

High Security Lock

Field of Invention

5 The present invention relates to high security locks and keys used in commercial buildings, business and security installations, and similar applications.

Background Art

10 While existing high security lock and key systems offer a reasonable level of protection, it is quite often the key which erodes the security of the system by being duplicated without proper authority. This situation occurs as over a period of time machinery and key blanks become available on the market which make unauthorised duplication possible. It is an object of the present invention to provide a system in which unauthorised duplication of keys is inhibited.

Summary of Invention

15 According to one aspect of the present invention there is disclosed a key locking mechanism comprising a barrel and a housing, said barrel including at least one lever adapted to rotate when a key is inserted in said mechanism, said lever including receipt means to receive a biased side bar which immobilises said barrel relative to said housing when said lever is in a locked
20 orientation, whereby rotation of said lever by a key to a predetermined orientation permits said side bar to be received into said lever, thereby releasing said barrel relative to said housing.

Preferably at least six in-line conventional pins also lock the barrel mechanism.

25 According to another aspect the present invention comprises a key adapted for use in a lock of the type comprising a barrel and a housing, said barrel including at least one lever for engaging a corresponding key, said lever including receipt means to receive a biased side bar which immobilises said barrel relative to said housing when said lever is in a locked orientation, and
30 wherein when said lever or levers are rotated to a predetermined position, said or each receipt means are aligned to permit said side bar to be received into said lever or levers, thereby releasing said barrel relative to said housing,

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said key being characterised in that it includes at least one groove which operatively engages the lever or levers of a corresponding lock so as to rotate the levers and release the lock.

5 According to another aspect of the present invention there is disclosed a key with at least two concave grooves running parallel to the length of the key. Two deeper combination grooves are cut over the length of the key, these activate the combination levers and the grooves are cut on the same radius as the combination levers pivot point. In addition there is at least one blade running parallel to the key and at 90° to the concaved grooves, this blade
10 activates the conventional pin tumblers or activates floating pins.

An advantage of this invention is that it provides a new concept in lock and key security which requires special key cutting equipment to produce the key. Various levels of security may be provided in the one lock mechanism structure. This invention provides a unique high security key and lock
15 mechanism which can provide billions of different key combinations.

Description

Several embodiments of the present invention will now be described with reference to the drawings:

20 Fig 1 is a perspective view of a key according to one aspect of the present invention;

Fig 2 is a sectional view of a key profile with top blade;

Fig 3 is a sectional view of a key profile with top and bottom blade;

Fig 4 is a sectional view of a key with variations of profile;

25 Fig 5 is a sectional view of keys which could be used if the number or the position of the combination levers were changed in the locking mechanism;

Fig 6 is a side view of the key showing sample depth position in the combination groove and a sample of the depth position on the top blade;

Fig 7 is a schematic view showing the standard combination lever position;

30 Fig 8 is a section view through a lock mechanism with top blade;

Fig 9 is a section view through a level 2 lock mechanism with top and bottom blade;



Fig 10 is a perspective view showing the key with top blade (Fig 1) combination lever (Fig. 7) and side bar (Fig. 10A);

Fig 11 is a perspective view showing all components used in Level 1 including outer shell body;

5 Fig 12 is a plan view showing rotating key vice and cutter; and

Fig 13 is a plan view of the apparatus of fig 12 in rotated orientation.

10 In order to understand the overall operation of the lock mechanism, we will first refer to figures 10 and 11. These illustrate a key locking mechanism 100, which includes a housing 8B, a locking barrel 11A, a series of combination levers 7, and conventional tumbler pins, 11C.

15 Pivot rods 11B locate combination levers 7, in the barrel 11A in diametrically opposite locations in recesses 14 in barrel 11A. Also interacting with the combination levers 7, are side bars 10A which when in the locked position immobilise or secure barrel 11A relative to housing 8B.

20 In Fig 10 one illustrative combination lever 7 is shown in more detail in order to exemplify the operation of the lever mechanism. The combination lever, 7, has a pivot hole 7A, a key engagement peg 7B, a receipt means, 7C in the form of a bight and a series of three other depth recesses 7D. Recesses 7D maintain side bar 10A, when no key is inserted, in a locking engagement with housing 8B. Pivot rods 11B maintain the set of levers 7 in position and provide an axis for pivoting

25 As illustrated in Fig 10, the key 1, when it is slid inside the barrel 11A by virtue of groove 1A rotates lever 7 by peg 7B engaging in groove 1A and rotating the lever 7 about pivot holes 7A. As key 1 is fully inserted into the barrel 11A, peg 7B is moved up and down following the groove and comes to rest so that receipt means or bight 7C is in line with side bar 10A. The side bars may then pass into the bight 7C and release the lock. Tension springs 10C return the side bar 10A from bight 7C into the corresponding recess in shell 8B when
30 the key is withdrawn from the barrel.

The receipt means or bight 7C can be varied in position to provide the different combinations. Figure 7 shows four positions of the bight 7C, which can

preferably be provided as shown by having only two different levers which can be reversed to provide four different bight 7C positions. For receipt means 7C to be located in position 1 simply requires the reversal of this lever to produce a lever with receipt means 7C in position 4. Likewise the levers having receipt means in positions 2 and 3 can be reversed. It will of course be understood that while four positions are preferred, a greater or smaller number of bight positions may be provided as will be understood by those skilled in the art. The number of possible combinations for the lock depends on the number of bight positions, as well as the number of individual levers which are provided. Further complexity is added by having conventional pin and blade profile arrangements at either the top or bottom or both, as will be described in more detail below.

Referring to Figures 1 to 6, the key 1 for use with the lock 100, has a groove 1A of a substantially zig zag configuration which operatively forces the peg 7B upwards and downwards thereby rotating lever 7. When the key is fully inserted the peg 7B is located in the positions identified in Fig 6 by the numbers 4, 2, 3, 2, 3 and 1. This combination will coincide with that necessary to unlock all the mechanisms in the lock 100. The key 1 also includes a conventional key profile system 1B for engaging of conventional pin tumblers 11C. Figures 2 and 3 illustrate in cross-section keys with a conventional profile on one side, figure 2, and on both sides, figure 3. The central groove is shown notionally in the centre.

Illustrated in Figs 4 and 5 are a sample of the different profiles which can be used with the lock mechanism of the present invention.

Illustrated in Fig 8 is a key lock mechanism as illustrated in Fig 11 however, this illustration is in the assembled condition and a section taken therethrough.

A further embodiment of the invention is illustrated in Fig 9 which has a similar configuration to that of Fig 8, however a profile 1B is located on top of the key 1 and a profile 1C is also located at the bottom of the key 1.

Illustrated in Figs 12 and 13 is a representation of the key-cutting equipment which allows the key to be rotated whilst the key blank is moved in the direction of the axis of rotation of the jaw in the key blank, thereby producing the zig zag groove in the key for use with the present invention.



5 This rotary action is not required in other keys or key cutting equipment and thus a higher level of security can be provided for the users of this system. However, the skilled worker in the art will appreciate that conventional machining equipment can be readily modified to perform this operation.

10 The embodiment of the invention illustrated utilises grooves 1A in keys 1, to interact with peg 7B on combination tumbler 7. It is envisaged that the combination lever 7 can have a groove which mates with a zig zag projection or like format, (sinusoidal, curved, intermittent or otherwise) on the size of the key 1. In this embodiment the portions above and below the key are cut away to leave the zig zag projection on the key.

