

(19)



Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 1 240 399 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:

15.09.2004 Bulletin 2004/38

(21) Application number: **00989145.8**

(22) Date of filing: **22.12.2000**

(51) Int Cl.7: **E05B 47/06**

(86) International application number:
PCT/SE2000/002653

(87) International publication number:
WO 2001/048341 (05.07.2001 Gazette 2001/27)

(54) **ELECTROMECHANICAL CYLINDER LOCK**

ELEKTROMECHANISCHES ZYLINDERSCHLOSS

SERRURE A CYLINDRE ELECTROMECHANIQUE

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE TR**

(30) Priority: **23.12.1999 SE 9904771**

(43) Date of publication of application:
18.09.2002 Bulletin 2002/38

(73) Proprietor: **ASSA AB**
S-631 05 Eskilstuna (SE)

(72) Inventors:
• **WALLDEN, Lars**
S-633 47 Eskilstuna (SE)

• **MAGNUSSON, Björn**
S-147 31 Tumba (SE)

(74) Representative: **Estreen, Lars et al**
Kransell & Wennborg AB
P.O. Box 27834
115 93 Stockholm (SE)

(56) References cited:
DE-A1- 3 727 566 **GB-A- 2 182 089**
US-A- 4 756 310 **US-A- 5 839 307**

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 1 240 399 B1

DescriptionFIELD OF INVENTION

[0001] The present invention relates generally to an electromechanical cylinder lock and, in particular, a cylinder lock in which a blocking arrangement is mechanically returned to a blocking position by means of key withdrawal.

BACKGROUND

[0002] Electromechanical locking devices are known which include electrically interfaced or controlled release mechanisms for operating a lock cylinder. For example, US patent No 5,839,307 discloses an electromechanical cylinder lock which includes an outer lock housing and a rotatable core located therein which is controlled by dual locking features. A plurality of electromechanical locking members in the core with grooves formed therein accept a side bar or portions in a non-blocking position. A magnetic core rotates the electromechanical locking members to a desired position relative to the side bar to allow rotation of the barrel.

[0003] A drawback with this prior art locking device is that no mechanical returning of the locking members is provided. This means that the locking members remain in a non-blocking position should the lock be de-energised during operation thereof, thus decreasing the security of the lock. This could be a result of someone removing the battery in the key powering the blocking mechanism.

OBJECTS OF THE INVENTION

[0004] An object of the present invention is to provide a lock device of the kind initially mentioned in which the electrically controlled blocking mechanism is automatically returned to a blocking position when the key is withdrawn from the lock cylinder.

[0005] Another object is to provide a lock device, which is more secure than prior art lock devices.

SUMMARY OF THE INVENTION

[0006] The invention is based on the realisation that the blocking mechanism can be provided with means co-operating with a return mechanism during withdrawal of a key from the lock.

[0007] Thus, according to the invention there is provided a lock-key combination as defined in claim 1.

[0008] A lock-key combination according to the invention is more secure than prior art devices in that mechanical returning of the blocking mechanism is ensured during withdrawal of the key from the lock.

BRIEF DESCRIPTION OF DRAWINGS

[0009] The invention is now described, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 shows an exploded view of the core of a cylinder lock device according to the invention;

Figs. 2a and 2b are enlarged perspective views of an actuator according to the invention;

Fig. 3 is an enlarged perspective view of a finger pin co-operating with components shown in figure 1;

Fig. 4 is a perspective view showing the interaction of the finger pin shown in fig. 3 and a key;

Fig. 5 shows a cross sectional view of the lock device of figure 1 with the blocking mechanism in a non-blocking position;

Fig. 6 is a view similar to that of figure 5 but with the blocking mechanism in a fully blocking position;

Fig. 7 is a view similar to that of figure 5 but with a side bar in an extended position;

Fig. 8 is a view similar to that of figure 5 but with the blocking mechanism in a blocking position effected by means of withdrawal of the key from the lock;

Fig. 9 is a cross sectional view of the lock device of figure 1 showing indexing of the actuator; and

Figs. 10a-c are a perspective view, a plan view and a cross sectional view of a second embodiment, respectively, of a second embodiment of a blocking mechanism according to the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0010] In the following, a detailed description of preferred embodiments of the invention will be given. In figure 1, an exploded perspective view of a cylinder core according to the invention, generally designated 10, is shown. The core is arranged to be placed in a bore 4 of a conventional cylinder housing 2 (shown in figures 5-9). Thus, the core has an outer surface substantially corresponding to the bore of the housing and includes a keyway 12 configured to receive a key as is known in the art. The core 10 includes a plurality of tumbler pin bores 14 that receive tumbler pins, of which one 16 is shown in figure 1. The manner in which a properly bitted key (not shown in figure 1) engages the tumbler pins and positions them to a shear line to permit the core 10 to be rotated with respect to the housing is known in the art and thus will not be described in more detail herein.

[0011] Throughout this description, the blocking function of the tumbler pins 16 will be disregarded, assuming that a correctly bitted key has been inserted into the lock. Thus, when for example it is stated herein that the core is blocked, it is blocked by the electrically controlled blocking mechanism.

