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(54) **Key and cylinder lock unit**

Schlüssel und Zylinderschlossanlage

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(56) References cited:
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Description

[0001] This invention relates to a key and cylinder lock unit.

[0002] Locks are known comprising a cylinder forming the lock body and a plug housed in the cylinder and provided with a radially projecting pawl for operating a bolt.

[0003] The cylinder and plug comprise a plurality of radial cylindrical recesses in which pins formed in two parts are housed and can slide axially. When the key is absent the axial position of the pins is such that the separation surface between their two constituent parts does not coincide with the surface of discontinuity between the plug and cylinder, with the result that the pins act as locking members for preventing the plug rotating relative to the cylinder. When however the key is inserted into a corresponding seat provided in the plug, it causes the various pins to move axially in accordance with its pattern, such as to make the separation surface between the two constituent parts of each pin coincide with the surface of discontinuity between the plug and cylinder, to enable the plug to be rotated by said key.

[0004] Various types of patterned keys exist, one of these consisting of a key comprising along one edge a series of notches, which determine, by supporting them, the correct positioning of pins present in the lock and urged against said notches by springs.

[0005] This type of key is advantageous in that if for example the notches are formed by a cutter the axis of which is inclined to the longitudinal axis of the shaft, they are able to cause each pin to move not only axially but to also rotate, hence considerably increasing the number of possible different patterns, to the advantage of security. However this type of key also has certain drawbacks, and in particular enables the key pattern to be read on sight by an expert, hence enabling it to be duplicated even without the original key being available.

[0006] Moreover this type of key has one or both its edges toothed, such that it may damage clothing, bags and surfaces in general with which the key comes into contact.

[0007] Another known type of key uses a flat shank with its major surface and possibly its other surfaces comprising recesses for housing the ends of the pins which lock the cylinder to the plug. As the depth of each recess varies, the axial position of the respective pin also varies, and only if the key pattern corresponds to that particular lock can its insertion into the plug cause this latter to be released and to be able to be rotated relative to the cylinder.

[0008] This known type of key has a smooth edge and therefore cannot damage bags or clothing, and in addition makes it more difficult to identify the pattern merely by viewing the key. However it can cause the pins only to translate axially but not to rotate, and consequently offers a relatively limited number of different combinations, and hence an unsatisfactory degree of security.

[0009] An object of the invention is to obviate the

aforesaid drawbacks by providing a key and cylinder lock unit having a high degree of security.

[0010] A further object of the invention is to provide a unit in which for releasing the plug from the cylinder the pins are required not only to move axially but also to rotate.

[0011] A further object of the invention is to provide a unit in which the key pattern cannot be easily identified by direct viewing.

[0012] A further object of the invention is to provide a unit in which it is extremely difficult to duplicate the key, in contrast to known keys, which can be cut by a file or drill, according to the type.

[0013] A further object of the invention is to provide a unit in which key duplication requires machining along three axes.

[0014] All these objects are attained according to the invention through a key and cylinder lock unit as described in claim 1.

[0015] Two embodiments of the present invention are described in detail hereinafter with reference to the accompanying drawings, in which:

- | | |
|-----------|--|
| Figure 1 | is perspective view of a key of the unit according to the invention; |
| Figure 2 | is a longitudinal section on the line II-II of Figure 3 showing a lock of the unit according to the invention in the locked state without its key; |
| Figure 3 | is a longitudinal section on the line III-III of Figure 2; |
| Figure 4 | is a cross-section on the line IV-IV of Figure 2; |
| Figure 5 | is a partly sectional perspective view showing the lock in the released state with the key inserted; |
| Figure 6 | is a longitudinal section on the line VI-VI of Figure 7; |
| Figure 7 | is a longitudinal section on the line VII-VII of Figure 6; |
| Figure 8 | is a cross-section on the line VIII-VIII of Figure 6; |
| Figure 9 | shows a different embodiment in the same view and the same state as Figure 2; |
| Figure 10 | is a longitudinal section on the line X-X of Figure 9; |
| Figure 11 | is a cross-section on the line XI-XI of Figure 9; |
| Figure 12 | shows it in the same view as Figure 11, but in the released state with the key inserted. |

[0016] As can be seen from Figures 1-8, the unit according to the invention comprises a lock, indicated overall by 2, and a key, indicated overall by 4. The lock comprises a plug 6 housed in a cylindrical cavity of a cylinder 8, of the type for example commonly known as a "European cylinder", ie with a cylindrical portion hous-

ing the plug 6 and a radial appendix housing the pin mechanism for locking and releasing the plug.

[0017] Specifically, the cylinder 8 comprises a plurality of cylindrical recesses 10 (five in the illustrated example) having their axes mutually parallel and perpendicular to the axis of the cylindrical cavity housing the plug 6, which also comprises a like number of cylindrical recesses 12 of the same diameter, these being coaxially aligned with the corresponding recesses in the cylinder 8 when the plug 6 is in a certain precise angular position.

[0018] The five recesses 12 of the plug 6 open into a longitudinal seat 14, also provided in the plug 6, for the insertion of the key 4.

[0019] Pairs of pins 16 and counterpins 18 are free to slide axially in and rotate within each pair of aligned recesses 10, 12 and are in mutual contact along a castellated surface. Each counterpin 18 is associated with a spring 22 also housed in the corresponding cylindrical recess 10 and interposed between a disc 20, resting on said counterpin 18, and a cap 24 applied to the end of the same recess 10. The purpose of the spring 22 is to urge the pin-counterpin pair towards the longitudinal seat 14 until a retention appendix 26 emerging radially from the pin 16 encounters a shoulder 28 of a longitudinal channel 29 provided in the body of the plug between the adjacent pins 16, its purpose being to limit the rotation of the pin-counterpin pair between the two walls of said channel 29.