 The present invention allows, for example, the following levels of security:

15 LEVEL 1 (12 levers with 4 depths) Combinations 11,230,590,464
 (6 conventional pins/3 depths)
 LEVEL 2 (12 levers with 4 depths) Combinations 201,326,592
 (12 floating pins/1 depth)
 LEVEL 3 (12 levers with 4 depths) Combinations 100,663,296
 (6 floating pins/1 depth)
20 LEVEL 4 (12 levers with 4 depths) Combinations 15,777,216
 LEVEL 5 (6 conventional pins/3 depths) Combinations 729

 The foregoing describes some embodiments of the present invention and modifications made by those skilled in the art can be made thereto without departing from the scope of the present invention.

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CLAIMS



1. A key locking mechanism comprising a barrel and a housing, said barrel including at least one lever adapted to rotate when a key is inserted in said mechanism, said lever including receipt means to receive a biased side bar which immobilises said barrel relative to said housing when said lever is in a locked orientation, whereby rotation of said lever by a key to a predetermined orientation permits said side bar to be received into said lever, thereby releasing said barrel relative to said housing.
2. A key locking mechanism as claimed in claim 1 wherein said lever is adapted to rotate in a plane perpendicular to a longitudinal direction of said mechanism.
3. A key locking mechanism as claimed in claim 1 wherein said lever includes a key engagement portion which is adapted to slide relative to said key.
4. A key locking mechanism as claimed in claims 1, 2, or 3 wherein said lever has at least 3 positions, one of which is said receipt means whilst the others keep said side bar in a position to immobilise said barrel relative to said housing.
5. A key locking mechanism as claimed in any of the previous claims wherein said mechanism there is provided at least one lever on either side of a key.
6. A key locking mechanism as claimed in any of the previous claims wherein said key lock mechanism also includes conventional pin tumblers or floating tumblers.
7. A key for use with the mechanism of claim 1 to 6 wherein the side of said key has at least one groove to engage and rotate said lever or levers.





8. A key as claimed in claim 7 wherein said groove is substantially zig zag in pattern, which when fully inverted engages said lever in the apex or trough of said zig zag.
9. A key as claimed in any one of claims 7 and 8 when dependent on claim 6, including profiles to engage said conventional tumbler pins.
10. A key cutting machine to manufacture a key as claimed in claims 7 to 9 wherein said groove is produced by holding a key in a rotating jaw which rotates a key blank as the key is moved in the direction of the axis of rotation of said jaw.
11. A key cutting machine to manufacture a key as claimed in claims 7 to 9 wherein said groove is produced by holding said key blank in a jaw which is movable in a direction perpendicular to and simultaneously to movement in a longitudinal direction of said key blank.
12. A lock including a locking mechanism according to any one of claims 1 to 6.
13. A lock and key set,
said lock comprising a barrel and a housing, said barrel including at least one lever for engaging a groove in a corresponding key, said lever including receipt means to receive a biased side bar which immobilises said barrel relative to said housing when said lever is in a locked orientation,
said key comprising at least one groove for engaging said lever or levers,
whereby upon insertion of said key, said groove or grooves engages said one or more levers and rotates said lever or levers to a predetermined orientation, such that said or each receipt means are aligned to permit said side





bar to be received into said lever or levers, thereby releasing said barrel relative to said housing.

14. A key adapted for use in a lock of the type comprising a barrel and a housing, said barrel including at least one lever for engaging a corresponding key, said lever including receipt means to receive a biased side bar which immobilises said barrel relative to said housing when said lever is in a locked orientation, and wherein when said lever or levers are rotated to a predetermined position, said or each receipt means are aligned to permit said side bar to be received into said lever or levers, thereby releasing said barrel relative to said housing,

said key being characterised in that it includes at least one groove which operatively engages the lever or levers of a corresponding lock so as to rotate the levers and release the lock.

15. A key substantially as herein described with reference to, and as illustrated in, Figures 1 and 2, Figure 1 as modified by Figures 3, 4 or 5, or Figure 6 of the accompanying drawings.

16. A key locking mechanism substantially as herein described with reference to, and as illustrated in, Figures 7, 8, 10 and 11, or Figures 7, 10 and 11 as modified by Figure 9, of the accompanying drawings.

17. A lock and key set substantially as herein described with reference to the accompanying drawings.

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ABSTRACT

High Security Lock

A lock mechanism is disclosed wherein a set of levers are arranged to pivot within a lock barrel. In a locked condition the levers retain a side bar so as to engage a housing. The corresponding key includes one or more grooves which engage the levers on insertion so as to rotate them to a position where the side bar may be received within the levers. Conventional blade and pin tumbler arrangements may be provided on the lock and key in conjunction with the novel lever mechanism.

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Fig 1.

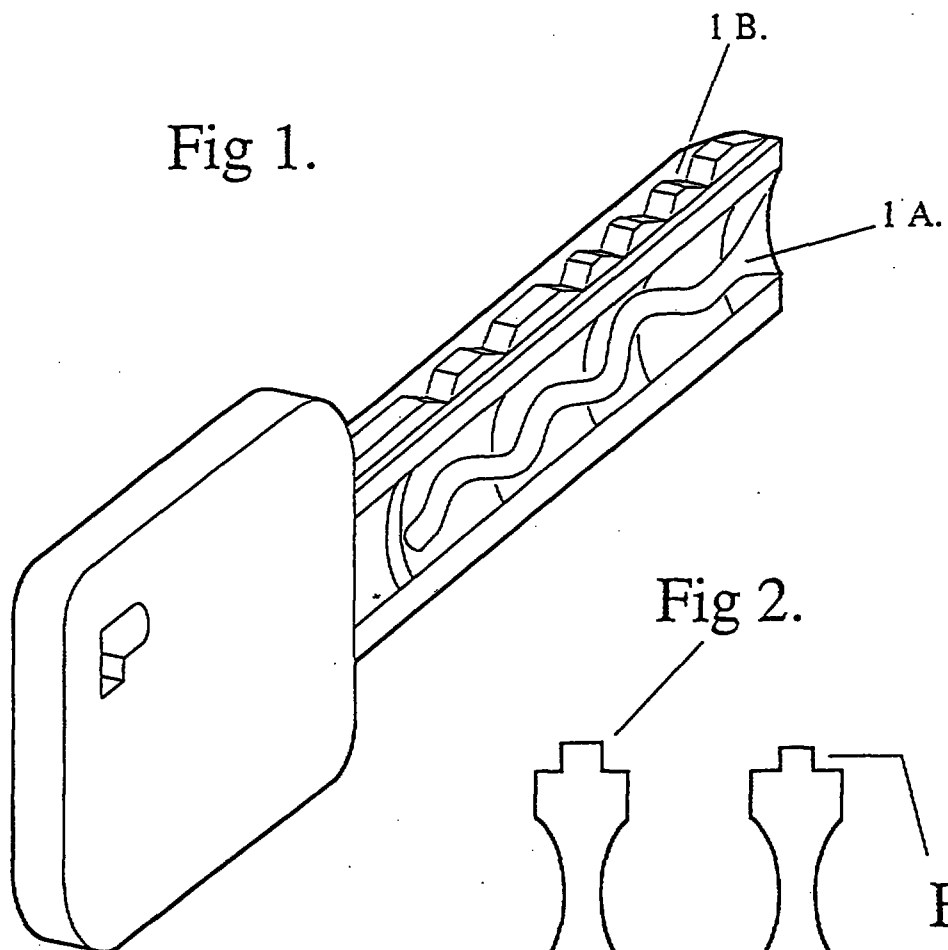


Fig 2.



Fig 3.

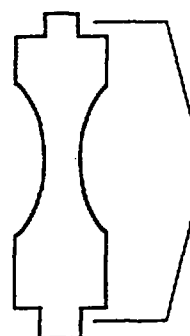


Fig 6.

