

Description

[0001] The invention relates to a padlock with a U-shaped lock casing, more particularly to a padlock which can minimize malfunctioning thereof due to spring fatigue.

[0002] A conventional padlock includes a lock casing, a key-operated lock core unit mounted in the lock casing, a shackle bar inserted between opposite shackle mounting portions of the lock casing for retaining an object on the lock casing between the opposite shackle mounting portions, and spring-loaded tumbler means associated operably with the lock core unit for engaging removably the shackle bar. The conventional padlock generally suffers from a disadvantage in that the lock core unit is not removable from the lock casing. As such, in case of spring fatigue that leads to malfunctioning of the padlock, the entire padlock has to be discarded although the lock core unit is still operable.

[0003] Therefore, the object of the present invention is to provide a padlock which can minimize malfunctioning thereof due to spring fatigue.

[0004] Accordingly, the present invention provides a padlock as defined in claim 1.

[0005] Other features and advantages of the present invention will become apparent in the following detailed description of the preferred embodiments with reference to the accompanying drawings, of which:

Figure 1 is a partly sectional, exploded perspective view of a first preferred embodiment of the padlock of the present invention;

Figure 2 is a cross-sectional view of the first preferred embodiment when in a locking state;

Figure 3 is another cross-sectional view of the first preferred embodiment when in the locking state, taken along line III-III of Figure 2;

Figure 4 is a cross-sectional view of the first preferred embodiment when in an unlocking state;

Figure 5 is another cross-sectional view of the preferred embodiment when in the unlocking state, taken along line V-V of Figure 4;

Figure 6 is a cross-sectional view of the first preferred embodiment, illustrating how a lock core unit can be removed from the lock casing;

Figure 7 is a cross-sectional view of a second preferred embodiment of the padlock of the present invention;

Figure 8 is another cross-sectional view of the second preferred embodiment, taken along line VIII-VI-II of Figure 7;

Figure 9 is an exploded perspective view illustrating the engagement between a catch member and a latch member of the padlock of the second preferred embodiment;

Figure 10 is a schematic top view of the catch and latch members of Figure 9 when the latch member is in a locking position; and

Figure 11 is another schematic top view of the catch and latch members of Figure 9 when the latch member is in an unlocking position.

[0006] Referring to Figures 1 to 3, the first preferred embodiment of the padlock of the present invention is shown to include a U-shaped lock casing 200, a key-operated lock core unit 400, a shackle bar 24, and a catch member 50.

[0007] The lock casing 200 includes a first casing part 20 and a second casing part 30 secured to the first casing part 20. The first casing part 20 has a first end surface 23, a lock core mounting portion 210 extending from the first end surface 23 in a longitudinal direction, and a first shackle mounting portion 25 extending from the lock core mounting portion 210 in a first transverse direction transverse to the longitudinal direction. The lock core mounting portion 210 has an insert end 22 opposite to the first end surface 23. The lock core mounting portion 210 is formed with a core receiving space 21 that extends in the longitudinal direction from the first end surface 23 through the insert end 22. The first shackle mounting portion 25 is formed with a blind first shackle insert hole 251 which is provided with a biasing spring 252 therein.

[0008] The second casing part 30 has a second end surface 38 which is opposite to the first end surface 23 of the first casing part 20 in the longitudinal direction, a latch receiving portion 310 adjacent to the second end surface 38, and a second shackle mounting portion 34 that extends from the latch receiving portion 310 in the first transverse direction. The latch receiving portion 310 is formed with a latch recess 31 and a latch entrance 33 which is communicated with the latch recess 31 and which receives fittingly the insert end 22 of the lock core mounting portion 210 such that the latch recess 31 is communicated with the core receiving space 21. The latch entrance 33 has a confining wall which is formed with a latch passage 312 that extends in the longitudinal direction from the latch recess 31 to the core receiving space 21. The latch receiving portion 310 is welded to the insert end 22 of the lock core mounting portion 210 of the first casing part 20. The latch receiving portion 310 has a confining wall which confines the latch recess 31 and the latch entrance 33. The confining wall has an access hole 313 formed therethrough, a curved inner surface part 32, a slide groove 37 that extends in the first transverse direction, and a latch passage 312 that is formed in the latch entrance 33 and that extends in the longitudinal direction between the latch recess 31 and the core receiving space 21. The second shackle mounting portion 34 is opposite to the first shackle mounting portion 25 in the longitudinal direction, and has a second shackle insert hole 35 formed therethrough. The second shackle insert hole 35 extends in the longitudinal direction, and is aligned with the first shackle insert hole 251. The second shackle insert hole 35 has an inner surface formed with a retaining shoulder

351 that confronts the first shackle mounting portion 25. The second lock casing 30 is further formed with a slide channel 36 that extends in the first transverse direction to communicate the second shackle insert hole 35 with the latch recess 31.

[0009] The lock core unit 400 includes a cylindrical lock core 43 formed with a keyhole 430 and disposed in the core receiving space 21. The lock core 43 is adapted to be rotated inside the core receiving space 21 upon insertion of a corresponding key (not shown) into the keyhole 430. The lock core 43 has one end 431 disposed adjacent to the insert end 22 of the lock core mounting portion 210. The lock core unit 400 further includes a latch member 40 connected to the end 431 of the lock core 43 and extending out of the core receiving space 21. The latch member 40 extends into the latch recess 31, and is rotatable inside the latch recess 31 between locking and unlocking positions when the corresponding key is operated. The latch member 40 includes a latch base 41 coupled to the end 431 of the lock core 43 and formed with a slide cavity 410 that extends in a second transverse direction transverse to the longitudinal direction, a latch body 42 mounted on the latch base 41 inside the slide cavity 410, and a biasing spring 413 for biasing the latch body 42 to extend outwardly of the slide cavity 410 and to project from the latch base 41 in the second transverse direction so as to enable the latch body 42 to engage the confining wall of the latch receiving portion 310. The latch base 41 has a convex outer wall surface 412.

[0010] The shackle bar 24 is an elongate straight bar, and has a first end 241 which extends removably into the first shackle insert hole 251 and which is formed with an abutment shoulder 242 confronting the second shackle mounting portion 34, and a second end 243 which extends through the second shackle insert hole 35 and which is formed with a shackle groove 244.