[0020] That end of each pin 16 distant from the counterpin 18 is provided with an eccentric appendix 30, the dimensions of the various parts concerned being such that when each retention appendix 26 rests against the corresponding shoulder 28, the eccentric appendix 30 of each pin 16 projects into the longitudinal seat 14 for the key 4.

[0021] Although the cavity in the cylinder 8 which houses the plug 6 is perfectly cylindrical, the corresponding lateral surface of the plug has a characteristic stepped shape compatible with the castellated shape of the surface of separation between each pin 16 and the relative counterpin 18 (see Figures 2, 5, 6).

[0022] The key 4 comprises a handgrip 33 and a shank 34 of overall parallelepiped section, with a chamfered tip and with each major face comprising a continuous channel 36 of width just greater than the diameter of the eccentric appendices 30. For the operation of the key it would be sufficient for the channel 36 to be provided on only one face of the key, however the presence of two channels symmetrical about the longitudinal axis of the key makes this reversible.

[0023] The channel 36, which is open and is slightly flared at the end of the key 4, is formed from a succession of several rectilinear portions arranged at an angle to each other so as to cause the channel to assume a broken-line configuration. In addition, the depth of the various portions is not constant and consequently the junction points of adjacent portions are at different distances from the outer face of the key.

[0024] The operation of the key and lock unit according to the invention is as follows:

with the key extracted, for the reasons which will be more apparent hereinafter, all the pin-counterpin pairs are positioned such that the radial appendices 26 provided on the pins 16 adhere to the corresponding shoulders 28 and the eccentric appendices 30 have the same angular position in the recess 12 housing the corresponding pin 16. In this position the stepped surface of discontinuity between each pin 16 and the relative counterpin 18 is such as not to allow the plug 6 to be rotated relative to the cylinder 8.

[0025] If a key 4 provided with the correct channel 36 for operating that lock is now inserted into the seat 14 of the plug 6, this insertion causes the channel 36 to engage the appendices 30 successively encountered and, because of the shape of said channel 36, to rotate and axially move the corresponding pin-counterpin pair within the respective cylindrical seat 10, 12.

[0026] When the key has been completely inserted into its seat (see Figures 5-8), the arrangement of each pin-counterpin pair is such that the separation surface between the two exactly prolongs the stepped lateral surface of the plug 6, to hence enable this latter to be rotated by the key 4.

[0027] After the lock has been operated, extraction of the key 4 causes the various pin-counterpin pairs to move in the reverse direction, and when the key has been completely extracted all the pairs lie at the same angle corresponding to the position of the open end of the channel 36.

[0028] This position is totally different from that set by the key 4 when completely inserted, and maintains the plug 6 locked to the cylinder 8.

[0029] In a different embodiment illustrated in Figures 9-12, the surface of separation between each pin and the relative counterpin is cylindrical instead of stepped, and the plug surface is cylindrical without steps. Each pin 16 comprises in its lateral surface a rectilinear groove 38, which for that angular position of each pin-counterpin pair established by the insertion of the key 4 is in phase with the others, to allow engagement by a further pin 40 movable axially between a position totally housed within the plug 6 and a position emerging from said plug to engage a front-standing recess 42 provided in the cylinder 8.

[0030] According to this second embodiment of the invention, when the key 4 is inserted into its seat 14 it causes all the pin-counterpin pairs to rotate and move axially; the axial movement brings the surface of discontinuity between the pin and counterpin of each pair to the level of the surface of discontinuity between the plug and cylinder, whereas the rotation of each pair brings all the grooves 38 in the pins 16 to face the pins 40, which can withdraw completely into the plug 6, to release it from the cylinder 8 and enable it to be rotated.

[0031] Independently of the embodiment used, the key and cylinder lock unit according to the invention is

considerably advantageous, and in particular:

- the key shank is without teeth, but at the same time is able to subject the pin-counterpin pairs to axial and rotational movement;
- it does not allow simple pattern identification by merely viewing the key;
- it uses a pattern with a very large number of different combination, making the lock particularly secure;
- extracting the key causes the various pin-counterpin pairs to rotate, so arranging them in a state in which they reliably lock the plug;
- for key duplication it requires expressly dedicated equipment.

Claims

1. A key and cylinder lock unit, in which the lock (2) comprises a plug (6), and a cylinder (8) provided with a radial protrusion, the plug and the protrusion being provided with a plurality of substantially radial cylindrical recesses (12,10) housing pins (16,18) formed in two parts separated by a surface, appropriately shaped for their mating which when they assume a predetermined axial and rotational position enable the plug (6) to rotate relative to the cylinder (8) under the control of a key inserted into a corresponding seat (14) provided in the plug (6) and interacting with the end of said pins which extend into said seat, characterised in that:

- that end of said pins which extends into said seat (14) is provided with an eccentric appendix (30),
- in that face facing said pins (16,18), the key (4) comprises a continuous channel (36) open towards the end of the key shank (34) and of width and cross-section suitable for housing the appendices (30) of the pins, it extending longitudinally with different depths and with a non-rectangular path,
- the shape of said channel (36) being such that when the key (4) is totally inserted into its seat (14), the axial and rotational position of each pin (16,18) are such that said plug (6) is released from said cylinder (8).

2. A unit as claimed in claim 1, characterised in that each pin comprises a first part (16) or actual pin, housed completely within the corresponding cylindrical recess (12) provided in the plug (6), and a second part (18) or counterpin, which is housed within the corresponding cylindrical recess (10) provided in the cylinder (8) and of which a part becomes housed within the relative cylindrical recess (12) of the plug (6) when the lock is locked.