[0012] With reference to figures 5-9, the housing 2 includes a cavity 6 in which is positioned a side bar 20 co-operating with the housing either to block or to permit rotation of the core within the housing. The function of a side bar is described for example in the Swedish patent application No 7906022-4, which is incorporated herein by reference. Thus, the wall of the cavity is formed as a camming surface for moving the side bar out of the cavity upon rotation of the core. As can be seen in figure 6, which shows the side bar 20 and an actuator 30 (discussed in detail below) in a core rotation blocking position, the side bar is received in the cavity 6 and its inner edge extends beyond the internal surface of the housing bore 4 and engages the housing to prevent the core from rotation to operate the lock.

[0013] The blocking mechanism will now be described in detail. Returning to figure 1, the term blocking mechanism will in this description refer to, besides the side bar 20, the elongated actuator 30 with a partly cylindrical envelope surface and an electric motor 40 with a shaft 46 mechanically coupled to the actuator 30.

[0014] The actuator is located radially inward of the side bar 20 in a cylindrical actuator bore 32, see figure 5. The actuator 30 can be rotated by means of the electric motor 40 positioned in the actuator bore 32 and mechanically connected to the actuator 30. In the preferred embodiment, the connection is effected by means of the motor shaft 46 being shaped like a screwdriver tip, that is, with an end portion with a flat or at least non-circular cross section. The end of the motor shaft 46 is positioned in a corresponding bore 33 in the end surface of the actuator facing the motor, see figure 2a. In that way, the actuator is rotated together with a motor shaft when the motor 40 is energised. In the other end thereof, the actuator 30 is journaled by means of an extending pin 34, see figure 2b, co-operating with a corresponding bore (not shown) in the actuator bore.

[0015] The motor 40 is energised under control of lock electronics 48 electrically connected to the motor by means of wires, see figure 1. The electronics 48 comprises a custom made micro controller with associated memories, driving circuitry etc. and is powered by a battery located in a key inserted into the lock. To that end, there is provided a key contact 42 in the form of an electrically conducting metal strip shaped so as to make contact with a contact on the side of the key blade of the inserted key.

[0016] Inward of the actuator 30 there is provided a finger pin 50 movable in a direction perpendicular to the centre axis of the cylinder core 10. The finger pin 50 is provided with a cut out portion 52 aligned with the actuator 30, see figure 3, and is spring loaded downward as

seen in figures 5-9 by means of a helical spring 54 located above the finger pin 50. With no key inserted, the finger pin rests on the actuator 30, as seen in figures 6 and 8, thereby securing it against unwanted rotation. However, the finger pin is lifted by the side code 72 of an inserted key 70, as seen in figures 4, 5 and 7, to an upper end position, in which the rotation of the actuator 30 is not affected.

[0017] Finally, to ensure that the side bar 20 engages the side bar cavity 6 when aligned therewith, a yoke shaped positioning element 60 is provided outside of the actuator 30 but inward of the side bar 20, see also figure 3. The positioning element 60 is spring biased radially outward by means of springs (not shown). Thus, with the side bar 20 aligned with the side bar cavity 4, the spring force applied on the positioning element 60 forces the side bar 20 radially outward and into engagement with the walls of the side bar cavity 4. There is also a spring (not shown) provided at the other end of the side bar compared to the positioning element and also functioning to urge the side bar 20 radially outward.

[0018] The operation of the blocking mechanism including the side bar 20 and the actuator 30 with motor 40 will now be described with reference to figures 5-9.

[0019] In figure 5, the blocking mechanism is shown in a non-blocking position, i.e., with an inserted key. The side bar 20 is shown out of alignment with the side bar cavity 6 and in a retracted position and the cylinder core 10 is thus free to rotate in the cylinder housing bore.

[0020] As is seen in the figures, the actuator 30 is not entirely cylindrical. Instead, besides a cylindrical envelope surface 38, it is provided with a recess 35 and an essentially flat engagement surface 36, see figures 2a and 2b.

[0021] In the non-blocking position, the actuator 30 is in the position shown in figure 5. The cut out portion comprising the recess 35 allows the side bar to be retracted within the outer periphery of the core 10 and into the recess 35, thus allowing rotation of the core relative to the housing. The rotation of the actuator 30 to the position shown in figure 5 is effected by means of the motor 40. When a correctly electronically coded key is inserted into the lock, the electronics 48 verifies that a correct key has been inserted and sends control signals to the motor 40 to rotate the actuator.

[0022] The normal blocking position of the blocking mechanism will now be described with reference to figure 6. The side bar 20 has now been aligned with the side bar cavity 6 and pushed therein by means of the force exerted by the positioning element 60 and the above mentioned spring (not shown) provided at the other end of the side bar. The actuator has then been rotated approximately 180° counter clockwise compared to the position shown in figure 5. This means that instead of the recess 35, the cylindrical envelope surface 38 of the actuator now faces the side bar. In that position, the side bar 20 is prevented from being cammed to within the outer periphery of the core 10, i.

e., to within the shear line between the core 10 and the housing 2. The rotational movement of the actuator 30 to the position shown in figure 6 is commanded by the electronics 48 when the key is withdrawn from the lock key-way 12. This is the normal operation of the blocking mechanism.