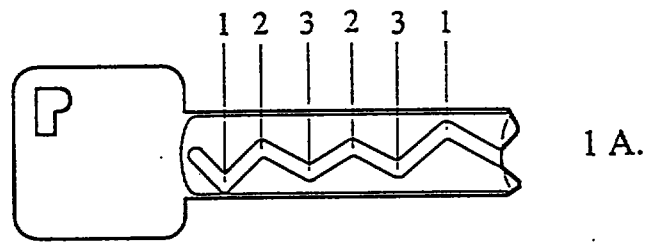


Fig 5.

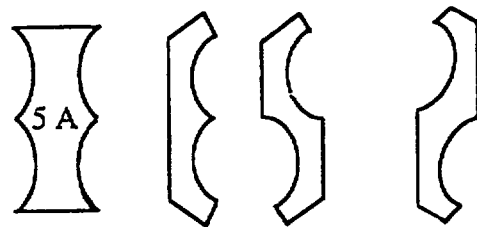


Fig 4.

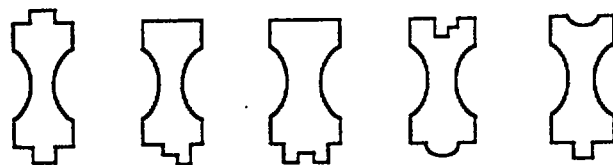


Fig 7.

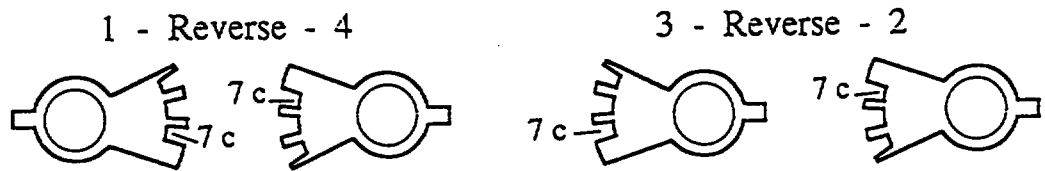


Fig 8.

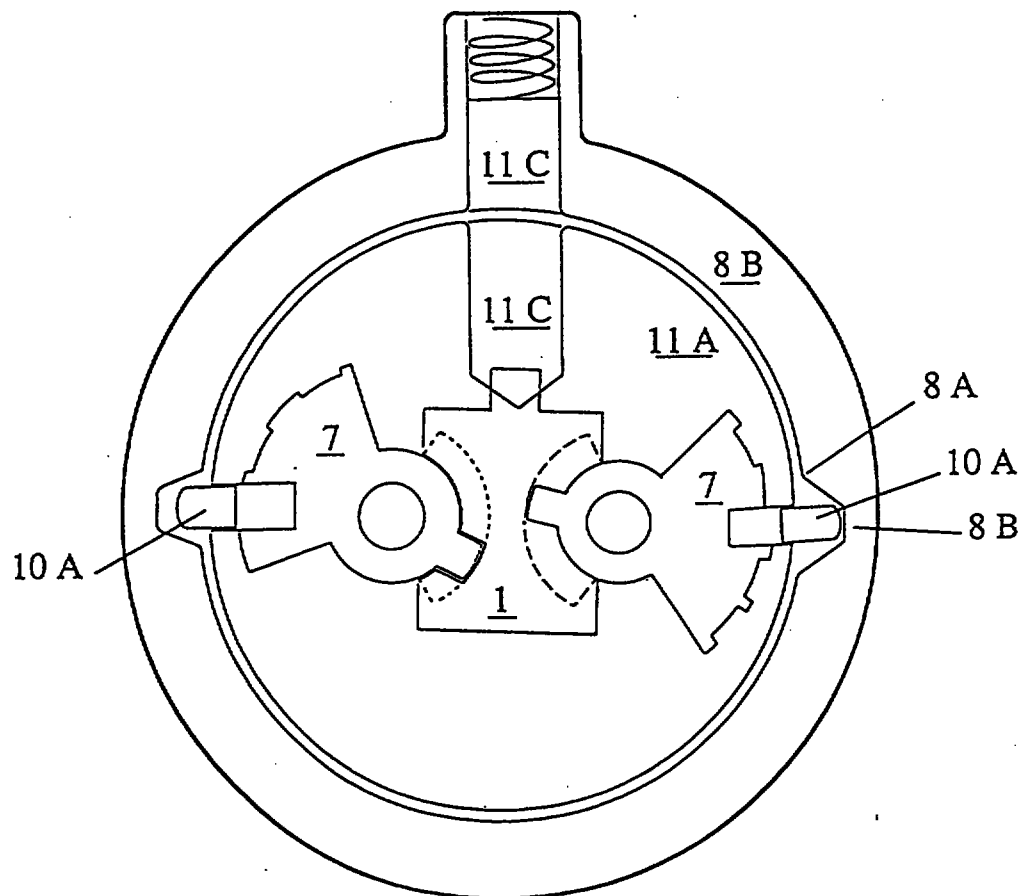


Fig 9.

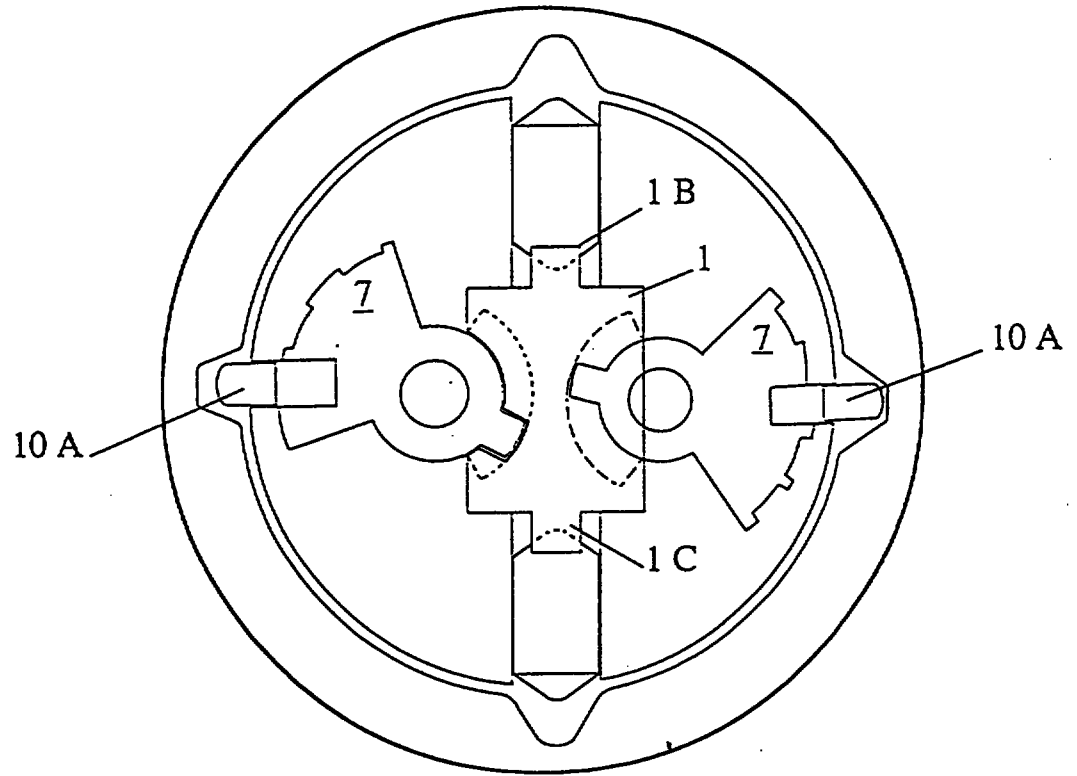


Fig 10.