3. A unit as claimed in claim 2, characterised in that the surface of discontinuity between each pin (16) and the relative counterpin (18) is step-shaped such as to prolong the similarly shaped lateral surface of the plug (6) when the lock is in its released state.

4. A unit as claimed in claim 1, characterised in that the channel (36) provided in the key (4) is formed from several portions of length corresponding to the distance between the axes of the appendices (30) of the pins (16) when these assume that angular position by which the lock is released.

5. A unit as claimed in claim 1, characterised in that the open end of the channel (36) is flared.

6. A unit as claimed in claim 1, characterised in that in the two opposing surfaces of its shank (34), the key (4) comprises two channels (36) symmetrical about the longitudinal axis of said shank.

7. A unit as claimed in claim 2, characterised in that with each pin (16) there is associated a radial appendix (26) delimiting the axial and rotational movement of said pin (16) and of the counterpin (18) associated with it.

8. A unit as claimed in claim 7, characterised in that the plug (6) comprises a longitudinal channel (29) traversing all the cylindrical recesses (12) and delimiting between adjacent recesses a space for the movement of said radial appendices (26).

9. A unit as claimed in claim 2, characterised in that in the lateral surface of each pin (16) there is provided a longitudinal groove (38), the grooves of all the pins (16) having an angular position such that when the key (4) is inserted into the lock, all said grooves (38) face further pins (49) for locking the plug (6) to the cylinder (8).

10. A unit as claimed in claim 9, characterised in that each pin (40) is housed completely in a corresponding seat in the plug (6) when one of its ends is housed in the groove (38) of the corresponding pin (16), part of it being housed at its other end in a corresponding recess (42) provided in the cylinder (8) when the first end (40) is not housed in the groove (38).

Patentansprüche

1. Schlüssel- und Zylinderschlossanlage, bei der das Schloss (2) einen Kern (6) und einen Zylinder (8) umfaßt, der mit einem radialen Vorsprung versehen ist, wobei der Kern und der Vorsprung mit einer Vielzahl von im wesentlichen radialen zylindrischen

Ausnahmen (12, 10) versehen ist, die Stifte (16, 18) aufnehmen, die aus zwei Teilen bestehen, die durch eine Oberfläche getrennt sind, damit sie passen, geeignet geformt sind und, wenn sie eine vorgegebene axiale und Drehposition einnehmen, es den Kern (6) ermöglichen, sich relativ zum Zylinder (8) zu drehen, gesteuert von einem Schlüssel, der in einen entsprechenden Sitz (14) gesteckt ist, der in dem Kern (6) vorgesehen ist, und mit den Enden der besagten Stifte zusammenwirkt, die sich in den besagten Sitz erstrecken, dadurch gekennzeichnet, dass

- das Ende der besagten Stifte, welche sich in den besagten Sitz (14) erstrecken, mit einem exzentrischen Ansatz (30) versehen ist,
- der Schlüssel (4) in der Fläche, die den besagten Stiften (16, 18) gegenüberliegt, einen kontinuierlichen Kanal (36) aufweist, der zu dem Ende des Schlüsselschaftes (34) offen ist und eine Breite und einen Querschnitt aufweist, der zur Aufnahme der Ansätze (30) der Stifte geeignet ist, und sich längs mit unterschiedlichen Tiefen auf einem nicht rechteckigen Weg erstreckt, wobei
- die Form des gesagten Kanals (36) derart ist, dass, wenn der Schlüssel (4) ganz in seinen Sitz (14) gesteckt ist, die axiale und Drehposition jedes Stiftes (16, 18) derart ist, dass der besagte Kern (6) vom Zylinder (8) freigegeben wird.

2. Anlage nach Anspruch 1, dadurch gekennzeichnet, dass jeder Stift einen ersten Teil (16) oder tatsächlichen Stift, der von der entsprechenden zylindrischen Ausnehmung (12), die in dem Kern (6) vorgesehen ist, vollständig aufgenommen wird, und einen zweiten Teil (18) oder Gegenstift umfaßt, der von der entsprechenden zylindrischen Ausnehmung (10) aufgenommen wird, die in dem Zylinder (8) vorgesehen ist, welcher Teil von der zugehörigen zylindrischen Ausnehmung (12) des Kerns (6) aufgenommen wird, wenn das Schloss gesperrt ist.

3. Anlage nach Anspruch 2, dadurch gekennzeichnet, dass die Oberfläche der Diskontinuität zwischen jedem Stift (16) und dem zugehörigen Gegenstift (18) derart stufenförmig ist, dass die ähnlich geformte Seitenoberfläche des Kerns (6) verlängert wird, wenn das Schloss in seinem geöffneten Zustand ist.

4. Anlage nach Anspruch 1, dadurch gekennzeichnet, dass der Kanal (36), der in dem Schlüssel (4) vorgesehen ist, aus mehreren Längsabschnitten gebildet ist, die dem Abstand zwischen den Achsen der Ansätze (30) der Stifte (16) entsprechen, wenn diese ihre Winkelposition einnehmen, in der das Schloss geöffnet ist.

5. Anlage nach Anspruch 1, dadurch gekennzeichnet, dass das offene Ende des Kanals (36) konisch erweitert ist.

5 6. Anlage nach Anspruch 1, dadurch gekennzeichnet, dass in den einander gegenüberliegenden Oberflächen seines Schaftes (34) der Schlüssel (4) zwei zur Längsachse des besagten Schaftes symmetrische Kanäle (36) umfaßt.

