(12) STANDARD PATENT (11) Application No. **AU 2015245923 B2**
(19) AUSTRALIAN PATENT OFFICE

(54) Title
A push-type pin cylinder assembly and a method of operating same

(51) International Patent Classification(s)
E05B 27/00 (2006.01) ***E05B 63/22*** (2006.01)
E05B 15/04 (2006.01)

(21) Application No: **2015245923** (22) Date of Filing: **2015.02.06**

(87) WIPO No: **WO15/154121**

(30) Priority Data

(31) Number	(32) Date	(33) Country
2014901312	**2014.04.10**	**AU**

(43) Publication Date: **2015.10.15**
(44) Accepted Journal Date: **2019.03.14**

(71) Applicant(s)
Gainsborough Hardware Industries Limited

(72) Inventor(s)
Lambrou, Harris;Greenbury, David

(74) Agent / Attorney
Spruson & Ferguson, GPO Box 3898, Sydney, NSW, 2001, AU

(56) Related Art
US 1288074 A
DE 102011000443 A1
US 4126025 A
US 652337 A

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
15 October 2015 (15.10.2015)

WIPO | PCT

(10) International Publication Number
WO 2015/154121 A1

(51) International Patent Classification:
E05B 27/00 (2006.01) *E05B 63/22* (2006.01)
E05B 15/04 (2006.01)

(21) International Application Number:
PCT/AU2015/000060

(22) International Filing Date:
6 February 2015 (06.02.2015)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
2014901312 10 April 2014 (10.04.2014) AU

(71) Applicant: **GAINSBOROUGH HARDWARE INDUSTRIES LIMITED** [AU/AU]; 31-33 Alfred Street, Blackburn, VIC 3130 (AU).

(72) Inventors: **LAMBROU, Harris**; 31-33 Alfred Street, Blackburn, VIC 3130 (AU). **GREENBURY, David**; 7/91 Wellington Street, St.Kilda, VIC 3182 (AU).

(74) Agent: **SPRUSON & FERGUSON**; GPO Box 3898, Sydney, New South Wales 2001 (AU).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

(54) **Title**: A PUSH-TYPE PIN CYLINDER ASSEMBLY AND A METHOD OF OPERATING SAME

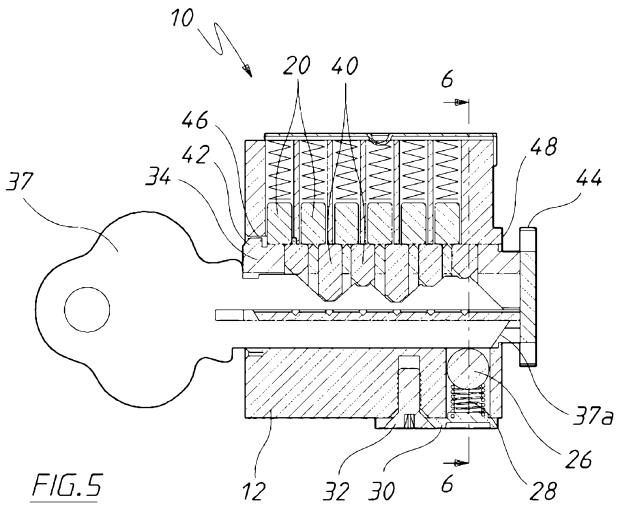

FIG.5

(57) **Abstract**: A push-type pin cylinder assembly (10) including a housing (12), a cylinder barrel (34) and a detent (26). The housing (10) has a barrel opening (14) therein. The cylinder barrel (34) has a key slot (36), a detent recess (38) and a longitudinal axis. The cylinder barrel (34) is slidably mounted in the barrel opening (14) for axial movement relative to the housing (12). The detent (26), which is mounted in the housing (12), is adapted to bias the barrel (34) towards a rest position when engaged with the detent recess (38). During insertion of a correctly coded key (37) into the key slot (36), the detent (26) holds the barrel (34) in the rest position until insertion of the key (37) is at least substantially complete after which the key (37) then causes the detent (26) to be driven out of biasing engagement with the cylinder barrel (34) where after pushing of the key (37) and/or the cylinder barrel (34) in the direction of key insertion axially moves the cylinder ban-el (34) relative to the housing (12) from the rest position to an actuated position.

WO 2015/154121 A1

A PUSH-TYPE PIN CYLINDER ASSEMBLY AND A METHOD OF OPERATING SAME

Field of the Invention

[0001] The present invention relates to a push-type pin cylinder assembly and a method of operating same.

[0002] The invention has been primarily developed for use in a door lock and will be described hereinafter with reference to this application. However, the invention is not limited to this particular use and is also suitable for window locks, key switches, alarms and electronic locks.