[0011] The catch member 50 is disposed in the latch recess 31, and is slidable along the slide groove 37. The catch member 50 includes a first catch body 51, and a second catch body 52 connected to the first catch body 51. The first catch body 51 has a first abutment wall 515, a shackle engaging projection 511 projecting from the first abutment wall 515 in the first transverse direction and extending into the slide channel 36, and a first connecting wall 512 extending from the first abutment wall 515 opposite to the shackle engaging portion 511. The first connecting wall 512 is formed with an engaging stud 513. The first abutment wall 515 and the shackle engaging projection 511 constitute a first end portion 51a of the catch member 50. The second catch member 52 includes a second abutment wall 521 which is opposite to the first abutment wall 515 in the first transverse direction, and which is spaced-apart from and parallel to the first abutment wall 515, and a second connecting wall 522 which extends from the second abutment wall 521 in the first transverse direction toward the first catch body 51. The second connecting wall 522 is formed with

an engaging hole 523 for engaging the engaging stud 513 of the first catch body 51 such that the second catch body 52 is slidable together with the first catch body 51 in the first transverse direction along the slide groove 37. The second abutment wall 521 constitutes a second end portion of the catch member 50 opposite to the first end portion 51a. A latch cavity 53 is defined between the first and second abutment walls 515, 521 to permit extension of the latch member 40 thereinto.

[0012] When the latch member 40 is disposed in the locking position, the latch body 42 abuts against and pushes the first abutment wall 515 of the first catch body 51 to cause the first and second catch bodies 51, 52 to slide along the slide groove 37 toward the second shackle mounting portion 34 so as to enable the shackle engaging projection 511 to project into the second shackle insert hole 35 and engage the shackle groove 244 in the second end 243 of the shackle bar 24.

[0013] Referring to Figures 4 and 5, to unlock the padlock, the key is inserted into the keyhole 430 to rotate the lock core 43 and cause rotation of the latch member 40 to the unlocking position. The latch body 42 slides along the curved wall 32, and is pushed by the curved wall 32 to extend inwardly and partly into the slide cavity 410 against biasing action of the biasing spring 413. At this time, the convex outer wall surface 412 of the latch base 41 abuts against and pushes the second abutment wall 521 of the second catch body 52 to cause the first and second catch bodies 51, 52 to slide along the slide groove 37 in a direction away from the second shackle mounting portion 34 so as to enable the shackle engaging projection 511 to retract into the slide channel 36 and disengage from the shackle bar 24. The shackle bar 24 is thus moved in the longitudinal direction away from the first shackle mounting portion 25 for removing the first end 241 thereof from the first shackle insert hole 251 due to the biasing action of the biasing spring 252 provided in the first shackle insert hole 251. The abutment shoulder 242 at the first end 241 of the shackle bar 24 abuts against the retaining shoulder 351 in the second shackle insert hole 35 to prevent removal of the shackle bar 24 from the second shackle insert hole 35.

[0014] Referring to Figures 5 and 6, when the latch member 40 is disposed in the unlocking position, the latch body 42 engages an inner wall surface 312a of the confining wall of the latch receiving portion 310, and is thus prevented from being removed from the latch receiving portion 310 along the longitudinal direction via the latch entrance 33. At this time, the latch body 42 is registered with the access hole 312, and is accessible by a tool 100 that extends into the access hole 312. By retracting the latch body 42 into the slide cavity 410 using the tool 100, the latch body 42 can be disengaged from the inner wall surface of the confining wall 310a. At this time, the latch body 2 is movable along the latch passage 312 to permit removal of the latch member 40 from the latch recess 31, and the latch member 40 has a size sufficient for retraction into the core receiving

space 21 of the first lock casing 20 and for removal of the lock core unit 400 from the core receiving space 21. Thus, the lock core unit 400 can be replaced with a new set when damaged, such as in the event of spring fatigue.

[0015] Referring to Figures 7 to 9, the second preferred embodiment of the padlock according to the present invention similarly includes a U-shaped lock casing with first and second casing parts 20', 30'. The first casing part 20' has a lock core mounting portion 210' formed with a core receiving space 21', and a first shackle mounting portion 25' that extends from the lock core mounting portion 210' and that is formed with a blind first shackle insert hole 251'. The second casing part 30' has a latch receiving portion 310' connected to the lock core mounting portion 210' and formed with a latch recess 31', and a second shackle mounting portion 34' that extends from the latch receiving portion 310' and that opposes the first shackle mounting portion 25'. The second shackle mounting portion 34' is formed with a second shackle insert hole 35' aligned with the first shackle insert hole 251'. A lock core unit 400' is received in the core receiving space 21', and is coupled to a latch member 42' which is disposed rotatably inside the latch recess 31'. The latch member 42' has a distal end face 421' transverse to an axis of the lock core unit 400', and a side wall 425' transverse to the distal end face 421'. The distal end face 421' is formed with a pin hole 422' that is eccentric to the axis of the lock core unit 400'. The side wall 425' is formed with a slide slot 424' that extends along a plane parallel to the end face 421', and a communicating hole 423' that extends parallel to the axis of the lock core unit 400' from the end face 421' to the slide slot 424'. The side wall 425' is formed with a stop flange 26' between the slide slot 424' and the end face 421'. The latch member 42' engages a catch member 44' that is disposed in the latch recess 31'. The catch member 44' has a first end portion 445' extending into a slide channel 36' that intercommunicates the latch recess 31' and the second shackle insert hole 35', and a second end portion 441' formed with a cylindrical pin 442' that extends rotatably into the pin hole 422' for engaging the latch member 42'. The catch member 44' is further formed with a stop projection 443' which extends from the first end portion 445' toward the second end portion 441' and which extends into the slide slot 424' via the communicating hole 423'. With further reference to Figures 10 and 11, when the lock core unit 400' is operated by a corresponding key (not shown) to rotate the latch member 42' for moving the same to the locking position, the catch member 44' is pushed toward the second shackle mounting portion 34' to be disposed in a locking position shown in Figure 10, wherein the catch member 44' is extended for engaging a shackle bar 24' that extends into the first and second shackle insert holes 251', 35'. On the other hand, when the latch member 42' is moved to the unlocking position, the catch member 44' is moved to an unlocking position shown in

Figure 11, wherein the catch member 44' is pulled inwardly for retraction within the slide channel 36' so as to disengage from the shackle bar 24'. As such, without the need for a spring in the latch member 42', the latch member 42' can actuate the catch member 44' to move the catch member 44' between the locking and unlocking positions when the latch member 42' rotates between the locking and unlocking positions.

