(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 975 351 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
01.10.2008 Bulletin 2008/40

(51) Int Cl.:
E05B 27/00 *(2006.01)* ***E05B 35/10*** *(2006.01)*

(21) Application number: **07425182.8**

(22) Date of filing: **28.03.2007**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC MT NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK RS

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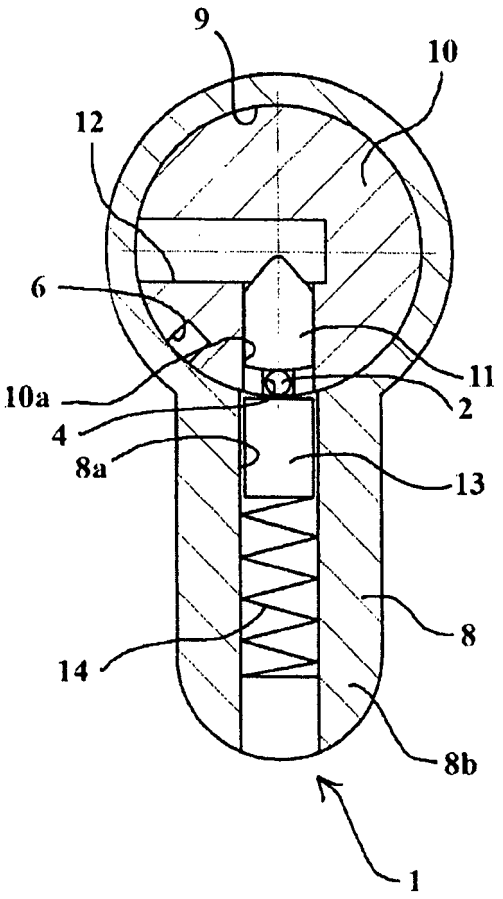
(54) Rekeyable cylinder lock

(57) Described herein is a cylinder lock of the type comprising a lock body or stator (8), a cylinder or rotor (10), mounted so that it can turn in the body and having a passage (12) for introduction of a key, an aligned series of first pins (11) mounted so that they can slide radially in the cylinder (10) in positions distributed along the axis of the cylinder, and an aligned series of second pins (13), slidably mounted in the stator (8) and designed to co-operate with said first pins (11), said lock being characterized in that it moreover comprises:
- a rekeying element (2), which is set in a position corresponding to the interface between the rotor and the stator, in a first position said rekeying element preventing two or more of said first pins (11) from co-operating with respective second pins (13); and
- a main key (3b) comprising a key body, which, when said key is inserted in said key passage (12), cooperates with said two or more first pins (11) so as to displace said rekeying element (2) into a second position such that, following upon rotation of the rotor (10), said rekeying element (2) sets itself within a seat (6) made in said rotor (10) so as not to be able to interact any longer with said two or more first pins (11).

FIG. 1



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Description

[0001] The subject of the present invention is a cylinder lock, of the type comprising a lock body or stator, a cylinder or rotor, mounted so that it can turn in the body and having a passage for introduction of a key, and an aligned series of first pins mounted so that they can slide radially in the cylinder in positions distributed along the axis of the cylinder, and an aligned series of second pins, mounted so that they can slide radially in the stator and designed to co-operate with said first pins.

[0002] In particular, the present invention refers to a cylinder lock of the rekeyable type, which can be operated with different keys, following upon rekeying operations.

[0003] Cylinder locks of this type are by now extremely widespread and extensively used in the building sector, for providing, for example, during work-site operations, in which a complex of dwellings is being built, the possibility of using a single site key common to all the locks associated to each of the various dwellings, and, at the moment when the latter are handed over to the owners, the possibility of rekeying the locks with purposely provided means in such a way that each lock will be operated only using a specific owner's key.

[0004] In the case referred to above, in order for the cylinder locks of the complex of dwellings to be operable first by a common worksite key and then only by a specific owner's key for each lock, it is necessary that they should have rekeying means that act so as to render the rekeying characteristics of a number of rekeying elements the same as one another initially and subsequently different in such a way that deriving from a single lock combination is a number of different combinations equal to the number of locks of the set.

[0005] Cylinder locks of a rekeyable type according to the known art have a very complex structure that requires extremely elaborate rekeying operations, so that providing locks of a rekeyable type according to the known art in sets of the type referred to above characterized by a large number proves extremely complicated and difficult to achieve.

