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(54) **Lock cylinder and key therefor**

Schließzylinder und Schlüssel dafür

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(73) Proprietor: **Banham Patent Locks Limited**
London W8 6SF (GB)

(72) Inventor: **Talbot, Don**
West Midlands WV12 4PQ (GB)

(74) Representative: **Ward, David Ian**
Marks & Clerk LLP
Alpha Tower
Suffolk Street
Queensway
Birmingham B1 1TT (GB)

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Description

[0001] The present invention relates to a lock cylinder and a key therefor. More particularly, the present invention relates to improvements in lock security and the number of different combinations of keys and locks available through design.

Background

[0002] A conventional key-operated pin-tumbler lock mechanism is commonly used in cylinder locks. This type of lock mechanism comprises a casing with a cylindrical hole which houses a plug. The plug has an axial slot for receiving a key, known as the keyway, and a series of transverse holes which are aligned with a series of corresponding holes in the lock casing. The holes contain a set of key pins of differing lengths, behind which are a set of spring-loaded driver pins. Without a key in the lock, the pins are biased by the springs such that the key pins are located in the plug while the driver pins sit across the interface (the shear line) between the plug and the casing, thereby preventing rotation of the plug. When the correct key is inserted into the lock, the ridges on the key move the driver pins into the holes against their bias so that the ends of the key pins and the driver pins align with the shear line, allowing the plug to rotate. If an incorrect key is inserted, one or more pairs of the pins are misaligned with the shear line and the plug is prevented from rotating. A disadvantage of this type of lock mechanism is that it is vulnerable to picking, whereby tools are inserted into the keyway to move the pins into alignment with the shear line. A number of mechanisms have therefore been devised to improve the security of cylinder locks.

[0003] DE 1812052 shows a pin tumbler lock system wherein the key comprises two rows of recesses, although the recesses are deliberately arranged in an "offset" pattern, as shown in Figures 2, 9 and 10, as opposed to being aligned in pairs. The key comprises two notches 29 aligned with respect to each other on either edge of the key (Figure 6), where the notches 29 align partially with one recess on either side of the key.

[0004] The Applicant's earlier European patent, EP0892130 B1, describes a lock cylinder mechanism in which a series of passages extend across the diameter of the plug, intersecting the keyway. Each passage contains a pair of pins which are biased towards each other by compression springs. In each pair, the pins may be of the same length or one of the pins may be longer than the other pin. Where one pin is longer than the other, the shorter pin is associated with a stronger spring, such that when the lock is in its rest position, the longer pin projects across the shear line. When a complementary key is inserted into the keyway, the shorter (or one of the same length) pins are moved slightly outwardly, allowing the longer (or other of the same length) pins to move inwardly into a set of recesses provided in the key so that they are within the confines of the plug and no longer project across the shear line, allowing the plug to rotate. The key may have two rows of recesses for engagement with a single set of pins. In this embodiment, the shank of the key has a C_2-axis of rotational symmetry so that the key can operate the lock in either orientation of the shank in the keyway. The mechanism described in this patent is more resistant to picking, since the usual method of applying a torque to the plug to locate the shear line would prevent the locking pins moving to the unlocked position, thereby preventing this method of manipulation.

[0005] An inherent disadvantage of the type of lock mechanisms described above is that space limitations limit the number of different key combinations. In practice, 30,000 combinations may be considered secure enough, but ideally a single combination would be used only once making all keys unique. It follows that the greater the number of combinations, the greater the security.

[0006] It is therefore an object of the present invention to provide a key-operable lock and a key therefor which mitigates at least some of the above-stated disadvantages of known mechanisms.

Statements of invention

[0007] According to a first aspect of the present invention there is provided a key for use with a key-operable lock, said key comprising:

a handle; and

a shaft configured to fit in a keyway and having a row of recesses along its length on a first major surface and a row of recesses on an opposite major surface such that said recesses on said first major surface interconnect with said recesses on said opposite major surface and said recesses on the first and the opposite major surfaces are aligned in pairs so as to be capable of accommodating locking pins and holding them in an unlocked position; and wherein

a first transverse cut-out is provided in a first minor surface of the shaft and a second transverse cut-out is provided in an opposite minor surface of the shaft, the first and second transverse cut-outs being oppositely aligned and provided at a position which is axially spaced with respect to the pairs of recesses so that, in use, the transverse cut-outs will align with a static blocking element provided in the lock so as to allow the shaft to by-pass the blocking element on rotation of the key in the lock, and wherein the transverse cut-outs are positioned between two adjacent pairs of recesses.

[0008] Embodiments of the first aspect of the present invention therefore provide a key having an increased level of security since the key is not only configured to move the locking pins into the required position but is also configured to by-pass an additional static blocking

element provided in the lock. Axially spacing the transverse cut-outs from the pairs of recesses ensures that the key can be made as robust as possible 32441946-1-CLJOHNSON since it allows a maximum amount of material to be maintained at all positions across the key shaft. If the transverse cut-outs were aligned with the pairs of recesses very little material would remain across this portion of the shaft thereby introducing a weak point which would be susceptible to breaking, particularly when subjected to torque forces during insertion into a lock.

[0009] In accordance with the above, it is possible to increase the number of unique key combinations by simply changing the position of the transverse cut-outs along the length of the shaft. Thus, the number of unique keys any one manufacturer can produce can be multiplied by the number of different positions at which the transverse cut-outs can be provided.