Background of the Invention

[0003] Pin cylinder assemblies are known, in both pivoting-type and push-type. In a pivoting-type pin cylinder assembly, insertion of a correctly coded key into a cylinder barrel aligns the interfaces between a series of chamber pins and top pins along a shear plane, whereafter the cylinder barrel can be pivoted relative to a housing. The relative pivoting movement between the cylinder barrel and the housing is then used to drive one or more components of a lock for locking and/or unlocking actions etc.

[0004] In a push-type pin cylinder assembly, the alignment of the interfaces between the chamber pins and top pins along the shear line by a correctly coded key allows the cylinder barrel to be moved axially, in the direction of key insertion, relative to the housing. This relative axial movement between the cylinder barrel and the housing can be used to drive components in the lock for locking and/or unlocking etc.

[0005] In a push-type pin cylinder assembly, it is desirable to stop the cylinder barrel from moving axially relative to the housing whilst the key is being inserted so as to maintain correct alignment between the housing pin openings and the barrel pin openings. If correct alignment is not maintained, then the insertion of the key into the barrel is not smooth. The key insertion will feel notchy, which is undesirable to users, and will require increased force for key insertion. The notchy feel is caused by the chamber pins in the barrel pin openings catching

on the edge of the (misaligned) housing pin openings as they are pushed into the barrel pin openings during key insertion.

[0006] German patent application no. DE 102011000443 discloses a detent mounted in a housing. The detent is biased into engagement with the cylinder barrel by a spring in order to restrict the barrel from moving relative to the housing whilst the key is being inserted. However, once the key has been inserted, in order to move the cylinder barrel axially relative to the housing, a user must push the cylinder barrel with enough force to overcome the engagement of the detent. This is a disadvantage as the relatively large pushing force required makes the pin cylinder assembly difficult to operate, particularly for the elderly or disabled. This disadvantage is exacerbated when the pin cylinder assembly is used in application where the barrel is used to apply force to, and move, an object or mechanism with its own resistance. In such applications, the cylinder detent force and the object/mechanism movement force must both be overcome simultaneously, which results in an increased key insertion force. Further, in the arrangement disclosed in German patent application no. DE 102011000443, the detent force must be higher than the force required to insert the key and must be overcome in the initial barrel movement. If the barrel is also moving the object/mechanism, then in some scenarios the sum of the two forces will be unacceptably high from a user perspective.

Object of Invention

[0007] It is an object of the present invention to substantially overcome or at least ameliorate the above disadvantage.

Summary of Invention

[0008] Disclosed herein is a push-type pin cylinder assembly including:

a housing with a barrel opening therein;

a cylinder barrel with a key slot, a detent recess and a longitudinal axis, the cylinder barrel being slidably mounted in the barrel opening for axial movement relative to the housing; and

a detent, mounted in the housing, adapted to bias the barrel towards a rest position when engaged with the detent recess,

wherein, during insertion of a correctly coded key into the key slot, the detent holds the barrel in the rest position until insertion of the key is at least substantially complete after which

the key then causes the detent to be driven out of biasing engagement with the cylinder barrel where after pushing of the key and/or the cylinder barrel in the direction of key insertion axially moves the cylinder barrel relative to the housing from the rest position to an actuated position.

[0008a] In accordance with an aspect of the present invention, there is provided a push-type pin cylinder assembly including:

a housing with a barrel opening therein;

a cylinder barrel with a key slot, a detent recess and a longitudinal axis, the cylinder barrel being slidably mounted in the barrel opening for axial movement relative to the housing; and

a detent, mounted in the housing, adapted to bias the barrel towards a rest position when engaged with the detent recess,

wherein, during insertion of a correctly coded key into the key slot, the detent holds the barrel in the rest position until insertion of the key is at least substantially complete, further insertion of the key into the key slot then causing the detent to be driven out of biasing engagement with the cylinder barrel where after pushing of the key and/or the cylinder barrel in the direction of key insertion axially moves the cylinder barrel relative to the housing from the rest position to an actuated position.

[0009] The detent preferably holds the barrel in the rest position until insertion of the key is complete.

[0010] The lock assembly preferably includes a set of bottom pins and the detent preferably holds the barrel in the rest position until insertion of the key has substantially moved all of the bottom pins to a shear line or a split line or to inside the housing.

[0011] The distal end of the key preferably causes the detent to be driven out of biasing engagement with the cylinder barrel.

[0012] The axial insertion force required to insert the key into the key slot is smaller than the force applied by the detent in biasing the cylinder barrel axially towards the rest position.

[0013] The detent is preferably biased towards the detent recess, most preferably by a spring. Alternatively, the detent is biased towards the detent recess by gravity.

[0014] In one form, the detent is a ball. In another form, the detent is a plunger.

[0015] The detent is preferably moved out of engagement with the detent barrel during approximately the last 2.5mm of axial movement of complete insertion of the key in the key slot.