[0006] The purpose of the present invention is to provide a cylinder lock of a rekeyable type having a very simple structure that envisages rekeying means provided for offering ample possibilities of variation of the lock combination, so as to enable a user to obtain sets of locks of the type described above that, as will be illustrated in what follows, are suited to a wide range of settings of operation.

[0007] The above purposes are achieved by a cylinder lock of the type described in the preamble of Claim 1, and characterized in that it comprises: a rekeying element, which is set in a position corresponding to the interface between the rotor and the stator, in a first position said rekeying element preventing two or more of said first pins from co-operating with respective second pins; and a main key comprising a key body, which, when said key is inserted in said key passage, co-operates with said two or more first pins so as to displace said rekeying element into a second position such that, following upon rotation of the rotor, said rekeying element sets itself within a seat made in said rotor so as not to be able to interact any longer with said two or more first pins.

[0008] The rekeying element according to the present invention is provided for co-operating with a plurality of first pins of the stator so that, in an extremely simple way and with a far from complicated structure, it is possible to intervene on a number of rekeying characteristics of the lock. Furthermore, deactivation of the rekeying element, and hence rekeying of the lock, is obtained in a simple and fast way via the use of a main key specific for each lock.

[0009] Further characteristics and advantages will be evident from the ensuing description with reference to the attached plates of drawings, which are provided purely by way of non-limiting example and in which:

- Figures 1-4 are cross-sectional views of the cylinder lock according to the invention in which the rekeying means are in different positions;
- Figure 5 shows a cross-sectional view according to the line V-V of Figure 1 in which a worksite key is inserted into the lock;
- Figure 6 shows a cross-sectional view according to the line VI-VI of Figure 1 in which an owner's key is inserted into the lock; and
- Figures 7 and 8 are partial perspective views of the stator body and of the rotor, respectively, of the lock according to the invention.

[0010] With reference to Figures 1-6, the lock 1 comprises a body 8 or stator traversed by a cylindrical passage 9, within which a rotor or cylinder 10 is mounted so that it can turn. Provided in the cylinder 10 is a series of first pins 11 mounted slidably and radially within respective radial holes 10a made in the cylinder 10 giving out into the passage 12 made axially through the cylinder 10, for introduction of a key.

[0011] The first pins 11 co-operate with second pins 13, mounted so that they can slide radially in respective holes 8a, which are made in an area corresponding to a flange extension 8b of the stator body 8, and recalled by springs 14 against the first pins 11.

[0012] A rekeying element 2 is set in an area corresponding to the interface between the cylinder 10 and the stator body 8, set between the first and second pins 11, 13.

[0013] As may be seen in Figures 5 and 6, the rekeying element 2 is formed by a bar that extends in an area corresponding to the interface between the cylinder 10 and stator 8, in a direction parallel to the axis of rotation of the cylinder 10.

[0014] In particular, as may be seen in Figure 7, in an area corresponding to the cylindrical surface of the cylinder 10 a notch 4 is provided, extending parallel to the axial direction of the cylinder by at least a stretch equal

to the length of the bar 2. Preferably, the notch 4 extends throughout the length of the cylinder 10. The notch 4 develops also in depth in a radial direction of the cylinder 10. The bar 2 can then set itself in the cylinder 10 so as to traverse a number of radial holes 10a and consequently intercept the respective first pins 11 provided therein.

[0015] A corresponding notch 5 is further envisaged in the stator body 8 (visible in Figure 8) in a position corresponding to the cylindrical passage 9 where the holes 8a within which the second pins 13 slide are made. The notch 5 extends parallel to the axial direction of the cylindrical passage 9 for a stretch equal at least to the length of the bar 2. Preferably, the notch 5 extends throughout the length of the cylindrical passage 9. The notch 5 develops also in depth in a direction substantially parallel to the direction of translation of the second pins 13.

[0016] When the cylinder 10 is in an angular position such that the notches 4 and 5 face one another, the bar 2 can then be translated between the cylinder 10 and the stator 8 in a direction substantially parallel to the direction of sliding of the second pins 13. The bottom surfaces of the notches 4 and 5 define end positions of the bar 2 within the cylinder 10 and the stator 8, respectively. The notch 4 has a depth equal to the thickness, in the radial direction of the rotor, of the bar 2, in such a way that the bar 2 bearing upon the bottom of the notch 4 is substantially flush, at its opposite side facing the outside of the rotor, with the cylindrical surface of the latter.