[0010] It will be understood that the transverse direction will be substantially horizontal when the key is orientated in a vertical plane such as commonly required for insertion into a keyway.

[0011] In a particular embodiment six pairs of recesses are provided. According to the invention, the transverse cut-outs are provided between two adjacent pairs of recesses rather than before or after the first or last pair of recesses.

[0012] In certain embodiments, two sets of transverse cut-outs may be employed. A first set of transverse cut-outs may be axially spaced along the length of the shaft from a second set of transverse cut-outs.

[0013] The (or each) transverse cut-out may be bounded by one or more straight or curved surfaces.

[0014] In a particular embodiment, first and second rows of recesses are provided on each major surface such that the key can operate the lock irrespective of the orientation of the shank in the keyway.

[0015] In certain embodiments of the invention, it is envisaged that the position of the pairs of recesses may be adjusted by one half of the pitch spacing of the recesses so as to accommodate the transverse cut-outs therebetween. In other embodiments, an adjacent pair of recesses may be spaced by one full pitch (or some other amount) so as to accommodate the transverse cut-outs therebetween. However, it will be noted that an aim of the present invention is to allow the manufacture of a larger number of different lock and key combinations by better utilising the space available in a lock/key (i.e. without significantly altering the length of the lock/key). Accordingly, an advantage of certain embodiments of the invention is that a large number of different lock and key combinations can be devised by separating only two adjacent pairs of recesses (rather than all pairs of recesses) so as to accommodate the transverse cut-outs, without requiring the dimensions of the lock or key to be significantly altered as a result.

[0016] According to a second aspect of the present invention there is provided a key-operable lock, operable with a key such as that described above, comprising:

a casing;

a plug having a keyway therein, the plug being rotatably housed within the casing;

a plurality of transverse passages extending through the plug and casing which intersect the keyway;

a pair of locking pins slidably mounted in each passageway and resiliently biased so as to be in mutual abutment within the keyway such that one locking pin of each pair projects across an interface between the plug and casing so as to prevent rotation of the plug until a complimentary key is inserted into the keyway to move the locking pins within the confines of the plug to thereby stop the locking pins from preventing rotation of the plug; and

wherein a static blocking element is provided which extends across the interface between the plug and the casing, at a position which is axially spaced with respect to said transverse passages, such that rotation of the plug is only permitted when the complimentary key has a shaft configured to by-pass the blocking element, and wherein the blocking means is provided between two adjacent pairs of locking pins.

[0017] Embodiments of the present invention therefore provide a lock with an increased level of security since the lock can only be unlocked by a key which is not only configured to move the locking pins into the required position but is also configured to by-pass the additional static blocking element. Spacing the blocking means from the transverse passages ensures that the key can be made as robust as possible, as will be described in more detail below.

[0018] Furthermore, with the present invention it is possible to increase the number of unique lock combinations by simply changing the position of the blocking element along the length of the plug. Thus, the number of unique locks any one manufacturer can produce can be multiplied by the number of different positions at which the blocking element can be provided.

[0019] In a particular embodiment six pairs of locking pins are provided. According to the invention, the blocking means is provided between two adjacent pairs of locking pins rather than before or after the first or last pair of pins.

[0020] It will be understood that the blocking element is statically fixed in position with respect to the casing. Thus, the blocking element may be integral with the casing or may be fixedly mounted in the casing.

[0021] The blocking element may comprise an annular or part-annular disc. The disc may be orientated substantially transversely with respect to the plug and may have an inner circumference which is closer to the centre of the plug than the outer circumference of the plug. The disc may comprise a cut-out which is aligned with the keyway to allow the key into the lock, when the lock is in a locked position.

[0022] In certain embodiments, two blocking elements

may be employed. A first of the two blocking elements may be provided in the upper half of the lock and a second of the two blocking elements may be provided in the lower half of the lock. The first and second blocking elements may be axially spaced along the length of the plug.

[0023] The blocking element may also serve to retain the plug in the casing.

[0024] The plug may comprise a substantially cylindrical body having an annular recess, slot or groove into which the blocking element is received, thereby allowing the plug to rotate relative to the casing and blocking element.

[0025] According to a third aspect of the invention there is provided a locking assembly, comprising a key-operable lock according to the second aspect of the invention and a complementary key according to the first aspect of the invention.

Brief Description of the Drawings

[0026] Embodiments of the invention will now be described by way of example only, with reference to the accompanying figures, in which:

Figure 1 shows a perspective view of an embodiment of a lock cylinder according to the present invention;
Figure 2 shows a transverse cross-sectional view of part of the lock cylinder of Figure 1;
Figure 3 shows a longitudinal cross-sectional view of part of the lock cylinder of Figure 1;
Figure 4 shows a transverse cross-sectional view of the key shown in Figure 3, taken along the line AA;
Figure 5 shows a transverse cross-sectional view of the key shown in Figure 3, taken along the line BB;
Figure 6 shows a transverse cross-sectional view of a comparative key having transverse cut-outs aligned with pairs of recesses;
Figure 7 illustrates seven possible series of positions for the pairs of recesses in a key such as that shown in Figure 3, where the spacing between the recesses is adjusted to accommodate transverse cut-outs in accordance with the present invention;
Figure 8A shows a longitudinal part cross-sectional view of a portion of a lock cylinder according to a further embodiment of the present invention, wherein the exterior (rather than the cross-section) of the plug is shown; and
Figure 8B shows a transverse cross-sectional view taken along line AA of Figure 8a.

