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

(11) **EP 3 680 424 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
15.07.2020 Bulletin 2020/29

(51) Int Cl.:
E05B 17/20 *(2006.01)* ***E05B 9/04*** *(2006.01)*
E05B 9/10 *(2006.01)*

(21) Application number: **19157603.2**

(22) Date of filing: **15.02.2019**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **10.01.2019 TW 108101050**

(71) Applicant: **Federal Lock Co., Ltd.**
Pintong County 912 (TW)

(72) Inventor: **TIEN-KAO, LIU**
912 Neipu Industrial District, Pingtung County (TW)

(74) Representative: **Jannig & Repkow**
Patentanwälte PartG mbB
Klausenberg 20
86199 Augsburg (DE)

(54) **AUTO LOCKED LOCK CYLINDER AFTER DESTRUCTION**

(57) A lock includes a body which includes tow collars and two lock holes that communicate with two transverse passages. The lock holes each include an elastic component and a stop pin received therein. The stop pin is tapered and includes a connection portion. Multiple notch are defined radially in the stop pin. Each transverse passage includes an elastomer and a lock pin received therein. Two transmission wheels are respectively located in the two collars and drives a cam. Two lock cylinders are respectively connected to the transmission wheels and support the lock blocks. The stop pin contacts the lock block. The connection portion is not connected to the hole, and the notch is located offset from the transverse passage. When the lock cylinder is damaged and is separated from the transmission wheel, the connection portion is connected to the hole, and cam and the transmission wheel cannot be rotated.

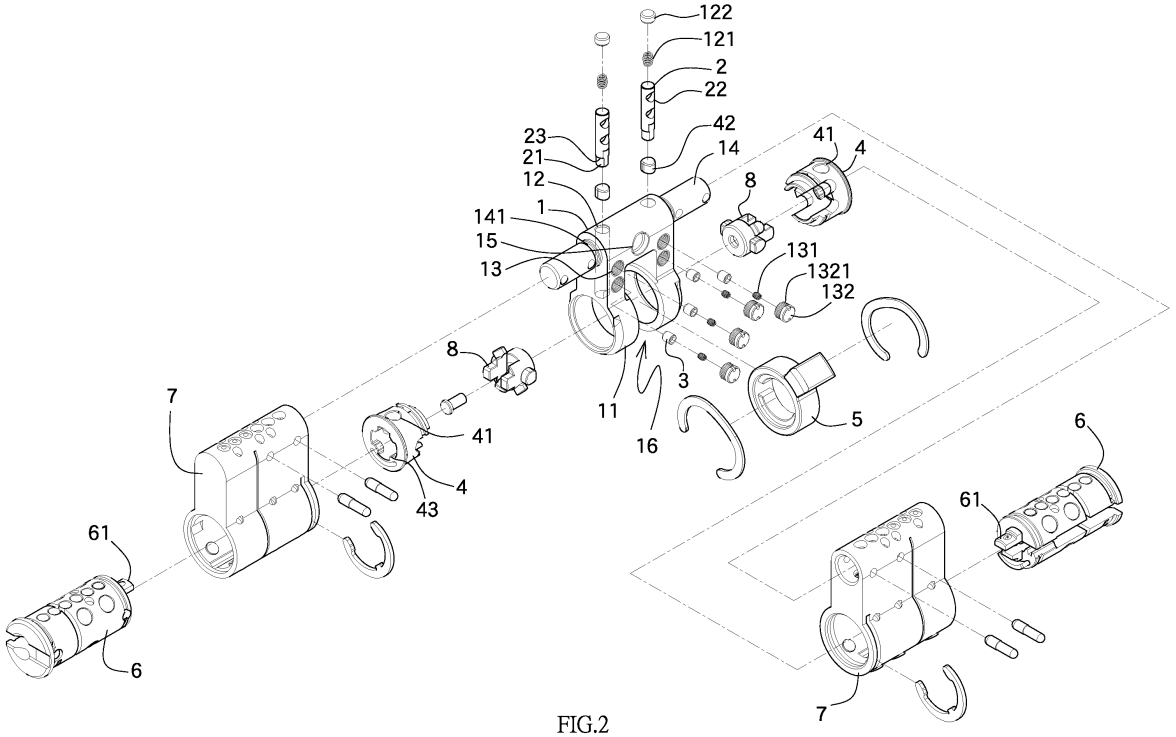


FIG.2

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Description

BACKGROUND OF THE INVENTION

1. Fields of the invention

[0001] The present invention relates to a lock cylinder that is automatically locked after being destructed.

2. Descriptions of Related Art

[0002] The conventional lock cylinder includes top and bottom beads that are aligned in a specific pattern to achieve purposes of locked feature and unlocked feature. Thefts try to pick and shift theses top and bottom beads to rotate the cam to unlock the lock cylinder without permission. If the lock cylinder includes a complicated arrangement of the top and bottom beads, it is less likely that the lock cylinder can be unlocked by picking and shifting these beads. However, the thefts can also break the housing of the lock to access the lock cylinder and to directly rotate the cam to unlock the lock. In other words, as long as the foreign force is large enough to break the housing of the lock, the lock cannot have the safety feature as desired.

[0003] The present invention intends to provide a lock cylinder that is able to eliminate the shortcomings mentioned above.