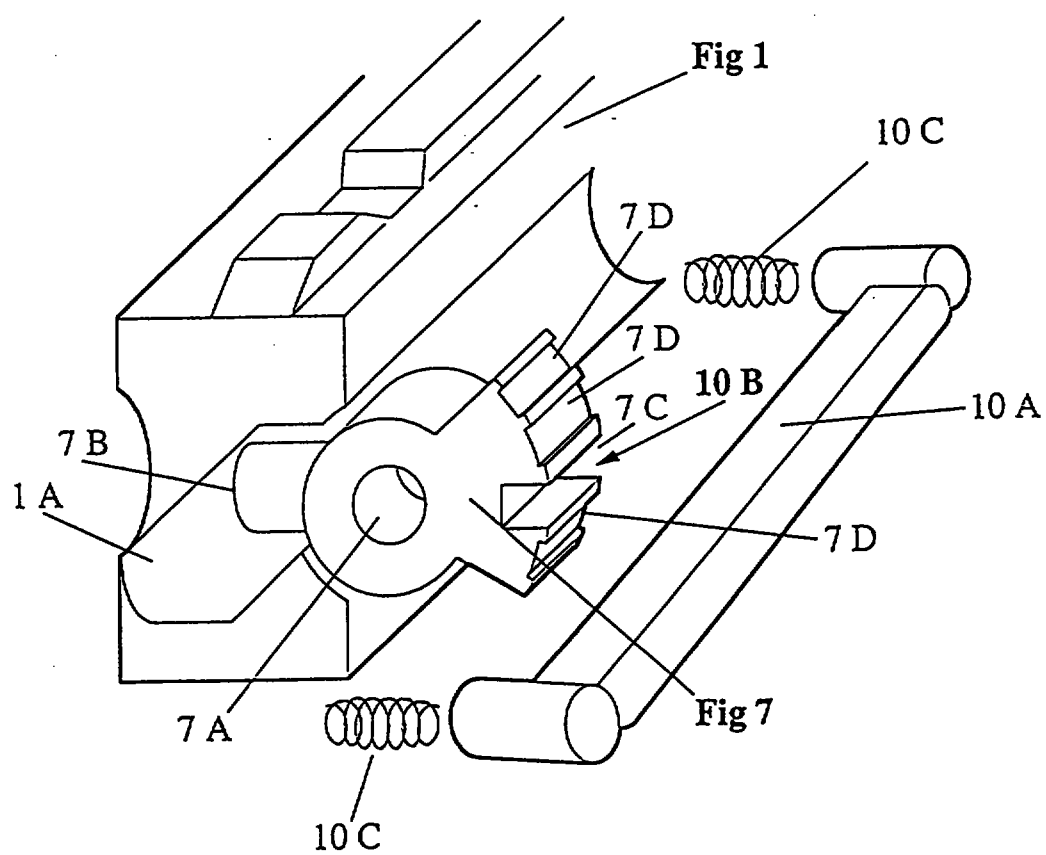


Fig 12.

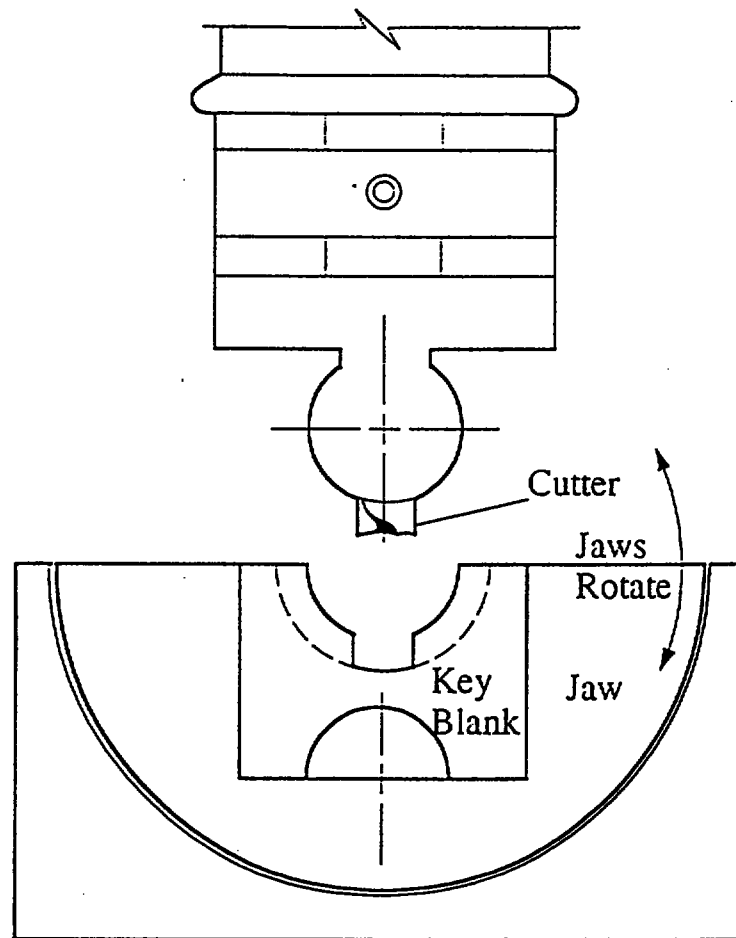
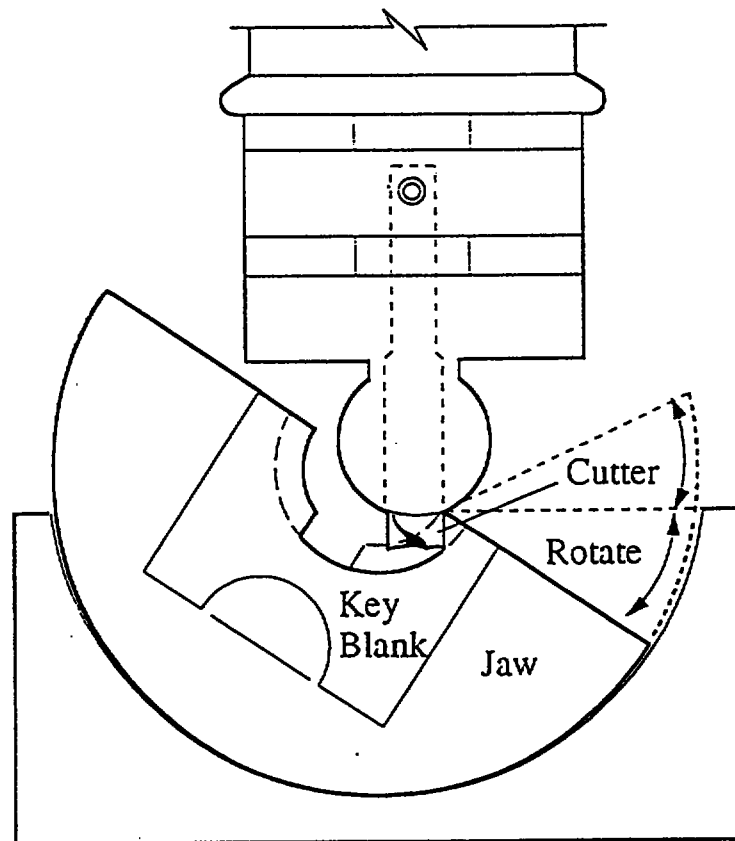


Fig 13.



The present invention relates to high security locks and keys used in commercial buildings, business and security installations, and similar applications.

While existing high security lock and key systems offer a reasonable level of protection, it is quite often the key which erodes the security of the system by being duplicated without proper authority. This situation occurs as over a period of time machinery and key blanks become available on the market which make unauthorised duplication possible. It is an object of the present invention to provide a system in which unauthorised duplication of keys is inhibited.

According to one aspect of the present invention there is disclosed a key locking mechanism comprising a barrel and a housing, said barrel including at least one lever adapted to rotate when a key is inserted in said mechanism, said lever including receipt means to receive a biased side bar which immobilises said barrel relative to said housing when said lever is in a locked orientation, whereby rotation of said lever by a key to a predetermined orientation permits said side bar to be received into said lever, thereby releasing said barrel relative to said housing.