[0023] However, there are situations in which this normal blocking operation is disabled. An example thereof is when the electronics 48 is de-energised with the key still in the key-way 12. This could be a result of someone removing the battery in the key powering the electronics 48 and the motor 40 or a power failure in case of a wired lock. In a lock according to the invention, there is provided a mechanical back-up returning of the normally electronically controlled blocking mechanism to a blocked position. This emergency returning will now be described with reference to figures 7 and 8.

[0024] In figure 7, the side bar 20 is shown in engagement with the walls of the side bar cavity 6. This position is obtained when the side bar 20 aligned with the side bar cavity 6 and, as already stated, the positioning element 60 forces the side bar into engagement with the side bar cavity walls. In that position, the side bar does not impede the rotation of the actuator 30.

[0025] When being withdrawn from the key-way 12, the key releases the finger pin 50 and the spring force exerted by the spring 54 forces the finger pin downward against the actuator 30. During displacement, an engagement surface 56 in the cut out portion 52 of the finger pin 50 engages the engagement surface 36 of the actuator, thereby forcing the actuator to rotate counter clockwise approximately 60° to the position shown in figure 8. After this rotation, the envelope surface 38 of the actuator faces the side bar 20, thereby blocking the radially inward movement of the side bar.

[0026] In the position shown in figure 8, the actuator 30 has not been rotated as far away from the non-blocking position shown in figures 5 and 7 as when in the normal blocking position shown in figure 6. However, the interaction between the engagement surface 36 of the actuator and the engagement surface 56 of the finger pin ensures that the actuator can not accidentally or fraudulently be rotated to a non-blocking position.

[0027] The rotation of the actuator 30 is also constrained or indexed by means of a protrusion or pin 22 provided on the side bar 20 and a co-operating indexing groove 39 in the envelope surface of the actuator 30, see figure 2a. The operation thereof appears from figure 9, which is a cross-sectional view of the lock in level with the indexing groove of the actuator. The groove 39 runs approximately 180° degrees around the actuator and the protrusion 22 is guided in that groove during rotation of the actuator. This limits the rotation of the actuator to within allowed limits and thus ensures reliable rotation of the actuator.

[0028] A second embodiment of a key and lock combination according to the invention will now be described with reference to figures 10a-c. In figure 10a there is

shown an actuator 30' of essentially the same shape as the actuator 30 described above with reference to the first embodiment. However, the actuator shown in figure 10a is provided with longitudinal grooves 37 along essentially the entire envelope surface 38' thereof. The grooves 37 constitute means co-operating with at least one step 24 provided on the side bar 20'. The function of the grooves 37 and the step 24 will now be described with reference to figure 10c, which is a cross sectional view of the actuator 30' and the side bar 20' taken along the lines A-A, see figure 10b.

[0029] In the position shown in figure 5, i.e., with the side bar in the side bar cavity 6, the step 24 does not impede the rotation of the actuator 30'. However, if someone is trying to rotate the core, e.g. trying to fraudulently open the lock, the side bar 20' is cammed out of the cavity, thereby pressing against the actuator 30'. If the actuator is rotated while the core is rotated, the step 24 of the side bar 20' will engage the first groove 37 encountered and be seated therein, thereby preventing further rotation of the actuator 30'.

[0030] The provision of the step 24 and the grooves 37 increases the security of the lock, making it even harder to effect a fraudulent movement of the actuator from a blocking to a non-blocking position.

[0031] Preferred embodiments of a key and lock combination according to the invention have been described. The person skilled in the art realises that these could be varied within the scope given by the appended claims. Thus, a motor has been shown powered by a battery provided in the key. It could also be powered by a battery provided in the lock or by an external power source connected to the lock by means of wires.

[0032] The actuator has been shown with a specific shape. It is realised that it could have any suitable shape as long as it moves from a non-blocking position (figure 5) to a blocking position (figure 8) under mechanical control when the key is withdrawn from the lock.

[0033] Although only one finger pin has been shown in the figures, there can be more than one finger pin interacting with an inserted key and the actuator. This finger pin has been shown movable essentially perpendicularly to the axis of the lock cylinder. It is realised that this pin can be movable in other directions as long as the interaction between the pin and the key and the actuator, respectively, is provided in a functioning way.

[0034] The finger pin has been shown interacting with a side code of the key. The finger pin can also interact with other portions of the key, such as a groove provided on the side of the key blade. It could for example be provided in the form of a guided pin.

REFERENCE NUMERALS

[0035]

- 2 Housing
- 4 Bore

6	Side bar cavity			vided in said core (10) and being rotatable between
10	Core			
12	Key-way			
14	Tumbler pin bores	5		- a first position (Fig. 5), in which the movement of said side bar (20) to said first side bar position is permitted; and
16	Tumbler pin			
20,	20' Side bar			
22	Indexing protrusion			- a second position (Fig. 6), in which movement of said side bar (20) to said first side bar position is blocked;
24	Step	10		
30,	30' Actuator			characterised by
32	Actuator bore			
33	Driving bore			
34	Journalling pin	15		- a returning means (50) mechanically co-operating with said key (70) and said actuator (30) and moving said actuator from said first position to a third position (Fig. 8) in response to withdrawal of the key from said key-way (12), said third position blocking movement of said side bar (20) to said first side bar position.
35	Recess			
36	Engagement surface			
37	Grooves			
38,	38' Envelope surface			
39	Indexing groove	20		
40	Motor		2.	Combination according to claim 1, wherein said returning means (50) is a pin, preferably a finger pin.
42	Key contact			
46	Motor shaft			
48	Electronics	25	3.	Combination according to claim 1 or 2, wherein said returning means (50) is movable in a direction essentially perpendicular to the centre axis of the core (10).
50	Finger pin			
52	Cut out portion			
54	Helical spring			
56	Engagement surface	30	4.	Combination according to any of claims 1-3, wherein said returning means (50) is biased in a direction towards the actuator (30), preferably by means of a spring (54), preferably a helical spring.
60	Positioning element			
70	Key			
72	Side code	35	5.	Combination according to any of claims 1-4, wherein said returning means (50) is co-operating with a side code (72) of the key (70).