SUMMARY OF THE INVENTION

[0004] The present invention relates to a lock and comprises a body which includes at least one collar and at least one lock hole that communicates with the at least one collar. At least one transverse passage is defined through the body and communicates with the lock hole. An elastic component and a stop pin are respectively located in the at least one lock hole. The stop pin includes a connection portion that is located opposite to the elastic component. At least one notch is defined radially in the stop pin. The at least one transverse passage is located corresponding to the at least one notch corresponding thereto. The at least one transverse passage has an elastomer and a lock pin received therein. At least one transmission wheel is pivotably located in the at least one collar. The at least one transmission wheel includes at least one hole defined radially therein which is located corresponding to the connection portion corresponding thereto and accommodates a lock block therein. A cam is engaged with the at least one transmission wheel which is driven by the cam. At least one lock cylinder has a transmission portion rotatably connected thereto and supports the lock block. The stop pin contacts the lock block. The connection portion is not connected to the at least one hole. The at least one notch is located offset from the transverse passage. When the transmission portion of the at least one lock cylinder is separated from the at least one transmission wheel, the connection portion is connected to the at least one hole, and the at least one notch is located corresponding to the transverse passage. The lock pin is biased by the elastomer and engaged with the notches.

[0005] Preferably, the body includes a connection rod extending axially from each of two ends thereof. Each connection rod has a neck which is located close to the at least one collar corresponding thereto. The strength of the neck of each connection rod is lower than that of the body and the connection rod corresponding thereto. Each of the connection rods is inserted into a housing that receives the at least one lock cylinder therein.

[0006] Preferably, the neck is integrally formed with the body and the connection rod corresponding thereto. The neck is a recessed area defined in the connection rod corresponding thereto.

[0007] Preferably, the at least one lock hole is defined through the body and a first cap seals a distal end of the at least one hole. The elastic component biases the stop pin and the first cap.

[0008] Preferably, the at least one transverse passage includes a second cap sealed at a distal end thereof. The elastomer is biased between the lock pin and the second cap. The second cap includes threaded portion defined in the outer periphery thereof. The at least one transverse passage is a threaded passage so that the second cap is threadedly connected to the at least one transverse passage.

[0009] Preferably, the body includes two collars and a space is formed between the two collars. The cam is located in the space. The at least one transmission wheel is installed to the inner periphery of the cam.

[0010] Preferably, there are two transmission wheels respectively located in the inner periphery of the cam. Each transmission wheel includes a positioning member. A positioning room is formed between the two positioning member. Two transmission members each are located at the inner periphery of the transmission wheel corresponding thereto. The transmission members are restricted in the positioning room. The transmission portions of the two lock cylinders are connected to the transmission members. The transmission portions drive the transmission wheel via the transmission member.

[0011] Preferably, each of the at least one lock hole communicates with two transverse passages. The stop pin includes two notches. The notches and the transverse passages are located along the axial direction of the stop pin.

[0012] Preferably, the at least one transverse passage is perpendicular to the at least one lock hole. When the connection portion is connected to the at least one hole, the lock pin is perpendicularly engaged with the notch.

[0013] Preferably, the stop pin is tapered and includes a shoulder and the connection portion. When the connection portion is connected to the at least one hole, the shoulder contacts the outer periphery of the at least one transmission wheel.

[0014] The advantages of the present invention are

that when the lock is hit from outside, because the strength of the neck and the connection ores is low, so that they are broken and the lock cylinder can be pulled out. The transmission portions do not support the lock blocks which are then separated from the holes. The stop pins are biased by the elastic components so that the connection portions are inserted into the holes. Besides, the notches are located corresponding to the transverse passages to align the lock pins with the notches to prevent the stop pins from being separated from the holes due to impact. When the connection portions are inserted into the holes, the transmission wheels are stocked such that the transmission wheels and the cam cannot be rotated to unlock the lock. Therefore, the lock is locked after the lock cylinders are damaged.

[0015] The notches are located at the lateral side of the stop pins and do not have curved faces so as to enhance the strength when the lock pins are positioned. Therefore, when the stop pins or the connection portions of the stop pins are hit from outside of the lock, the stop pins or the lock pins are not broken or deformed. When the lock is locked, the stop pins are engaged with the transmission wheels to cause the cam not to be rotated to unlock the lock, and the feature of anti-theft is enhanced.

[0016] The present invention can be used to the locks using lock cylinders, regardless of the locks with single lock cylinder or with two lock cylinders.

[0017] The present invention will become more apparent from the following description when taken in connection with the accompanying drawings which show, for purposes of illustration only, a preferred embodiment in accordance with the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018]