Detailed Description of Specific Embodiments

[0027] Referring to Figures 1 and 2 there is illustrated a key-operable lock cylinder 2 in accordance with an embodiment of the present invention. The lock 2 comprises a rotatable cylindrical plug (i.e. rotor) 4 which is housed in a non-rotatable casing (i.e. stator) 6 of annular cross section and a cam 8. Extending axially into the plug 4 is a keyway 10 which is eccentrically located along a diameter of the plug 4. The cam 8 is driveably coupled with the plug 4. A row of six transverse passages 12 pass through the plug 4 and casing 6 intersecting the keyway 10.

[0028] As shown in Figure 2, a region 12a of each passage 12 through the casing 6 is narrower than a region 12b of the passage 12 through the plug 4. At each interface of the passage 12 with the keyway 10 an annular seat 14 is provided. In each passage 12 is located a pair of locking pins 16, 16', each having a tapered region 16a, an annular rim 16b, a stepped region 16c and a cylindrical end region 16d. In a rest position (shown in Figure 2), the pins 16, 16' abut each other at ends 16e adjacent the tapered regions 16a.

[0029] The pins 16, 16' are resiliently biased towards each other by a compression spring 18, 18' associated with each pin 16, 16'. Each pin 18, 18' is held in place by the annular rim 16b of its associated pin 16, 16' at one end, and an annular collar 20 at a second end, said collar 20 abutting the casing 6 at an interface 22 between the plug 4 and the casing 6. For each pair of pins 16, 16' one compression spring 18' is more strongly biased. In the case where the pins 16, 16' are of different lengths, the shorter pin 16' is provided with the more strongly biased spring 18' (as shown in Figure 2). For each pin 16, 16', the distance from the end 16e of the pin 16, 16' to the rim 16b is such that in the rest position shown the longer pin 16 projects across the interface 22 between the plug 4 and the casing 6. If the pins 16, 16' are equal in length, either may be provided with the more resilient spring 18'.

[0030] As shown in Figure 3, the lock 2 further comprises a blocking element 30 provided approximately two-thirds of the way along the length of the casing 6 from the opening of the keyway 10. The blocking element 30 is constituted by a part-annular metal disc which is provided in a lower half of the casing 6 (on the side of the plug 4 which is open to the keyway 10) and extends into the plug 4. The blocking element 30 is substantially arc-shaped and has a cut-out which is aligned with the keyway 10 to allow a key 40 into the lock 2, when the lock 2 is in a locked position.

[0031] In the embodiment of Figure 3, the plug 4 has an annular recess 32 into which the blocking element 30 is received, thereby allowing the plug 4 to rotate relative to the casing 6 and blocking element 30 when the correct key 40 is inserted into the keyway 10. In addition, a retaining clip 34 is provided in an upper half of the casing 6, close to the opening of the keyway 10. The retaining clip 34 is similar to the blocking element 30 and is in the form of a part-annular metal disc which extends into the plug 4 and has a cut-out aligned with the keyway 10. In practice, the blocking element 30 and the retaining clip 34 may each serve to block a non-complementary key from operating the lock 2 as well as retaining the plug 4 within the casing 6. Certain embodiments may therefore only require one of the blocking element 30 or the retaining clip 34 to be provided to perform both functions.

[0032] As shown in Figure 3, the key 40 comprises an integrally formed handle 42 and shaft 44. The shaft 44 is tapered at a free end 46. On a first major surface 48, the shaft 44 has first 50a and second 50b rows of tapered recesses 52a, 52b along its length, said rows 50a, 50b being positioned either side of a centre line. The recesses 52a, 52b interconnect with tapered recesses provided on an opposite major surface of the shaft 44 (not shown). For each row position in the first row 50a, the depth of the interconnecting recess on the opposite second side is the same as the depth of the recess 52a in the same position of the second row 50b of the first major surface 48. The same applies to the second row 50b and so the shaft 44 has a C_2-axis of rotational symmetry along its length.

[0033] In the embodiment shown in Figure 3, each row 50a, 50b comprises six pairs of interconnected recesses 52a, 52b and the last two sets of recesses 52a, 52b have been shifted half a pitch towards the free end 46, when compared to the remaining recesses 52a, 52b. Thus, a gap X is provided in each row of recesses. A first transverse cut-out 54a is provided in a top (first minor) surface of the shaft 44 in the region of the gap X and a second transverse cut-out 54b is provided in an opposite bottom (minor) surface of the shaft 44. The first and second transverse cut-outs 54a, 54b are oppositely aligned and as they are provided in the gap X they are axially spaced with respect to the pairs of recesses 52a, 52b. By providing the transverse cut-outs 54a and 54b in the gap X, the shaft 44 still has adequate material across its width both in the region of the transverse cut-outs 54a, 54b (as shown in Figure 4) and in the region of the recesses 52a, 52b (as shown in Figure 5). If the transverse cut-outs 54a and 54b were positioned in the region of the recesses 52a, 52b (or if a cut-out was provided all along the length of the shaft 44 to by-pass the blocking element 30), as illustrated for comparison in Figure 6, the shaft 44 will be weakened and will be susceptible to braking during use.