[0017] The second pins 13, which are pushed by the springs 14, act on the bar 2 so as to maintain the latter in the aforesaid end position within the rotor and flush with the cylindrical surface thereof. The bar 2 blocked in said end position prevents the first pins 11 intercepted thereby from acting through the second pins 13 for determining the combination of the lock. In fact, in this configuration, the first pins 11 do not co-operate with the respective second pins 13, which are blocked by the bar 2 outside of the rotor 10 so that the latter is free to rotate independently of the "keying" (i.e., the conformation of the key body) that a key inserted presents in the area corresponding to said first pins 11. In this sense, the first pins 11 on which the bar 2 acts are "de-activated".

[0018] Thanks to the rekeying element 2 according to the present invention, it is thus possible to "de-activate" a plurality of first pins 11 of the rotor 10 in such a way as to modify the combination of the lock. The combination varies in the sense that a smaller number of pins, with respect to the total number of pins available, is active for determining the effective combination of the lock. In the case where it is desired to provide a set of cylinder locks that may be activated using a single common key, for example using a site key, it is necessary to envisage a given number of first pins 11 with the same keying characteristics, understood as height and position of the pins, so that by "de-activating", via the bar 2, the further first different pins 11, the aforesaid first pins 11 provide in each lock one and the same combination associated to the aforesaid site key.

[0019] In the embodiment described herein, the bar 2 is provided for acting on three first pins 11 of the cylinder 10 (Figure 5). The bar 2 can, however, have a length such as to act on the number of first pins 11 desired for the various applications. In addition, it is also possible to envisage a number of rekeying elements 2 set at the interface between the rotor and the stator in areas corresponding to first nonconsecutive pins of the succession of pins provided in the rotor.

[0020] With the cylinder locks according to the present invention, it is moreover possible to provide a set of locks, which, in an initial stage of use, provides a first common key, and, in a subsequent stage of use, is differentiated into sub-set of locks each provided with a respective second key, common to the locks of the same sub-set. In a final stage of use, the locks of each sub-set can be differentiated from one another by being provided with a specific keying configuration. In this particular arrangement of a set of locks, it is possible to provide a number of rekeying elements 2, which are removed (with the modalities described in what follows) in subsequent stages of use of the locks. In fact, from the initial set of locks presenting the first key common to all the locks, once a first rekeying element is removed, the various sub-sets of locks are defined, each formed by the locks with the "activated" pins that have the same keying characteristics. The locks of different sub-sets are differentiated from one another as regards the various keying characteristics of said "activated" pins. At the same time, the locks of the same sub-set can be activated via the second common key thanks to the presence of the further rekeying element that acts on the remaining "de-activated" pins. Once also the further rekeying element in the various sub-sets has been removed, each lock is provided with a specific keying configuration.

[0021] The cylinder locks according to the invention are consequently extremely flexible and suited for generating sets and sub-sets of cylinder locks with a worksite key and owner's keys, in the number and with the modalities required in the individual cases. As highlighted above, the locks according to the invention are extremely flexible and can be easily adapted to the requirements of use. Setting of each lock so as to be prearranged for a given set and sub-set is extremely simple and easy to study at the design level, in so far as the bar, which constitutes the rekeying means according to the invention, enables a wide range of possibilities of setting since it is possible to choose selectively and vary according to the cases its length, and hence the number of rekeying elements (the first pins 11) on which it acts, the position, the number, and, in the case where a number of bars is envisaged, the number of steps for de-activation of said bars.

[0022] With reference to Figures 1 to 4, the cylinder 10 has a housing seat 6 at a radial end that is rotated through a certain angle with respect to the radial holes 10a of the cylinder 10. The housing seat 6 extends in a direction substantially parallel to the axis of rotation of the cylinder

10. Preferably, in order to provide the structure of the cylinder lock with a greater flexibility, the housing seat 6 extends throughout the length of the cylinder 10.

[0023] Figures 1 and 5 illustrate a condition where a site key 3a is inserted within the key passage 12. The body of the site key has, at its longitudinal section designed to co-operate with the pin 11 "de-activated" via the bar 2, a cross section of dimensions such that the pin 11 and the bar 2 lie within the cylinder 10. As may be seen in the figures, the notch 4 provided in the cylinder 10 has a depth equal to the radial thickness of the bar 2, in such a way that the second pin 13 that acts against the bar 2 remains on the borderline between the stator body 8 and the rotor 10, on the outside of the latter, the cylinder 10 consequently being free to rotate. It is thus evident that the body of the site key has a cross section co-operating with the first "de-activated" pins 11 of maximum dimension such that, also in the cylinder lock of the set of locks that has first pins 11 "de-activated" of greatest longitudinal extension, said pins and the bar 2 lie within the cylinder 10. Preferably, the site key has a key body with the aforesaid maximum dimension in an area corresponding to the entire portion thereof co-operating with the "de-activated" pins 11.