10 7. Anlage nach Anspruch 2, dadurch gekennzeichnet, dass jedem Stift (16) ein radialer Ansatz (26) zugeordnet ist, der die axiale und Drehbewegung des besagten Stiftes (16) und des im zugeordneten Gegenstiftes (18) begrenzt.

8. Anlage nach Anspruch 7, dadurch gekennzeichnet, dass der Kern (6) einen Längskanal (29) umfaßt, der sämtliche zylindrischen Ausnehmungen (12) quert und zwischen benachbarten Ausnehmungen einen Raum zur Bewegung der besagten radialen Ansätze (26) begrenzt.

20 9. Anlage nach Anspruch 2, dadurch gekennzeichnet, dass in der Seitenoberfläche jedes Stiftes (16) eine Längsnut (38) vorgesehen ist, wobei die Nuten aller Stifte (16) eine solche Winkelposition besitzen, dass, wenn der Schlüssel (4) in das Schloss gesteckt ist, allen besagten Nuten (38) weitere Stifte (49) zum Sperren des Kerns (6) gegenüber dem Zylinder (8) gegenüberliegen.

35 10. Anlage nach Anspruch 9, dadurch gekennzeichnet, dass jeder Stift (40) vollständig von einem entsprechenden Sitz in dem Kern (6) aufgenommen wird, wenn eines seiner Enden von der Nut (38) des entsprechenden Stiftes (16) aufgenommen wird, wobei ein Teil von ihm an seinem anderen Ende von einer entsprechenden Ausnehmung (42) aufgenommen wird, die in dem Zylinder (8) vorgesehen ist, wenn das erste Ende (40) nicht von der Nut (38) aufgenommen wird.

45 Revendications

1. Ensemble de serrure à cylindre et de clé, dans lequel la serrure (2) comprend un barillet (6) et un cylindre (8) formé avec un prolongement radial, le barillet et le prolongement comprenant une pluralité de logements cylindriques sensiblement radiaux (12,10) recevant des goupilles (16,18) qui sont formées en deux parties séparées par une surface conformée de façon appropriée à leur coopération et qui, quand elles occupent une position axiale et angulaire prédéterminée, permettent au barillet (6) de tourner par rapport au cylindre (8) sous commande d'une clé qui est insérée dans un passage

correspondant (14) prévu dans le barillet (6) et qui coopère avec l'extrémité desdites goupilles qui s'étendent dans ledit passage, caractérisé en ce que:

- l'extrémité desdites goupilles qui s'étend dans le passage précité (14) est pourvue d'un téton excentrique (30),
- dans sa face tournée vers lesdites goupilles (16,18), la clé (4) comprend un canal continu (36) ouvert vers l'extrémité du corps de clé (34) et ayant une largeur et une section transversale appropriées à la réception des tétons (30) des goupilles, ce canal ayant des profondeurs différentes sur son étendue longitudinale et une forme non-rectangulaire,
- la forme dudit canal (36) étant telle que, quand la clé (4) est totalement insérée dans le passage (14), la position axiale et en rotation de chaque goupille (16,18) est telle que ledit barillet (6) est déverrouillé dans ledit cylindre (8).

2. Un ensemble comme revendiqué en revendication 1, caractérisé en ce que chaque goupille comprend une première partie (16) ou goupille véritable, reçue complètement à l'intérieur du logement cylindrique correspondant (12) prévu dans le barillet (6), et une seconde partie (18) ou contre-goupille qui est reçue à l'intérieur du logement cylindrique correspondant (10) prévu dans le cylindre (8) et dont une partie est reçue à l'intérieur du logement cylindrique correspondant (12) du barillet (6) quand la serrure est verrouillée.

3. Un ensemble comme revendiqué en revendication 2, caractérisé en ce que la surface de discontinuité entre chaque goupille (16) et la contre-goupille (18) associée est de forme étagée de façon à prolonger la surface latérale conformée de façon similaire du barillet (6) quand la serrure est déverrouillée.

4. Un ensemble comme revendiqué en revendication 1, caractérisé en ce que le canal (36) prévu dans la clé (4) est formé de plusieurs parties de longueur correspondant à la distance entre les axes des tétons (30) des goupilles (16) quand celles-ci occupent la position angulaire dans laquelle la serrure est déverrouillée.

5. Un ensemble comme revendiqué en revendication 1, caractérisé en ce que l'extrémité ouverte du canal (36) est évasée.

6. Un ensemble comme revendiqué en revendication 1, caractérisé en ce que sur les deux surfaces opposées de son corps (34), la clé (4) comprend deux canaux (36) symétriques par rapport à l'axe longitudinal dudit corps.

7. Un ensemble comme revendiqué en revendication 2, caractérisé en ce qu'à chaque goupille (16) est associé un ergot radial (26) délimitant le mouvement axial et de rotation de ladite goupille (16) et de la contre-goupille (18) associée.

8. Un ensemble comme revendiqué en revendication 7, caractérisé en ce que le barillet (6) comprend un canal longitudinal (29) traversant tous les logements cylindriques (12) et délimitant entre des logements adjacents un espace pour le déplacement desdits ergots radiaux (26).

9. Un ensemble comme revendiqué en revendication 2, caractérisé en ce qu'une rainure longitudinale (38) est prévue dans la surface latérale de chaque goupille (16), les rainures de toutes les goupilles (16) ayant une position angulaire telle que, quand la clé (4) est insérée dans la serrure, toutes lesdites rainures (38) font face à d'autres goupilles (40) pour le verrouillage du barillet (6) dans le cylindre (8).