[0034] It will be understood that, in accordance with embodiments of the present invention, the locking pins 16, 16' will be spaced to align with the recesses 52a, 52b taking into account the gap X provided in the key 40. As also shown in Figure 3, the blocking element 30 is provided adjacent the gap X.

[0035] In use, with no key 40 inserted in the keyway 10, the pins 16, 16' projecting across the interface 22 between the plug 4 and the casing 6 prevent the plug 4 from being turned. However, when the complementary key 40 is inserted into the keyway 10, the tapered end 46 of the shaft 44 will move the pins 16, 16' apart to allow the shaft 44 to be fully inserted into the keyway 10. When the shaft 44 is fully located in the keyway 10, the first row 50a of interconnected recesses 52a, 52b will be aligned with the locking pins 16, 16' and the springs 18, 18' will urge the pins into the respective recesses 52a, 52b. In turn, this will relocate the pins 16, 16' so that they do not project across the interface 22 between the plug 4 and the casing 6.

[0036] Furthermore, the transverse cut-outs 54a, 54b will align with the blocking element 30 so as to allow the shaft 44 to by-pass the blocking element 30 on rotation of the key 40 in the lock 2.

[0037] Figure 7 illustrates seven possible series of positions (labelled A, B, C, D, E, F, G) for each row of recesses 52a in a key such as that shown in Figure 3, where the spacing between the recesses 52a is adjusted to provide a gap X to accommodate transverse cut-outs in accordance with the present invention. Thus, it can be seen that series A shows the recesses 52a evenly spaced along the shaft, with the gap X being provided after the recess 52a closest to the free end 46 of the shaft 44. Series B shows the situation where the last recess 52a (closest to the free end 46) has been moved half a pitch towards the free end 46 to create the gap X between the 6th and fifth recesses 52a. Series C shows the situation where the last two recesses 52a have been moved half a pitch towards the free end 46 to create the gap X between the fifth and fourth recesses 52a. Series D shows the situation where the last three recesses 52a have been moved half a pitch towards the free end 46 to create the gap X between the fourth and third recesses 52a. Series E shows the situation where the last four recesses 52a have been moved half a pitch towards the free end 46 to create the gap X between the third and second recesses 52a. Series F shows the situation where the last five recesses 52a have been moved half a pitch towards the free end 46 to create the gap X between the second and first recesses 52a. Series G shows the situation where all six recesses 52a have been moved half a pitch towards the free end 46 to create the gap X between the first recess 52a and the handle 40. The seven series described above therefore provide seven different combinations of pin positions. We can calculate the number of possible combinations for a lock having 6 pin positions and 5 different lengths of pins as 5^6 x 7 which equals 109,375. If we also use the gap X to include a blocking element at five of these positions (excluding series A and G which are not mechanically practical) we can further increase the number of combinations by a factor of 5, leading to a total of 546,875 different combinations. Accordingly, embodiments of the invention can greatly increase the number of unique lock and key configurations available as well as increasing the security of the device.

[0038] In other embodiments of the invention, the blocking element 30 may be provided in the upper half of the casing 6 (e.g. spaced a distance behind the retaining clip 34). However, in this embodiment it will be understood that a key having suitable recesses to accommodate the locking pins but no transverse cut-outs, will be allowed to rotate in the lock 2 until the shaft of the key abuts the blocking element 30. This will occur after approximately 90° of rotation, which may not be sufficient to move the cam 8 into an unlocked position. Thus, as long as the blocking element 30 prevents the required rotation of the cam 8, it is not necessary for the blocking element 30 to completely prevent rotation of the plug 4,

as per the embodiment described above.

[0039] Figures 8A and 8B show a further embodiment of the present invention, in which two blocking elements 30 are provided in the casing 6, one of which is provided in the upper half of the casing 6 and the other of which is provided in the lower half of the casing 6. Figure 8A also shows the exterior annular recess 32 of the plug 4, which is provided to receive the blocking elements 30 so as to allow the plug 4 to rotate relative to the casing 6 and blocking elements 30, when a key having appropriate transverse cut-outs is inserted into the keyway 10. This embodiment may permit the key to be removed and/or inserted after the plug 4 and keyway 10 have been rotated by 180°. The provision of two blocking elements 30 therefore blocks incorrect keys from turning the lock regardless of which position the plug 4 is in when the key is inserted.

[0040] It will be appreciated by persons skilled in the art that various modifications may be made to the above embodiments without departing from the scope of the present appended claims.

Claims

1. A key (40) for use with a key-operable lock, said key comprising:

a handle (42) ; and
a shaft (44) configured to fit in a keyway and having a row of recesses (52a, 52b) along its length on a first major surface (48) and a row of recesses (52a, 52b) on an opposite major surface such that said recesses on said first major surface interconnect with said recesses on said opposite major surface and said recesses on the first and the opposite major surfaces are aligned in pairs so as to be capable of accommodating locking pins and holding them in an unlocked position; and
wherein a first transverse cut-out (54a) is provided in a first minor surface of the shaft and a second transverse cut-out (54b) is provided in an opposite minor surface of the shaft, the first and second transverse cut-outs being oppositely aligned and provided at a position which is axially spaced with respect to the pairs of recesses (52a, 52b) so that, in use, the transverse cut-outs will align with a static blocking element provided in the lock so as to allow the shaft to by-pass the blocking element on rotation of the key in the lock, and wherein the transverse cut-outs are positioned between two adjacent pairs of recesses.

