening the lock. Some of the driver pins 5 maintain a relatively large distance in relation to plane 9 (equivalent to the thickness of the keyway 2). Other driver pins maintain a middle distance and still others a minimal distance, so that as shown in FIGS. 1 and 4, the driver pins 5 are depressed to varying degrees. This allows bolt pins 7 to enter their corresponding perforations 4 thus locking the clasp *b*. The plurality of rows of pins provide a number of retention points (in this case, 9) so that literally millions of combinations are obtained.

In order to displace the bolt control element *b*, it is necessary that all the driver pins 5 be lifted to a point where the juncture between the driver pins 5 and the bolt pins 7 are coplanar with the planar surface 9. This condition may be achieved only through the insertion of the corresponding key *c*.

As shown in FIG. 3, the key *c* is a thin plate having a chamfer 11 defined on one end for lifting the driver pins 5 as the key *c* is inserted into the keyway 2. The key *c* also has a plurality of grooves 10 forming the frame of the key *c* and positioned in exact correspondence to the frame forming the driver pins 5. Each groove 10 has a thickness equivalent to the distance between the extreme top of the corresponding driver pin 5 and the planar surface 9. Thus, by introducing the key *c* as is graphically shown in FIGS. 2 and 6, the end of each driver pin 5 and the corresponding end of each bolt pin 7 are leveled and made coplanar with planar surface 9.

In this position, the bolt control element *b* is freed for movement so that the lever *d* may be moved by the handle 14. As described previously, movement of lever *d* causes the armor latch *e* to move into or out of locked position. In the same fashion, the key *c* must be placed in the channel 2 thus leveling the driver pins 5 in order to close the lock.

The key *c* has a series of abutments 24 which limit the penetration of the key *c* in the channel 2. The abutments 24 are machined on the key *c* in order to precisely position it so that each of the grooves 10 correspond precisely with its respective driver pin 5. The key *c* shown in FIG. 3 has a double set of grooves 10 which allow it to be reversible in the keyway

2. Also, an elongated eye 25 is provided in the key *c* so that it may easily be kept on a keyring.

The locking mechanism of this invention as has been set forth provides a device having maximum precision in its locking mechanism. The particular locking mechanism of this preferred embodiment has nine pins aligned in three columns which allow a maximum of 1,800,000 different corresponding key combinations. Thus, the lock of this invention is impenetrable by a skeleton key or the like to a mathematically ascertained certainty.

The narrow entrance 3 of the keyway 2 does not admit the introduction of elements other than one having the same design as the key *c*. Great precision is obtained by the planar surface 9 on which the bolt control element *b* travels. This feature minimizes the tolerance play in the device and avoids unnecessary maneuvers in opening and closing the lock.

It is to be understood that the embodiment of the invention which has been described is merely illustrative of one of the applications of the principles of the invention. Numerous modifications may be made to the disclosed embodiment without departing from the true spirit and scope of the invention.

What is claimed is:

1. A key controlled lock having a locking bolt to be controlled by a key having a plurality of grooves of varied predetermined depths comprising, in combination,
 a fixed base having a channel defined on one side thereof, a keyway and at least three perforations defined non-linearly within said fixed base, said perforations opening into the keyway and the channel defined in said fixed base,
 a bolt control element movable with respect to and operatively connected to said bolt and movably secured within said channel and having a plurality of bolt pin receiving bores adapted to correspond to said plurality of perforations when said bolt control element is in locked position, a plurality of bolt pins slidably secured within said bores and a corresponding plurality of driver pins having varied predetermined lengths slidably secured within said perforations such that when said bolt control element is locked, said bolt pins are depressed from said bores into said perforations and said driver pins are biased into contact with the surface of said keyway, such that when said key is inserted in said keyway, said plurality of grooves of varied predetermined depths in said key correspond with each of said driver pins respectively and counterbias each of said driver pins and said bolt pins to cause each juncture between each of said bolt pins and said driver pins to be positioned at the interface of said bolt control element and said channel for allowing said bolt control element to be moved in said channel without opposition from said bolt pins or said driver pins and without movement of said

key.

2. The combination of claim 1 including, means within said bores for biasing said bolt pins against said driver pins such that when said bolt control element is in locked position, said bolt pins forcibly penetrate into said perforations in said base and bias said driver pins against the surface of said keyway to prevent any movement of said bolt control element in said channel.

3. The apparatus of claim 2 wherein said means for biasing comprise a compression spring in each of said bores.

4. The combination lock of claim 1 wherein said key is a planar plate having chamfered ends and wherein said grooves defined on one surface of said plate cooperate with said driver pins to determine the opposite run of each of said driver pins so that when the key is inserted into the keyway, the juncture between said driver pins and said bolt pins is coplanar with the surface between said bolt control element and said channel.

5. The apparatus of claim 1 wherein said bolt control element comprises a bar railed in guides as a runner traversing a run from the locked position to the unlocked position.

6. The apparatus of claim 1 including a lever having a operating handle pivotally secured to said base, a resistance arm coupled to said bolt control element at one end and secured to the pivot end of said operating handle at the other end, and an operating arm having a first end secured to said pivot end and a second end coupled to the bolt, such that when said handle is moved, said control element and said bolt are also moved.

7. The apparatus as set forth in claim 6 including a secondary bolt for aid lock operatively connected to the bolt of said lock such that when the handle is moved and said bolt is operated, said secondary bolt is also operated.

8. The apparatus of claim 1 wherein said keyway has a rectilinear opening for receiving said key.

9. The apparatus as set forth in claim 1 wherein said key includes at least one abutment means defined thereon for limiting the penetration of said key in the keyway such that said key may be precisely positioned within the keyway.

10. The apparatus as set forth in claim 1 including at least nine of the perforations aligned in three columns, at least nine of the bolt pin receiving bores adapted to correspond to said nine perforations when the bolt control element is locked and including at least nine of the bolt pins slidably secured within the bores and at least nine of the driver pins having varied predetermined lengths slidably secured within the perforations.

11. The apparatus set forth in claim 1 wherein said key includes a first plurality of grooves on one end of the key and a second plurality of grooves on the other end of said key such that said key may be reversibly inserted in the keyway.

12. The apparatus as set forth in claim 1 wherein said bolt control element is remote from said bolt.

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