Preferably at least six in-line conventional pins also lock the barrel mechanism.

According to another aspect the present invention comprises a key adapted for use in a lock of the type comprising a barrel and a housing, said barrel including at least one lever for engaging a corresponding key, said lever including receipt means to receive a biased side bar which immobilises said barrel relative to said housing when said lever is in a locked orientation, and wherein when said lever or levers are rotated to a predetermined position, said or each receipt means are aligned to permit said side bar to be received into said lever or levers, thereby releasing said barrel relative to said housing,

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said key being characterised in that it includes at least one groove which operatively engages the lever or levers of a corresponding lock so as to rotate the levers and release the lock.

According to another aspect of the present invention there is disclosed a key with at least two concave grooves running parallel to the length of the key. Two deeper combination grooves are cut over the length of the key, these activate the combination levers and the grooves are cut on the same radius as the combination levers pivot point. In addition there is at least one blade running parallel to the key and at 90° to the concaved grooves, this blade activates the conventional pin tumblers or activates floating pins.

An advantage of this invention is that it provides a new concept in lock and key security which requires special key cutting equipment to produce the key. Various levels of security may be provided in the one lock mechanism structure. This invention provides a unique high security key and lock mechanism which can provide billions of different key combinations.

Description

Several embodiments of the present invention will now be described with reference to the drawings:

Fig 1 is a perspective view of a key according to one aspect of the present invention;

Fig 2 is a sectional view of a key profile with top blade;

Fig 3 is a sectional view of a key profile with top and bottom blade;

Fig 4 is a sectional view of a key with variations of profile;

Fig 5 is a sectional view of keys which could be used if the number or the position of the combination levers were changed in the locking mechanism;

Fig 6 is a side view of the key showing sample depth position in the combination groove and a sample of the depth position on the top blade;

Fig 7 is a schematic view showing the standard combination lever position;

Fig 8 is a section view through a lock mechanism with top blade;

Fig 9 is a section view through a level 2 lock mechanism with top and bottom blade;

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Fig 10 is a perspective view showing the key with top blade (Fig 1) combination lever (Fig. 7) and side bar (Fig. 10A);

Fig 11 is a perspective view showing all components used in Level 1 including outer shell body;

Fig 12 is a plan view showing rotating key vice and cutter; and

Fig 13 is a plan view of the apparatus of fig 12 in rotated orientation.

In order to understand the overall operation of the lock mechanism, we will first refer to figures 10 and 11. These illustrate a key locking mechanism 100, which includes a housing 8B, a locking barrel 11A, a series of combination levers 7, and conventional tumbler pins, 11C.

Pivot rods 11B locate combination levers 7, in the barrel 11A in diametrically opposite locations in recesses 14 in barrel 11A. Also interacting with the combination levers 7, are side bars 10A which when in the locked position immobilise or secure barrel 11A relative to housing 8B.

In Fig 10 one illustrative combination lever 7 is shown in more detail in order to exemplify the operation of the lever mechanism. The combination lever, 7, has a pivot hole 7A, a key engagement peg 7B, a receipt means, 7C in the form of a bight and a series of three other depth recesses 7D. Recesses 7D maintain side bar 10A, when no key is inserted, in a locking engagement with housing 8B. Pivot rods 11B maintain the set of levers 7 in position and provide an axis for pivoting

As illustrated in Fig 10, the key 1, when it is slid inside the barrel 11A by virtue of groove 1A rotates lever 7 by peg 7B engaging in groove 1A and rotating the lever 7 about pivot holes 7A. As key 1 is fully inserted into the barrel 11A, peg 7B is moved up and down following the groove and comes to rest so that receipt means or bight 7C is in line with side bar 10A. The side bars may then pass into the bight 7C and release the lock. Tension springs 10C return the side bar 10A from bight 7C into the corresponding recess in shell 8B when the key is withdrawn from the barrel.

The receipt means or bight 7C can be varied in position to provide the different combinations. Figure 7 shows four positions of the bight 7C, which can

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preferably be provided as shown by having only two different levers which can be reversed to provide four different bight 7C positions. For receipt means 7C to be located in position 1 simply requires the reversal of this lever to produce a lever with receipt means 7C in position 4. Likewise the levers having receipt means in positions 2 and 3 can be reversed. It will of course be understood that while four positions are preferred, a greater or smaller number of bight positions may be provided as will be understood by those skilled in the art. The number of possible combinations for the lock depends on the number of bight positions, as well as the number of individual levers which are provided. Further complexity is added by having conventional pin and blade profile arrangements at either the top or bottom or both, as will be described in more detail below.

Referring to Figures 1 to 6, the key 1 for use with the lock 100, has a groove 1A of a substantially zig zag configuration which operatively forces the peg 7B upwards and downwards thereby rotating lever 7. When the key is fully inserted the peg 7B is located in the positions identified in Fig 6 by the numbers 4, 2, 3, 2, 3 and 1. This combination will coincide with that necessary to unlock all the mechanisms in the lock 100. The key 1 also includes a conventional key profile system 1B for engaging of conventional pin tumblers 11C. Figures 2 and 3 illustrate in cross-section keys with a conventional profile on one side, figure 2, and on both sides, figure 3. The central groove is shown notionally in the centre.

Illustrated in Figs 4 and 5 are a sample of the different profiles which can be used with the lock mechanism of the present invention.

Illustrated in Fig 8 is a key lock mechanism as illustrated in Fig 11 however, this illustration is in the assembled condition and a section taken therethrough.

A further embodiment of the invention is illustrated in Fig 9 which has a similar configuration to that of Fig 8, however a profile 1B is located on top of the key 1 and a profile 1C is also located at the bottom of the key 1.

Illustrated in Figs 12 and 13 is a representation of the key-cutting equipment which allows the key to be rotated whilst the key blank is moved in the direction of the axis of rotation of the jaw in the key blank, thereby producing the zig zag groove in the key for use with the present invention.

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This rotary action is not required in other keys or key cutting equipment and thus a higher level of security can be provided for the users of this system. However, the skilled worker in the art will appreciate that conventional machining equipment can be readily modified to perform this operation.

The embodiment of the invention illustrated utilises grooves 1A in keys 1, to interact with peg 7B on combination tumbler 7. It is envisaged that the combination lever 7 can have a groove which mates with a zig zag projection or like format, (sinusoidal, curved, intermittent or otherwise) on the size of the key 1. In this embodiment the portions above and below the key are cut away to leave the zig zag projection on the key.

The present invention allows, for example, the following levels of security:

LEVEL 1 (12 levers with 4 depths) Combinations 11,230,590,464

(6 conventional pins/3 depths)

LEVEL 2 (12 levers with 4 depths) Combinations 201,326,592

(12 floating pins/1 depth)

LEVEL 3 (12 levers with 4 depths) Combinations 100,663,296

(6 floating pins/1 depth)

LEVEL 4 (12 levers with 4 depths) Combinations 15,777,216

LEVEL 5 (6 conventional pins/3 depths) Combinations 729

The foregoing describes some embodiments of the present invention and modifications made by those skilled in the art can be made thereto without departing from the scope of the present invention.

