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(54) **ELECTRONIC LOCK**

(57) The present invention proposes an electronic lock (15) comprising, a cylinder body (1) having a first cylinder half (14a) and second cylinder half (14b), a plug (8) rotatable within said cylinder body (1), said cylinder plug (8) having a keyway for receiving a key, a release assembly within the cylinder body (1), said release assembly having a retention pin (3) which selectively engages the plug to prevent the rotation thereof and disengages the plug (8) in response to an actuating signal to allow the rotation thereof. According to the present invention said electronic lock (15) further comprises, an antenna (4) for light-frequency detection receiving data from an electronic circuit (9) which is placed at a shaft of the key when the key (11) is inserted into the keyway fully; an solenoid-activated actuator (2) for housing and driving said retention pin (3) downwardly or upwardly according to the longitudinal axis of the electronic lock (X) and an electronic card (12) compares the data read from the antenna (4) with data stored in the memory itself, such that if the data received from the antenna is found to be acceptable, the electronic card (12) provides an output signal the solenoid-activated actuator (2) to set the electronic lock (15) in an open or locked condition.

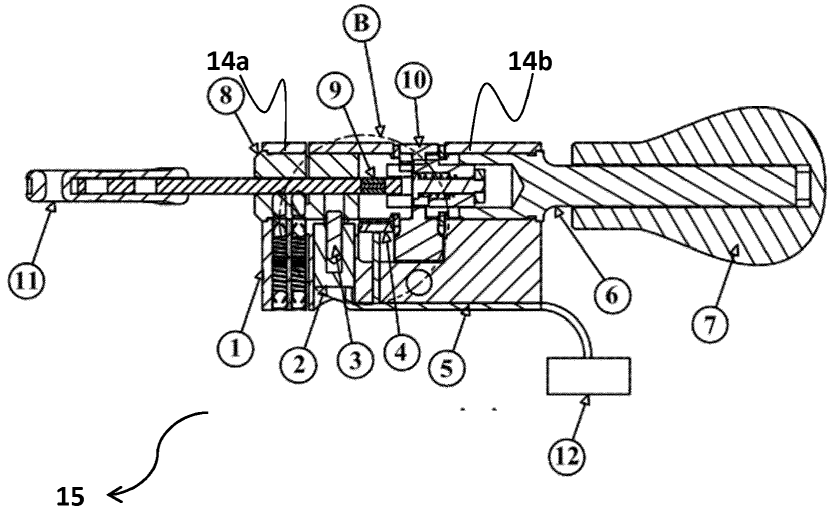

Fig. 2

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Description

Technical Field of the Invention

[0001] The present invention relates to an electronic lock, and more particularly to an electronic lock having an electronic circuit which interacts with the antenna of cylinder lock to set the lock in an open or closed position by driving a retention pin of an actuator.

Background of the Invention

[0002] Conventional locks use pins of varying lengths to prevent the lock from opening without the correct key. Pin tumblers are most commonly employed in cylinder locks, but may also be found in tubular pin tumbler locks. In addition to that Instead of a key, you have a plastic card that has a magnetic strip on the back. By sliding the card into the lock, an electronic reader circuit decodes the information on the strip and checks for a match with a code stored inside it. If it's the right key, the circuit activates a powerful electromagnet that pulls a bolt sideways, allowing you to open the door.

[0003] Conventional mechanical locks can be vulnerable against pick locking activities, and because of its nature locks and corresponding tumbler are mechanical that cannot be changed. At the market, there are several types' electronic locks having complex mechanism which keeps the price high. Key of the electronic locks is very important, which may easily damage when exposed to water or humid environment. In addition to that battery of the key may damage or run out, in this case finding new battery could be not easy for replacement.

[0004] Many electronic locks have complex parts which causes its price to be high compare to the conventional locks. The key of the electronic locks mainly keeps a battery in itself which can be difficult to replace when is needed. It is also desired that such system should be a purely electronic one, i.e. not dependent on mechanical bitting or the key to open the lock cylinder.

Objects of the Invention

[0005] Primary object of the present invention is to provide an electronic lock having an ability to electronically transfer information from key to the cylinder to set the lock in an open or closed position.