10. Un ensemble comme revendiqué en revendication 9, caractérisé en ce que chaque goupille (40) est logée complètement dans un siège correspondant du barillet (6) quand une de ses extrémités est reçue dans la rainure (38) de la goupille correspondante (16), une partie de la goupille (40) étant reçue à son autre extrémité dans un logement correspondant (42) prévu dans le cylindre (8) quand sa première extrémité (40) n'est pas logée dans la rainure (38).

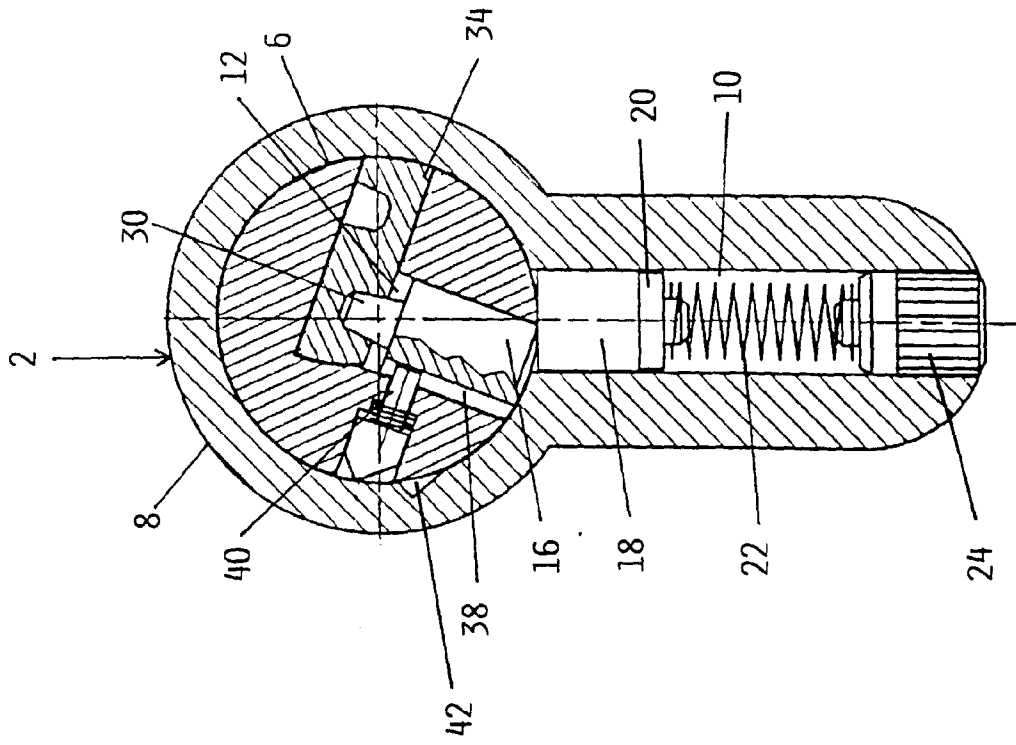


FIG. 12

FIG. 1

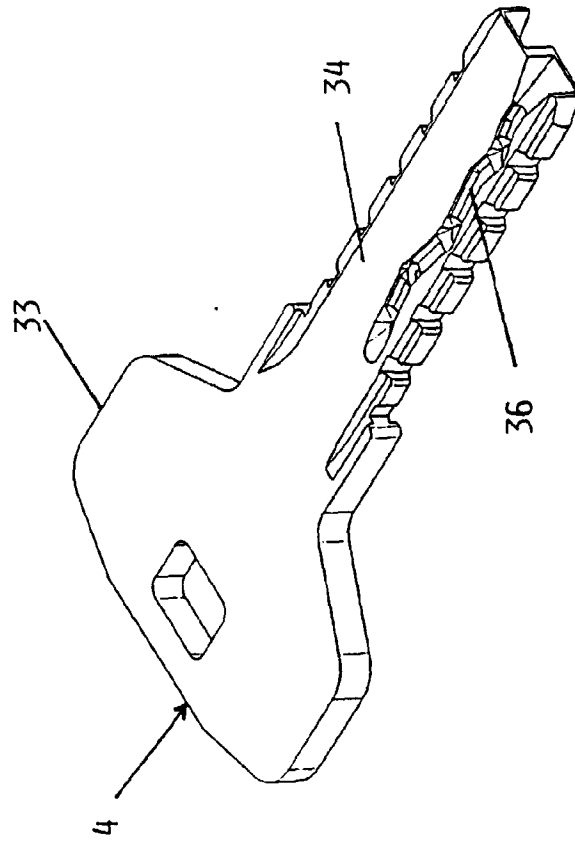


FIG. 2

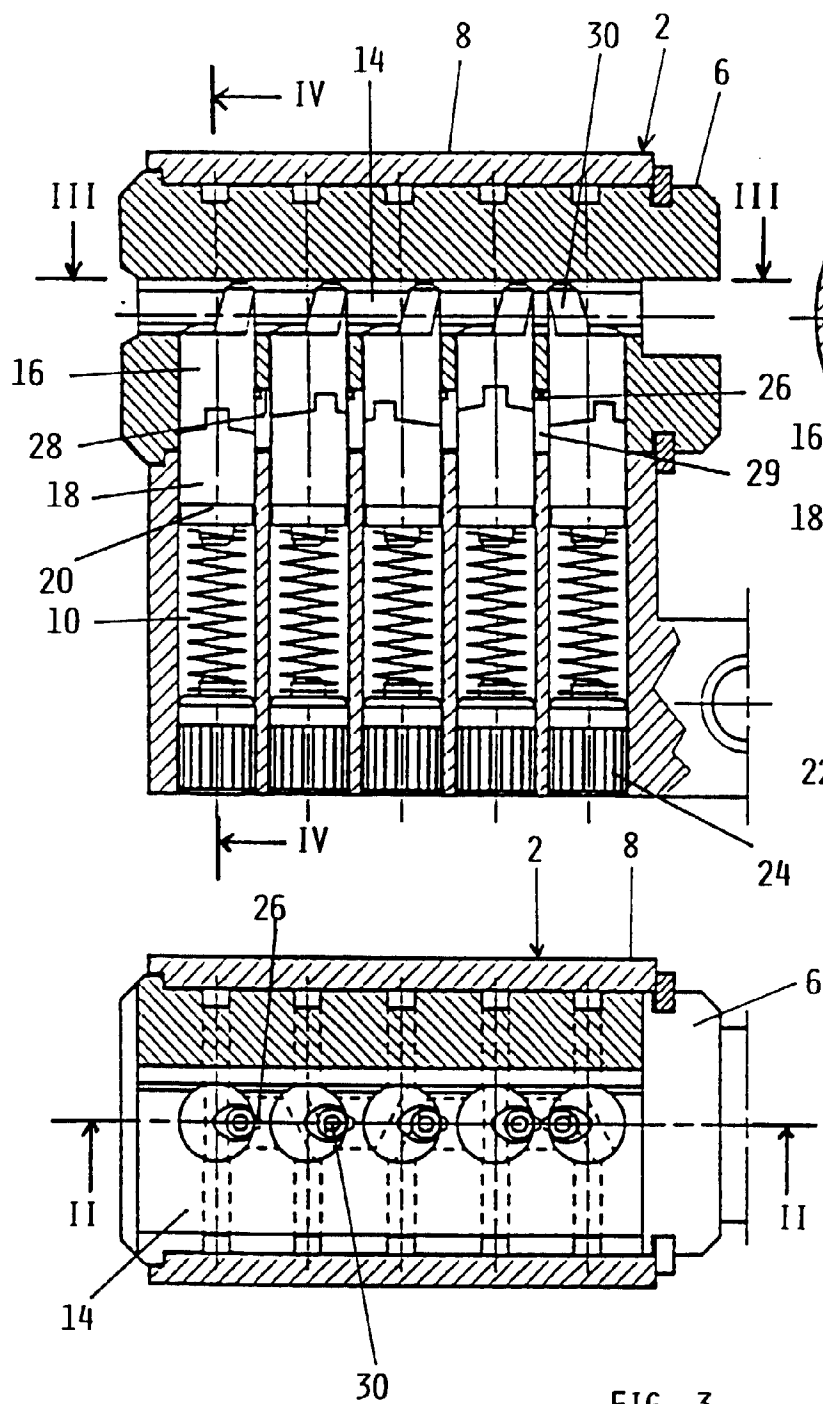


FIG. 4

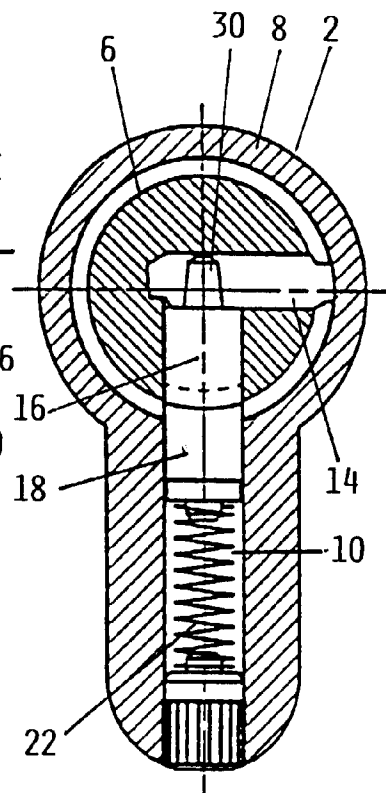
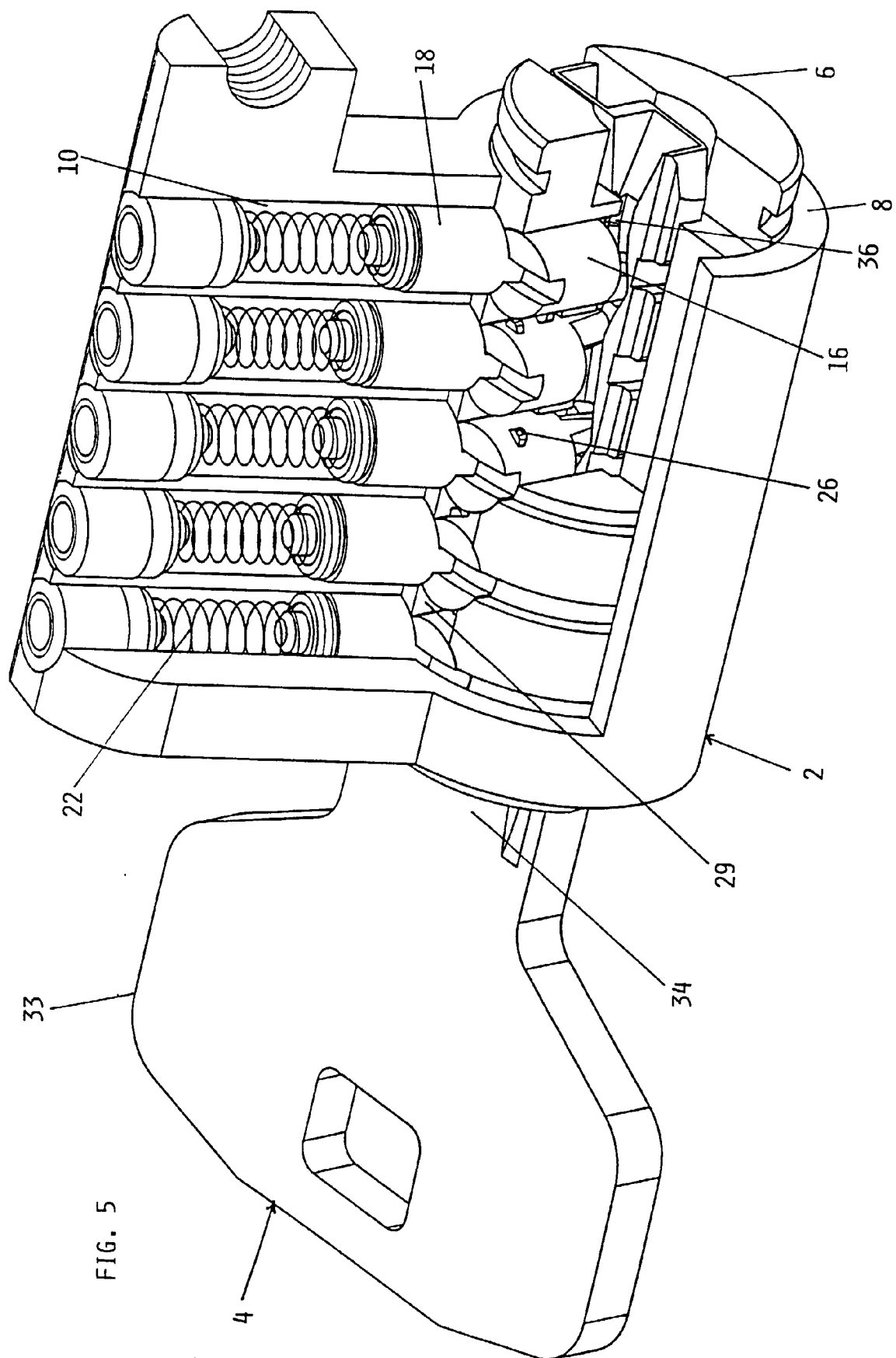