Claims

1. An electromechanical cylinder lock-key combination, comprising
 - a housing (2) having a bore;
 - a core (10) rotatably arranged in said bore and having a key-way (12) for receiving a key (70);
 - a side bar (20) co-operating between the housing (2) and the core (10) and being movable between
 - a first position, in which rotation of the core with respect to the housing is permitted, and
 - a second position, in which rotation of the core with respect to the housing is blocked; and
 - an electronically controllable actuator (30) pro-
2. Combination according to claim 1, wherein said returning means (50) is a pin, preferably a finger pin.
3. Combination according to claim 1 or 2, wherein said returning means (50) is movable in a direction essentially perpendicular to the centre axis of the core (10).
4. Combination according to any of claims 1-3, wherein said returning means (50) is biased in a direction towards the actuator (30), preferably by means of a spring (54), preferably a helical spring.
5. Combination according to any of claims 1-4, wherein said returning means (50) is co-operating with a side code (72) of the key (70).
6. Combination according to any of claims 1-5, wherein said actuator is provided with an essentially cylindrical envelope surface (38) with a recess (35) and a first engagement surface (36), said first engagement surface being arranged to co-operate with a second engagement surface (56) provided on the returning means (50) so as to move the actuator from said first position (Fig. 5) to said third position (Fig. 8) in response to withdrawal of the key (70) from said key-way (12).
7. Combination according to claim 6, wherein said second engagement surface is provided in a cut-out portion of said returning means (50).
8. Combination according to claim 7, wherein said first and second engagement surfaces (36,56) are essentially flat and, with said actuator in the first position, have a mutual angle of about 60°.

9. Combination according to any of claims 1-8, wherein said actuator (30) is provided with an indexing groove co-operating with a protrusion (22) provided on said side bar (20) so as to limit the rotation of said actuator.
10. Combination according to claim 9, wherein said groove is running about 180° around said actuator in a direction parallel to the direction of rotation of said actuator.
11. Combination according to any of claims 1-10, wherein said actuator is journaled in a first end thereof by means of a motor shaft (48) co-operating with a bore provided in said first end and in a second end thereof by means of a protruding pin (34).
12. Combination according to any of claims 1-11, wherein said actuator (30') is provided with longitudinal grooves (37) arranged to co-operate with a step (24) provided on the side bar (20') in order to prevent rotation of the actuator (30') during rotation of the core (10).

Revendications

1. Combinaison de serrure à cylindre électromécanique, comprenant :

un boîtier (2) comprenant un alésage ;
 un noyau (10) agencé en rotation dans ledit alésage et comprenant une rainure (12) pour recevoir une clé (70) ;
 une barre latérale (20) coopérant entre le boîtier (2) et le noyau (10) et étant mobile entre une première position, dans laquelle la rotation du noyau par rapport au boîtier est permise, et une deuxième position, dans laquelle la rotation du noyau par rapport au boîtier est bloquée ; et
 un actionneur à commande électronique (30) prévu dans ledit noyau (10) et étant rotatif entre une première position (figure 5) dans laquelle le mouvement de ladite barre latérale (20) vers ladite première position de barre latérale est permise ; et
 une seconde position (figure 6) dans laquelle le mouvement de ladite barre latérale (20) vers ladite première position de barre latérale est bloquée ;

caractérisée par

des moyens de rappel (50) coopérant de manière mécanique avec ladite clé (70) et ledit actionneur (30) et déplaçant ledit actionneur depuis ladite première position à une troisième position (figure 8) en réponse au retrait de la clé de ladite rainure (12),

ladite troisième position bloquant ledit mouvement de ladite barre latérale (20) vers ladite première position de barre latérale.