[0006] Another object of the present invention is to provide an electronic lock having an antenna at first cylinder half such that said lock can be used with rosette which permits to use the locks in steel doors.

[0007] Another object of the present invention is to provide an electronic lock with a key having no battery on itself such that ensuring long-life time.

[0008] Another object of the present invention is to provide an electronic lock which is suitable to every type of door even in steel doors.

[0009] Another object of the present invention is to provide an electronic lock which is resistive against "lock-picking" attempts.

Summary of the Invention

[0010] The present invention proposes an electronic lock comprising, a cylinder body having a first cylinder half and second cylinder half, a plug rotatable within said cylinder body, said cylinder plug having a keyway for receiving a key, a release assembly within the cylinder body, said release assembly having a retention pin which selectively engages the plug to prevent the rotation thereof and disengages the plug in response to an actuating signal to allow the rotation thereof. According to the present invention said electronic lock further comprises, an antenna for light-frequency detection receiving data from an electronic circuit which is placed at a shaft of the key when the key is inserted into the keyway fully; an solenoid-activated actuator for housing and driving said retention pin downwardly or upwardly according to the longitudinal axis of the electronic lock (X) and an electronic card compares the data read from the antenna with data stored in the memory itself, such that if the data received from the antenna is found to be acceptable, the electronic card provides an output signal the solenoid-activated actuator to set the electronic lock in an open or locked condition.

Brief Description of the Figures

[0011] Accompanying drawings are given solely for the purpose of exemplifying an electronic lock whose advantages over prior art were outlined above and will be explained in detail hereinafter:

Fig. 1 demonstrates a perspective top view of the electronic lock according to the present invention.

Fig. 2 demonstrates an A-A cross section of the fig. 1 according to the present invention.

Fig. 3 demonstrates enlarged view of the B section shown in fig. 2 according to the present invention.

Fig. 4a demonstrates a perspective view of the electronic lock according to the present invention.

Fig. 4b demonstrates a cross section view of the electronic lock where the actuator pin is lifted according to the present invention.

Fig. 5 demonstrates a perspective view of a suitable key of the electronic lock according to the present invention.

Fig. 6 demonstrates a cross section view of the actuator of the lock according to the present invention.

Detailed Description of the Invention

[0012]

1.	Cylinder body
2.	Actuator
3.	Retention pin
4.	Antenna
5.	Connection cable
6.	Handle rod
7.	Handle
8.	Plug
9.	Electronic circuit
10.	Pawl
11.	Key
12.	Electronic card
14a.	First cylinder half
14b.	Second cylinder half
15.	Electronic lock
16.	Tip portion
X	Longitudinal axis of the electronic lock
20.	Locking house
22.	Spring
23.	Coil windings
24.	Solenoid

[0013] Referring now to the figures outlined above, the preferred embodiment of the present invention comprises a cylinder body (1) having a first cylinder half (14a) and second cylinder half (14b), a handle (7) to be situated on the second cylinder half with a handle rod (6), an actuator (2) for actuating a retention pin (3) for blocking movement of a plug (8) of the cylinder body, an antenna (4) for receiving signal coming from an electronic circuit (9) of a key (11), an electronic card (12).

[0014] Referring to the figure 1, said electronic lock (15) comprises the cylinder body (1) one end of which the key (11) can be inserted for actuating a pawl (10), and the other end of the cylinder body is equipped with the handle (7) for the user to lock or open the door. According to the Fig. 2, demonstrating an A-A cross section of the fig. 1, the actuator (2) is placed at first cylinder half (14a) with the retention pin (3), when the user inserts the key (11) inside the cylinder body (1), the antenna (4) sense the electronic circuit (9) of the key (11) which is placed at the tip portion of the key, and activates the actuator (2) of the retention pin (3) up or down according to the longitudinal axis of the electronic lock (X). Said first cylinder half (14a) has a locking house (20) as a groove, engages with the retention pin (3) when the actuator is activated.