[0016] Referring back to Figure 8, a lock core retainer 26' is received in a receiving cavity 252' in the first shackle mounting portion 25' and communicated with the core receiving space 21'. The first shackle mounting portion 25' has a side wall which confronts the second shackle mounting portion 34' and which is formed with a through hole 231' that is communicated with the receiving cavity 252'. When the padlock is in use, the through hole 231' is concealed by an article that is locked on the padlock. The lock core retainer 26' includes a retaining shaft 260' and a biasing spring 262' for biasing the retaining shaft 260' to project into the core receiving space 21' for engaging a retaining groove 45' formed in an outer wall surface of the lock core unit 400' so as to retain the lock core unit 400' in the lock core mounting portion 210'. The retaining shaft 260' has an outer surface formed with a groove 261'.

[0017] Referring to Figures 8 and 10, when the latch member 42' is disposed in the locking position, the stop projection 443' of the catch member 44' abuts against the stop flange 426' of the latch member 42' to prevent disengagement of the latch member 42' from the catch member 44' in a direction along the axis of the lock core unit 400', thereby strengthening the engagement between the latch member 42' and the catch member 44'.

[0018] When the latch member 42' moves to the unlocking position, the shackle bar 24' springs away and is removed from the first shackle insert hole 251' by virtue of a biasing spring 252 provided in the first shackle insert hole 251'. The shackle bar 24' has a first end adjacent to the first shackle insert hole 251' and provided with an abutment unit which is in the form of a spring-loaded ball member 352' for engaging a retaining shoulder 351' within the second shackle insert hole 35' so as to prevent removal of the shackle bar 24' from the second shackle insert hole 35' and thus the lock casing 200'.

[0019] Referring to Figure 11, when the latch member 42' is disposed in the unlocking position, the stop flange 443' is registered with the communicating hole 423' to permit removal of the latch member 42' from the catch member 44'. When it is desired to replace the lock core unit 400', the latch member 42' is first moved to the unlocking position and the article is removed from the padlock. Then, a tool (not shown) is extended into a space between the first and second shackle mounting portions 34', 25', and into the receiving cavity 252' via the through hole 231' for engaging the groove 261' of the retaining shaft 260' so as to retract the retaining shaft 260' into the receiving cavity 252', thereby disengaging the retaining shaft 260' from the retaining groove 45' of the

lock core unit 400'. The lock core unit 400' is thus removable from the core receiving space 21' at this time.

Claims

1. A padlock **characterised by:**

a lock casing (200, 200') comprising a first casing part (20) and a second casing part (30) with the first casing part (20) having a first end surface (23) and the second casing part (30) having a second end surface (38) which end surfaces are parallel to each other, and the lock casing including:

a lock core mounting portion (210,210') adjacent to said first end surface (23) and formed with a core receiving space (21,21') that extends in a longitudinal direction from said first end surface (23) toward said second end surface (38); and a first shackle mounting portion (25,25') that extends from said lock core mounting portion (210,210') in a direction transverse to the longitudinal direction containing a first shackle insert hole (251,251');

and a latch receiving portion (310,310') adjacent to said second end surface (38) and formed with a latch recess (31,31') communicated with said core receiving space (21,21'); and a second shackle mounting portion (34,34') that extends from said latch receiving portion (310,310') in a transverse direction and that is opposite to said first shackle mounting portion (25,25'), said second shackle mounting portion (34,34') containing a second shackle insert hole (35,35') that is aligned with said first shackle insert hole (251,251') in the longitudinal direction, said second shackle mounting portion (34,34') being further formed with a slide channel (36,36') that extends in a transverse direction to communicate said second shackle insert hole (35,35') with said latch recess (31,31');

a shackle bar (24, 24') having a first end (241) extending into said first shackle insert hole (251, 251') and a second end (243) extending into said second shackle insert hole (35,35'), at least one of said first and second ends (241,243) being removable from a corresponding one of the insert holes (251,251',35,35');

a key-operated lock core unit (400,400') including:

a cylindrical lock core (43) formed with

a keyhole (430) and disposed in said core receiving space (21,21'), said lock core (43) being adapted to be rotated inside said core receiving space (21,21') upon insertion of a corresponding key into said keyhole (430), said lock core (43) having one end (431) disposed adjacent to said latch recess (31,31'); and

a latch member (40,42') connected to said one end (431) of said lock core (43) and extending into said latch recess (31,31'), said latch member (40,42') being rotatable inside said latch recess (31,31') between locking and unlocking positions when the corresponding key is operated;

and a catch member (50,44') disposed slidably in said latch recess (31,31') and engaging said latch member (40,42'), said catch member (50,44') having a first end portion (51a,445') which extends into said slide channel (36,36'), and a second end portion (521,441') opposite to said first end portion (51a,445') with said latch member (40,42') moving said catch member (50,44') in a transverse direction toward said second shackle mounting portion (34,34') so as to enable said first end portion (51a,445') of said catch member (50,44') to project into said second shackle insert hole (35,35') for engaging said shackle bar (24,24') when said latch member (40,42') is disposed in the locking position and said latch member (40,42') moving said catch member (50,44') in a direction away from said second shackle mounting portion (34,34') so as to enable said first end portion (51a,445') of said catch member (50,44') to retract into said slide channel (36,36') for disengaging from said shackle bar (24,24') when said latch member (40,42') is disposed in the unlocking position.

2. The padlock according to Claim 1, further **characterised in that** said first end portion (51a) of said catch member (50) is formed with a first abutment wall (515) and a shackle engaging projection (511) which projects from said first abutment wall (515) in a perpendicular direction and which extends into said slide channel (36) and said second end portion of said catch member (50) is formed with a second abutment wall (521) which is spaced apart from, and is perpendicular to, said first abutment wall

(515), with said catch member (50) having a latch cavity (53) defined between said first and second abutment walls (515,521) for extension of said latch member (40) thereinto, and said latch member (40) acting on first abutment wall (515) to move said catch member (50) in the first transverse direction toward said second shackle mounting portion (34), and acting on said second abutment wall (521) to move said catch member (50) away from said second shackle mounting portion (34).

3. The padlock according to Claim 2, further **characterised in that** said catch member (50) includes a first catch body (51) engaged by second catch body (52), said first end portion (51a) being formed on said first catch body (51), and said second end portion (521) being formed on said second catch body (52), said first catch body (51) further having a connecting wall (512) which extends from said first abutment wall (515) toward said second abutment wall (521) and which is formed with an engaging stud (513), said second catch body (52) further having a connecting wall (522) which extends from said second abutment wall (521) toward said first abutment wall (515) and which is formed with an engaging hole (523) for engaging said engaging stud (513).