2. Combinaison selon la revendication 1, dans laquelle lesdits moyens de rappel (50) sont une clavette, de préférence, une clavette à griffe.
3. Combinaison selon la revendication 1 ou 2, dans laquelle lesdits moyens de rappel (50) sont mobiles dans un sens essentiellement perpendiculaire à l'axe central du noyau (10).
4. Combinaison selon l'une quelconque des revendications 1 à 3, dans laquelle lesdits moyens de rappel (50) sont comprimés en direction de l'actionneur (30), de préférence au moyen d'un ressort (54), de préférence un ressort hélicoïdal.
5. Combinaison selon l'une quelconque des revendications 1 à 4, dans laquelle lesdits moyens de rappel (50) coopèrent avec un code latéral (72) de la clé (70).
6. Combinaison selon l'une quelconque des revendications 1 à 5, dans laquelle ledit actionneur est pourvu d'une surface d'enveloppe essentiellement cylindrique (38) avec un creux (35) et une première surface de mise en prise (36), ladite première surface de mise en prise étant agencée pour coopérer avec une deuxième surface de mise en prise (56) prévue sur les moyens de rappel (50) de manière à déplacer l'actionneur depuis ladite première position (figure 5) vers ladite troisième position (figure 8) en réaction au retrait de la clé (70) de ladite rainure (12).
7. Combinaison selon la revendication 6, dans laquelle ladite deuxième surface de mise en prise est prévue dans une partie découpée desdits moyens de rappel (50).
8. Combinaison selon la revendication 7, dans laquelle lesdites première et deuxième surfaces de mise en prise (36, 56) sont essentiellement plates et, avec ledit actionneur dans ladite première position, présentent un angle mutuel d'environ 60°.
9. Combinaison selon l'une quelconque des revendications 1 à 8, dans laquelle ledit actionneur (30) est pourvu d'une rainure d'indexation coopérant avec une saillie (22) prévue sur ladite barre latérale (20) de manière à limiter la rotation dudit actionneur.
10. Combinaison selon la revendication 9, dans laquelle ladite rainure s'étend à environ 180° autour dudit actionneur dans un sens parallèle au sens de rotation dudit actionneur.

11. Combinaison selon l'une quelconque des revendications 1 à 10, dans laquelle ledit actionneur est tourillonné dans une première extrémité de celui-ci au moyen d'un arbre de moteur (48) coopérant avec un alésage prévu dans ladite première extrémité et dans une deuxième extrémité de celui-ci au moyen d'une cheville en saillie (34). 5
12. Combinaison selon l'une quelconque des revendications 1 à 11, dans laquelle ledit actionneur (30') est pourvu de rainures longitudinales (37) agencées pour coopérer avec une saillie (24) prévue sur la barre latérale (20') afin d'empêcher la rotation de l'actionneur (30') pendant la rotation du noyau (10). 10

Patentansprüche

1. Elektromechanische Zylinderschloss-Schlüsselkombination, aufweisend: 20
- ein Gehäuse (2), welches eine Bohrung aufweist;
 - einen Kern (10) verdrehbar in der Bohrung angeordnet und einen Schlüsselweg (12) aufweisend, zur Aufnahme eines Schlüssels (70); 25
 - eine Seitenleiste (20), welche mit dem Gehäuse (2) und dem Kern (10) zusammenarbeitet und bewegbar ist zwischen
 - einer ersten Position, in welcher Verdrehung des Kerns in Bezug auf das Gehäuse gestattet ist, und 30
 - einer zweiten Position, in welcher Verdrehung des Kerns mit Bezug auf das Gehäuse blockiert ist; und 35
 - einen elektronisch steuerbaren Aktuator (30), der in dem Kern (10) bereitgestellt ist und der verdrehbar ist zwischen
 - einer ersten Position (Fig. 5), in welcher die Bewegung der Seitenleiste (20) in die erste Seitenleistenposition gestattet ist; und 40
 - einer zweiten Position (Fig. 6), in welcher die Bewegung der Seitenleiste (20) in die erste Seitenleistenposition blockiert ist; 45
- gekennzeichnet durch**
- ein Rückkehrmittel (50), welches mechanisch mit dem Schlüssel (70) und dem Aktuator (30) zusammenarbeitet und den Aktuator aus der ersten Position in eine dritte Position (Fig. 8) bewegt, als Reaktion auf das Abziehen des Schlüssels aus dem Schlüsselweg (12), wobei die dritte Position das Bewegen der Seitenleiste (20) in die erste Seitenleistenposition blockiert. 50
2. Kombination nach Anspruch 1, wobei das Rückkehrmittel (50) einen Stift darstellt, bevorzugt einen Fingerstift. 55
3. Kombination nach Anspruch 1 oder 2, wobei das Rückkehrmittel (50) in einer Richtung im Wesentlichen senkrecht auf die Zentrumsachse des Kerns (10) bewegbar ist.
4. Kombination nach irgendeinem der Ansprüche 1 bis 3, wobei das Rückkehrmittel (50) in einer Richtung in Richtung des Aktuators (30) vorgespannt ist, bevorzugt mittels einer Feder (54), bevorzugt einer Schraubenfeder.
5. Kombination nach irgendeinem der Ansprüche 1 bis 4, wobei das Rückkehrmittel (50) mit einem Seitencode (72) des Schlüssels (70) zusammenarbeitet.
6. Kombination nach irgendeinem der Ansprüche 1 bis 5, wobei der Aktuator mit einer im Wesentlichen zylindrischen Hülloberfläche (38) bereitgestellt ist, mit einer Vertiefung (35) und einer ersten Eingriffs-oberfläche (36), wobei die erste Eingriffs-oberfläche (36) so angeordnet ist, dass sie mit einer zweiten Eingriffs-oberfläche (56) zusammenarbeitet, die auf dem Rückkehrmittel (50) bereitgestellt ist, um den Aktuator aus der ersten Position (Fig. 5) in die dritte Position (Fig. 8) zu bewegen, als Antwort auf das Abziehen des Schlüssels (70) aus dem Schlüsselweg (12).
7. Kombination nach Anspruch 6, wobei die zweite Eingriffs-oberfläche an einem Ausschnittsabschnitt des Rückkehrmittels (50) bereitgestellt ist.
8. Kombination nach Anspruch 7, wobei die ersten und zweiten Eingriffs-oberflächen (36, 56) im Wesentlichen flach sind und wenn sich der Aktuator in der ersten Position befindet, einen gegenseitigen Winkel von ungefähr 60° aufweisen.
9. Kombination nach irgendeinem der Ansprüche 1 bis 8, wobei der Aktuator (30) mit einer Indexvertiefung bereitgestellt ist, welche mit einem Vorsprung (22) zusammenarbeitet, welcher auf der Seitenleiste (20) bereitgestellt ist, um die Rotation des Aktuators zu begrenzen.
10. Kombination nach Anspruch 9, wobei die Vertiefung ungefähr 180° um den Aktuator herum verläuft, in einer Richtung parallel zur Drehrichtung des Aktuators.
11. Kombination nach irgendeinem der Ansprüche 1 bis 10, wobei der Aktuator in einem seiner ersten Enden mittels einer Motorwelle (48) verzapft ist, die mit einer Bohrung zusammenarbeitet, welche in dem ersten Ende bereitgestellt ist und in einem zweiten Ende davon mittels eines vorstehenden Stiftes (34).

