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

(11) EP 0 903 455 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
24.03.1999 Bulletin 1999/12

(51) Int. Cl.[6]: **E05B 21/00**

(21) Application number: **98116877.6**

(22) Date of filing: **07.09.1998**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **18.09.1997 IT BO970565**

(71) Applicant:
Costruzioni Italiane Serrature Affini C.I.S.A. S.p.A.
I-48018 Faenza (Province of Ravenna) (IT)

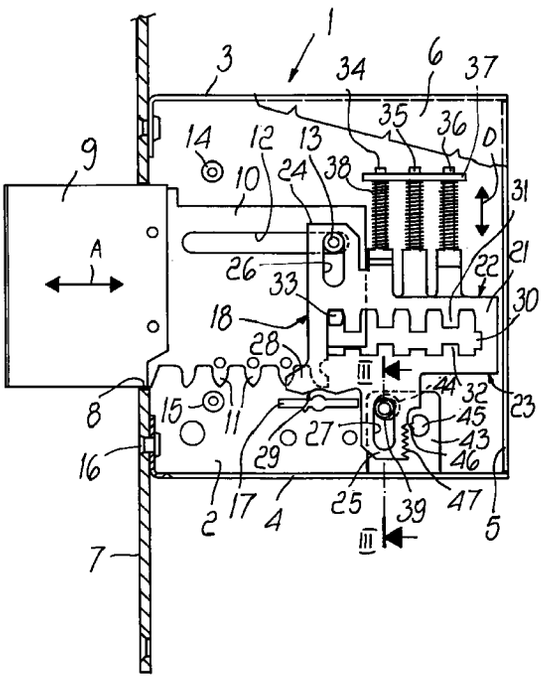
(72) Inventor: **Errani, Deo**
48018 Faenza (Prov. of Ravenna) (IT)

(74) Representative:
Modiano, Guido, Dr.-Ing. et al
Modiano & Associati SpA
Via Meravigli, 16
20123 Milano (IT)

(54) Effraction-resistant device for a lock with flat tumblers

(57) An effraction-resistant device for a lock with plate tumblers (18) comprising a casing (1) which slidingly accommodates a bolt (9) whose tang (10) has a rack-like set of teeth (11) for moving the bolt by means of a double-pattern actuation key and a transverse pin (33) for locking the bolt so that it is engaged in openings (30) of the tumblers (18) which are elongated in the direction in which the bolt slides. The openings have, along their longitudinal edges, mutually opposite teeth (31,32) which form passages through which the transverse pin (33) can travel by successive key turns. The tumblers (18) have two slots (26,27) which are elongated at right angles to the tang (10) and are engaged by respective guiding pins (13,39) in order to guide the tumblers (18), in contrast with return springs (38), at right angles to the direction in which the bolt (9) slides. The device is characterized in that one (13) of the guiding pins is fixed and the other one (39) is movable and has opposite ends which are rigidly coupled, with play, in respective seats formed in respective mutually opposite walls of the box-like body, so as to allow movements of the pin in the slots and oscillations of the tumblers in an inclined position; engagement means (45,47) are provided which are adapted to engage the tumblers (18) when they are fraudulently made to oscillate in the inclined position.

FIG.1



EP 0 903 455 A2

Description

[0001] The present invention relates to an effraction-resistant device for a lock with flat tumblers.

[0002] Locks of this type (also known as double-pattern locks) comprise a bolt sliding in a case which has a tang provided with a rack-like set of teeth for moving the bolt by means of a double-pattern actuation key and of a transverse square locking pin which protrudes from both faces of the tang to engage in openings of the tumblers. The openings are elongated in the direction in which the bolt slides and have, along their longitudinal edges, mutually opposite teeth which form passages through which said square pin travels in steps which correspond to successive turns of the lock.

[0003] When the key is actuated, by means of the coded serrations the tumblers are moved into a mutual arrangement whereby the subsequent rotation of the key allows to slide the square pin between the mutually opposite teeth to allow the extraction or retraction of the bolt with respect to the box-like body. The tumblers retract and are kept in their inactive position, i.e, in the position for blocking the square pin, by means of respective springs which act between a peripheral wall of the box-like body of the lock and an edge of the tumbler. A drawback of double-pattern locks is the fact that the tumblers can be accessed from outside through the keyhole and can be fraudulently moved by skillfully using suitable picks so as to allow to move the bolt.