FIG. 3



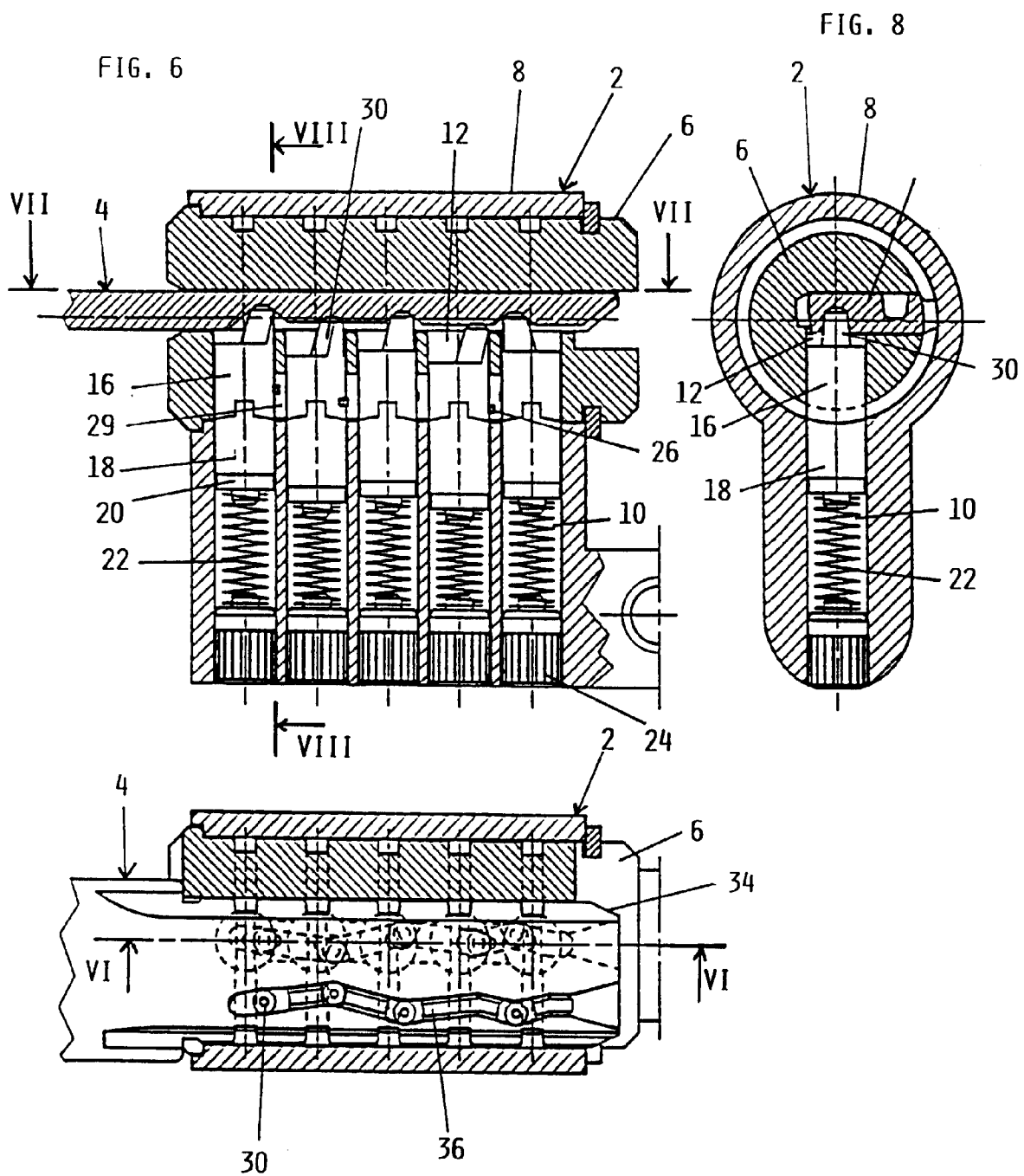


FIG. 7

FIG. 9

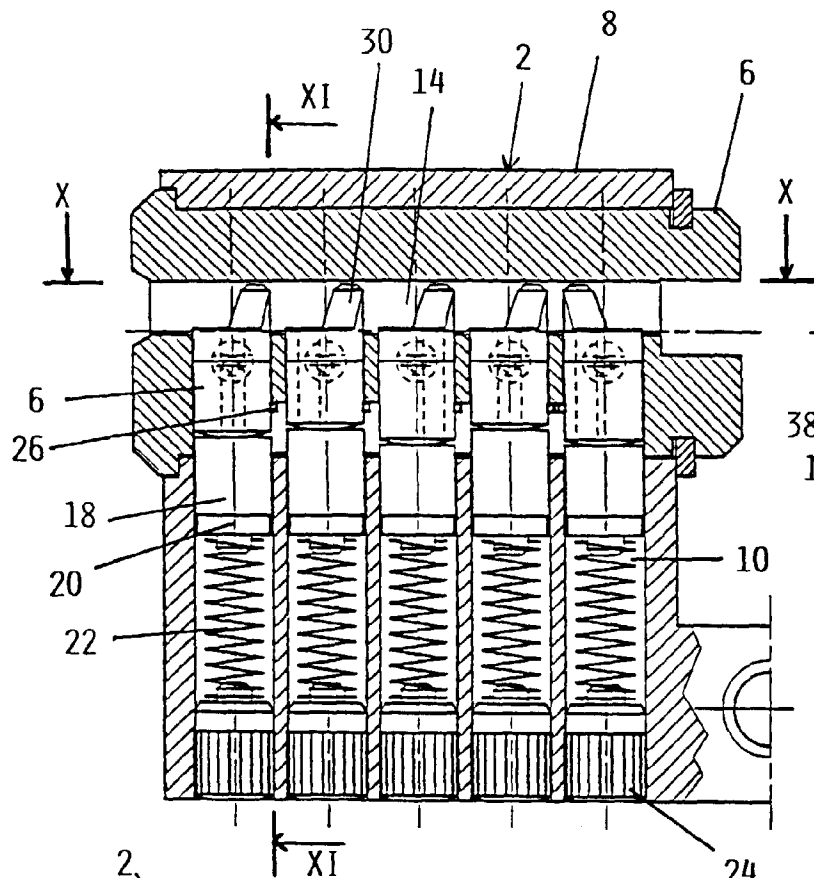