2. The key according to claim 1 wherein two sets of transverse cut-outs are provided.

3. The key according to claim 2 wherein a first set of transverse cut-outs is axially spaced along the length of the shaft from a second set of transverse cut-outs.

4. The key according to any preceding claim wherein the position of the pairs of recesses is adjusted by one half of the pitch spacing of the recesses so as to accommodate the transverse cut-outs therebetween.

5. A key-operable lock (2) for use with a key according to any preceding claim comprising:

a casing (6);
a plug (4) having a keyway (10) therein, the plug being rotatably housed within the casing;
a plurality of transverse passages (12) extending through the plug and casing which intersect the keyway;
a pair of locking pins (16, 16') slidably mounted in each passageway and resiliently biased so as to be in mutual abutment within the keyway such that one locking pin of each pair projects across an interface between the plug and casing so as to prevent rotation of the plug until a complimentary key is inserted into the keyway to move the locking pins within the confines of the plug to thereby stop the locking pins from preventing rotation of the plug; and
wherein a static blocking element (30) is provided which extends across the interface between the plug and the casing, at a position which is axially spaced with respect to said transverse passages, such that rotation of the plug is only permitted when the complimentary key has a shaft configured to by-pass the blocking element, and wherein the blocking means is provided between two adjacent pairs of locking pins.

6. The lock according to claim 5 wherein the blocking element is integral with the casing or fixedly mounted in the casing.

7. The lock according to claims 5 or 6 wherein the blocking element comprises an annular or part-annular disc.

8. The lock according to claim 7 wherein the disc is orientated substantially transversely with respect to the plug and the distance between the inner circumference of the disc and the centre of the plug is less than the distance between the outer circumference of the plug and the centre of the plug.

9. The lock according to claim 7 or claim 8 wherein the disc comprises a cut-out which is aligned with the keyway to allow the key into the lock, when the lock

is in a locked position.

10. The lock according to any one of claims 5 to 9 wherein two blocking elements are employed.

11. The lock according to claim 10 wherein a first of the two blocking elements is provided in the upper half of the lock and a second of the two blocking elements is provided in the lower half of the lock.

12. The lock according to any one of claims 5 to 11 wherein the plug comprises a substantially cylindrical body having an annular recess, slot or groove into which the blocking element is received, thereby allowing the plug to rotate relative to the casing and blocking element.

13. A locking assembly, said locking assembly comprising a key-operable lock according to any one of claims 5 to 12 and a complementary key according to any one of claims 1 to 4.

Patentansprüche

1. Schlüssel (40) zur Verwendung bei einem mit Schlüssel betätigbaren Schloss, wobei der Schlüssel umfasst:

einen Griff (42); und
einen Schaft (44), der so konfiguriert ist, dass er in eine Schlüsselnut passt, und der eine Reihe von Ausnehmungen (52a, 52b) entlang seiner Länge auf einer ersten Primärfläche (48) und eine Reihe von Ausnehmungen (52a, 52b) auf einer gegenüberliegenden Primärfläche aufweist, so dass die Ausnehmungen auf der ersten Primärfläche sich mit den Ausnehmungen auf der gegenüberliegenden Primärfläche verbinden und die Ausnehmungen auf der ersten und der gegenüberliegenden Primärfläche paarweise ausgerichtet sind, um in der Lage zu sein, Vernegelungsstifte aufzunehmen und diese in einer unverriegelten Position zu halten; und
wobei eine erste Queraussparung (54a) in einer ersten Sekundärfläche des Schafts vorgesehen ist und eine zweite Queraussparung (54b) in einer gegenüberliegenden Sekundärfläche des Schafts vorgesehen ist, wobei die erste und die zweite Queraussparung gegenüberliegend ausgerichtet und an einer Position vorgesehen sind, die in Bezug auf die Paare von Ausnehmungen (52a, 52b) axial beabstandet ist, so dass die Queraussparungen in Verwendung sich mit einem statischen Blockierelement ausrichten, das im Schloss vorgesehen ist, um dem Schaft zu ermöglichen, das Blockierelement bei Drehung des Schlüssels im Schloss zu umgehen, und wobei die Queraussparungen zwischen zwei benachbarten Paaren von Ausnehmungen positioniert sind.

2. Schlüssel nach Anspruch 1, wobei zwei Sätze von Queraussparungen vorgesehen sind.

3. Schlüssel nach Anspruch 2, wobei ein erster Satz von Queraussparungen entlang der Länge des Schafts von einem zweiten Satz von Queraussparungen axial beabstandet ist.

4. Schlüssel nach einem vorstehenden Anspruch, wobei die Position der Paare von Ausnehmungen um eine Hälfte des Teilungsabstands der Ausnehmungen eingestellt ist, um die Queraussparungen dazwischen aufzunehmen.

