

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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