[0024] There thus clearly emerges the ease and simplicity of setting the cylinder locks according to the invention in order to organize and generate sets of locks of a number varying according to the requirements and having a common worksite key and specific owner's keys for each lock.

[0025] Figures 2 and 6 represent a condition where the owner's key 3b of the lock shown in said figures is inserted within the key passage 12. As is envisaged in conventional locks, the owner's key has keying characteristics, which, in combination with the keying characteristics of the first pin 11, provide a configuration such that the cylinder 10 is free to rotate. The first pin 11 is in fact carried by the aforesaid specific key within the cylinder 10 flush with the external surface of the latter, as generally occurs during activation of conventional locks. The displacement of the pin 11 brought about by the owner's key entails a translation of the bar 2 within the housing notch 5 provided in the stator body 8. Following upon rotation of the cylinder 10, as may be seen in Figures 3 and 4, once the housing seat 6 provided in the cylinder 10 is brought to correspond to the holes of the stator body 8 in which the second pins 13 slide, the bar 2 is pushed by said pins 13 within the aforesaid seat 6. A further rotation of the cylinder 10 draws the bar 2 along, said bar 2 remaining trapped within the cylinder 10. In this way, activation of the cylinder lock is enabled only with the owner's key. For ease of implementation, it is preferable to envisage a housing seat 6 presenting a circumferential width smaller than the transverse dimension of the second pins 13. In this way, in fact, the pins 13, irrespective of the dimension of the bar 2 and of the seat 6, cannot be inserted within the latter and in any way constitute an obstacle to rotation of the cylinder 10 within the stator body 8.

[0026] It is evident from what has been said above that the present invention provides a cylinder lock of the rekeyable type characterized by a high simplicity of construction and use, in which rekeying of the cylinder lock is moreover carried out in a simple and fast way using a main specific key.

[0027] Of course, the details of construction and the embodiments of the invention may vary widely with respect to what is described and illustrated herein, without thereby departing from the scope of the present invention, as defined in the ensuing claims.

Claims

1. A cylinder lock, of the type comprising a lock body or stator (8), a cylinder or rotor (10), mounted so that it can turn in the body and having a passage (12) for introduction of a key, an aligned series of first pins (11) mounted so that they can slide radially in the cylinder (10) in positions distributed along the axis of the cylinder, and an aligned series of second pins (13) mounted slidably in the stator (8) and designed to co-operate with said first pins (11), said lock being **characterized in that** it moreover comprises:

   - a rekeying element (2), which is set in a position corresponding to the interface between the rotor and the stator, in a first position said rekeying element preventing two or more of said first pins (11) from co-operating with respective second pins (13); and
   - a main key (3b) comprising a key body, which, when said key is inserted in said key passage (12), co-operates with said two or more first pins (11) so as to displace said rekeying element (2) into a second position such that, following upon rotation of the rotor (10), said rekeying element (2) sets itself within a seat (6) made in said rotor (10) so as not be able to interact any longer with said two or more first pins (11).

2. The cylinder lock according to Claim 1, **characterized in that** said rekeying element (2) is a bar (2) provided for co-operating with two or more of said first pins.

3. The cylinder lock according to Claim 1, **characterized in that** said bar (2) extends according to a direction parallel to the axis of rotation of the rotor (10).

4. The cylinder lock according to Claim 1, **characterized in that** said bar (2) is constrained so that it is free to translate between said first position and said second position according to a direction parallel to the direction of translation of said second pins (13).

5. The cylinder lock according to Claim 3, **characterized in that** said first position is identified within the rotor (10) in such a way that said bar (2) is flush with the external surface of said rotor.

6. The cylinder lock according to Claim 5, **characterized in that** provided on said rotor is at least one contrast notch (4), which extends in a direction substantially parallel to the axis of rotation of the rotor, within which said bar (2) sets itself, the bottom surface of said notch identifying said first position of said bar.

7. The cylinder lock according to Claim 6, **characterized in that** said notch has a depth equal to the dimension of the bar in the radial direction of the rotor.