[0016] In one form, the key abuts the detent to then directly cause the detent to be driven out of biasing engagement with the cylinder barrel.

[0017] In another form, the key indirectly causes the detent to be driven out of biasing engagement with the cylinder barrel, most preferably via one or more intermediate members.

[0018] The housing preferably includes a set of housing pin openings therein and the cylinder barrel preferably includes a corresponding set of barrel pin openings therein, wherein the set of housing pin openings and the set of barrel pin openings are aligned with each other in the rest position and displaced from each other in the actuated position.

[0019] The pin cylinder assembly preferably further includes:

a set of chamber pins associated with the set of barrel pin openings; and

a set of top pins and springs associated with housing pin openings.

[0020] In a second aspect, the present invention provides a method of operating a push-type pin cylinder assembly, the method including the sequential steps of:

a. biasing a cylinder barrel towards a rest position, relative to a housing, with a detent;
b. inserting a correctly coded key into a key slot in the cylinder barrel in an key inserting axial direction;
c. holding the cylinder barrel in the rest position until at least substantially complete insertion of the key in the key slot;
d. releasing the biasing of the cylinder barrel by moving the detent out of engagement with the cylinder barrel with the key; and
e. pushing the cylinder barrel in the key advancing axial direction, relative to the housing, from the rest position to an actuated position.

[0021] Step d. preferably includes releasing the biasing of the cylinder barrel by moving the detent out of engagement with the cylinder barrel with a distal end of the key.

[0022] Step e. preferably includes pushing the cylinder barrel by pushing the key and/or pushing the cylinder barrel.

[0023] Step c. preferably includes holding the barrel in the rest position until complete insertion of the key in the key slot.

[0024] The axial insertion force required to insert the key in step b. is smaller than the force applied by the detent in biasing the cylinder barrel axially towards the rest position in step a.

[0025] Step d. preferably includes the detent being moved out of engagement with the detent barrel during approximately the last 2.5mm of axial movement of complete insertion of the key in the key slot.

[0026] In one form, step d. includes releasing the biasing of the cylinder barrel by moving the detent out of engagement with the cylinder barrel responsive to abutment of the detent with the key.

[0027] In another form, step d. includes moving one or more intermediate members with the key and releasing the biasing of the cylinder barrel by moving the detent out of engagement with the cylinder barrel responsive to abutment of the detent with one or more intermediate members.

Brief Description of Drawings

[0028] A preferred embodiment of the invention will now be described, by way of an example only, with reference to the accompanying drawings in which:

[0029] Fig. 1 is cross sectional side view of an embodiment of a push-type pin cylinder assembly, with a cylinder barrel in a rest position and a key almost fully inserted therein;

[0030] Fig. 2 is a cross sectional end view of the assembly shown in Fig. 1 along line 2-2;

[0031] Fig. 3 is a cross sectional side view of the assembly shown in Fig. 1, with the barrel in the rest position and the key fully inserted;

[0032] Fig. 4 is a cross sectional end view of the assembly shown in Fig. 3 along line 4-4;

[0033] Fig. 5 is a cross sectional side view of the assembly shown in Fig. 1, after movement of the cylinder barrel from the rest position to an actuated position;

[0034] Fig. 6 is a cross sectional end view of the pin cylinder assembly shown in Fig. 5 along line 6-6;

[0035] Fig. 7 is a side view of the lock assembly in the state shown in Fig. 1, adjacent a tact switch; and

[0036] Fig. 8 is a side view of the lock assembly in the state shown in Fig. 5, adjacent the tact switch.

Description of Embodiments

[0037] Fig. 1 shows a push-type pin cylinder assembly 10. The assembly 10 includes a brass housing 12 with a cylindrical barrel opening 14 therein. The housing 12 also has six cylindrical housing pin openings 16 therein, which each locate a spring 18 and a brass top pin 20 respectively. The springs 18 and the top pins 20 are retained in their respective barrel pin openings 16 by a steel top cover plate 22, which is deformed into engagement with the housing 12.

[0038] The housing 12 also includes a cylindrical detent opening 24 in which is located a steel ball detent 26 and a spring 28. The detent 26 and the spring 28 are retained in the detent opening 24 by a steel bottom cover plate 30, which is secured to the housing 12 by a screw 32.

[0039] A cylindrical barrel 34 is located in the barrel opening 14. The barrel 34 includes a key slot 36 therein which is adapted to receive a key 37. The exterior of the barrel 34 is a clearance fit within the interior of the barrel opening 14, so as to allow the barrel 34 to slide axially relative to the housing 12. The distal end of the barrel 34 includes an outwardly concave detent recess 38, which opens into the key slot 36. The barrel 34 also includes six barrel pin openings 39, which each locate a respective brass chamber pin 39.