[0015] Said electronic circuit (9) of the key (11) interacts with the antenna (4) which is in a communication with the electronic card (12) via connection cables (5). Verification and identification of the data receiving from the antenna (4) are processed in the electronic card (12), if the electronic card (12) approves the defined key (11) is inserted into the cylinder body (1) then receive a signal to the actuator (2). The user may define more than one key (11) for the electronic lock (15) with the electronic card (12). The electronic card (12) compares data read from the antenna (4) with data stored in memory itself, such that if the data received from the antenna (4) is found to be acceptable, the electronic card (12) provides the actuating signal to a solenoid-activated actuator (2) to move the retention pin (3).

[0016] Main idea underlying of the invention is that the electromechanical relationship between the key and the lock cylinder. The electronic locking system of the present invention provides powerful, flexible "locking system" capabilities-i.e. access control functions. Fig 4a shows a perspective view of the electronic lock (15) where a tip portion (16) of the key (11) inserted in the keyway fully.

[0017] Said retention pin (3) preferably can be one piece and prevents the movement of the cylinder boy (1). When the pin (3) is in its extended position, as seen in figure 3, actuator releases the pin (3) and let the rotation of the plug (1). Before the key (11) is inserted into the keyway, the locking pin (3) is held in an upward position as shown in FIG. 3. Upon an "allow access" decision by the key electronics after the full insertion of an authorized key (FIG. 6A), actuator is activated pulling of the retention pin (3).

[0018] In another embodiment, the antenna (4) can be selectively connected to a detector constructed to respond to the radio frequency signal or to a detector constructed to respond to the light-frequency signal and cooperating with the electronic card (12). The actuator (2) houses a solenoid-actuated retention pin (4) which is oriented perpendicular to the longitudinal axis of the electronic lock. The retention pin (3) mates with a grooved section which prevents rotation of the plug (8) in certain states of the actuator. If the electronic lock (15) recognizes a valid key is inserted, actuator (3) is energized, and retention pin (3) is pulled inside the grooved housing of the actuator (3). The plug (8) is thereby unlocked and free to rotate. Upon removal of the key from the keyway, retention pin (3) returns to its fully depressed position, blocks the plug (8). A spring (22) can be used and in turn may push the retention pin (3) into a locked position.

[0019] A suitable design for key 30, shown in FIG. 5, is quite similar to that of a conventional mechanical key. Key shaft of the key (11) and especially the tip portion (16) of the key (11) houses the electronic circuit (9) which is suitable to interface with the antenna (4). Said hosing of the electronic circuit has a cross section in a form of rectangular. Thanks to its nature, said key has no battery for electronic circuit (9) such that it provides long term usage and durability. Because of the electronic circuit (9) of the key is positioned at the tip of the key shaft, there is no powerful electronic materials are needed. Advantageously, battery for the key, especially for the electronic circuit, is not needed and long-lasting usage is obtained.

[0020] Upon insertion of the valid key, the antenna sense the electronic circuit end sends a signal to the elec-

tronic card. The data is processed by the electronic card to energize the solenoid-activated actuator (2), pulling retention pin back and allowing plug (8) to rotate freely. Actuator is thus energized only in the event that retention pin has been moved downwardly into its open position, thereby energizing the actuator.

[0021] In another embodiment, when retention pin (3) is in its locking position, it is necessary in order to retract the pin to provide current through coil to generate a field of opposite polarity to that of solenoid means, of sufficient strength. When current of opposite polarity is applied, retention pin (3) will move downwardly. Whilst the key is absent, the retention pin is retained in the locking position.

[0022] Figure 6 demonstrates a cross section view of the actuator of the lock according to the present invention. Said actuator (2) mainly comprises a solenoid (24) having a coil windings (23) and a spring (22) biasing against the retention pin (3). When the electronic card (12) energizes the coil windings (23), the coil is also energized to withdraw the retention pin so that the plug can move.

Claims

1. An electronic lock (15) comprising:

a cylinder body (1) having a first cylinder half (14a) and a second cylinder half (14b);
a plug (8) having a keyway for receiving a key, rotatable within said cylinder body (1),
an solenoid-activated actuator (2) within the cylinder body (1), said actuator (2) having a retention pin (3) which selectively engages the plug (8) to prevent the rotation thereof and disengages the plug (8) in response to an actuating signal to allow rotation thereof **characterized in that**, said electronic lock (15) further comprises:

an antenna (4) for receiving data from an electronic circuit (9) placed at a shaft of the key, when the key (11) is inserted into the keyway fully;
the solenoid-activated actuator (2) for housing and driving said retention pin (3) downwardly or upwardly according to the longitudinal axis of the electronic lock (X); and
an electronic card (12) compares data read from the antenna (4) with data stored in memory itself, such that if the data received from the antenna (4) is found to be acceptable, the electronic card (12) provides the actuating signal to the solenoid-activated actuator (2) to move the retention pin (3).