8. The cylinder lock according to Claim 7, **characterized in that** said notch extends throughout the length of the rotor.

9. The cylinder lock according to Claim 4, **characterized in that** said second position is identified on the outside of the rotor.

10. The cylinder lock according to Claim 9, **characterized in that** provided on said stator (8) is at least one contrast notch (5), within which said bar (2) sets itself in said second position.

11. The cylinder lock according to Claim 1, **characterized in that** a secondary key (3a) is provided having a key body that, when said key is inserted in said key passage, is such that said bar (2) remains in said first position.

12. The cylinder lock according to Claim 11, **characterized in that** the cross sections of the body of said secondary key (3b), which interact with said two or more first pins (11), have dimensions equal to or smaller than the difference between the radius of the cylinder minus the length of respective ones of said two or more first pins and the thickness of said rekeying element.

FIG. 4

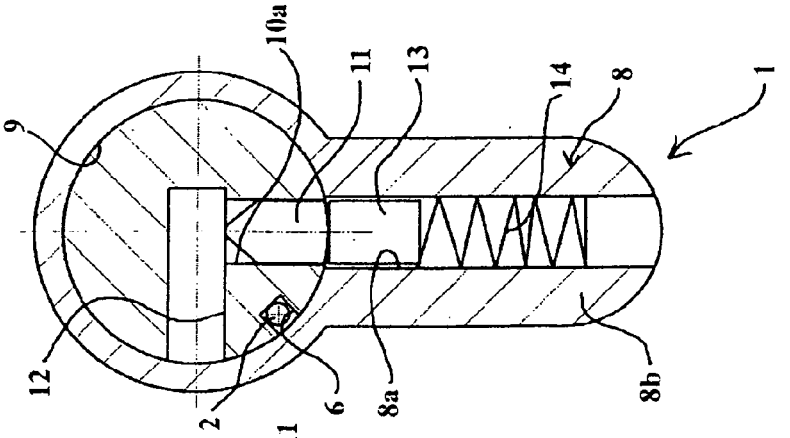


FIG. 3

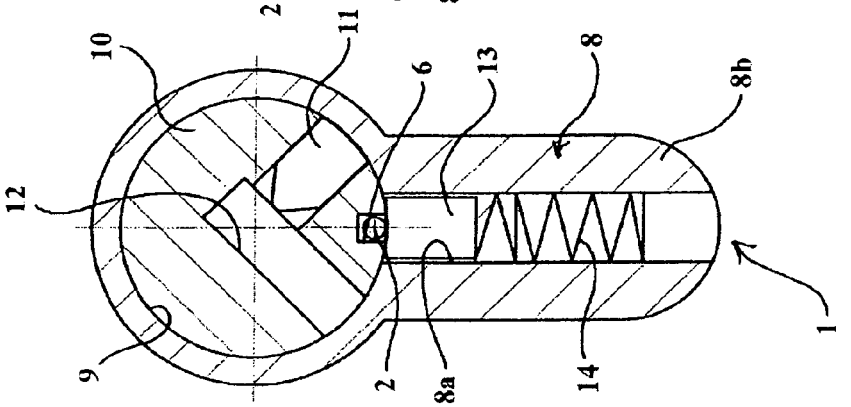


FIG. 2

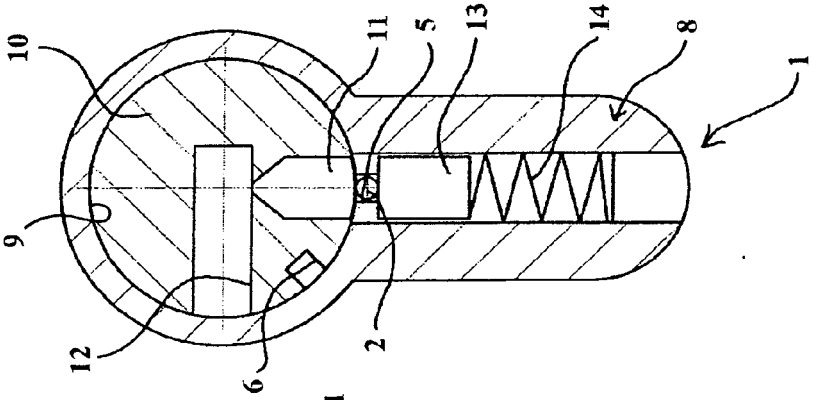


FIG. 1

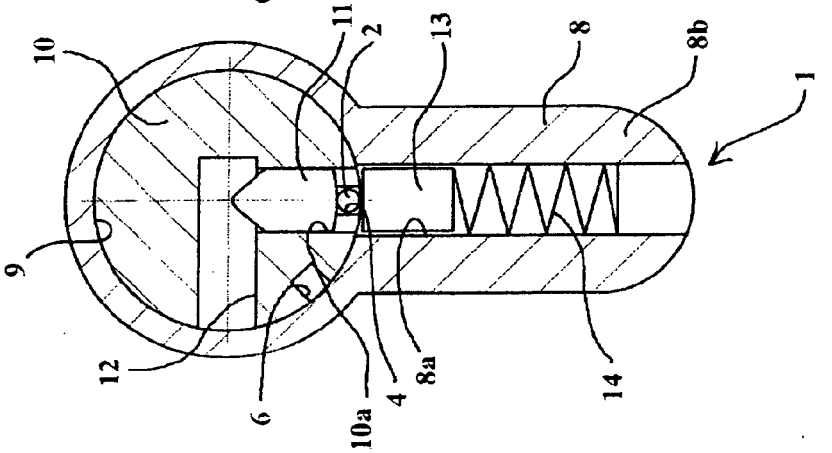


FIG. 5

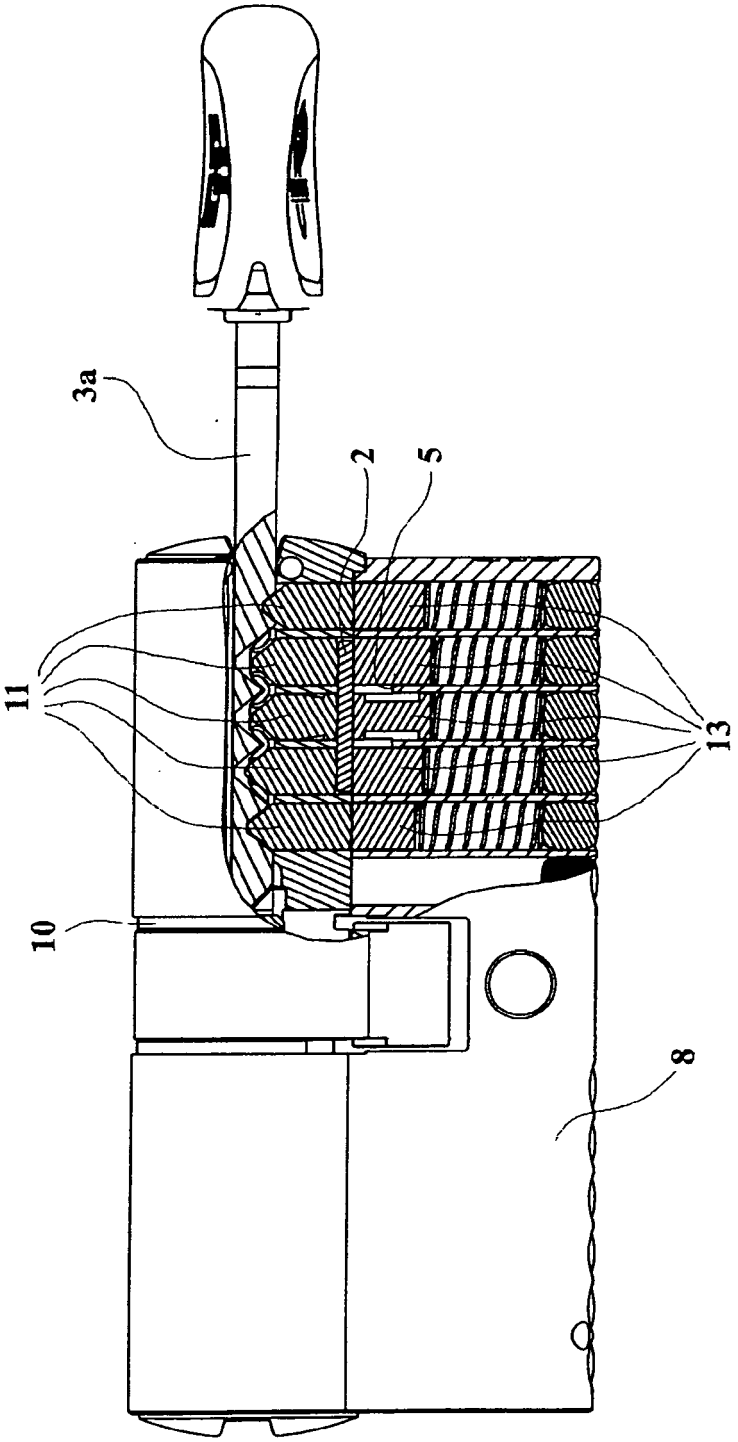


FIG. 6