Fig. 1 is a perspective view to show the lock of the present invention;
Fig. 2 is an exploded view of the lock of the present invention;
Fig. 3 is a cross sectional view, taken along line A-A of Fig. 1;
Fig. 4 is a cross sectional view, taken along line B-B of Fig. 1;
Fig. 5 shows that the connection portion is inserted into the hole after the lock cylinder is removed, and
Fig. 6 shows that the lock pins are engaged with the notches after the lock cylinder is removed.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0019] Referring to Figs. 1 to 4, the lock of the present invention comprises a body 1 which includes at least one collar 11 and at least one lock hole 12 that communicates with the at least one collar 11. At least one transverse passage 13 is defined through the body 1 and communicates with the lock hole 12. An elastic component 121 and a stop pin 2 are respectively located in the at least one lock hole 12. The stop pin 2 includes a connection portion 21 that is located opposite to the elastic component 121. The diameter of the connection portion 21 is smaller than that of the stop pin 2. At least one notch 22 is defined radially in the stop pin 13. The at least one lock hole 12 is defined through the body 1 and a first cap 122 seals the distal end of the at least one hole 12. The elastic component 121 biases the stop pin 2 and the first cap 122. The at least one transverse passage 13 is located corresponding to the at least one notch 22 corresponding thereto. The at least one transverse passage 13 has an elastomer 131 and a lock pin 3 received therein. In one embodiment, the at least one transverse passage 13 includes a second cap 132 sealed at the distal end thereof. The elastomer 131 is biased between the lock pin 3 and the second cap 132. The second cap 132 includes threaded portion 1321 defined in the outer periphery thereof. The at least one transverse passage 13 is a threaded passage so that the second cap 132 is threadedly connected to the at least one transverse passage 13.

[0020] At least one transmission wheel 4 is pivotably located in the at least one collar 11. The at least one transmission wheel 4 includes at least one hole 41 defined radially therein which is located corresponding to the connection portion 21 corresponding thereto and accommodates a lock block 42 therein.

[0021] A cam 5 is engaged with the at least one transmission wheel 4 which is driven by the cam 5.

[0022] At least one lock cylinder 6 has a transmission portion 61 rotatably connected thereto and the transmission portion 61 is rotatable in the at least one transmission wheel 4 corresponding thereto so as to support the lock block 42. The stop pin 2 contacts the lock block 42. The connection portion 21 is not connected to the at least one hole 41. As shown In Fig. 4, the at least one notch 22 is located offset from the transverse passage 13.

[0023] As shown in Fig. 5, when the at least one lock cylinder 6 is removed by force, the transmission portion 61 of the at least one lock cylinder 6 is separated from the at least one transmission wheel 4, and the lock bock 42 is not supported by the transmission portion 61. Therefore, the connection portion 21 is connected to the at least one hole 41. Because the cam 5 is co-rotatable with the at least one transmission wheel 4, even when the at least one transmission wheel 4 is connected with the stop pin 2, and the cam 5 or the at least one transmission wheel 4 receives a force, the cam 5 cannot be rotated to unlock the lock. In order to prevent the stop pin 2 from separating from the at least one hole 41 when the connection portion 21 is connected to the at least one hole 41, the stop pin 2 is tapered and includes a shoulder 23 and the connection portion 21. When the connection portion 21 is connected to the at least one hole 41, the shoulder 23 contacts the outer periphery of the at least one transmission wheel 4. As shown in Fig. 6, in order to

prevent the connection portion 21 from being pushed back to the at least one lock hole 12, the at least one notch 22 is located corresponding to the at least one transverse passage 13, and the lock pin 3 is biased by the elastomer 131 and engaged with the notches 22. The at least one notch 22 is located at the lateral side thereof. Preferably, the at least one transverse passage 13 is perpendicular to the at least one lock hole 12. When the connection portion 21 is connected to the at least one hole 41, the lock pin 3 is perpendicularly engaged with the notch 22. Therefore, the at least one notch 22 does not a curved face to enhance the strength when lock pin 3 is engaged with the notch 22. Even when a force hits from the inner periphery of the transmission wheel 4 toward the connection portion 21, the stop pin 2 or the lock pin 3 are not broken or deformed to cause failure of the auto-lock feature. In one embodiment, each of the at least one lock hole 12 communicates with two transverse passages 13. The stop pin 2 includes two notches 22. The notches 22 and the transverse passages 13 are located along the axial direction of the stop pin 2. By the two sets of the lock pins 3 respectively engaged with the notches 22, the stop pins 2 are more stable and secured so that the stop pins 2 cannot be pushed backward. When the auto-lock feature is performed, the stop pins 2 firmly engaged with the transmission wheels 4, so that the cam 5 is ensured not to be rotated.

[0024] In one embodiment, in order to let the lock to have the auto-lock feature when the lock is hit and the lock cylinder 6 is removed due to that the body 1 is hit and broken, the body 1 includes a connection rod 14 extending axially from each of two ends thereof. Each connection rod 14 has a neck 141 which is located close to the at least one collar 11 corresponding thereto. The strength of the neck 141 of each connection rod 14 is lower than that of the body 1 and the connection rod 14 corresponding thereto. Each of the connection rods 14 is inserted into a housing 7 that receives the at least one lock cylinder 6 therein. As shown in Figs. 1 and 3, the body 1 is located in a door and is connected to the door by extending a bolt (not shown) through a fixing hole 15 at the center of the lock. An unauthorized person can only hit the housing 7 or the lock cylinder 6 from a limited space at one side of the door. Because the strength of the neck 141 is low so that the neck 141 is broken due to the hit, and the housing 7, the lock cylinder 6 and the broken connection rod 14 can be pulled out from the lock. When the lock cylinder 6 is removed from the lock, the lock is automatically locked as shown in Figs. 5 and 6.

[0025] Preferably, the neck 141 is integrally formed with the body 1 and the connection rod 14 corresponding thereto. The neck 141 is a recessed area defined in the connection rod 14 corresponding thereto.