[0004] The method most frequently used by effractors to align the tumblers to make the bolt slide, entails, while the key is extracted and therefore the lock is in the closed position, forcing the bolt to retract into the lock and at the same time acting on the tumblers with a pick.

[0005] Due to the different machining tolerances which are always present, it is possible to block the tumbler that has the smallest play. This tumbler can be easily located by acting thereon with a pick inserted in the key slot. Since the tumbler cannot slide, it opposes more resistance to the action of the pick. When said tumbler has been moved until it reaches the level of the passage between the mutually opposite teeth, the square pin can perform a very small additional movement until a new tumbler having the next greater play relative to the release tumbler is blocked. By acting on this new tumbler with the pick as described and by repeating the same operations on all the remaining tumblers, it is possible, at each turn, to align all the tumblers and achieve movement of the bolt until the lock opens.

[0006] Various constructions have been proposed to obviate fraudulent opening of double-pattern locks according to the above-described method but have proved to be highly inadequate. A construction of the above type is disclosed for example in Italian Patent No. 906,584 in the name of this same Applicant.

[0007] The aim of the present invention is to provide a device which can prevent the fraudulent opening of locks with flat tumblers but is more effective and economically advantageous.

[0008] This aim is achieved with an effraction-resistant device for a lock with plate tumblers, comprising a bolt sliding in a casing and having a tang provided with a rack-like set of teeth for moving the bolt by means of a double-pattern actuation key and a transverse pin for locking the bolt so that it is engaged in openings of the tumblers which are elongated in the direction in which the bolt slides, said openings having, along their longitudinal edges, mutually opposite teeth which form passages through which said transverse pin can travel by successive key turns, said tumblers having two slots which are elongated at right angles to said tang and are engaged by respective guiding pins in order to guide said tumblers, in contrast with return springs, at right angles to the direction in which the bolt slides, characterized in that one of said guiding pins is fixed and the other one is movable and has opposite ends which are rigidly coupled, with play, in respective seats formed in respective mutually opposite walls of said casing, so as to allow movements of said pin in said slots and oscillations of said tumblers in an inclined position, engagement means being provided which are adapted to engage said tumblers when they are fraudulently made to oscillate in said inclined position.

[0009] Further characteristics and advantages of the present invention will become apparent from the following detailed description on the basis of the accompanying drawings, wherein:

Figure 1 is a sectional side view of a lock according to the invention;
Figure 2 is a view of the lock in the effraction-preventing position;
Figure 3 is a sectional view, taken along the plane III-III of Figure 1;
Figure 4 is a sectional view, taken along the plane IV-IV of Figure 3;
Figure 5 is a sectional view, taken along the plane V-V of Figure 3;
Figure 6 is a sectional view, taken along the plane VI-VI of Figure 3;
Figures 7, 8 and 9 are views which are similar to Figures 4, 5 and 6 but show the lock in the effraction-preventing position.

[0010] With reference to the above figures, the lock comprises a casing 1 which is composed of a bottom 2 which is surrounded by a peripheral wall composed of two longitudinal walls 3 and 4 and of a transverse wall 5. The walls 3, 4 and 5 are respectively referenced as upper, lower and rear walls with reference to the drawing for the sake of convenience in description. The reference numeral 6 designates the cover for closing the casing.

[0011] The casing 1 is associated, for example by means of rivets 16, with a front faceplate 7 in which the rectangular opening 8 is formed; the bolt 9 of the lock,

which is slideable in the direction A, protrudes outside through said opening. The bolt 9 continues inside the casing with the tang 10. The tang 10 is constituted by a flat bar which is thinner than the bolt 9 and lies on the centerline plane which is co-planar to the bolt.

[0012] The tang 10 has, along its lower edge, a set of teeth 11 which is shaped like a rack. A slot 12 is formed in the tang 9 and is elongated in the direction A. A pin engages in said slot and is formed by an internally threaded bush 13 which rises from the bottom 2 of the casing whereto it is fixed. The bush 13 allows to guide the tang 10 during the extraction and retraction strokes of the bolt 9 with respect to the casing and, together with other bushes 14 and 15, acts as engagement for the screws by means of which the cover 6 is fixed so as to close the casing 1 of the lock.

[0013] As shown in Figure 3, the rack 11 is aligned with the centerline plane C of the bolt 9 and the opening 17 for inserting the double-pattern key to actuate the lock is located below said rack. An opening which is symmetrical to the opening 17 is provided in the cover 6 as well.