4. The padlock according to Claim 2 or 3, further **characterised in that** said latch member (40) includes:

a latch base (41) coupled to said one end (431) of said lock core (43) and formed with a slide cavity (410) that extends in a direction transverse to the first longitudinal direction; and a spring-loaded latch body (42) mounted on said latch base (41) inside said slide cavity (410), said latch body (42) being biased to extend outwardly of said slide cavity (410) and projecting from said latch base (41), said latch body(42)abutting against said first abutment wall (515) of said catch member (50) when said latch member (40) is disposed in the locking position.

5. The padlock according to claim 4, further **characterised in that** said latch base (41) has a convex outer wall surface (412) which abuts against said second abutment wall (521) of said catch member (50) away from said second shackle mounting portion (34) when said latch member (40) is removed from the locking position to the unlocking position.

6. The padlock according to Claims 4 or 5, further **characterised in that** said latch member (40) has a size which is sufficient to engage an inner wall surface of said latch receiving portion (310) that defines said latch recess (31) when said latch body

(42) projects from said latch base (41) due to biasing action thereof, and which is sufficient for retraction into said core receiving space (21) and for removal of said lock core unit (400) from said core receiving space (21) along the longitudinal direction when said latch body (42) is retracted into said slide cavity (410).

7. The padlock according to any one of Claims 4 to 6, further **characterised in that** said inner wall is comprised by a confining wall (310a) of said latch receiving portion (310) and comprises an access hole (313) adapted to permit insertion of a tool (100) into said latch recess (31) for retracting said latch body (42) into said slide cavity (410) to permit removal of said lock core unit (400) from said core receiving space (21) along the longitudinal direction when said latch member (40) is disposed in the unlocking position.

8. The padlock according to any preceding claim, **characterised in that** said second end (243) of said shackle bar (24,24') extends through said second shackle insert hole (35,35'), and contains a shackle groove (244) for engaging said first end portion (51a) of said catch member (50), said first end (241) of said shackle bar (24,24') extending removably into said first shackle insert hole (251,251'), said first shackle insert hole (251,251') being formed as a blind hole and being provided with a biasing spring (252) for biasing said shackle bar (24,24') away from said first shackle mounting portion (25,25') to permit removal of said first end (241) of said shackle bar (24,24') from said first shackle insert hole (251,251') when said latch member (40,42') is disposed in the unlocking position, said first end (241) of said shackle bar (24,24') being provided with an abutment unit (242,352'), said second shackle insert hole (35,35') having an inner surface formed with a retaining shoulder (351,351') which abuts against said abutment unit (242,352') to prevent removal of said shackle bar (24,24') from said second shackle insert hole (35,35') when said latch member (40,42') is disposed in the unlocking position.

9. The padlock according to Claim 8, further **characterised in that** said abutment unit is in the form of an abutment shoulder (242).

10. The padlock according to Claim 8 or 9, further **characterised in that** said abutment unit includes a spring-loaded ball member (352').

11. The padlock according to Claim 1, further **characterised in that** said latch member (42') comprises an end face (421') which is transverse to an axis of rotation of said lock core (43) containing a pin hole (422') that is eccentric to the axis of said lock core

(43); and a catch member (44') containing a pin (442') which extends rotatably into said pin hole (422') in said latch member (42') for engaging said latch member (42') such that said catch member (44') is movable between locking and unlocking positions when said latch member (42') moves between the locking and unlocking positions.

12. The padlock according to Claim 11, further **characterised in that** said latch member (42') has a side wall (425') transverse to said end face (421'), said side wall (425') containing a slide slot (424') that extends along a plane parallel to said end face (421'), and a communicating hole (423') parallel to the axis of rotation of said lock core (43) that extends from said end face (421') to said slide slot (424'), said side wall (425') having a stop flange (426') formed between said end face (421') and said slide slot (424'), said catch member (44') being formed with a stop projection (443') which extends into said slide slot (424') via said communicating hole (423'), said stop projection (443') being slidable along said slide slot (424') when said catch member (44') and said latch member (42') move between their locking and unlocking positions, said stop projection (443') of said catch member (44') being registered with said stop flange (426') of said latch member (42') to prevent removal of said catch member (44') from said latch member (42') along a direction parallel to the axis of rotation of said lock core (43) when said latch member (42') is disposed in the locking position, said stop projection (443') being registered with said communicating hole (423') to permit removal of said catch member (44') from said latch member (42') along the direction parallel to the axis of said lock core (43) when said latch member (42') is disposed in the unlocking position.

13. The padlock according to Claims 11 or 12, further **characterised by** a lock core retainer (26') mounted on said first shackle mounting portion (25') and extending perpendicular to the axis of rotation of said lock core into said core receiving space (21') for engaging said lock core unit (400') so as to prevent removal of said lock core unit (400') from said core receiving space (21') along the longitudinal axis of rotation of said lock core when said latch member (42') is in the unlocking position.

14. The padlock according to Claim 11, 12 or 13, further **characterised in that** said first shackle mounting portion (25') is formed with a receiving cavity (252') communicated with said core receiving space (21'), said lock core retainer (26') including a retaining shaft (260') received in said receiving cavity (252'), and a biasing spring (262') for biasing said retaining shaft (260') to project into said core receiving space (21') for engaging a retaining groove (45') of said

lock core unit (400'), said first shackle mounting portion (25') being formed with a through hole (231') which is communicated with said receiving cavity (252') and which is adapted to permit extension of a tool into said receiving cavity (252') for moving and retracting said retaining shaft (260') into said receiving cavity (252').

15. The padlock according to Claim 14, further **characterised in that** said retaining shaft (260') has an outer surface formed with a groove (261') adapted to engage the tool.