[0040] The barrel 34 also includes a proximal peripheral flange 42 and a distal peripheral flange 44. The proximal end of the housing 12 includes a cylindrical proximal recess 46, adapted to receive the distal flange 42 therein, and the distal end of the housing includes a distal shoulder 48, adapted to abut the distal flange 44.

[0041] The operation of the assembly 10 shall now be described. Figs. 1 and 2 show the barrel 34 located in a rest position relative to the housing 12. The rest position is the position adopted by the barrel 34 in the absence of key therein, or in the presence of an incorrectly

coded key therein. In the rest position, the barrel pin openings 16 are adjacent with the barrel pin openings 39. The proximal flange 42 is positioned axially leftwards from the proximal recess 46 and the distal flange 44 is in abutting engagement with the distal shoulder 48. The barrel 34 is maintained in the rest position relative to the housing 12 by the chamber pins 40 and the top pins 20 bridging across the barrel pin openings 39 and the housing pin openings 16. The barrel 34 is also biased to the rest position by the radial force of the detent 26 pressing towards and into the recess 38.

[0042] Figs. 1 and 2 shows the key 37, which is correctly coded relative to the chamber pins 40 and the top pins 20, almost fully inserted into the key slot 36. In this position, distal end 37a of the key 38 has just moved into abutment with the detent 26.

[0043] Figs. 3 and 4 show the key 37 after full insertion in the key slot 36. In this position, the distal end 37a of the key 37 has moved the detent 26 out of engagement with the recess 38 in the housing 12. In this position, the grooves in the key 37 position the chamber pins 40 and the top pins 18, such that their interfaces are aligned at the outermost surface of the barrel 34 and the innermost surface of the housing opening 14, which is known as the shear plane. In this position, the chamber pins 40 and the top pins 20 no longer prevent axial movement between the cylinder barrel 34 and the housing 12.

[0044] In the preferred embodiment shown, the detent 26 is moved out of engagement with the housing during the last 2.5 mm of key insertion. However, whilst the detent 26 is engaged with the barrel 34 (i.e. during the majority of key insertion) its function is to maintain the correct alignment between the barrel pin openings 39 and the housing pin openings 16, as required for correct operation of the assembly 10.

[0045] Figs. 5 and 6 show the cylinder barrel 34 in an actuated position, in which it has moved axially to the right from the rest position. In this actuated position, the proximal flange 42 is received within the proximal recess 46 and the distal flange 44 is moved away from the distal shoulder 48.

[0046] Figs. 7 and 8 show the assembly 10 mounted adjacent a circuit board 50 upon which is mounted an electrical tact switch 52. Fig. 7 shows the barrel 34 in the rest position, in which the switch 52 is open. Fig. 8 shows the barrel 34 in the actuated position, in which the switch

52 has been pressed closed by the distal shoulder flange 44 of the barrel 34. In this way, the assembly 10 can be used to actuate an electrically powered lock or other device.

[0047] The barrel 34 is driven back to rest position when the key 37 is moved axially to the left from the actuated position. During this movement the barrel 34 is driven to the left by the grooves in the key 37 contacting and engaging with the chamber pins 40. The chamber pins 40 are unable to move outwardly until the barrel 34 reaches the rest position. As a result, the key 37, the chamber pins 40 and the barrel 34 all move together until the barrel 34 reaches the rest position, where the distal flange 44 abuts the distal shoulder 48. In this position, the chamber pins 40 are aligned with the housing pin openings 16 and able to move outwardly into same. The key 38 can then be withdrawn from the key slot 36 and the detent 26 reengages with the barrel 34 to bias the barrel 34 into the rest position shown in Figs. 1 to 4. The barrel 34 is held in the rest position by the top pins 20 bridging across the barrel pin openings 39 and the housing pin openings 16.

[0048] The advantage provided by the assembly 10 is that resistance to the axial movement of the barrel 34 from the rest position to the actuated position is greatly reduced. This is because the biasing of the barrel 34 to the rest position by the detent 26 is released just before/as the key is fully inserted. Once this occurs, a user does not have to overcome a biasing force, in the opposite direction of key insertion, to move the barrel to the actuated position.

[0049] Although the invention has been described with reference to a preferred embodiment, it will be appreciated by person skilled in the art that the invention may be embodied in many other forms. For example, in the embodiment shown, the movement of the barrel actuates an electrical tact switch. However, in other embodiments (not shown), the movement of the barrel drives or actuates one or more mechanical components of an associated lock assembly.

2015245923 28 Feb 2019

CLAIMS

1. A push-type pin cylinder assembly including:

a housing with a barrel opening therein;

a cylinder barrel with a key slot, a detent recess and a longitudinal axis, the cylinder barrel being slidably mounted in the barrel opening for axial movement relative to the housing; and

a detent, mounted in the housing, adapted to bias the barrel towards a rest position when engaged with the detent recess,

wherein, during insertion of a correctly coded key into the key slot, the detent holds the barrel in the rest position until insertion of the key is at least substantially complete, further insertion of the key into the key slot then causing the detent to be driven out of biasing engagement with the cylinder barrel where after pushing of the key and/or the cylinder barrel in the direction of key insertion axially moves the cylinder barrel relative to the housing from the rest position to an actuated position.