5. Mit Schlüssel betätigbares Schloss (2) zur Verwendung mit einem Schlüssel nach einem der vorstehenden Ansprüche, das umfasst:

ein Gehäuse (6);
einen Zapfen (4) mit einer darin vorgesehenen Schlüsselnut (10), wobei der Zapfen drehbar innerhalb des Gehäuses aufgenommen ist;
eine Mehrzahl von Querkanälen (12), die sich durch den Zapfen und das Gehäuse erstrecken, die sich mit der Schlüsselnut schneiden;
ein Paar von Vernegelungsstiften (16, 16'), die gleitfähig in jedem Kanal angebracht und biegsam vorgespannt sind, um gegenseitig innerhalb der Schlüsselnut anzuliegen, so dass ein Vernegelungsstift jedes Paares über eine Schnittstelle zwischen dem Zapfen und dem Gehäuse vorsteht, um eine Drehung des Zapfens zu verhindern, bis ein komplementärer Schlüssel in die Schlüsselnut eingefügt wird, um die Vernegelungsstifte innerhalb der Grenzen des Zapfens zu bewegen, so dass die Vernegelungsstifte eine Drehung des Zapfens nicht länger verhindern; und
wobei ein statisches Blockierelement (30) vorgesehen ist, das sich über die Schnittstelle zwischen dem Zapfen und dem Gehäuse erstreckt, in einer Position, die in Bezug auf die Querkanäle axial beabstandet ist, so dass eine Drehung des Zapfens nur dann zugelassen wird, wenn der komplementäre Schlüssel einen Schaft aufweist, der so konfiguriert ist, dass er das Blockierelement umgeht, und wobei das Blockiermittel zwischen zwei benachbarten Paaren von Vernegelungsstiften vorgesehen ist.

6. Schloss nach Anspruch 5, wobei das Blockierelement mit dem Gehäuse integral ausgebildet oder fest im Gehäuse angebracht ist.

7. Schloss nach Anspruch 5 oder 6, wobei das Blockierelement eine ringförmige oder teilweise ringförmige Scheibe umfasst.

8. Schloss nach Anspruch 7, wobei die Scheibe in Bezug auf den Zapfen im Wesentlichen quer ausgerichtet ist und der Abstand zwischen dem Innenumfang der Scheibe und der Mitte des Zapfens geringer als der Abstand zwischen dem Außenumfang des Zapfens und der Mitte des Zapfens ist.

9. Schloss nach Anspruch 7 oder 8, wobei die Scheibe eine Aussparung umfasst, die mit der Schlüsselnut ausgerichtet ist, um das Einführen des Schlüssels in das Schloss zu ermöglichen, wenn sich das Schloss in einer verriegelten Position befindet.

10. Schloss nach einem der Ansprüche 5 bis 9, wobei zwei Blockierelemente verwendet werden.

11. Schloss nach Anspruch 10, wobei ein erstes der zwei Blockierelemente in der oberen Hälfte des Schlosses vorgesehen ist und ein zweites der zwei Blockierelemente in der unteren Hälfte des Schlosses vorgesehen ist.

12. Schloss nach einem der Ansprüche 5 bis 11, wobei der Zapfen einen im Wesentlichen zylindrischen Körper mit einer ringförmigen Ausnehmung, einem ringförmigen Schlitz oder einer ringförmigen Nut umfasst, in der bzw. dem das Blockierelement aufgenommen wird, wodurch dem Zapfen ermöglicht wird, sich in Bezug auf das Gehäuse und das Blockierelement zu drehen.

13. Vernegelungsanordnung, wobei die Verriegelungsanordnung ein mit Schlüssel betätigbares Schloss nach einem der Ansprüche 5 bis 12 und einen komplementären Schlüssel nach einem der Ansprüche 1 bis 4 umfasst.

Revendications

1. Clé (40) destinée à une serrure actionnable par une clé, ladite clé comprenant :

   une poignée (42) ; et
   un axe (44) configuré pour loger dans un passage de clé et présentant une rangée de cavités (52a, 52b) sur sa longueur sur une première surface majeure (48) et une rangée de cavités (52a, 52b) sur une surface majeure opposée de manière que lesdites cavités sur ladite première surface majeure sont interconnectées avec lesdites cavités sur ladite surface majeure opposée et que lesdites cavités de la première surface majeure et de la surface majeure opposée soient alignées par paires de manière à pouvoir recevoir des goupilles de verrouillage et à les retenir dans une position non verrouillée ; et
   dans laquelle une première échancrure transversale (54a) est prévue dans une première surface mineure de l'axe et une seconde échancrure transversale (54b) est prévue dans une surface mineure opposée de l'axe, les première et seconde échancrures transversales étant alignées en vis-à-vis et étant prévues en une position axialement espacée par rapport aux paires de cavités (52a, 52b) de manière que, à l'usage, les échancrures transversales soient alignées avec un élément de blocage statique prévu dans la serrure de manière à permettre à l'axe de passer outre l'élément de blocage lors de la rotation de la clé dans la serrure, les échancrures transversales étant positionnées entre deux paires de cavités adjacentes.

2. Clé selon la revendication 1, dans laquelle il est prévu deux ensembles d'échancrures transversales.

3. Clé selon la revendication 2, dans laquelle un premier ensemble d'échancrures transversales est axialement espacé d'un second ensemble d'échancrures transversales sur la longueur de l'axe.

4. Clé selon l'une quelconque des revendications précédentes, dans laquelle la position des paires de cavités est ajustée d'une moitié du pas des cavités de manière à assurer la disposition des échancrures transversales entre elles.