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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A key locking mechanism comprising a barrel and a housing, said barrel including at least one lever adapted to rotate when a key is inserted in said mechanism, said lever including receipt means to receive a biased side bar which immobilises said barrel relative to said housing when said lever is in a locked orientation, whereby rotation of said lever by a key to a predetermined orientation permits said side bar to be received into said lever, thereby releasing said barrel relative to said housing.
2. A key locking mechanism as claimed in claim 1 wherein said lever is adapted to rotate in a plane perpendicular to a longitudinal direction of said mechanism.
3. A key locking mechanism as claimed in claim 1 wherein said lever includes a key engagement portion which is adapted to slide relative to said key.
4. A key locking mechanism as claimed in claims 1, 2, or 3 wherein said lever has at least 3 positions, one of which is said receipt means whilst the others keep said side bar in a position to immobilise said barrel relative to said housing.
5. A key locking mechanism as claimed in any of the previous claims wherein said mechanism there is provided at least one lever on either side of a key.
6. A key locking mechanism as claimed in any of the previous claims wherein said key lock mechanism also includes conventional pin tumblers or floating tumblers.
7. A key for use with the mechanism of claim 1 to 6 wherein the side of said key has at least one groove to engage and rotate said lever or levers.

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8. A key as claimed in claim 7 wherein said groove is substantially zig zag in pattern, which when fully inverted engages said lever in the apex or trough of said zig zag.

9. A key as claimed in any one of claims 7 and 8 when dependent on claim 6, including profiles to engage said conventional tumbler pins.

10. A key cutting machine to manufacture a key as claimed in claims 7 to 9 wherein said groove is produced by holding a key in a rotating jaw which rotates a key blank as the key is moved in the direction of the axis of rotation of said jaw.

11. A key cutting machine to manufacture a key as claimed in claims 7 to 9 wherein said groove is produced by holding said key blank in a jaw which is movable in a direction perpendicular to and simultaneously to movement in a longitudinal direction of said key blank.

12. A lock including a locking mechanism according to any one of claims 1 to 6.

13. A lock and key set,
said lock comprising a barrel and a housing, said barrel including at least one lever for engaging a groove in a corresponding key, said lever including receipt means to receive a biased side bar which immobilises said barrel relative to said housing when said lever is in a locked orientation,
said key comprising at least one groove for engaging said lever or levers,

whereby upon insertion of said key, said groove or grooves engages said one or more levers and rotates said lever or levers to a predetermined orientation, such that said or each receipt means are aligned to permit said side bar to be received into said lever or levers, thereby releasing said barrel relative to said housing.

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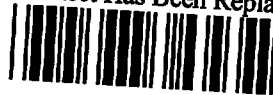
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14. A key adapted for use in a lock of the type comprising a barrel and a housing, said barrel including at least one lever for engaging a corresponding key, said lever including receipt means to receive a biased side bar which immobilises said barrel relative to said housing when said lever is in a locked orientation, and wherein when said lever or levers are rotated to a predetermined position, said or each receipt means are aligned to permit said side bar to be received into said lever or levers, thereby releasing said barrel relative to said housing,

said key being characterised in that it includes at least one groove which operatively engages the lever or levers of a corresponding lock so as to rotate the levers and release the lock.

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ABSTRACT**HIGH SECURITY LOCK**

A lock mechanism is disclosed wherein a set of levers are arranged to pivot within a lock barrel. In a locked condition the levers retain a side bar so as to engage a housing. The corresponding key includes one or more grooves which engage the levers on insertion so as to rotate them to a position where the side bar may be received within the levers. Conventional blade and pin tumbler arrangements may be provided on the lock and key in conjunction with the novel lever mechanism.

Fig. 1

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Preferably said at least one lever further includes at least a second inter-engagement means which is adapted to inter-engage with said side bar without activating said mechanism between said locked and unlocked states.

Preferably said first inter-engagement means is adapted, when said at least one lever is pivoted into said predetermined orientation, to receive said side bar within said at least one lever thereby unlocking said barrel relative to said housing.

According to another aspect of the invention, a key adapted to be used with the above mechanism is provided wherein a side face of said key has an arcuate profile upon which a channel of generally constant width is located; said arcuate profile substantially corresponding to the arc traced out by said projection when said lever pivots within said mechanism; said channel adapted to receive a projection portion of at least one lever of said mechanism; said lever adapted to track within said channel upon the insertion of said key in said mechanism and thereby pivoting said lever within said mechanism such that said mechanism is activated between locked and unlocked states.

Preferably said channel defines a non-linear path within which said projection tracks when said key is inserted in said channel.

Preferably said non-linear path comprises a plurality of intermediate paths; each said intermediate path being angularly displaced from adjacent intermediate paths.

According to another aspect of the present invention, a lock mechanism and key set is provided, said lock mechanism including a barrel that is adapted to lock and unlock relative to a housing upon the operation of a key, said mechanism including at least one lever adapted to activate said mechanism between locked and unlocked states when located in a predetermined orientation within said mechanism; said lever incorporating a projection adapted to be received within a channel of said key; said key incorporating at least one channel of generally constant width located on a side face of said key and adapted to receive said projection; whereby upon insertion of said key, said projection tracks said channel thereby pivoting said lever into a final orientation when said key is sufficiently inserted in said mechanism for activation between the locked and unlocked states; said activation occurring when said final orientation corresponds to said predetermined orientation.

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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:



1. A key locking mechanism including a barrel that is adapted to lock and unlock relative to a housing upon the operation of a key, said mechanism including at least one lever with a projection which is adapted to be received within a channel of generally constant width in said key; said at least one lever adapted to pivot within said mechanism by said projection tracking within said channel upon the insertion of said key in said mechanism whereby said at least one lever assumes a final orientation when said key is sufficiently inserted in said mechanism for activation between the locked and unlocked states; said activation occurring when said final orientation corresponds to a predetermined orientation.
2. A key locking mechanism as claimed in claim 1 wherein said barrel is adapted to lock and unlock relative to said housing upon the operation of a biased side bar; said at least one lever further including a first inter-engagement means which is adapted to inter-engage with said side bar so as to activate said mechanism between said locked and unlocked states.
3. A key locking mechanism as claimed in claim 3 wherein said at least one lever further includes at least a second inter-engagement means which is adapted to inter-engage with said side bar without activating said mechanism between said locked and unlocked states.
4. A key locking mechanism as claimed in claim 2 or claim 3 wherein said first inter-engagement means is adapted, when said at least one lever is pivoted into said predetermined orientation, to receive said side bar within said at least one lever thereby unlocking said barrel relative to said housing.
5. A key locking mechanism as claimed in any one of the preceding claims wherein said lever is un-biased in operation.

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6. A key lock mechanism as claimed in any one of the preceding claims wherein said at least one lever is adapted to pivot in a plane perpendicular to a longitudinal direction of said mechanism.
7. A key locking mechanism as claimed in any one of the preceding claims wherein said mechanism incorporates at least a second lever adapted to inter-engage a second channel in said key; said inter-engagement between said second lever and said second channel operating as defined for said at least one lever and said channel in any preceding claim.
8. A key locking mechanism as claimed in claim 6 wherein said at least a second lever is located on an opposite side of said mechanism to said at least one lever and said second channel is located on an opposite side of said key to said first channel.
9. A key locking mechanism as claimed in any one of the preceding claims wherein said mechanism also includes conventional pin tumblers or floating tumblers.
10. A key lock mechanism as claimed in any one of the preceding claims and incorporating a plurality of said at least one lever and/or a plurality of said second lever.
11. A key adapted to be used with the mechanism of any one of claims 1 to 10 wherein a side face of said key has an arcuate profile upon which a channel of generally constant width is located; said arcuate profile substantially corresponding to the arc traced out by said projection when said lever pivots within said mechanism; said channel adapted to receive a projection portion of at least one lever of said mechanism; said lever adapted to track within said channel upon the insertion of said key in said mechanism and thereby pivoting said lever within said mechanism such that said mechanism is activated between locked and unlocked states.

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12. A key as claimed in claim 11 wherein said channel defines a non-linear path within which said projection tracks when said key is inserted in said channel thereby pivoting said lever within said mechanism.