2. An electronic lock (15) as in claim 1 **characterized in that**, said electronic lock (15) further comprises a spring (22) for pushing the retention pin (3) into a locked position, upon removal of the key from the keyway.

3. An electronic lock (15) as in claim 1 **characterized in that**, said electronic circuit (9) of the key (11) interacts with the antenna (4) which is in a communication with the electronic card (12) via connection cables (5).

4. An electronic lock (15) as in claim 1 **characterized in that**, said electronic lock (15) comprises a grooved housing on the actuator (3), when the electronic lock (15) recognizes a valid key is inserted, the actuator (3) is energized, and retention pin (3) is pulled inside the grooved housing of the actuator (3).

5. An electronic lock (15) as in claim 1 **characterized in that**, said electronic lock (15) comprises a handle (7) to be situated on the second cylinder half with a handle rod (6).

6. An electronic lock (15) as in claim 1 **characterized in that**, said actuator comprises a solenoid (24) having a coil windings (23) and the spring (22) biasing against the retention pin (3).

7. An electronic lock (15) as in claim 1 **characterized in that**, said antenna (4) is arranged to respond to the light-frequency signal.

8. An electronic lock (15) as in claim 1 **characterized in that**, electronic card (12) is arranged to be defined more than one key (11) for the electronic lock (15).