5. Serrure (2) actionnable par une clé, destinée à une clé selon l'une quelconque des revendications précédentes, comprenant :

   une enveloppe (6) ;
   un barillet (4) présentant un passage de clé (10) dans celui-ci, le barillet étant disposé rotatif dans l'enveloppe ;
   une pluralité de passages transversaux (12) traversant le barillet et l'enveloppe en intersection avec le passage de clé ;
   une paire de goupilles de verrouillage (16, 16') montée coulissante dans chaque traversée et sollicitée de façon élastique de manière à être en butée mutuelle à l'intérieur du passage de clé de manière qu'une goupille de verrouillage de chaque paire fasse saillie à travers une interface entre le barillet et l'enveloppe pour ainsi empêcher la rotation du barillet jusqu'à ce qu'une clé complémentaire soit introduite dans le passage de clé afin de déplacer les goupilles de verrouillage dans les limites du barillet pour ainsi suspendre les goupilles de verrouillage dans leur action anti-rotation du barillet ; et

dans laquelle il est prévu un élément de blocage (30) statique qui traverse l'interface entre le barillet et l'enveloppe, en une position qui est axialement espacée par rapport auxdits passages transversaux, de manière que la rotation du barillet ne soit permise que lorsque la clé complémentaire a un axe configuré pour passer outre l'élément de blocage, le moyen de blocage étant prévu entre deux paires de goupilles de verrouillage adjacentes.

6. Serrure selon la revendication 5, dans laquelle l'élément de blocage est constitutif de l'enveloppe ou monté fixe dans l'enveloppe.

7. Serrure selon l'une des revendications 5 ou 6, dans laquelle l'élément de blocage comprend un disque annulaire ou partiellement annulaire.

8. Serrure selon la revendication 7, dans laquelle le disque est orienté de manière sensiblement transversale par rapport au barillet et la distance séparant la circonférence intérieure du disque et le centre du barillet est inférieure à la distance séparant la circonférence extérieure du barillet et le centre du barillet.

9. Serrure selon la revendication 7 ou la revendication 8, dans laquelle le disque comprend une échancrure qui est alignée avec le passage de clé afin de permettre à la clé de pénétrer dans la serrure, lorsque la serrure est dans une position verrouillée.

10. Serrure selon l'une quelconque des revendications 5 à 9, dans laquelle sont employés deux éléments de blocage.

11. Serrure selon la revendication 10, dans laquelle un premier des deux éléments de blocage est prévu dans la moitié supérieure de la serrure et un second des deux éléments de blocage est prévu dans la moitié inférieure de la serrure.

12. Serrure selon l'une quelconque des revendications 5 à 11, dans laquelle le barillet comprend un corps sensiblement cylindrique présentant une cavité, fente ou rainure annulaire dans laquelle est reçu l'élément de blocage, en permettant ainsi au barillet de tourner par rapport à l'enveloppe et à l'élément de blocage.

13. Ensemble de verrouillage, comprenant une serrure actionnable par une clé selon l'une quelconque des revendications 5 à 12 et une clé complémentaire selon l'une quelconque des revendications 1 à 4.