2. The push-type pin cylinder assembly as claimed in claim 1, wherein the detent holds the barrel in the rest position until insertion of the key is complete.

3. The push-type pin cylinder assembly as claimed in claim 1, wherein the lock assembly includes a set of bottom pins and the detent holds the barrel in the rest position until insertion of the key has substantially moved all of the bottom pins to a shear line or a split line or to inside the housing.

4. The push-type pin cylinder assembly as claimed in claim 1, 2 or 3, wherein the distal end of the key causes the detent to be driven out of biasing engagement with the cylinder barrel.

5. The push-type pin cylinder assembly as claimed in any one of the preceding claims, wherein the axial insertion force required to insert the key into the key slot is smaller than the force applied by the detent in biasing the cylinder barrel axially towards the rest position.

6. The push-type pin cylinder assembly as claimed in any one of the preceding claims, wherein the detent is biased towards the detent recess.

7. The push-type pin cylinder assembly as claimed in claim 6, wherein the detent is biased towards the detent recess by a spring.

8. The push-type pin cylinder assembly as claimed in claim 6, wherein the detent is biased towards the detent recess by gravity.

9. The push-type pin cylinder assembly as claimed in any one of the preceding claims, wherein the detent is a ball.

10. The push-type pin cylinder assembly as claimed in any one of claims 1 to 8, wherein the detent is a plunger.

11. The push-type pin cylinder assembly as claimed in any one of the preceding claims, wherein the detent is moved out of engagement with the cylinder barrel during approximately the last 2.5mm of axial movement of complete insertion of the key in the key slot.

12. The push-type pin cylinder assembly as claimed in any one of the preceding claims, wherein the key abuts the detent to then directly cause the detent to be driven out of biasing engagement with the cylinder barrel.

13. The push-type pin cylinder assembly as claimed in any one of claims 1 to 11, wherein the key indirectly causes the detent to be driven out of biasing engagement with the cylinder barrel.

14. The push-type pin cylinder assembly as claimed in claim 13, wherein the key indirectly causes the detent to be driven out of biasing engagement with the cylinder barrel via one or more intermediate members.

15. The push-type pin cylinder assembly as claimed in any one of the preceding claims, wherein the housing includes a set of housing pin openings therein and the cylinder barrel includes a corresponding set of barrel pin openings therein, wherein the set of housing pin openings and the set of barrel pin openings are aligned with each other in the rest position and displaced from each other in the actuated position.