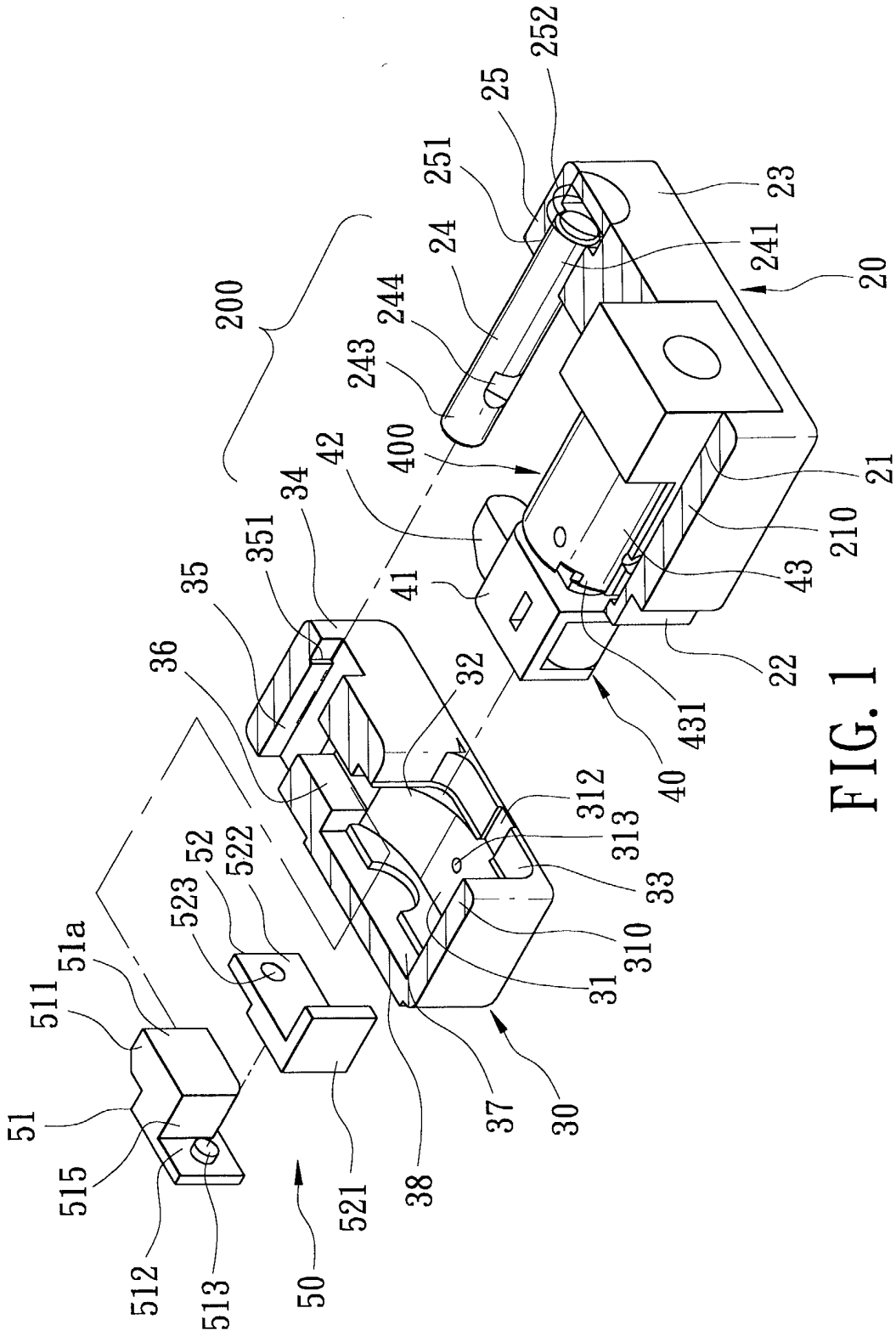


FIG. 1

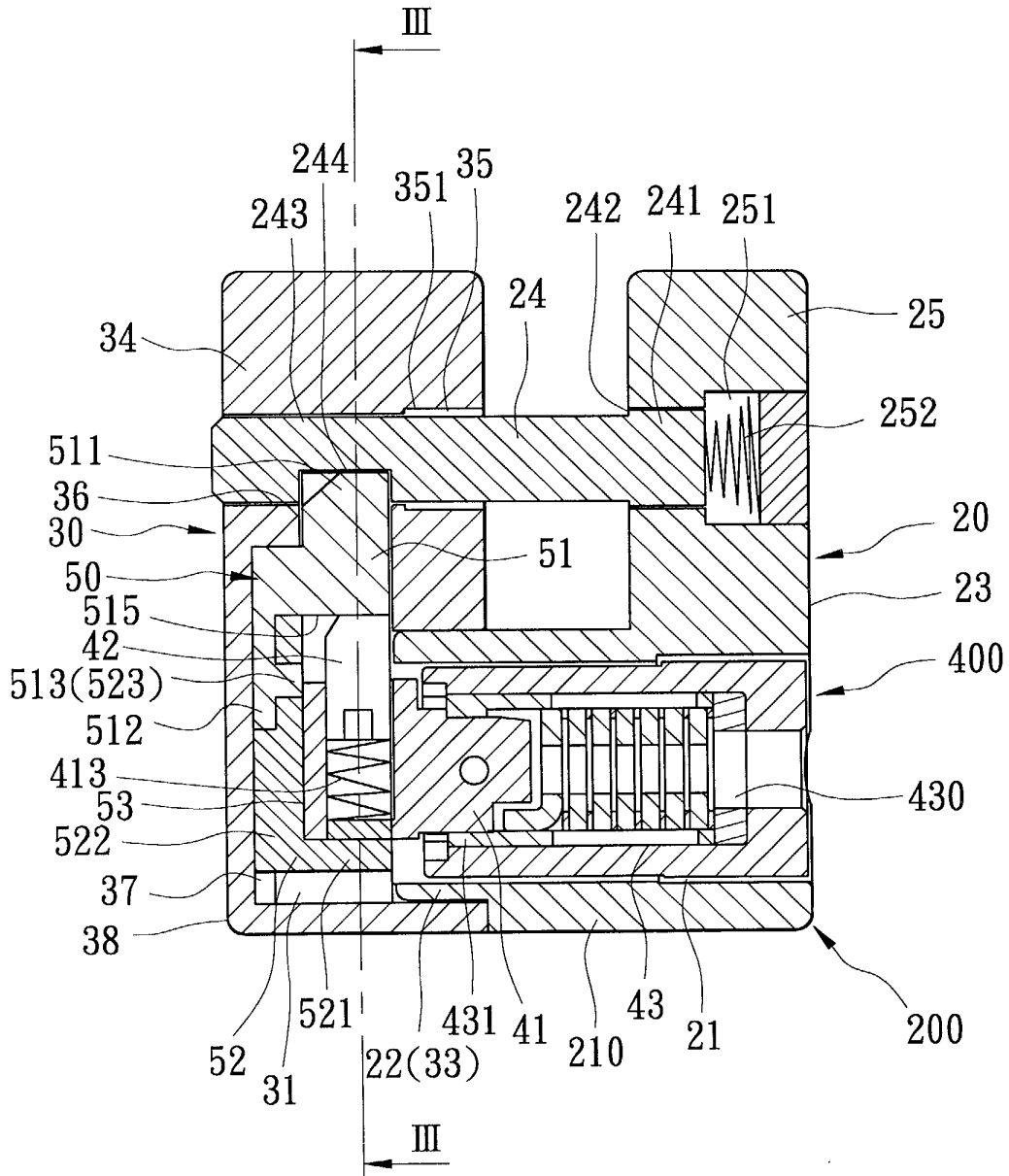


FIG. 2

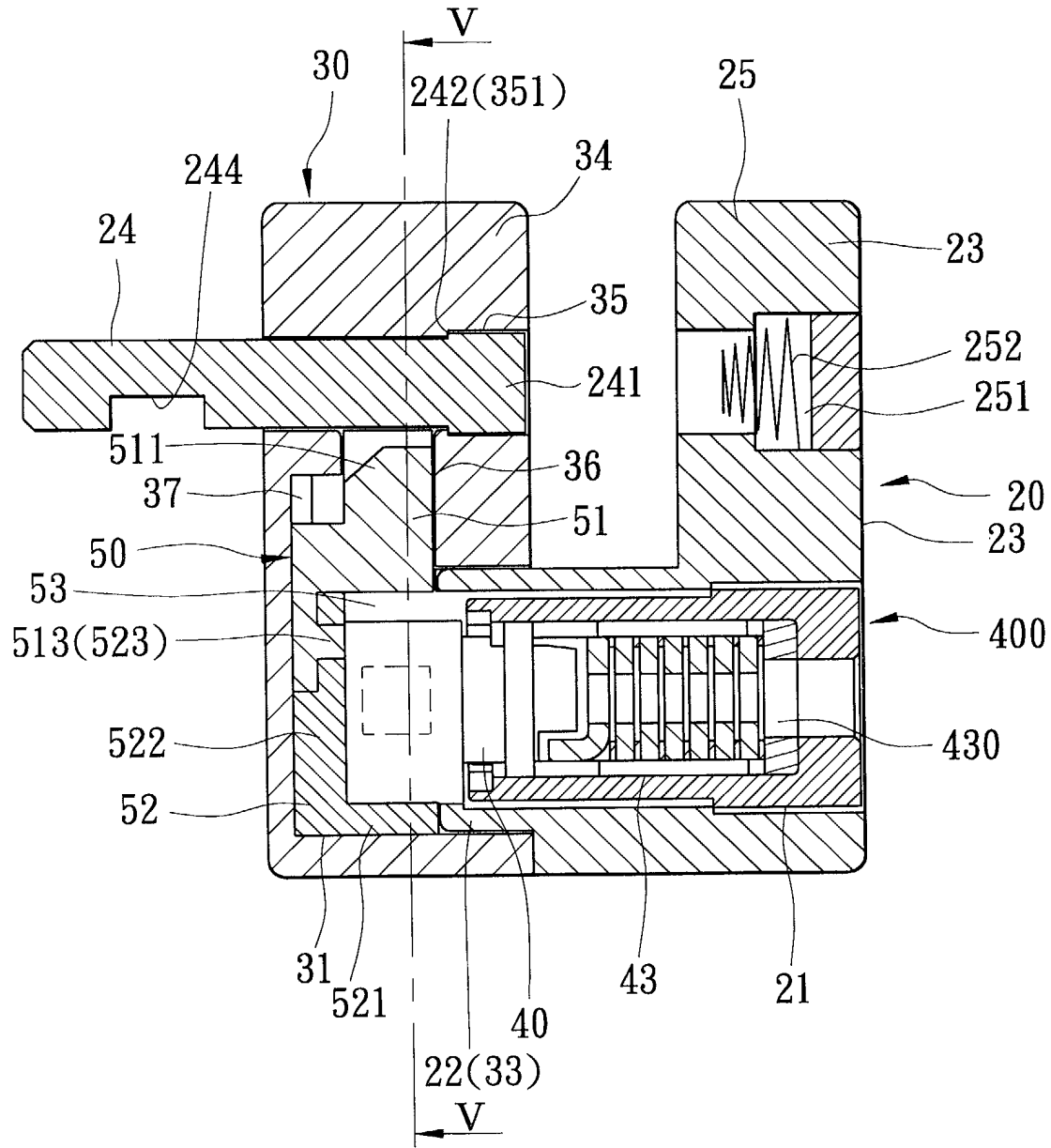


FIG. 4

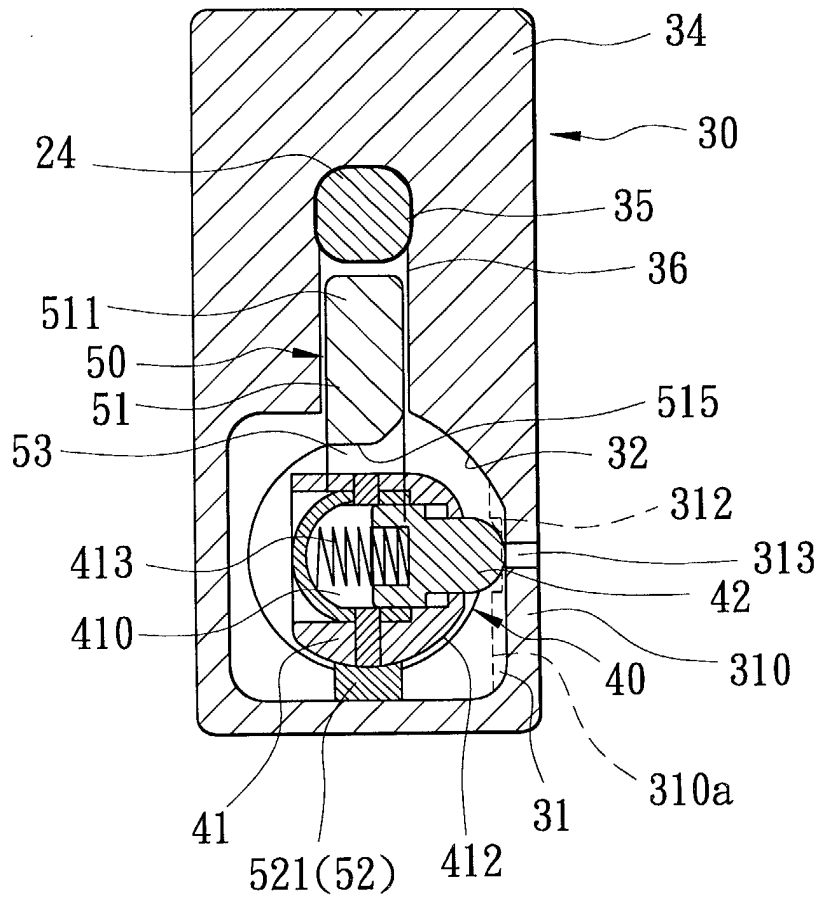


FIG. 5

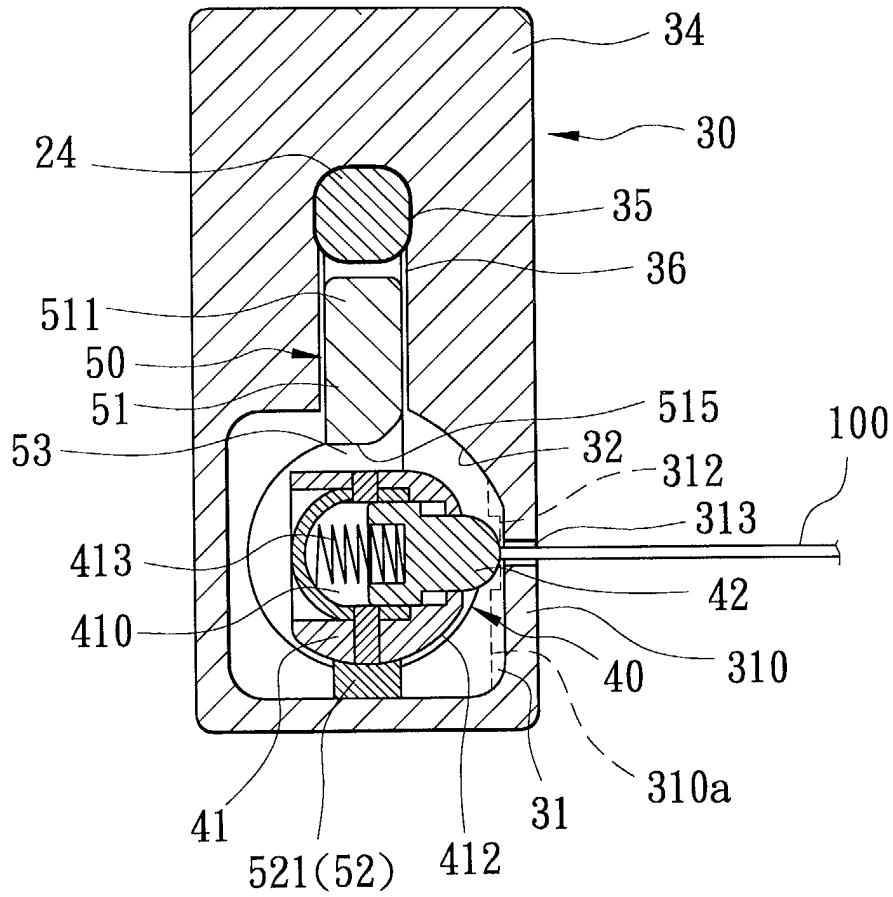


FIG. 6

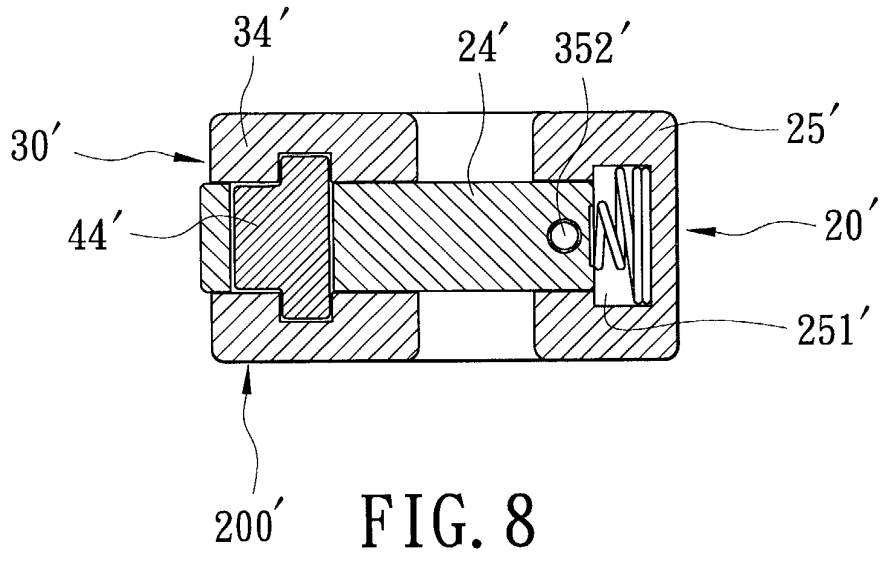