[0014] Two sets of flat tumblers are arranged to the sides of the tang 10. Each set is composed of three adjacent tumblers 18, 19 and 20. Each tumbler is composed of a substantially rectangular part 21 with an upper edge 22 and a lower edge 23 wherefrom an expansion 24 protrudes toward the lower wall 4.

[0015] Expansions 24 and 25 protrude toward the upper wall 3 and toward the lower wall 4 from the rectangular part 21; said expansions have respective slots 26 and 27 which are parallel to each other and are elongated in the direction D at right angles to the direction A.

[0016] At the keyhole 17, the rectangular part 21 has a beak 28 with a lower profile 29 which is shaped so that it can be engaged by the double-pattern key inserted in the opening 17 of the bottom 2 or of the cover 6.

[0017] An opening 30 is formed in the part 21 of each tumbler and is elongated in the direction A. A series of teeth 31 protrudes from the upper longitudinal edge of said opening and is arranged so as to face a second set of teeth 32 which protrudes from the lower edge of the opening 30. The teeth 31 and 32 form, between them, approximately square tooth spaces which allow the insertion therein of a square locking pin 33 which protrudes from both sides of the tang 10 with which it is rigidly coupled. The heights of the teeth 31 of each tumbler are alternately equal but are different according to a given coding with respect to the height of the teeth of the adjacent tumbler. The mutually opposite ends of the upper teeth 31 and of the lower teeth 32 also delimit a passage which is slightly lower than the height of the square pin 33, so as to allow said pin to pass between the mutually opposite teeth when the two sets of tumblers 18, 19 and 20 are actuated by the key.

[0018] Respective rods 34, 35 and 36 protrude upward from the tumblers 18, 19 and 20 of the two sets and are guided in holes of a plate 37 which is fixed at right angles to the bottom 2 of the casing 1. The rods 34, 35 and 36 have abutment shoulders for respective cylindrical springs 38 which are fitted over the rods. The springs 38, by abutting against the plate 37, keep all the tumblers in the position for engagement on the pin 33.

[0019] A pin 39, equal in diameter to the slots 27 of the expansions 25, is driven through said slots. Lugs 40 having a smaller diameter protrude axially from the opposite ends of the pin 39 and enter seats 41 and 42 of the bottom 2 and of the cover 6 of the casing. The seats 41 and 42 are constituted by slots which are inclined with respect to the axis A and their inclination is such that when the pin 39 is actuated against the wall 5 it also moves upward, i.e., toward the upper wall 6.

[0020] The two sets of tumblers 18, 19 and 20 are mutually divided, as specified above, by a space determined by the tang 10 of the bolt 9.

[0021] A flap 43 having the same thickness protrudes into said space and is fixed to the lower wall 4 of the casing. The flap 43 lies between the expansions 25 of the tumblers and is provided with an opening 44 through which the pin 39 is driven. The dimensions of the opening 44 are such as to surround the pin 39 without ever making contact therewith.

[0022] The flap 43, at the level of the expansions 25, is crossed by a pin 45 which is rigidly coupled thereto and has a tooth 46 on the side directed toward the expansions 25.

[0023] A series of notches is formed in the edges of the expansions 24 which are directed toward the pin 45 and form a rack-like set of teeth 47 which is parallel to the respective slots 26.

[0024] The operation of the above-described lock is fully identical to the operation of conventional locks. The tumblers 18, 19 and 20 of the two sets, by means of the thrust applied by the springs 38, press against the pin 39 so as to keep the lugs 40 of the pin 39 engaged in the lower ends of the seats 41 and 42.

[0025] In this position, the pin 39 keeps the slots 27 at right angles to the sliding direction A of the bolt and therefore the tooth 46 remains spaced from the set of teeth 47.

[0026] Accordingly, in order to actuate the lock from the closed position (shown in Figures 1 and 2) into the open position, by inserting the double-pattern key in the keyhole 17 and turning it clockwise all the tumblers are aligned so that the passage formed between the mutually opposite teeth 31 and 32 is arranged to the right of the square pin 33, so that said square pin 33 can move to the right and engage the next tooth space, from where it then moves into the next tooth space at every half-turn of the key. When the bolt 9 is fully retracted into the lock, the square pin 33 is at the opposite end of the opening 28.

[0027] The retraction of the bolt 9 occurs in a fully identical but reversed manner: the key, after moving the tumblers into the intended alignment, acts on the set of teeth 11 of the tang 10, pushing the bolt inward.

[0028] The retention of the tumblers in the position in which the square pin 33 blocks the bolt 9 is ensured by the springs 38, which return all the tumblers into the position in which they rest on the pin 33 at each turn of the lock, i.e., at each half-turn of the key.