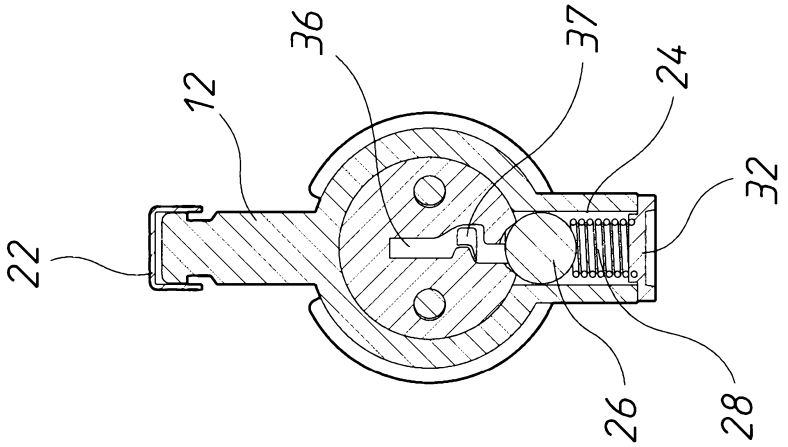
36
37
24
12
32
22
26
28

FIG.2

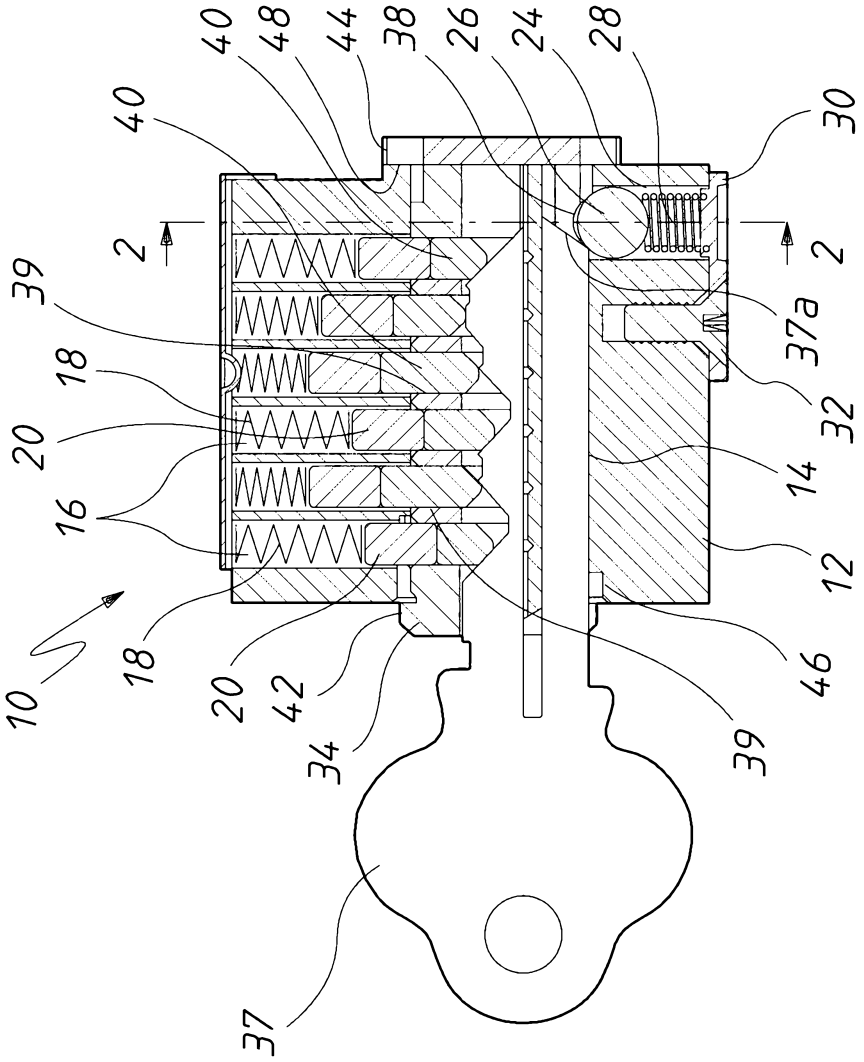
40
48
44
38
26
24
28
40
30
2
2
39
37a
18
32
20
14
16
12
10
18
20
42
34
46
39
37