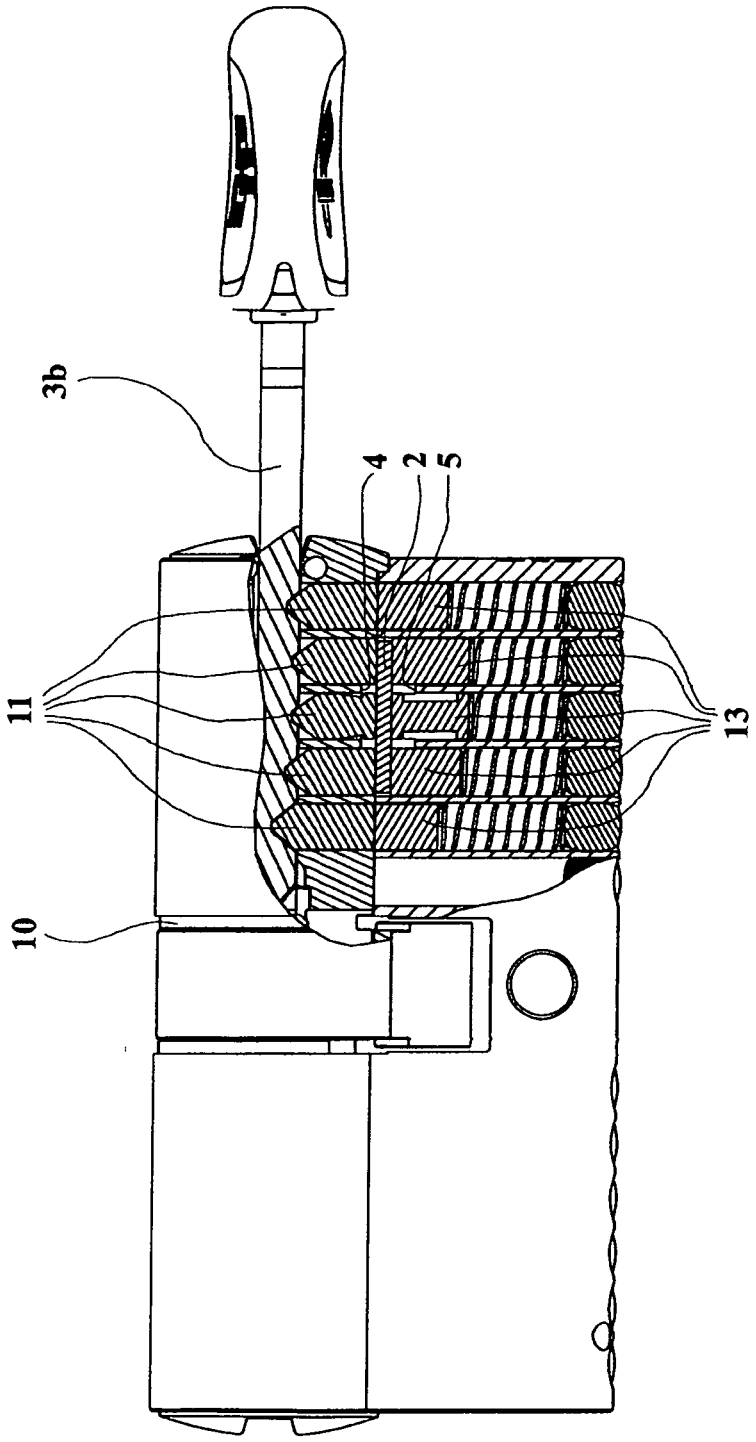


FIG. 8

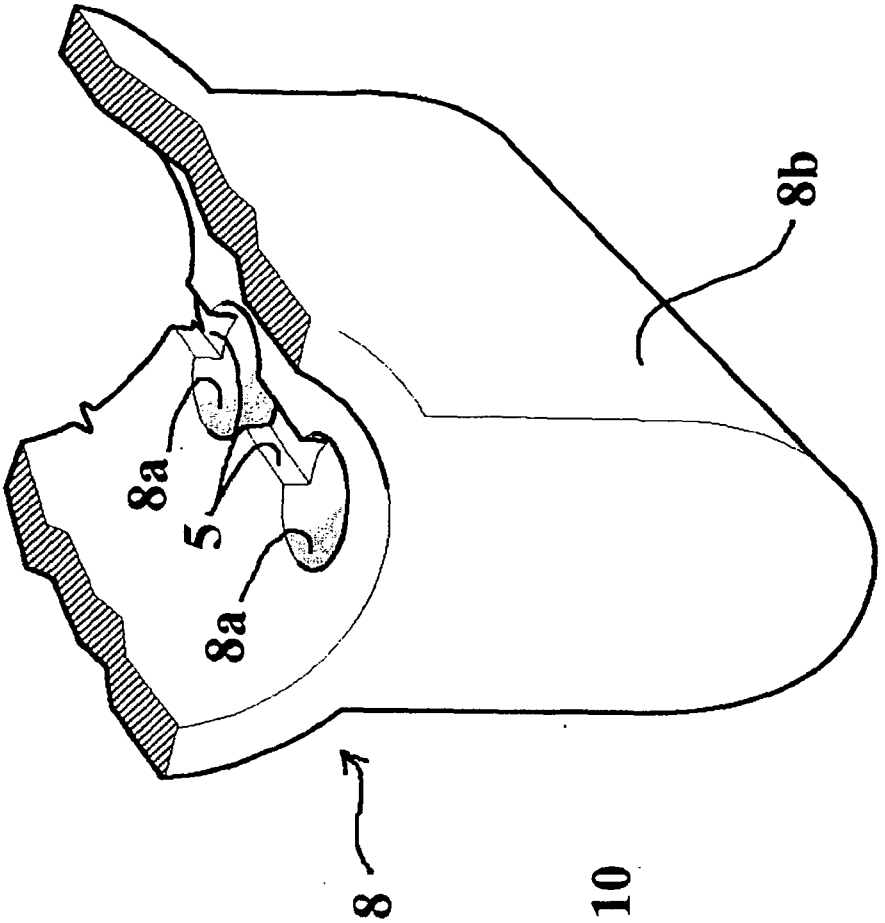
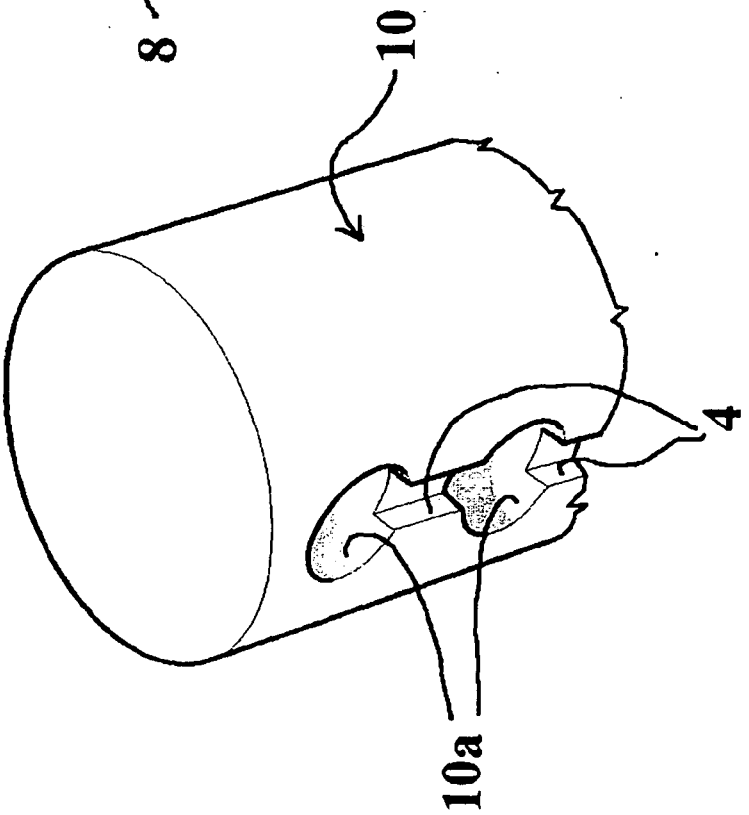


FIG. 7



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EUROPEAN SEARCH REPORT

Application Number
EP 07 42 5182

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	31 August 2007	Westin, Kenneth

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31-08-2007

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