FIG. 11

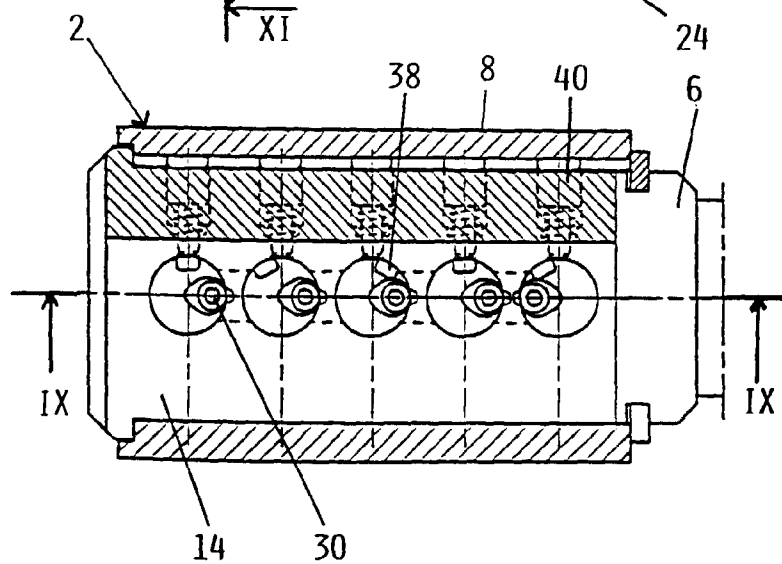
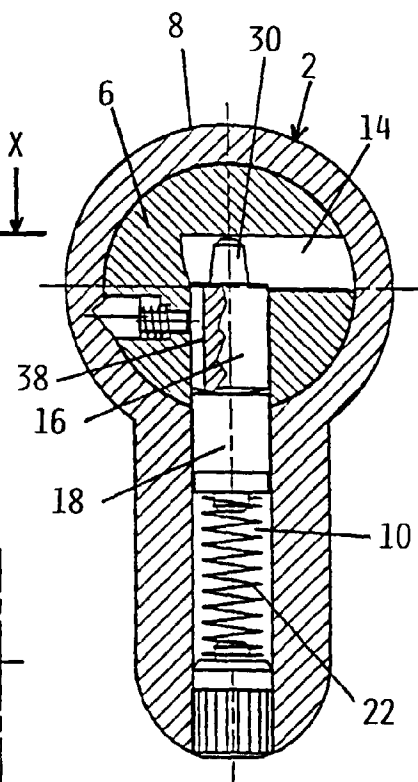


FIG. 10