FIG.1

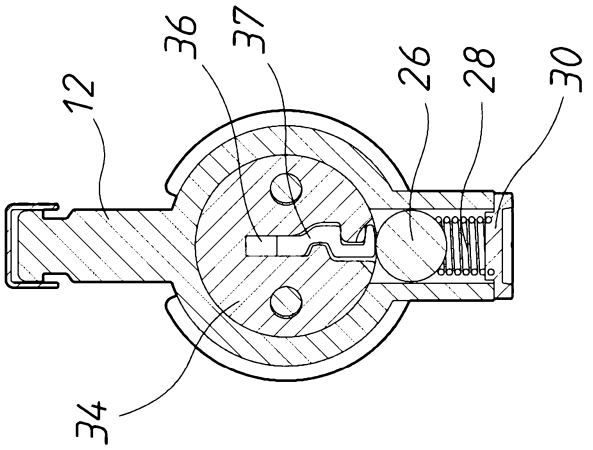

FIG.4

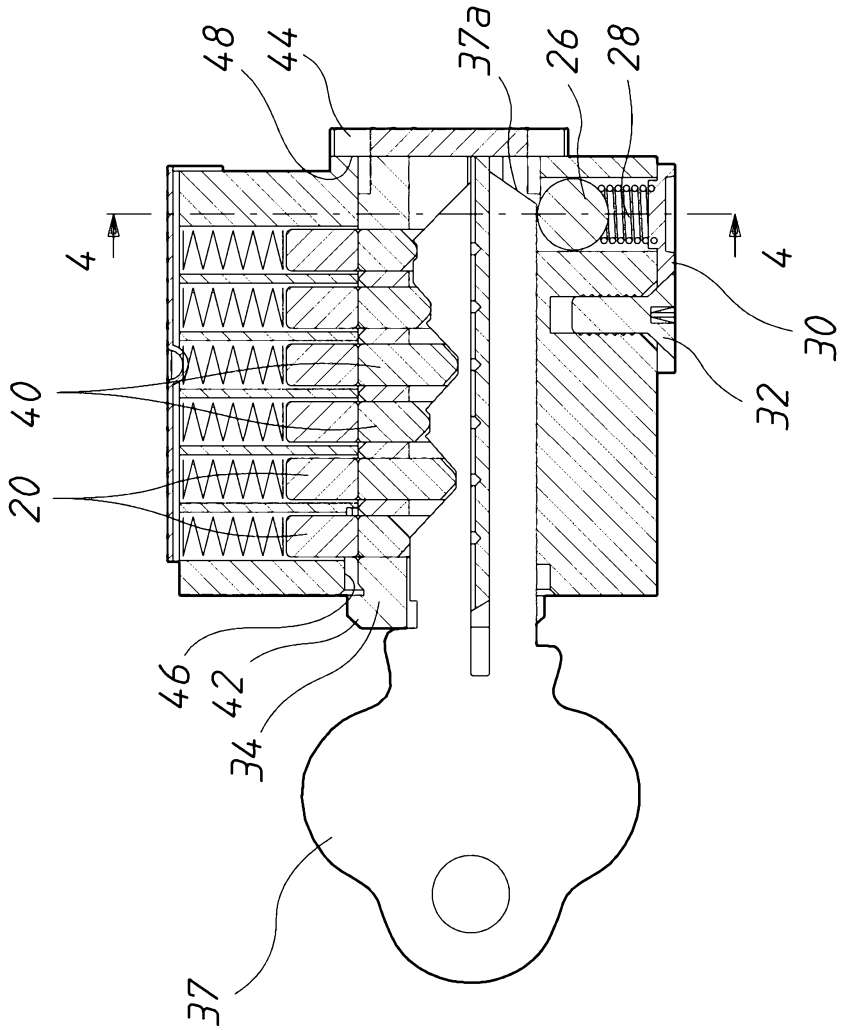

FIG.3

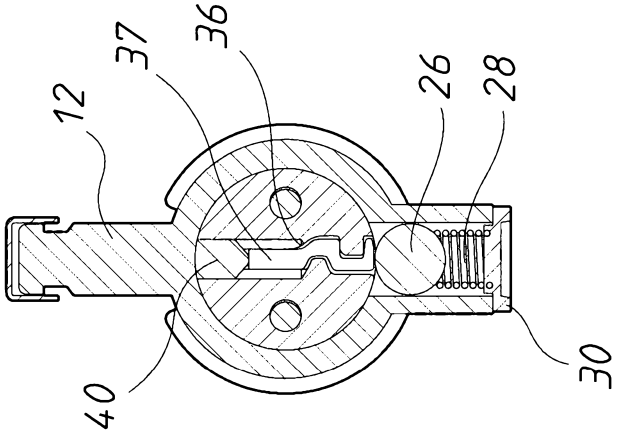