[0029] When the lock is in the closed position shown in Figures 1 and 2, effraction attempts aimed at aligning the tumblers with picks inserted through the opening 17 are neutralized thanks to the fact that the tooth 46 engages the notches of the set of teeth 47.

[0030] If an effractor tries to open the lock by lifting the tumblers 18, 19 and 20 of the two sets to the level of the square pin 33, for example by using picks which act in the direction D on the edge 29 of the tumblers and in the direction A on the bolt 10 according to the method described initially, the thrust on the bolt transmitted to the tumblers by the square pin 33 causes the oscillation of the tumblers around the pin 13.

[0031] As the tumblers are gradually lifted by a pick, the lugs 40 of the pin 39, due to the inclined orientation of the seats 41 and 42, move along said seats 41 and 42, allowing the expansions 25 to stop against the pin 45. In this position, the tooth 46 engages the notches of the set of teeth 47 and locks the tumblers, preventing their alignment with the square pin 33.

[0032] As soon as the forcing thrust on the bolt ceases, the pin 39, due to the thrust applied thereto by the springs 38 by means of the tumblers, is guided by the inclination of the seats 41 and 42 into the bottom of said seats, so as to return the tumblers into the position in which they are disengaged from the tooth 46.

[0033] The present invention perfectly achieves the intended aim. In particular, it should be observed that the pin 39 closes the space between the two sets of tumblers and the tang 10, so that it is fully inaccessible from outside. Accordingly, it is not available to any external locking action which, by preventing the oscillation of the tumblers, would expose the lock to effraction attempts.

[0034] The device is susceptible of numerous modifications and variations, within the scope of the claims. For example, it is possible to provide two or more teeth which are formed in one or more pins rigidly coupled to the flap 43 and are adapted to engage the set of teeth of the expansions 25. Likewise, it is possible to form on the expansions 25 one or more teeth which engage in a corresponding set of teeth formed in the flap 43.

[0035] The disclosures in Italian Patent Application No. BO97A000565 from which this application claims priority are incorporated herein by reference.

[0036] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. An effraction-resistant device for a lock with plate tumblers (18, 19, 20), comprising a bolt (9) sliding in a casing (1) and having a tang (10) provided with a rack-like set of teeth (11) for moving the bolt by means of a double-pattern actuation key and a transverse pin (33) for locking the bolt so that it is engaged in openings (30) of the tumblers (18, 19, 20) which are elongated in the direction in which the bolt slides, said openings (30) having, along their longitudinal edges, mutually opposite teeth (31, 32) which form passages through which said transverse pin (33) can travel by successive key turns, said tumblers (18, 19, 20) having two slots (26, 27) which are elongated at right angles to said tang (10) and are engaged by respective guiding pins (13, 39) in order to guide said tumblers (18, 19, 20), in contrast with return springs (38), at right angles to the direction in which the bolt (9) slides, characterized in that one (13) of said guiding pins is fixed and the other one (39) is movable and has opposite ends (40) which are rigidly coupled, with play, in respective seats (41, 42) formed in respective mutually opposite walls (2, 6) of said casing (1), so as to allow movements of said pin (39) in said seats (41, 42) and oscillations of said tumblers (18, 19, 20) in an inclined position, engagement means (45, 47) being provided which are suitable to engage said tumblers (18, 19, 20) when they are fraudulently made to oscillate in said inclined position.

2. The device according to claim 1, characterized in that said engagement means comprises a plurality of notches which form a set of teeth (47) along an edge of the tumbler (18, 19, 20) which lies transversely to the sliding direction of the bolt (9), and at least one tooth (46) which is fixed inside the lock in opposition to said set of teeth (47), the oscillation of said tumblers (18, 19, 20) being adapted to cause the engagement of said tooth (46) in the notches of said set of teeth (47) to prevent the movement of said tumblers (18, 19, 20) transversely to the sliding direction of the bolt (9).

3. The device according to claim 1, characterized in that said engagement means (46, 47) comprises at least one tooth which is formed along an edge of the tumbler which lies transversely to the sliding direction of the bolt and a plurality of notches which form a set of teeth provided on a flap which is fixed inside the casing, the oscillation of said tumblers being adapted to produce the engagement of said tooth in the notches of said set of teeth to prevent the movement of said tumblers transversely to the sliding direction of the bolt.