[0026] It is noted that the lock cylinder 6 can be installed in one end of the body 1, or installed in each of two ends of the body 1. The disclosed embodiment shows that the lock includes two lock cylinders 6. As shown in Figs. 1 to 4, the body 1 includes two collar 11 and a space 16 is formed between the two collars 11. The cam 5 is located in the space 16. The at least one transmission wheel 4 is installed to the inner periphery of the cam 5. In one embodiment, there are two transmission wheels 4 respectively located in the inner periphery of the cam 5. Each transmission wheel 4 includes a positioning member 43. A positioning room 44 is formed between the two respective positioning members 43. Two transmission members 8 each are located at the inner periphery of the transmission wheel 4 corresponding thereto, and are restricted in the positioning room 44. The transmission members 8 are restricted by the positioning members 43 and cannot be removed from the end of the transmission wheel 4 that has the lock cylinder 6. The transmission portion 61 of the lock cylinder 6 is connected to the transmission member 8 corresponding thereto. The transmission portion 61 is driven by the transmission wheel 4 via the transmission member 8. As shown in Fig. 5, when the connection portions 21 are inserted into the holes 41, the two transmission members 8 are located in the positioning room 44, and cannot be removed from the end from which the lock cylinder 6 is removed, so as to protect the interior components from being damaged, and also to reduce the room and area that the unauthorized persons from hitting the connection portions 21 from the holes 41.

[0027] In order to prevent the unauthorized persons to rotate the lock cylinder 6 to make the connection portion 21 not be inserted into the hole 41 to fail the auto-lock feature, the at least one transmission wheel 4 may have multiple holes 41 to ensure that the connection portion 21 can be inserted into one of the holes 41 regardless the angle that the lock cylinder 6 is rotated.

[0028] While we have shown and described the embodiment in accordance with the present invention, it should be clear to those skilled in the art that further embodiments may be made without departing from the scope of the present invention.

Claims

1. A lock comprising:

a body (1) which includes at least one collar (11) and at least one lock hole (12) that communicates with the at least one collar (11), at least one transverse passage (13) defined through the body (1) and communicating with the lock hole (12), an elastic component (121) and a stop pin (2) respectively located in the at least one lock hole (12), the stop pin (2) including a connection portion (21) that is located opposite to the elastic component (121), at least one notch (22) defined radially in the stop pin (13), the at least one transverse passage (13) located corresponding to the at least one notch (22) corresponding thereto, the at least one transverse

passage (13) having an elastomer (131) and a lock pin (3) received therein;

at least one transmission wheel (4) pivotably located in the at least one collar (11), the at least one transmission wheel (4) including at least one hole (41) defined radially therein which is located corresponding to the connection portion (21) corresponding thereto and accommodates a lock block (42) therein;

a cam (5) engaged with the at least one transmission wheel (4) which is driven by the cam (5), and

at least one lock cylinder (6) having a transmission portion (61) rotatably connected thereto and supporting the lock block (42), the stop pin (2) contacting the lock block (42), the connection portion (21) being not connected to the at least one hole (41), the at least one notch (22) located offset from the transverse passage (13), when the transmission portion (61) of the at least one lock cylinder (6) is separated from the at least one transmission wheel (4), the connection portion (21) is connected to the at least one hole (41), and the at least one notch (22) is located corresponding to the transverse passage (13), the lock pin (3) is biased by the elastomer (131) and engaged with the notches (22).

2. The lock as claimed in claim 1, wherein the body (1) includes a connection rod (14) extending axially from each of two ends thereof, each connection rod (14) has a neck (141) which is located close to the at least one collar (11) corresponding thereto, a strength of the neck (141) of each connection rod (14) is lower than that of the body (1) and the connection rod (14) corresponding thereto, each of the connection rods (14) is inserted into a housing (7) that receives the at least one lock cylinder (6) therein.

3. The lock as claimed in claim 2, wherein the neck (141) is integrally formed with the body (1) and the connection rod (14) corresponding thereto, the neck (141) is a recessed area defined in the connection rod (14) corresponding thereto.

4. The lock as claimed in claim 1, wherein the at least one lock hole (12) is defined through the body (1) and a first cap (122) seals a distal end of the at least one hole (12), the elastic component (121) biases the stop pin (2) and the first cap (122).

5. The lock as claimed in claim 1, wherein the at least one transverse passage (13) includes a second cap (132) sealed at a distal end thereof, the elastomer (131) is biased between the lock pin (3) and the second cap (132), the second cap (132) includes threaded portion (1321) defined in an outer periphery thereof, the at least one transverse passage (13) is a threaded passage so that the second cap (132) is threadedly connected to the at least one transverse passage (13).

6. The lock as claimed in claim 1, wherein the body (1) includes two collars (11) and a space (16) is formed between the two collars (11), the cam (5) is located in the space (16), the at least one transmission wheel (4) is installed to an inner periphery of the cam (5).

7. The lock as claimed in claim 6, wherein there are two transmission wheels (4) respectively located in the inner periphery of the cam (5), each transmission wheel (4) includes a positioning member (43), a positioning room (44) is formed between the two positioning member (43), two transmission members (8) each are located at an inner periphery of the transmission wheel (4) corresponding thereto, the transmission members (8) are restricted in the positioning room (44), the transmission portions (61) of the two lock cylinders (6) are connected to the transmission members (8), the transmission portions (61) drive the transmission wheel (4) via the transmission member (8).