FIG. 8

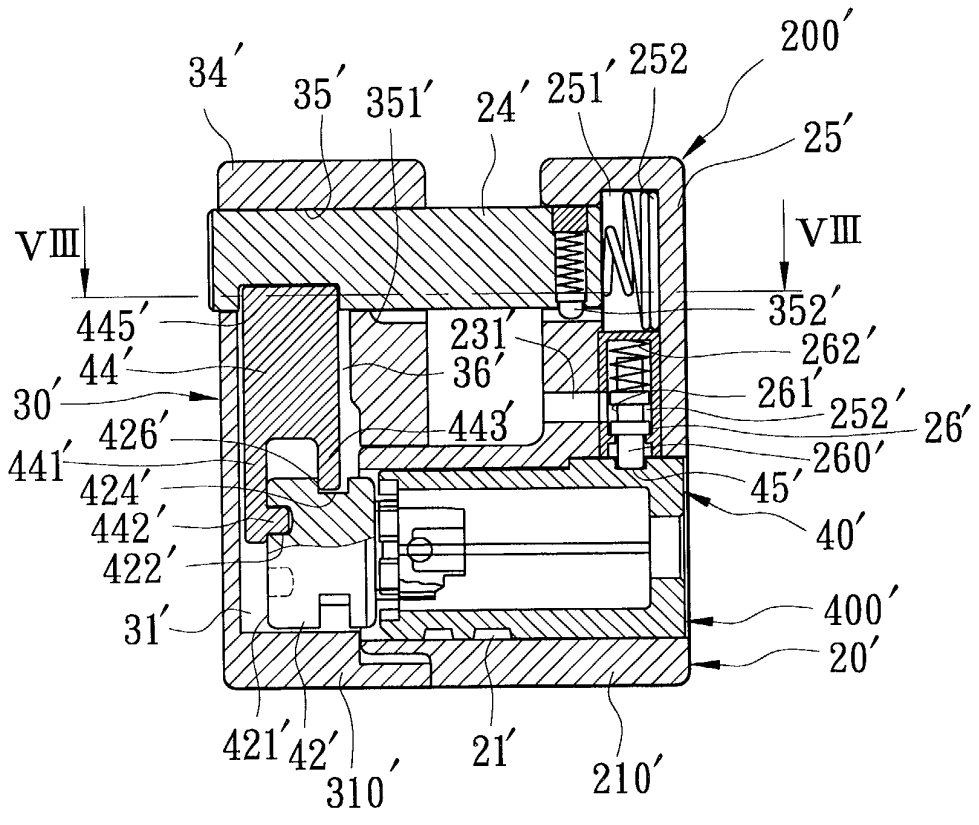


FIG. 7

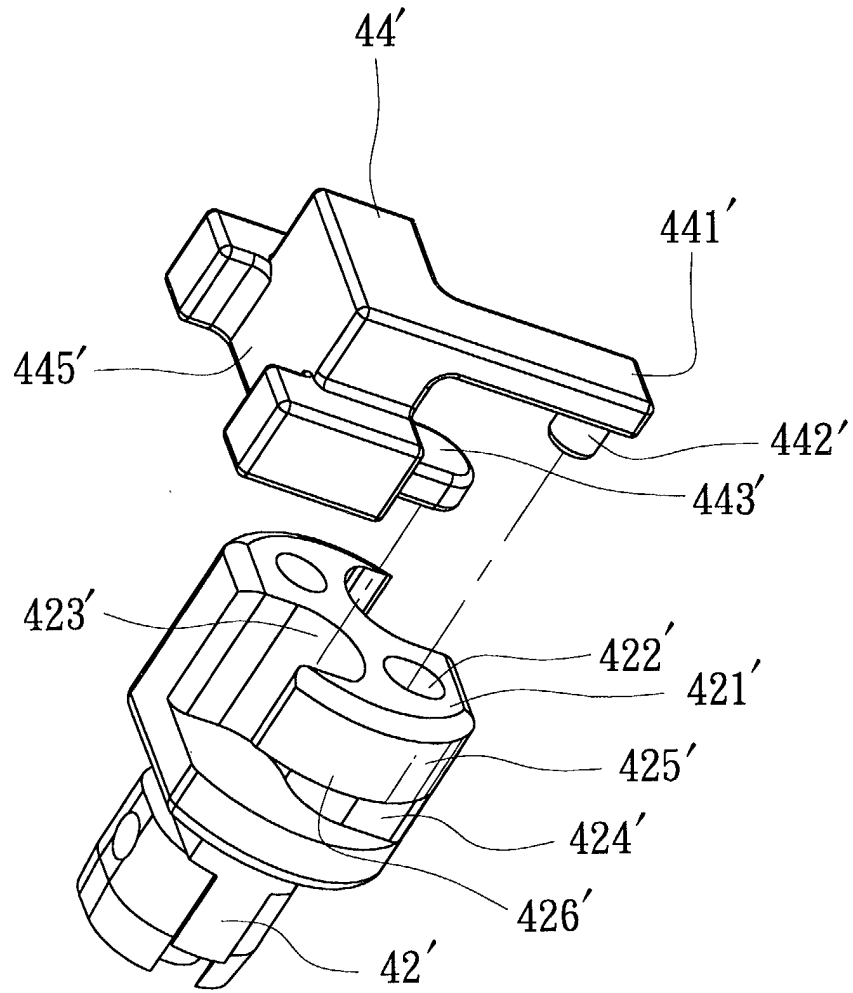


FIG. 9

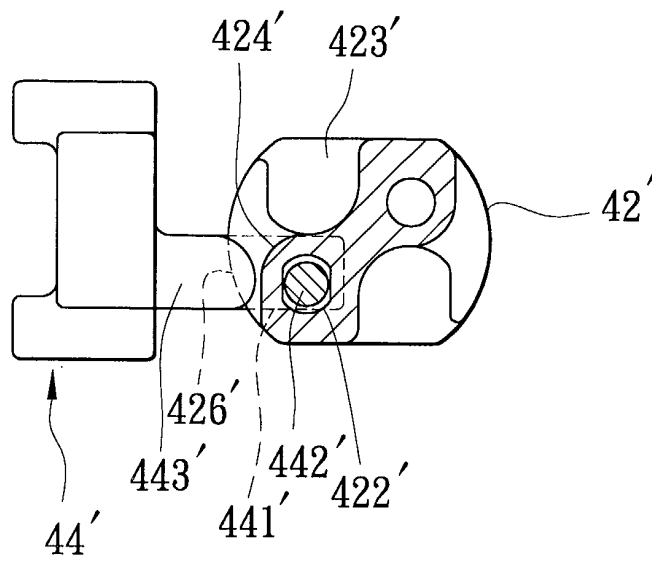


FIG. 10

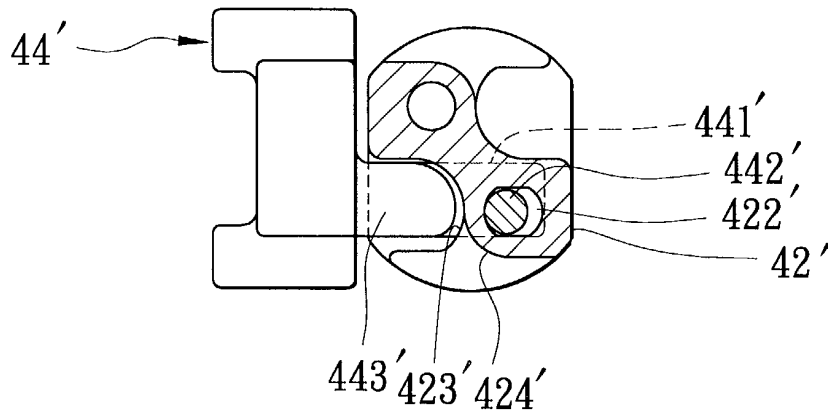


FIG. 11



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.CI.7)
X	US 2 104 981 A (FALK BERNARD S) 11 January 1938 (1938-01-11)	1, 2	E05B67/36 E05B67/24
Y	* the whole document *	8-11, 13-15	
Y	GB 1 218 128 A (VIRO INNOCENTI SPA) 6 January 1971 (1971-01-06)	8-10	
A	* the whole document *	1	
Y	FR 953 722 A (VINS VACLAV;RYBA JOSEF) 12 December 1949 (1949-12-12)	11	
A	* the whole document *	4, 8	
Y	EP 0 964 123 A (CHEN WATERSON) 15 December 1999 (1999-12-15)	13-15	
A	* paragraph '0029! - paragraph '0030!; figure 11 * * paragraph '0016! - paragraph '0018!; figures 2-5 *	1, 4, 6, 7	
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