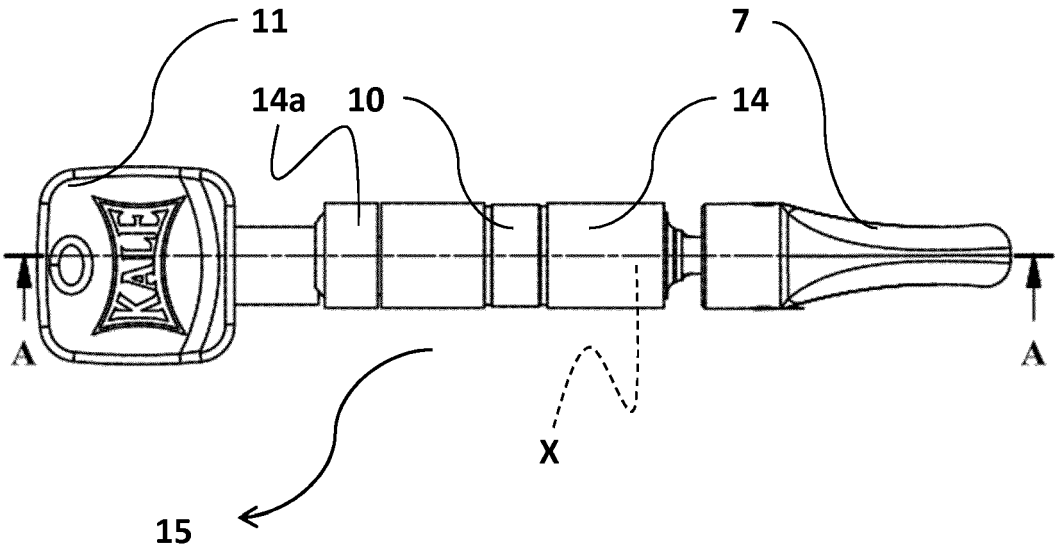

Fig. 1

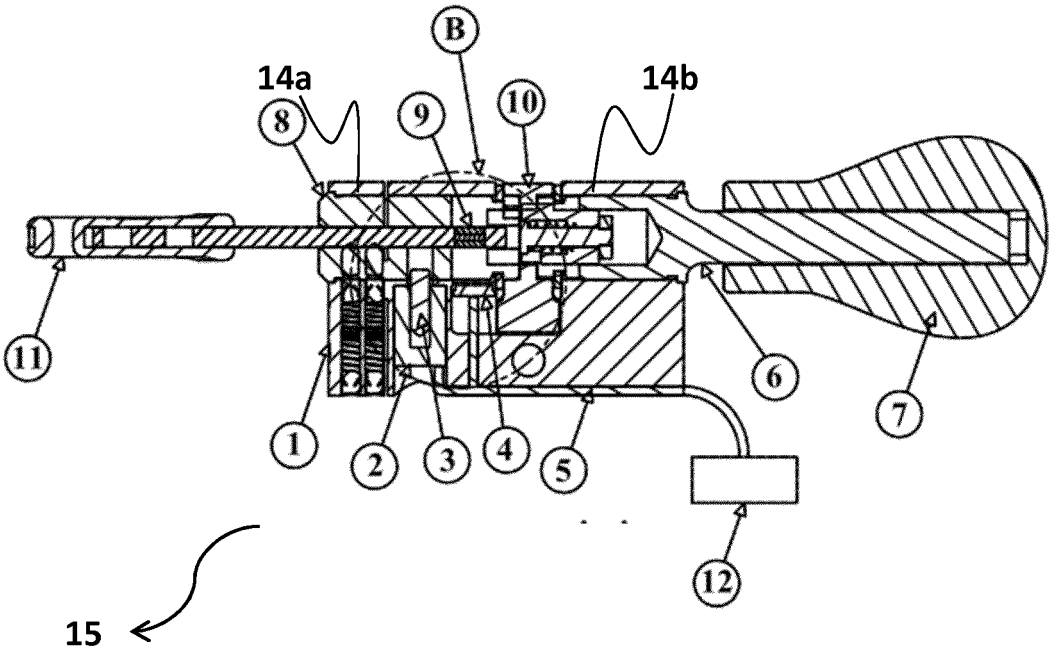

Fig. 2

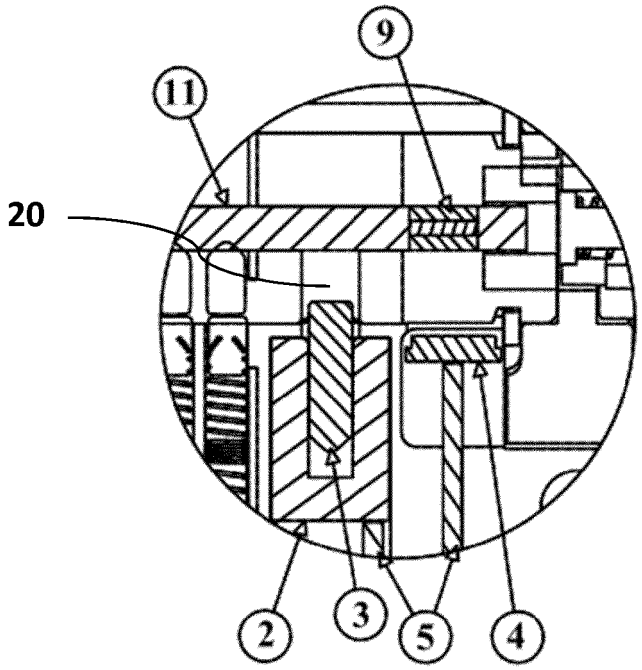

Fig. 3

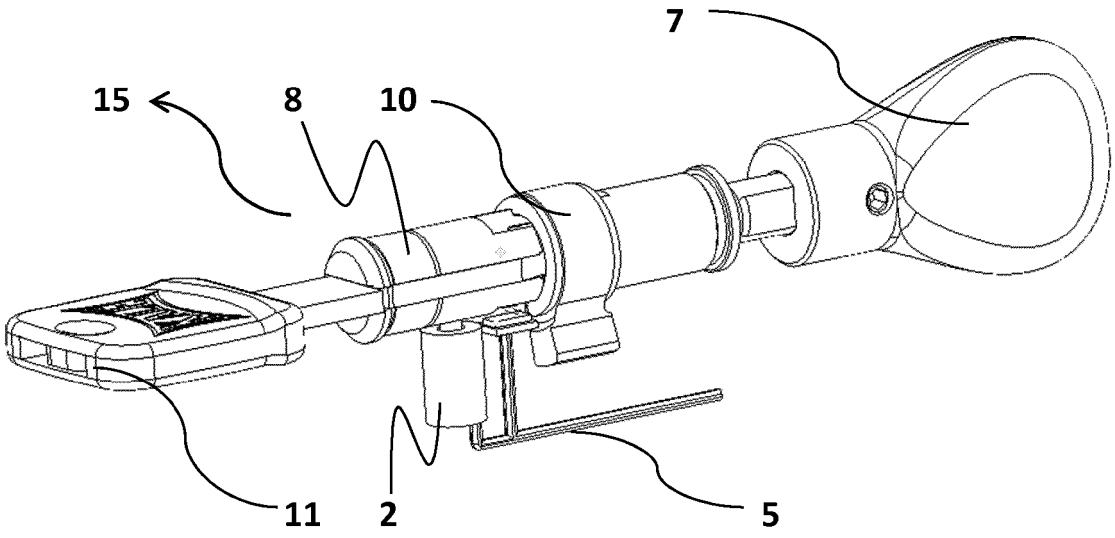

Fig. 4a

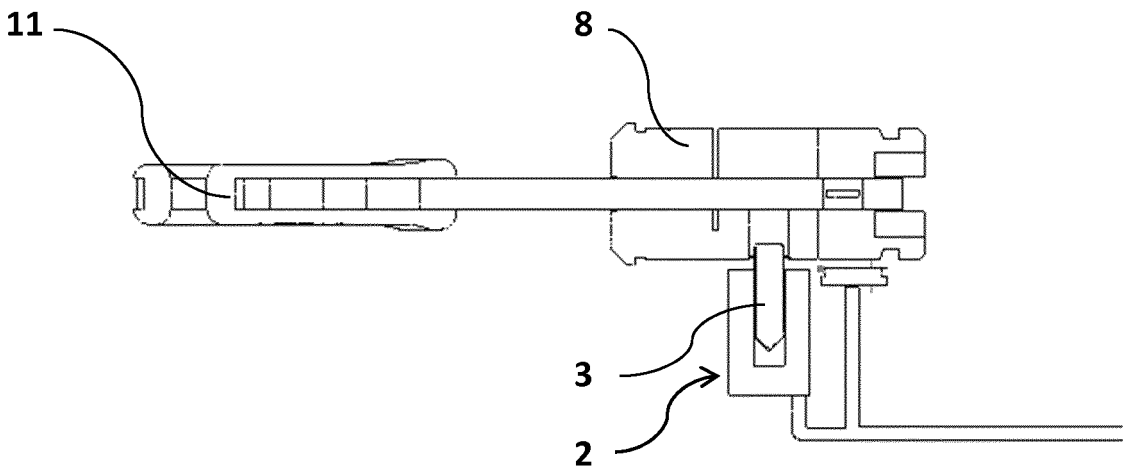

Fig. 4b

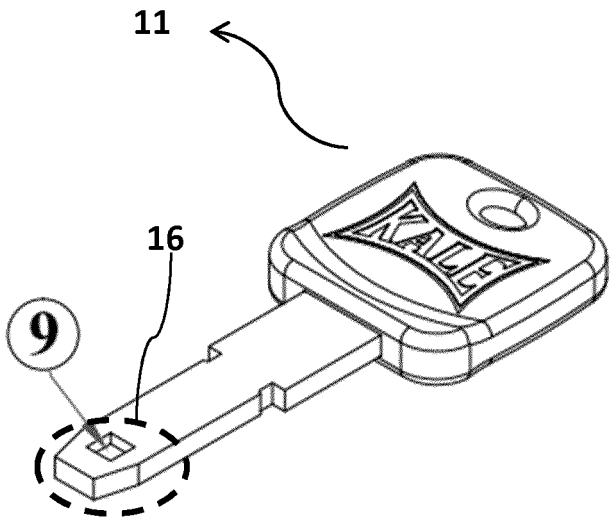

Fig. 5

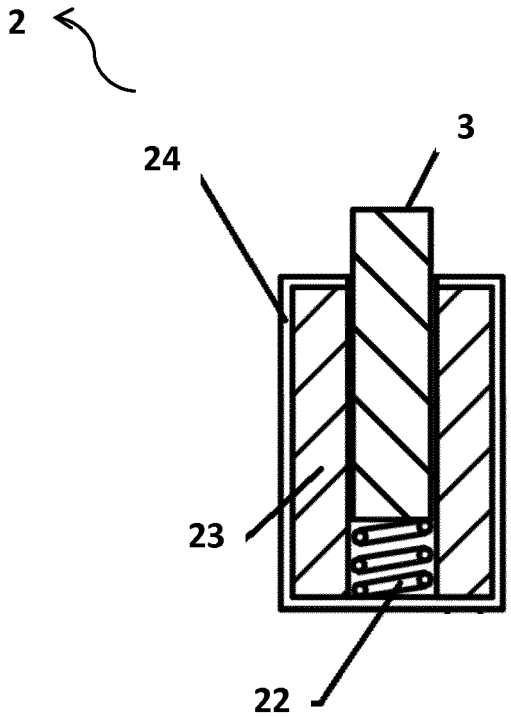

Fig. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 16 17 9557

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 6 442 985 B1 (WATANUKI YOSHIO [JP] ET AL) 3 September 2002 (2002-09-03) * abstract * * * column 1, line 20 - column 6, line 65 * * column 8, line 1 - column 9, line 19 * * figures 1-10 * -----	1-4,6,8	INV. G07C9/00
X	US 2003/084691 A1 (KATO YOSHIHITO [JP] ET AL) 8 May 2003 (2003-05-08) * abstract * * * paragraph [0080] - paragraph [0106] * * figures 1,2,9,10 * * paragraph [0119] - paragraph [0124] * -----	1-8	