8. The lock as claimed in claim 1, wherein each of the at least one lock hole (12) communicates with two transverse passages (13), the stop pin (2) includes two notches (22), the notches (22) and the transverse passages (13) are located in an axial direction of the stop pin (2).

9. The lock as claimed in claim 1, wherein the at least one transverse passage (13) is perpendicular to the at least one lock hole (12), when the connection portion (21) is connected to the at least one hole (41), the lock pin (3) is perpendicularly engaged with the notch (22).

10. The lock as claimed in claim 1, wherein the stop pin (2) is tapered and includes a shoulder (23) and the connection portion (21), when the connection portion (21) is connected to the at least one hole (41), the shoulder (23) contacts an outer periphery of the at least one transmission wheel (4).

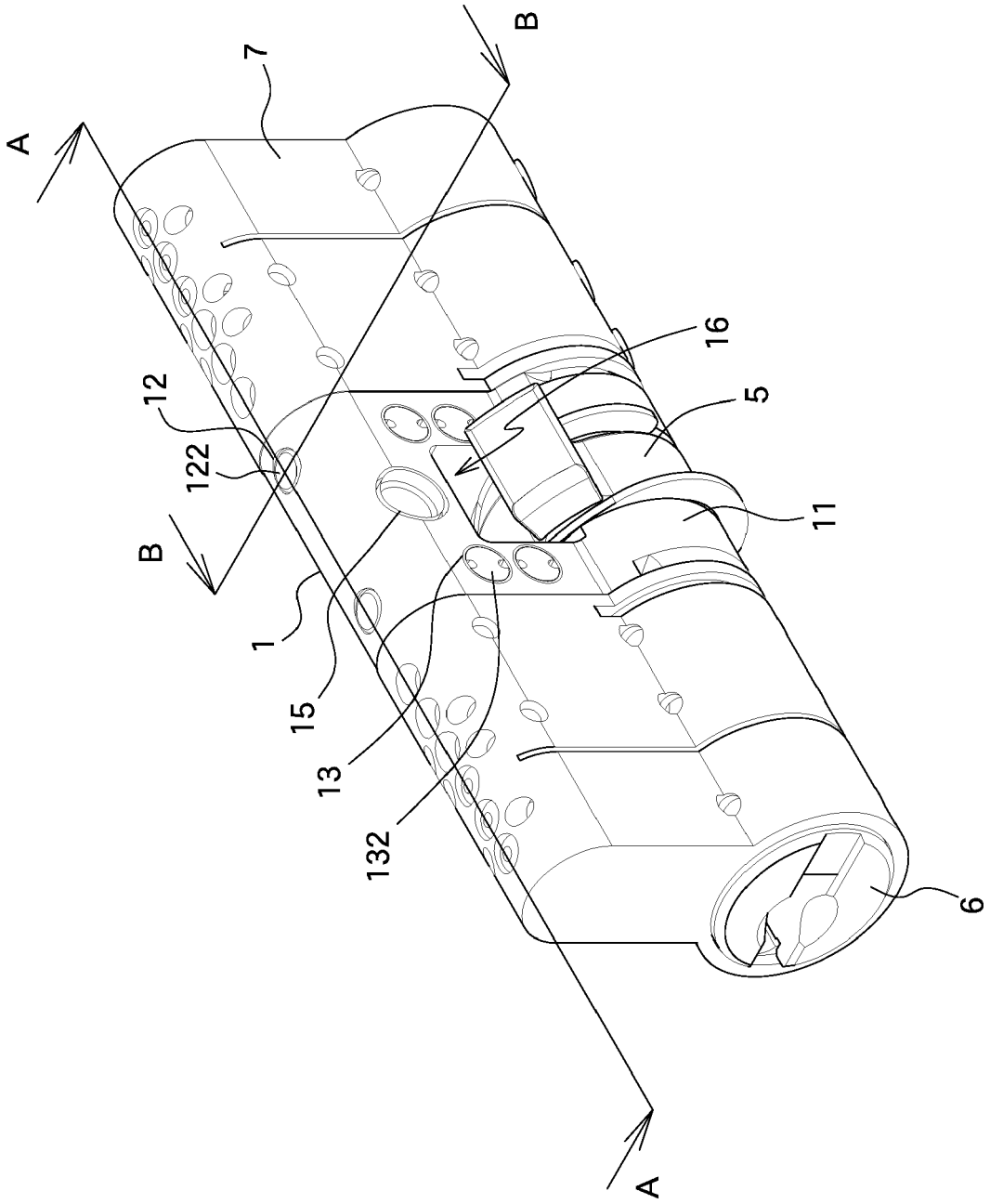


FIG.1

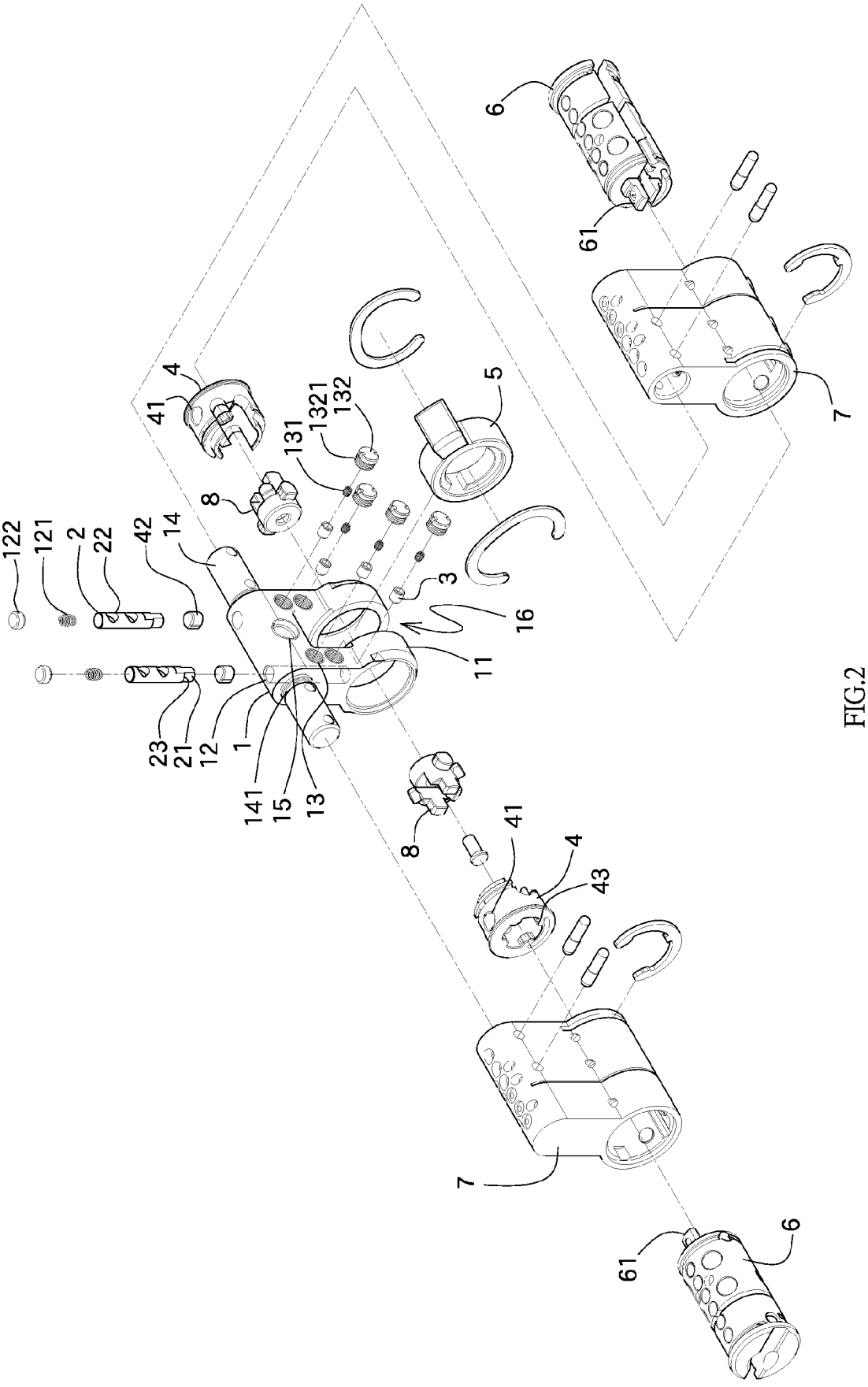

6
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FIG.2

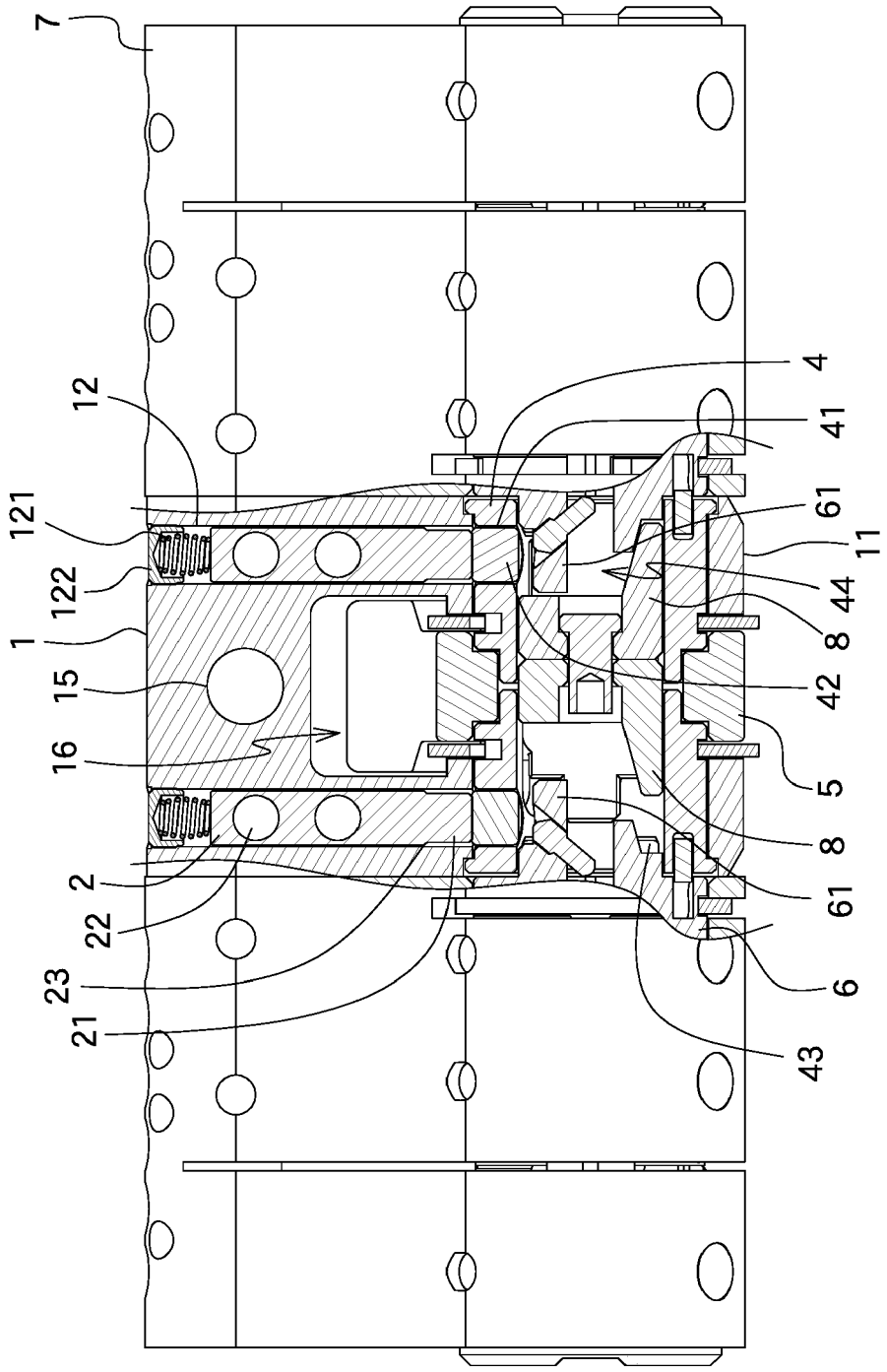


FIG.3

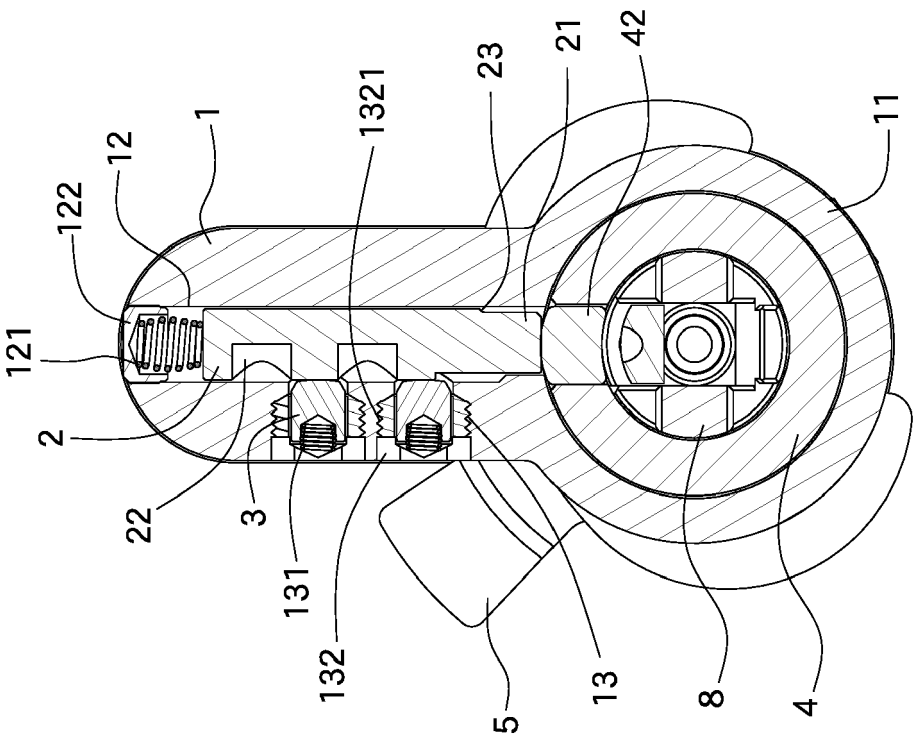