12. Kombination nach irgendeinem der Ansprüche 1 bis 11, wobei der Aktuator (30') mit länglichen Vertiefungen (37) ausgestattet ist, die angeordnet sind, um mit einer Stufe (24) zusammenzuarbeiten, die auf der Seitenleiste (20') bereitgestellt ist, um die Rotation des Aktuators (30') während der Rotation des Kerns (10) zu verhindern.

10

15

20

25

30

35

40

45

50

55

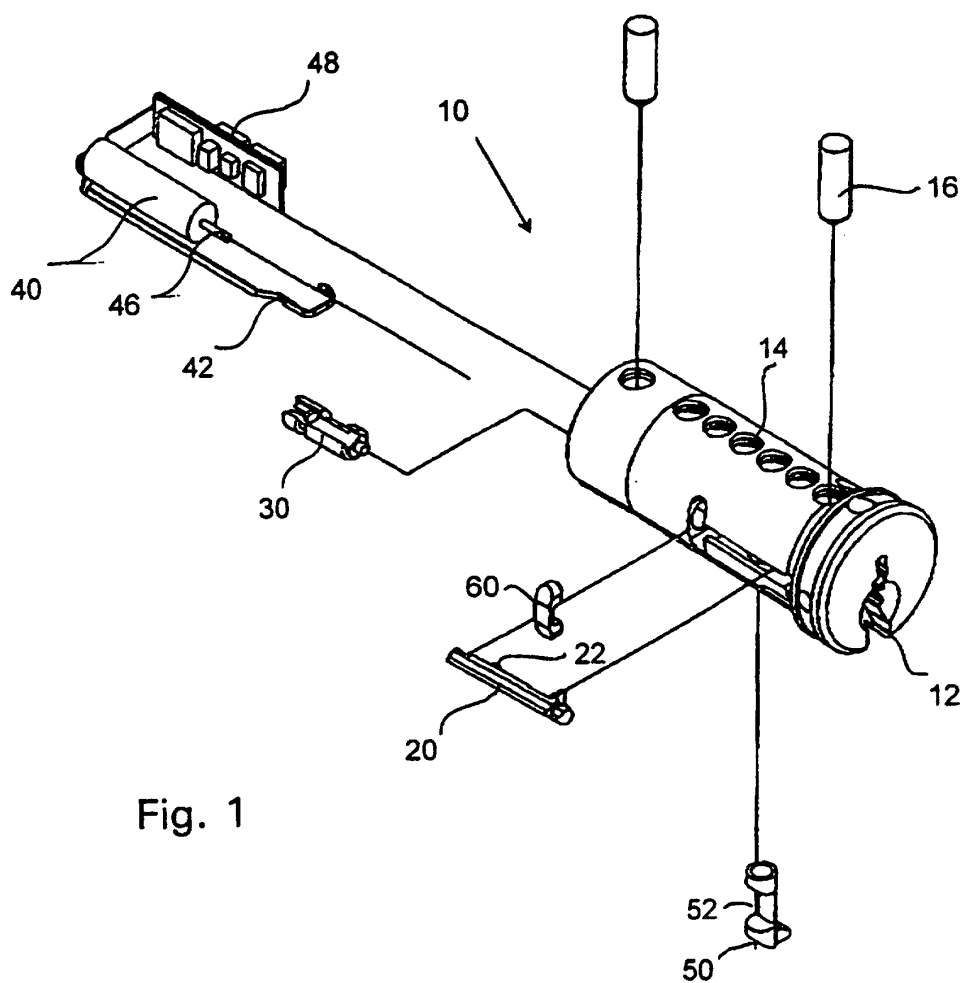


Fig. 1

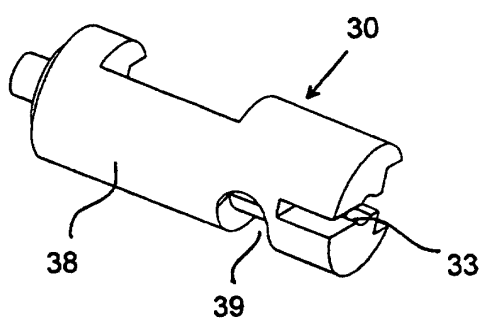


Fig. 2a

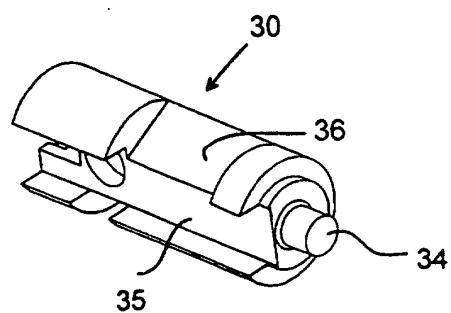


Fig. 2b

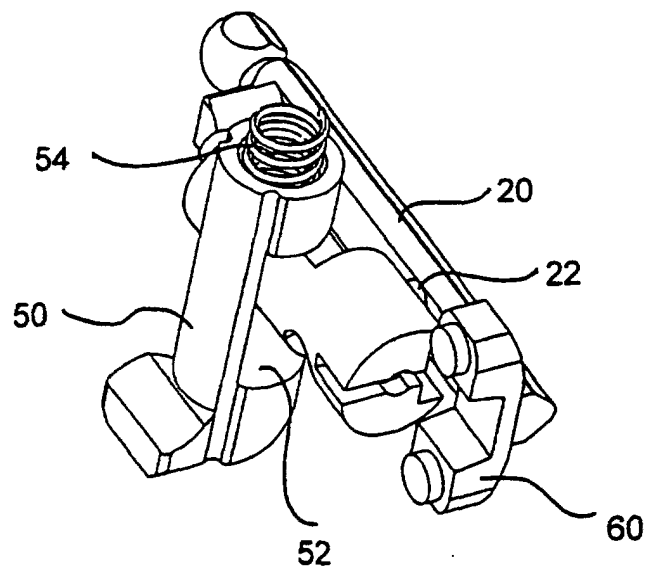


Fig. 3

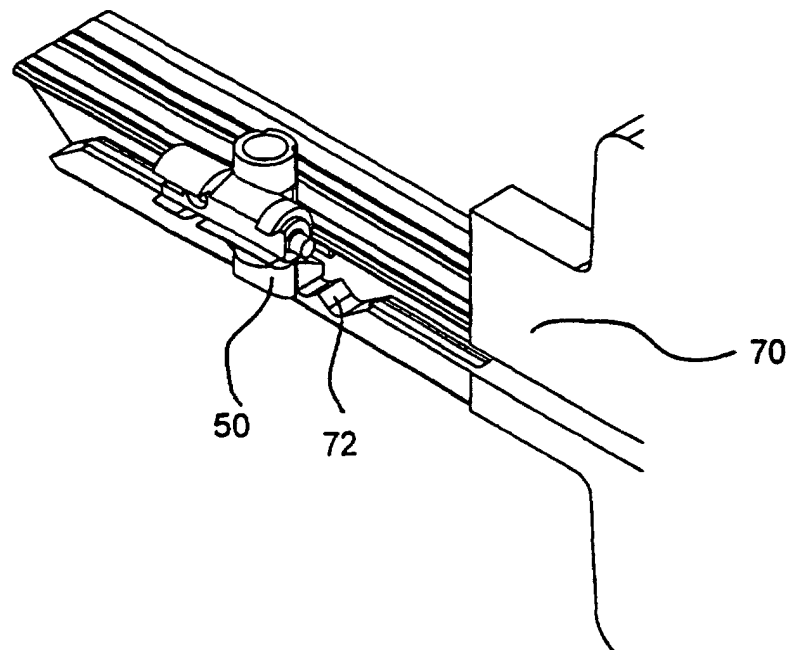


Fig. 4

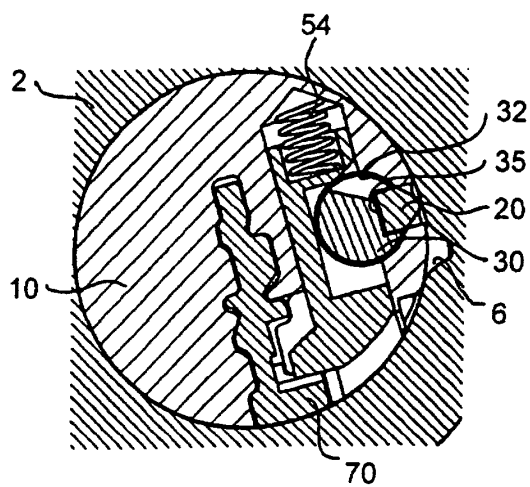


Fig. 5