X	US 2002/189307 A1 (GOKCEBAY ASIL T [US] ET AL) 19 December 2002 (2002-12-19) * abstract * * * paragraph [0017] - paragraph [0044] * * figures 1-6 * -----	1-8	
A	US 2002/134120 A1 (DAVIS PAUL R [US]) 26 September 2002 (2002-09-26) * abstract * * * figures 1-11 * * paragraph [0030] - paragraph [0051] * -----	1-8	TECHNICAL FIELDS SEARCHED (IPC) G07C E05B B60R
X	EP 2 017 795 A1 (ILOQ OY [FI]) 21 January 2009 (2009-01-21) * abstract * * * paragraph [0025] - paragraph [0065] * * figures 3a-7b * -----	1	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	18 January 2017	Pañeda Fernández, J

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 16 17 9557

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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18-01-2017

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6442985 B1	03-09-2002	DE 10029007 A1	11-01-2001
		US 6442985 B1	03-09-2002
US 2003084691 A1	08-05-2003	AU 2002301853 B2	19-05-2005
		JP 2003135808 A	13-05-2003
		US 2003084691 A1	08-05-2003
		US 2004159135 A1	19-08-2004
US 2002189307 A1	19-12-2002	NONE	
US 2002134120 A1	26-09-2002	AT 438775 T	15-08-2009
		AU 782772 B2	25-08-2005
		AU 2793201 A	07-08-2001
		BR 0107744 A	12-11-2002
		CA 2395703 A1	02-08-2001
		CN 1396979 A	12-02-2003
		CN 101059882 A	24-10-2007
		EP 1250505 A1	23-10-2002
		ES 2330303 T3	09-12-2009
		JP 4648604 B2	09-03-2011
		JP 2003520918 A	08-07-2003
		MX PA02006922 A	05-04-2004
		NZ 519694 A	30-07-2004
		US 2002134120 A1	26-09-2002
		US 2003140667 A1	31-07-2003
		WO 0155539 A1	02-08-2001
EP 2017795 A1	21-01-2009	CA 2729007 A1	22-01-2009
		CN 101755289 A	23-06-2010
		EP 2017795 A1	21-01-2009
		ES 2386819 T3	31-08-2012
		JP 5295235 B2	18-09-2013
		JP 2010533807 A	28-10-2010
		KR 20100039367 A	15-04-2010
		RU 2010103940 A	27-08-2011
		US 2010139343 A1	10-06-2010
		WO 2009010638 A1	22-01-2009

EPO FORM P0459

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