FIG.4

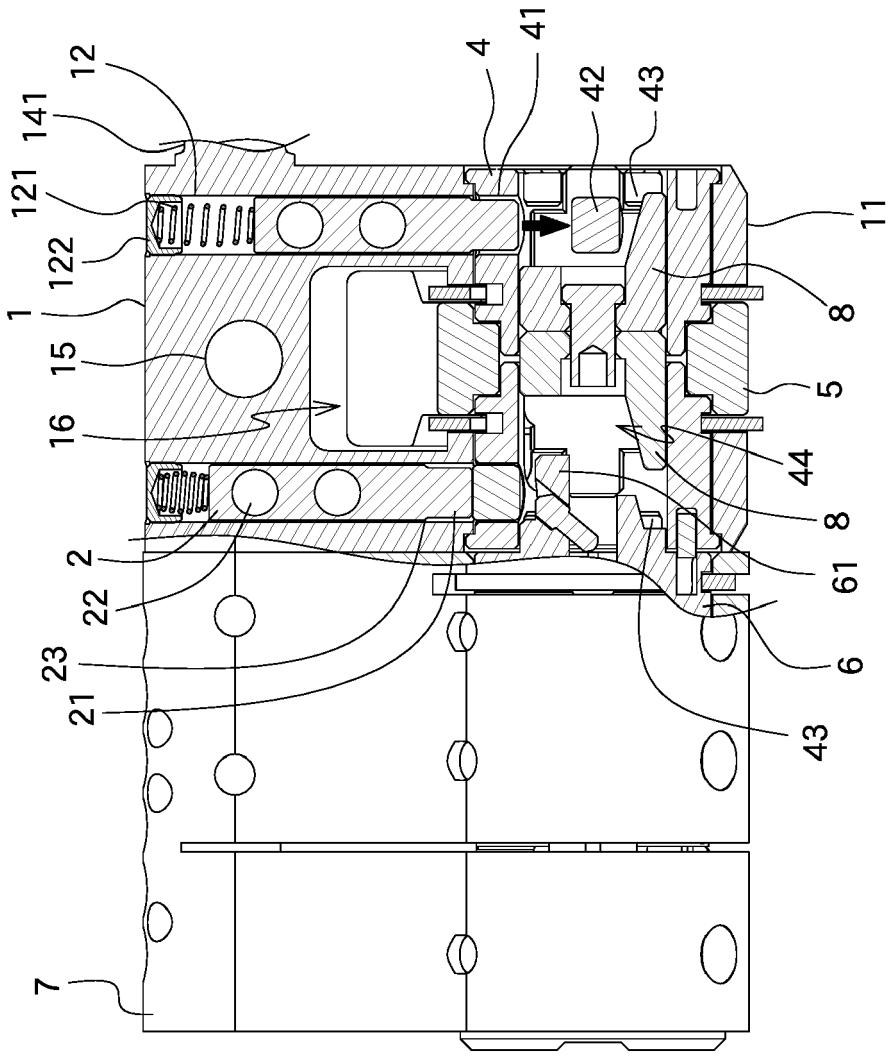


FIG.5

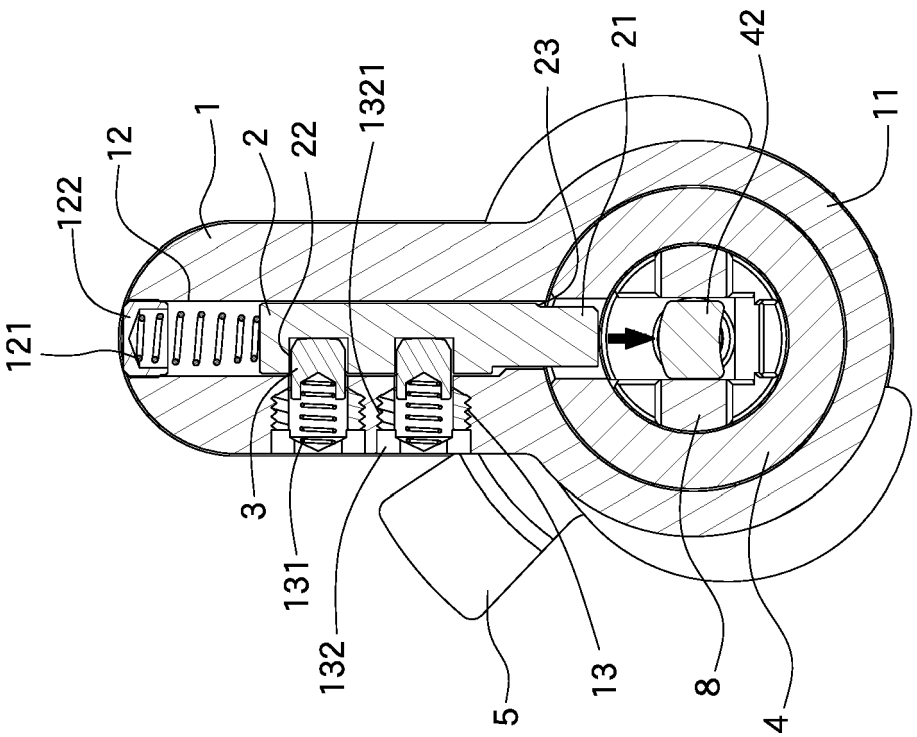


FIG.6

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EUROPEAN SEARCH REPORT

Application Number
EP 19 15 7603

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	GB 2 515 054 A (FED LOCK CO LTD [CN]) 17 December 2014 (2014-12-17) * the whole document *	1-3,6-10	INV. E05B17/20 E05B9/04 E05B9/10
X	EP 2 679 749 A1 (LIU TIEN-KAO [TW]) 1 January 2014 (2014-01-01) * the whole document *	1-3,6,7, 9,10	
Y	EP 2 840 204 A2 (KABA GMBH [AT]) 25 February 2015 (2015-02-25) * column 9, line 31 - line 41; figures *	4,5	
Y	GB 2 545 389 A (BANHAM PATENT LOCKS LTD [GB]) 21 June 2017 (2017-06-21) * page 14, line 30 - line 31; figures *	4,5	

TECHNICAL FIELDS SEARCHED (IPC)
E05B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	6 September 2019	Westin, Kenneth

CATEGORY OF CITED DOCUMENTS

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06-09-2019

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EP 2679749 A1	01-01-2014	NONE	
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