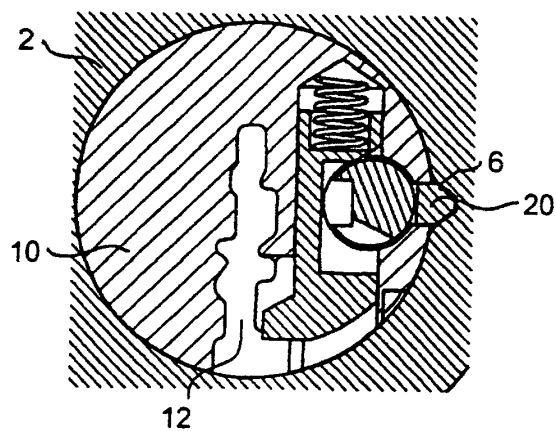


Fig. 6

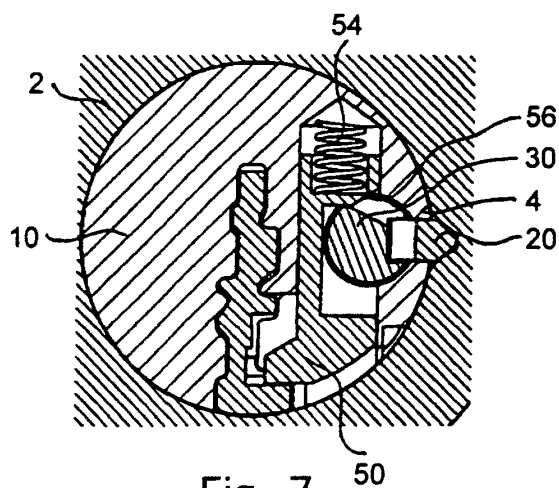


Fig. 7

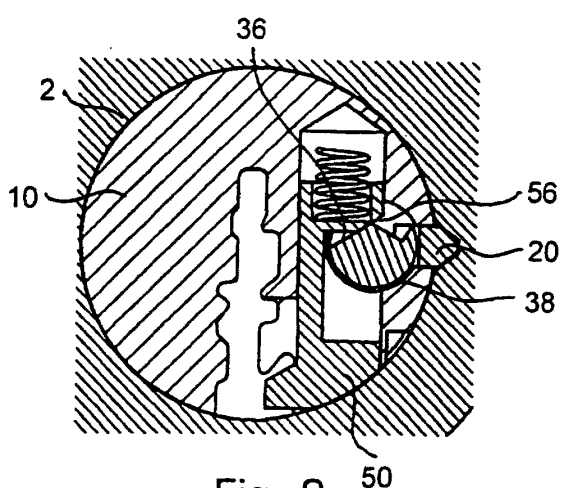


Fig. 8

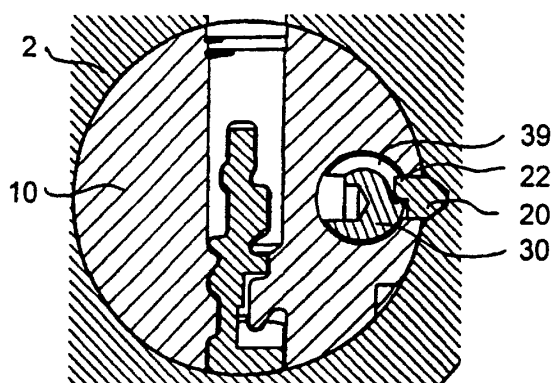


Fig. 9

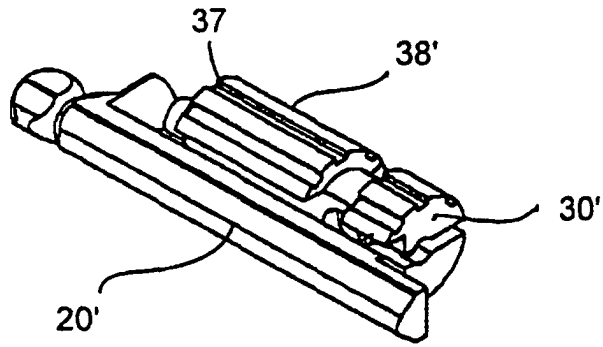


Fig. 10a

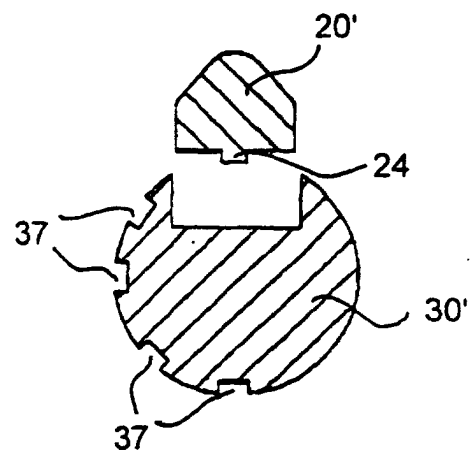


Fig. 10c

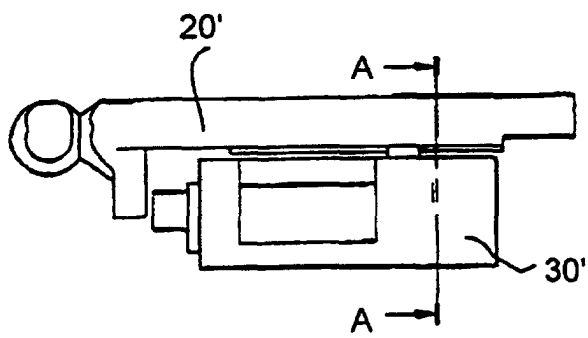


Fig. 10b