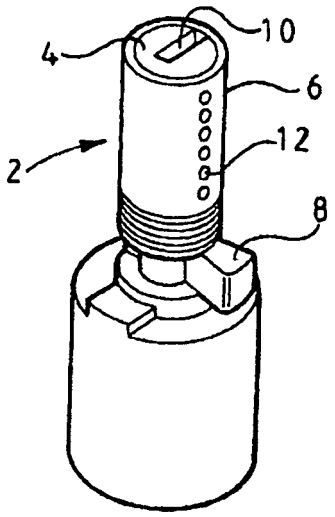

10
4
6
2
12
8

FIG 1

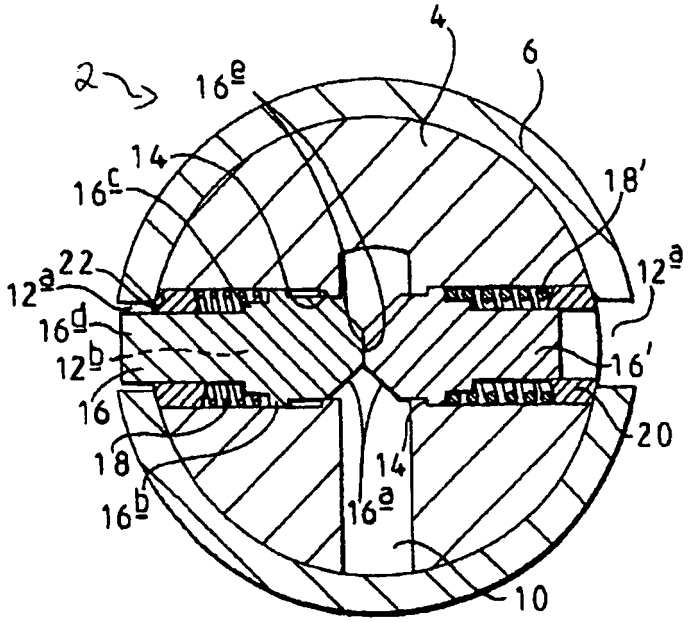

4
6
2
16e
14
16c
18'
22
12a
16d
12b
16'
16
20
18
14
16b
16a
10

FIG 2

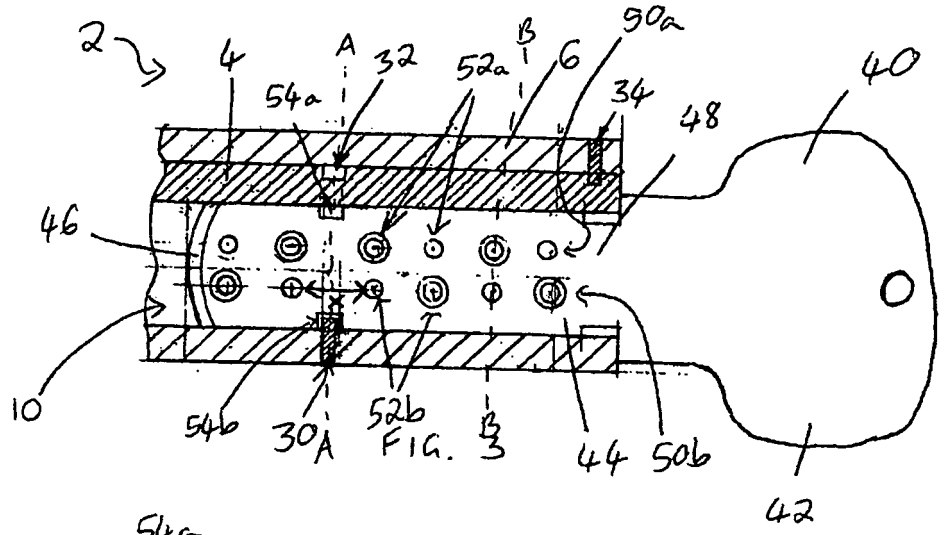


FIG. 3

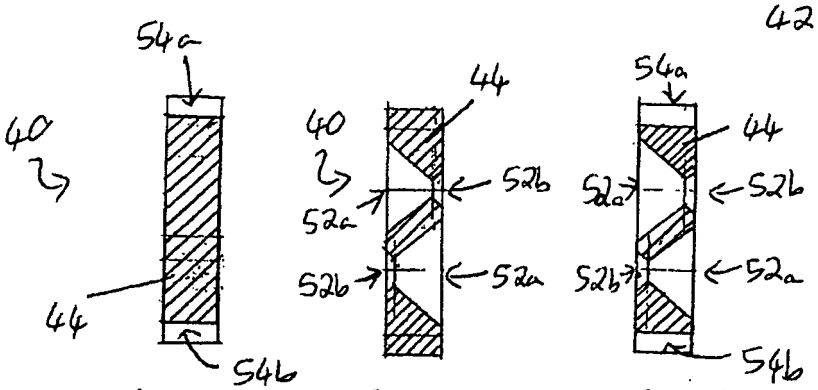


FIG. 4

FIG. 5

FIG. 6

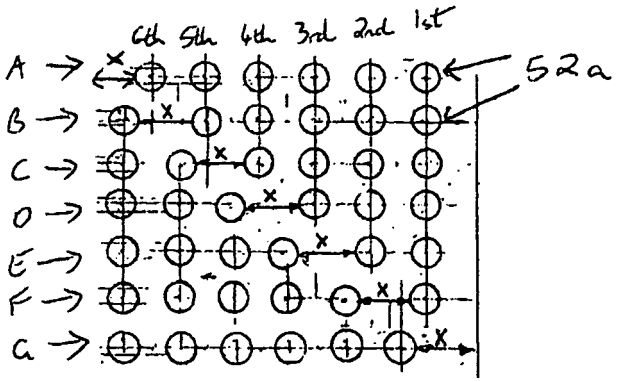


FIG. 7

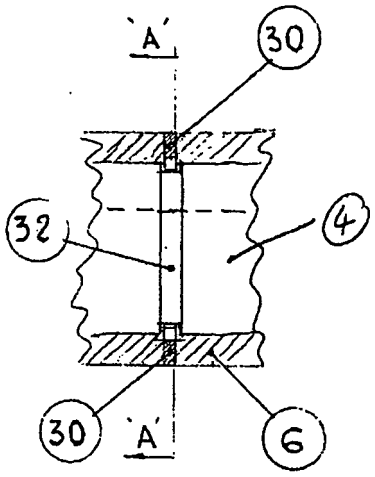


FIG. 8A

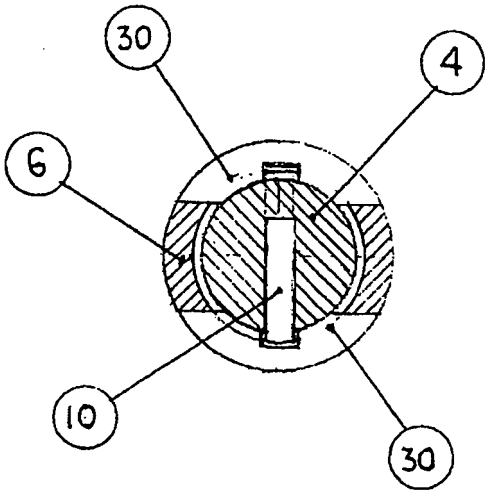


FIG. 8B

REFERENCES CITED IN THE DESCRIPTION

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- EP 0892130 B1 **[0004]**