13. A key as claimed in claim 12 wherein said non-linear path comprises a plurality of intermediate paths; each said intermediate path being angularly displaced from adjacent intermediate paths.

14. A key as claimed in claim 13 wherein said channel is shaped so that the projection on said lever engages said channel at the transitional portion between said intermediate channels when said key is located within said lock at said final orientation.

15. A key as claimed in any one of claims 11 to 14 wherein said key incorporates at least a second channel located on a side face of said key opposite the side face on which the first said channel is located.

16. A key as claimed in any one of claims 11 to 15 wherein said key is adapted to inter-engage with conventional pin tumblers or floating tumblers.

17. A lock mechanism and key set, said lock mechanism including a barrel that is adapted to lock and unlock relative to a housing upon the operation of a key, said mechanism including at least one lever adapted to activate said mechanism between locked and unlocked states when located in a predetermined orientation within said mechanism; said lever incorporating a projection adapted to be received within a channel of said key;

said key incorporating at least one channel of generally constant width located on a side face of said key and adapted to receive said projection;

whereby upon insertion of said key, said projection tracks said channel thereby pivoting said lever into a final orientation when said key is sufficiently inserted in said mechanism for activation between the locked and unlocked states; said activation occurring when said final orientation corresponds to said predetermined orientation.

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18. A lock mechanism and key set as claimed in claim 17 wherein said barrel is adapted to lock and unlock relative to said housing upon the operation of a biased side bar; said at least one lever further including a first inter-engagement means which is adapted to inter-engage with said side bar so as to activate said mechanism between said locked and unlocked states.

19. A lock mechanism and key set as claimed in claim 18 wherein said at least one lever further includes at least a second inter-engagement means which is adapted to inter-engage with said side bar without activating said mechanism between said locked and unlocked states.

20. A lock mechanism and key set as claimed in any one of claims 17 to 19 wherein said first engagement means is adapted, when said at least one lever is rotated into said predetermined orientation, to receive said side bar within said at least one lever thereby unlocking said barrel relative to said housing.

21. A lock mechanism and key set as claimed in any one of claims 17 to 20 wherein said lever is un-biased in operation.

22. A lock mechanism and key set as claimed in any one of claims 17 to 21 wherein said at least one lever is adapted to rotate in a plane perpendicular to a longitudinal direction of said mechanism.

23. A lock mechanism and key set as claimed in any one of claims 17 to 22 wherein said mechanism incorporates at least a second lever adapted to inter-engage a second channel in said key; said inter-engagement between said second lever and said second channel operating as defined for said at least one lever and said channel in any preceding claim.

24. A lock mechanism and key set as claimed in any one of claims 17 to 23 wherein said at least a second lever is located on an opposite side of said mechanism to the first said lever and said second channel is located on an opposite side of said key to the first said channel.

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25. A lock mechanism and key set as claimed in any one of claims 17 to 24 wherein said mechanism also includes conventional pin tumblers or floating tumblers.
26. A lock mechanism and key set as claimed in any one of claims 17 to 25 wherein said channel defines a non-linear path within which said projection tracks when said key is inserted in said channel thereby rotating said lever within said mechanism.
27. A lock mechanism and key set as claimed in claim 26 wherein said non-linear path comprises a plurality of intermediate paths; each said intermediate path being angularly displaced from adjacent intermediate paths.
28. A lock mechanism and key set as claimed in claim 27 wherein said channel is shaped so that the projection on said lever engages said channel at the transitional portion between said intermediate channels when said lever is located in said final orientation.
29. A lock mechanism and key set as claimed in any one of claims 17 to 28 wherein said key incorporates at least a second channel located on a side face of said key opposite the side face on which the first said channel is located.
30. A lock mechanism and key set as claimed in any one of claims 17 to 29 wherein at least one side face of said key has an arcuate profile upon which said channel is located; said arcuate profile substantially corresponding to the arc traced out by said projection when said lever rotates within said mechanism.
31. A lock mechanism as claimed in any one of claims 17 through 30 wherein said key is adapted to inter-engage conventional floating tumblers or pin tumblers.
32. A key lock mechanism as claimed in any one of claims 17 through 31 and incorporating a plurality of said at least one levers and/or a plurality of said second levers.

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High Security Lock

Field of Invention

The present invention relates to high security locks and keys used in commercial buildings, business and security installations, and similar applications.

Background Art

While existing high security lock and key systems offer a reasonable level of protection, it is quite often the key which erodes the security of the system by being duplicated without proper authority. This situation occurs as over a period of time machinery and key blanks become available on the market which make unauthorised duplication possible. It is an object of the present invention to provide a system in which unauthorised duplication of keys is inhibited.

Summary of Invention

According to one aspect of the present invention there is disclosed a key locking mechanism comprising a barrel that is adapted to lock and unlock relative to a housing upon the operation of a key, said mechanism including at least one lever with a projection which is adapted to be received within a channel of generally constant width in said key, said projection adapted to track within said channel portion thereby rotating said at least one lever within said mechanism such that said mechanism is activated between the locked and unlocked states when said at least one lever is rotated into a predetermined orientation.

Preferably at least six in-line conventional pins also lock the barrel mechanism.

According to another aspect the present invention comprises a key adapted for use in such a lock wherein a side face of said key has at least one channel of generally constant width that is adapted to receive a projection portion of at least one lever of said mechanism that is adapted to track said channel thereby rotating said lever within said mechanism such that said mechanism is activated between locked and unlocked states.

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Preferably said at least one lever further includes at least a second inter-engagement means which is adapted to inter-engage with said side bar without activating said mechanism between said locked and unlocked states.

Preferably said first inter-engagement means is adapted, when said at least one lever is pivoted into said predetermined orientation, to receive said side bar within said at least one lever thereby unlocking said barrel relative to said housing.

According to another aspect of the invention, a key adapted to be used with the above mechanism is provided wherein a side face of said key has an arcuate profile upon which a channel of generally constant width is located; said arcuate profile substantially corresponding to the arc traced out by said projection when said lever pivots within said mechanism; said channel adapted to receive a projection portion of at least one lever of said mechanism; said lever adapted to track within said channel upon the insertion of said key in said mechanism and thereby pivoting said lever within said mechanism such that said mechanism is activated between locked and unlocked states.

Preferably said channel defines a non-linear path within which said projection tracks when said key is inserted in said channel.

Preferably said non-linear path comprises a plurality of intermediate paths; each said intermediate path being angularly displaced from adjacent intermediate paths.

According to another aspect of the present invention, a lock mechanism and key set is provided, said lock mechanism including a barrel that is adapted to lock and unlock relative to a housing upon the operation of a key, said mechanism including at least one lever adapted to activate said mechanism between locked and unlocked states when located in a predetermined orientation within said mechanism; said lever incorporating a projection adapted to be received within a channel of said key; said key incorporating at least one channel of generally constant width located on a side face of said key and adapted to receive said projection; whereby upon insertion of said key, said projection tracks said channel thereby pivoting said lever into a final orientation when said key is sufficiently inserted in said mechanism for activation between the locked and unlocked states; said activation occurring when said final orientation corresponds to said predetermined orientation.

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The groove, or channel, operatively engages the lever or levers of the corresponding lock so as to rotate the levers and release the lock.

The key may comprise at least two concave grooves running parallel to the length of key. Two deeper combination grooves are cut over the length of the key, these activate the combination levers and the grooves are cut on the same radius as the combination levers pivot point. In addition there is at least one blade running parallel to the key and at 90° to the concaved grooves, this blade activates the conventional pin tumblers or activates floating pins.

An advantage of this invention is that it provides a new concept in lock and key security which requires special key cutting equipment to produce the key. Various levels of security may be provided in the one lock mechanism structure. This invention provides a unique high security key and lock mechanism which can provide billions of different key combinations.