FIG.6

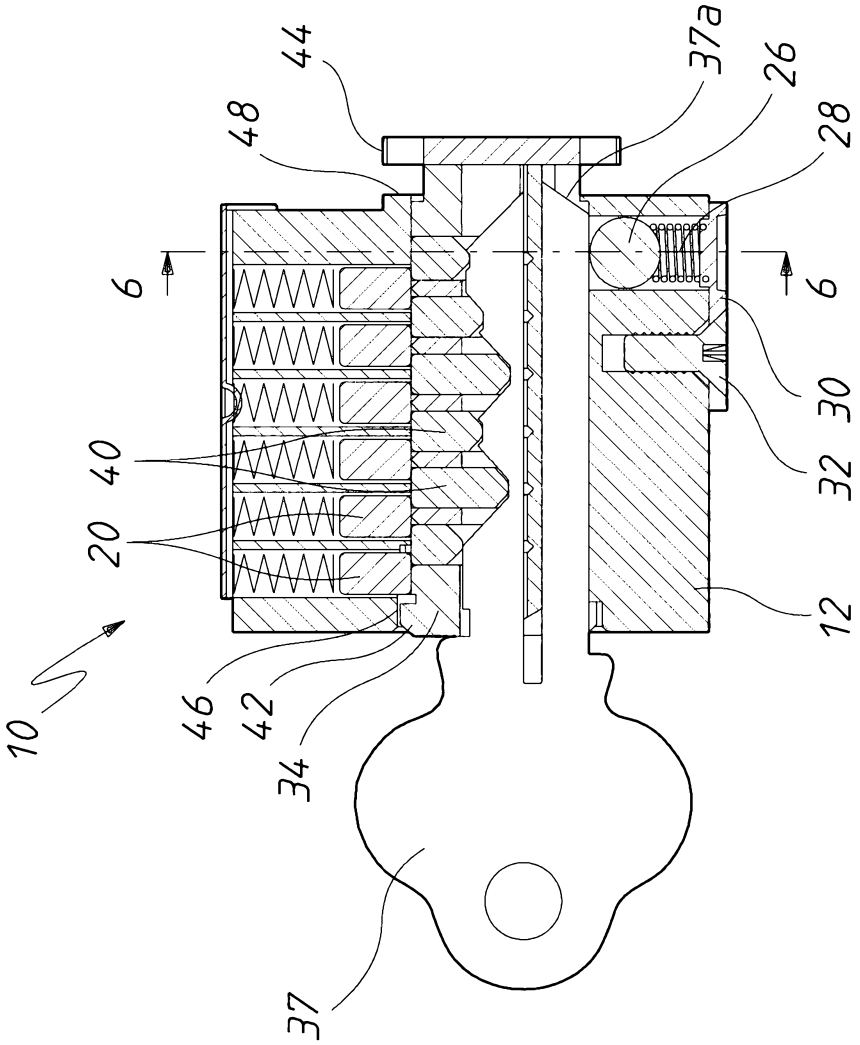

FIG.5

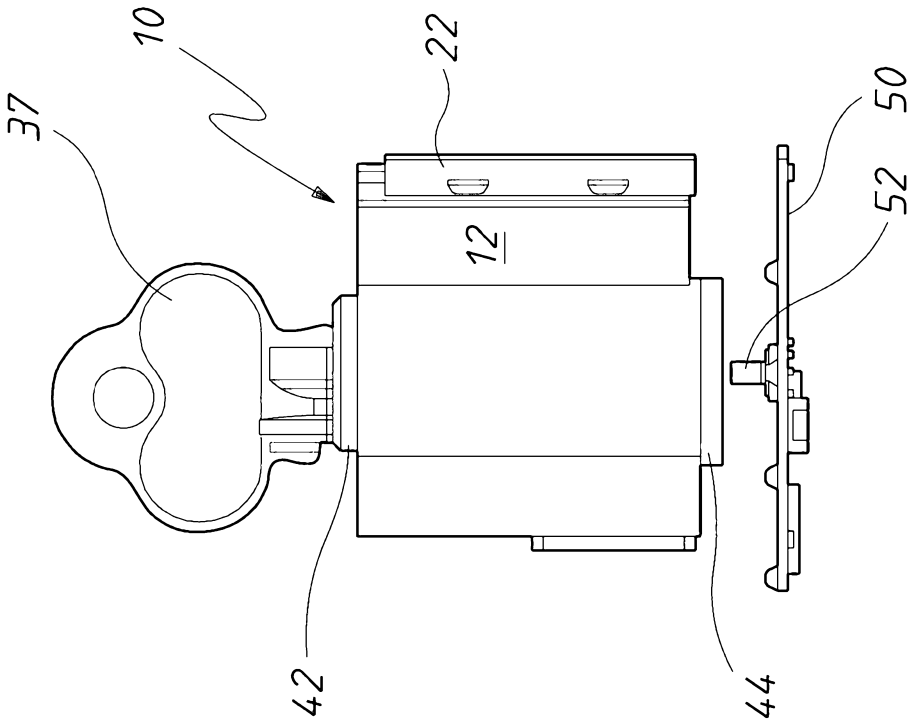

FIG.7

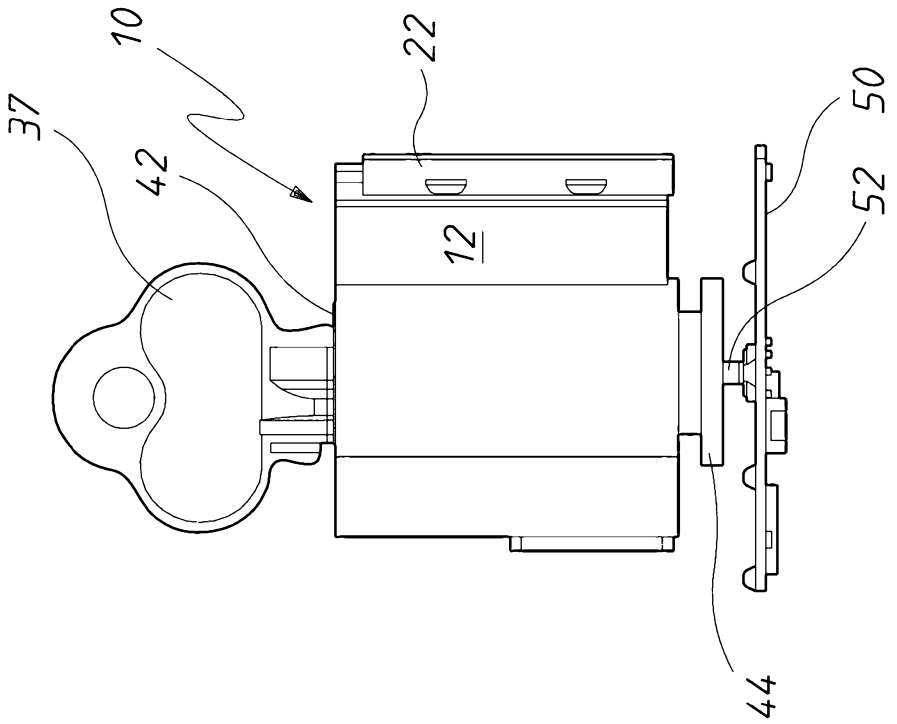

FIG.8