Description

Several embodiments of the present invention will now be described with reference to the drawings:

Fig 1 is a perspective view of a key according to one aspect of the present invention;

Fig 2 is a sectional view of a key profile with top blade;

Fig 3 is a sectional view of a key profile with top and bottom blade;

Fig 4 is a sectional view of a key with variations of profile;

Fig 5 is a sectional view of keys which could be used if the number or the position of the combination levers were changed in the locking mechanism;

Fig 6 is a side view of the key showing sample depth position in the combination groove and a sample of the depth position on the top blade;

Fig 7 is a schematic view showing the standard combination lever position;

Fig 8 is a section view through a lock mechanism with top blade;

Fig 9 is a section view through a level 2 lock mechanism with top and bottom blade;

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CLAIMS

1. A key locking mechanism including a barrel that is adapted to lock and unlock relative to a housing upon the operation of a key, said mechanism including at least one lever with a projection which is adapted to be received within a channel of generally constant width in said key; said at least one lever adapted to pivot within said mechanism by said projection tracking within said channel upon the insertion of said key in said mechanism whereby said at least one lever assumes a final orientation when said key is sufficiently inserted in said mechanism for activation between the locked and unlocked states; said activation occurring when said final orientation corresponds to a predetermined orientation.
2. A key locking mechanism as claimed in claim 1 wherein said barrel is adapted to lock and unlock relative to said housing upon the operation of a biased side bar; said at least one lever further including a first inter-engagement means which is adapted to inter-engage with said side bar so as to activate said mechanism between said locked and unlocked states.
3. A key locking mechanism as claimed in claim 3 wherein said at least one lever further includes at least a second inter-engagement means which is adapted to inter-engage with said side bar without activating said mechanism between said locked and unlocked states.
4. A key locking mechanism as claimed in claim 2 or claim 3 wherein said first inter-engagement means is adapted, when said at least one lever is pivoted into said predetermined orientation, to receive said side bar within said at least one lever thereby unlocking said barrel relative to said housing.
5. A key locking mechanism as claimed in any one of the preceding claims wherein said lever is un-biased in operation.

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6. A key lock mechanism as claimed in any one of the preceding claims wherein said at least one lever is adapted to pivot in a plane perpendicular to a longitudinal direction of said mechanism.
7. A key locking mechanism as claimed in any one of the preceding claims wherein said mechanism incorporates at least a second lever adapted to inter-engage a second channel in said key; said inter-engagement between said second lever and said second channel operating as defined for said at least one lever and said channel in any preceding claim.
8. A key locking mechanism as claimed in claim 6 wherein said at least a second lever is located on an opposite side of said mechanism to said at least one lever and said second channel is located on an opposite side of said key to said first channel.
9. A key locking mechanism as claimed in any one of the preceding claims wherein said mechanism also includes conventional pin tumblers or floating tumblers.
10. A key lock mechanism as claimed in any one of the preceding claims and incorporating a plurality of said at least one lever and/or a plurality of said second lever.
11. A key adapted to be used with the mechanism of any one of claims 1 to 10 wherein a side face of said key has an arcuate profile upon which a channel of generally constant width is located; said arcuate profile substantially corresponding to the arc traced out by said projection when said lever pivots within said mechanism; said channel adapted to receive a projection portion of at least one lever of said mechanism; said lever adapted to track within said channel upon the insertion of said key in said mechanism and thereby pivoting said lever within said mechanism such that said mechanism is activated between locked and unlocked states.

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12. A key as claimed in claim 11 wherein said channel defines a non-linear path within which said projection tracks when said key is inserted in said channel thereby pivoting said lever within said mechanism.

13. A key as claimed in claim 12 wherein said non-linear path comprises a plurality of intermediate paths; each said intermediate path being angularly displaced from adjacent intermediate paths.

14. A key as claimed in claim 13 wherein said channel is shaped so that the projection on said lever engages said channel at the transitional portion between said intermediate channels when said key is located within said lock at said final orientation.

15. A key as claimed in any one of claims 11 to 14 wherein said key incorporates at least a second channel located on a side face of said key opposite the side face on which the first said channel is located.

16. A key as claimed in any one of claims 11 to 15 wherein said key is adapted to inter-engage with conventional pin tumblers or floating tumblers.

17. A lock mechanism and key set, said lock mechanism including a barrel that is adapted to lock and unlock relative to a housing upon the operation of a key, said mechanism including at least one lever adapted to activate said mechanism between locked and unlocked states when located in a predetermined orientation within said mechanism; said lever incorporating a projection adapted to be received within a channel of said key;

said key incorporating at least one channel of generally constant width located on a side face of said key and adapted to receive said projection;

whereby upon insertion of said key, said projection tracks said channel thereby pivoting said lever into a final orientation when said key is sufficiently inserted in said mechanism for activation between the locked and unlocked states; said activation occurring when said final orientation corresponds to said predetermined orientation.

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18. A lock mechanism and key set as claimed in claim 17 wherein said barrel is adapted to lock and unlock relative to said housing upon the operation of a biased side bar; said at least one lever further including a first inter-engagement means which is adapted to inter-engage with said side bar so as to activate said mechanism between said locked and unlocked states.

19. A lock mechanism and key set as claimed in claim 18 wherein said at least one lever further includes at least a second inter-engagement means which is adapted to inter-engage with said side bar without activating said mechanism between said locked and unlocked states.

20. A lock mechanism and key set as claimed in any one of claims 17 to 19 wherein said first engagement means is adapted, when said at least one lever is rotated into said predetermined orientation, to receive said side bar within said at least one lever thereby unlocking said barrel relative to said housing.

21. A lock mechanism and key set as claimed in any one of claims 17 to 20 wherein said lever is un-biased in operation.

22. A lock mechanism and key set as claimed in any one of claims 17 to 21 wherein said at least one lever is adapted to rotate in a plane perpendicular to a longitudinal direction of said mechanism.

23. A lock mechanism and key set as claimed in any one of claims 17 to 22 wherein said mechanism incorporates at least a second lever adapted to inter-engage a second channel in said key; said inter-engagement between said second lever and said second channel operating as defined for said at least one lever and said channel in any preceding claim.

24. A lock mechanism and key set as claimed in any one of claims 17 to 23 wherein said at least a second lever is located on an opposite side of said mechanism to the first said lever and said second channel is located on an opposite side of said key to the first said channel.

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25. A lock mechanism and key set as claimed in any one of claims 17 to 24 wherein said mechanism also includes conventional pin tumblers or floating tumblers.

26. A lock mechanism and key set as claimed in any one of claims 17 to 25 wherein said channel defines a non-linear path within which said projection tracks when said key is inserted in said channel thereby rotating said lever within said mechanism.

27. A lock mechanism and key set as claimed in claim 26 wherein said non-linear path comprises a plurality of intermediate paths; each said intermediate path being angularly displaced from adjacent intermediate paths.

28. A lock mechanism and key set as claimed in claim 27 wherein said channel is shaped so that the projection on said lever engages said channel at the transitional portion between said intermediate channels when said lever is located in said final orientation.

29. A lock mechanism and key set as claimed in any one of claims 17 to 28 wherein said key incorporates at least a second channel located on a side face of said key opposite the side face on which the first said channel is located.

30. A lock mechanism and key set as claimed in any one of claims 17 to 29 wherein at least one side face of said key has an arcuate profile upon which said channel is located; said arcuate profile substantially corresponding to the arc traced out by said projection when said lever rotates within said mechanism.

31. A lock mechanism as claimed in any one of claims 17 through 30 wherein said key is adapted to inter-engage conventional floating tumblers or pin tumblers.

32. A key lock mechanism as claimed in any one of claims 17 through 31 and incorporating a plurality of said at least one levers and/or a plurality of said second levers.

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