4. The device according to claim 2 or 3, characterized

in that said movable pin (39) has, at its opposite ends, lugs (40) whose diameter is smaller than the diameter of the portion that passes through said tumblers (18, 19, 20), said lugs (40) engaging seats (41, 42) of the walls (2, 6) of said casing (1) which are elongated in an oblique direction with respect to the sliding direction of said bolt (9), so that when said bolt (9) is actuated so as to retract into the casing, said movable pin (39) determines an oscillation of the tumblers (18, 19, 20) into the position in which said tooth (46) engages the notches of said set of teeth (47), whilst when said bolt (9) is not actuated, said springs (38) push and retain said movable pin (39) in the bottom of said seats (41, 42).

5. The device according to one of claims 2 and 4, characterized in that said tooth (46) is formed on a pin (45) which passes through a flap (43) which is fixed to the inside of said casing and lies in a space which is formed between said tumblers (18, 19, 20) by the tang (10) of said bolt (9), said flap (43) being as thick as said space and having an opening (44) which is crossed by said movable pin (39).

FIG.1

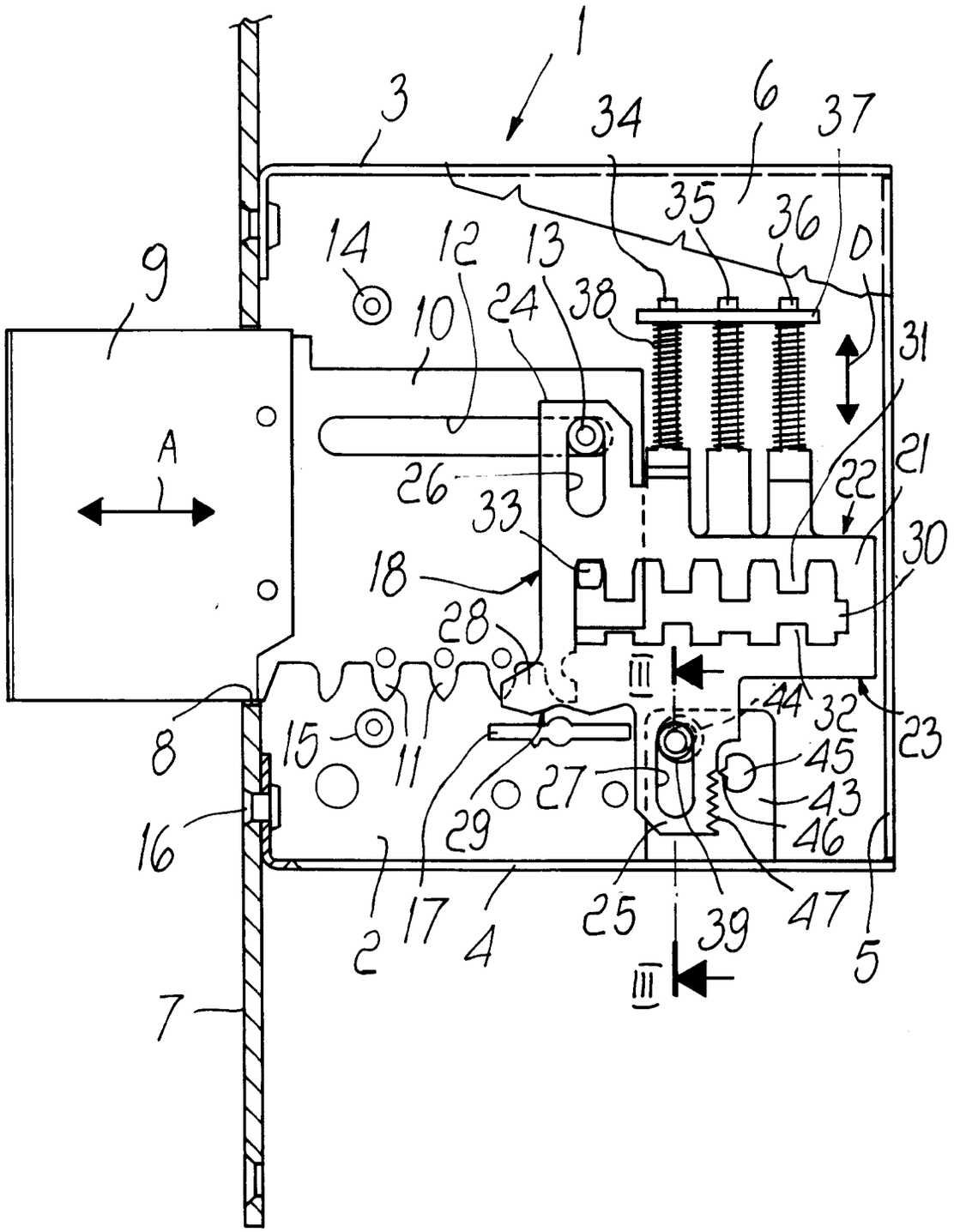
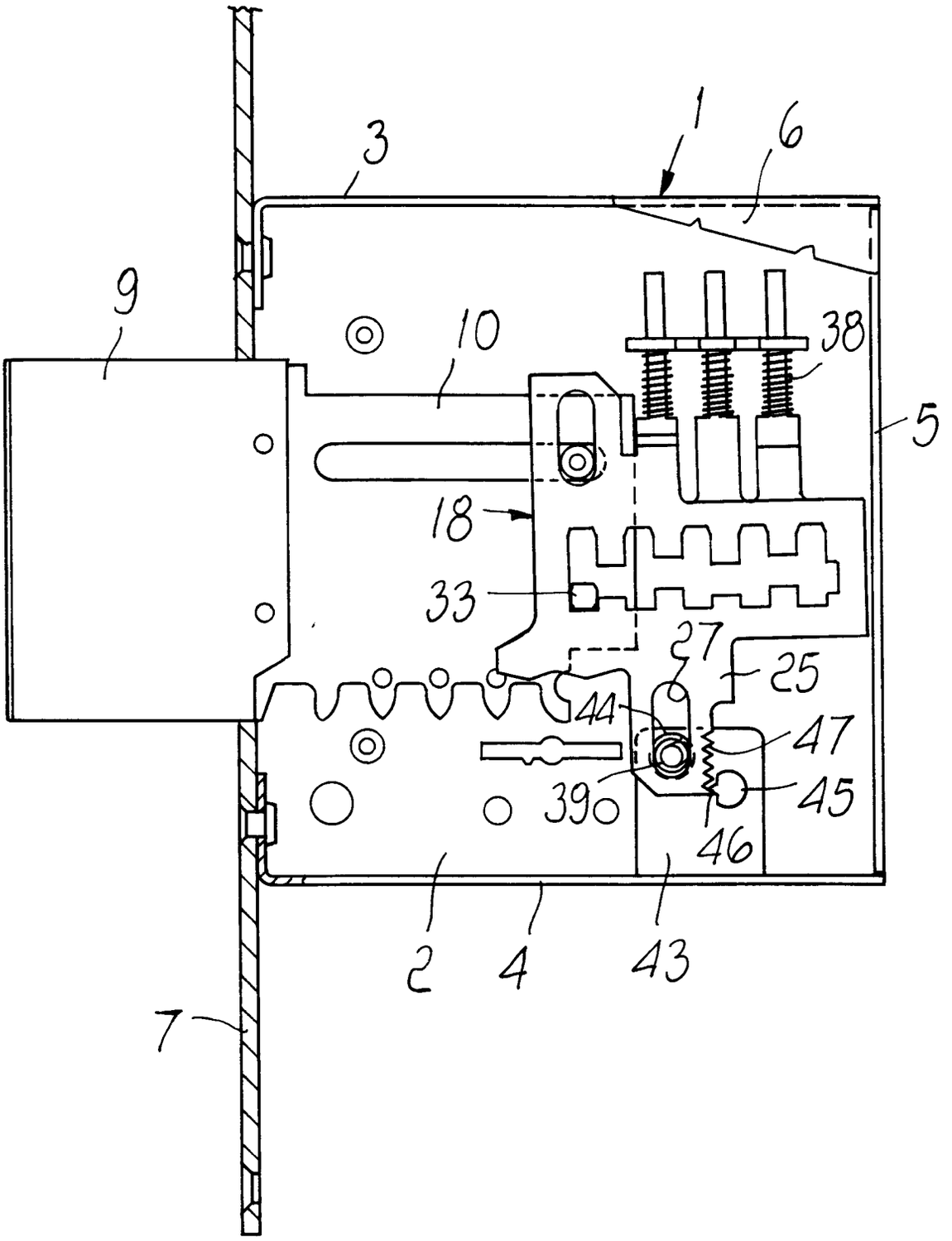

1
3
34
6
37
35
36
D
14
12
13
9
10
24
38
31
A
26
33
22
21
18
30
28
III
44
32
23
8
15
11
45
27
43
16
29
46
17
25
39
47
2
4
5
III
7

FIG.2



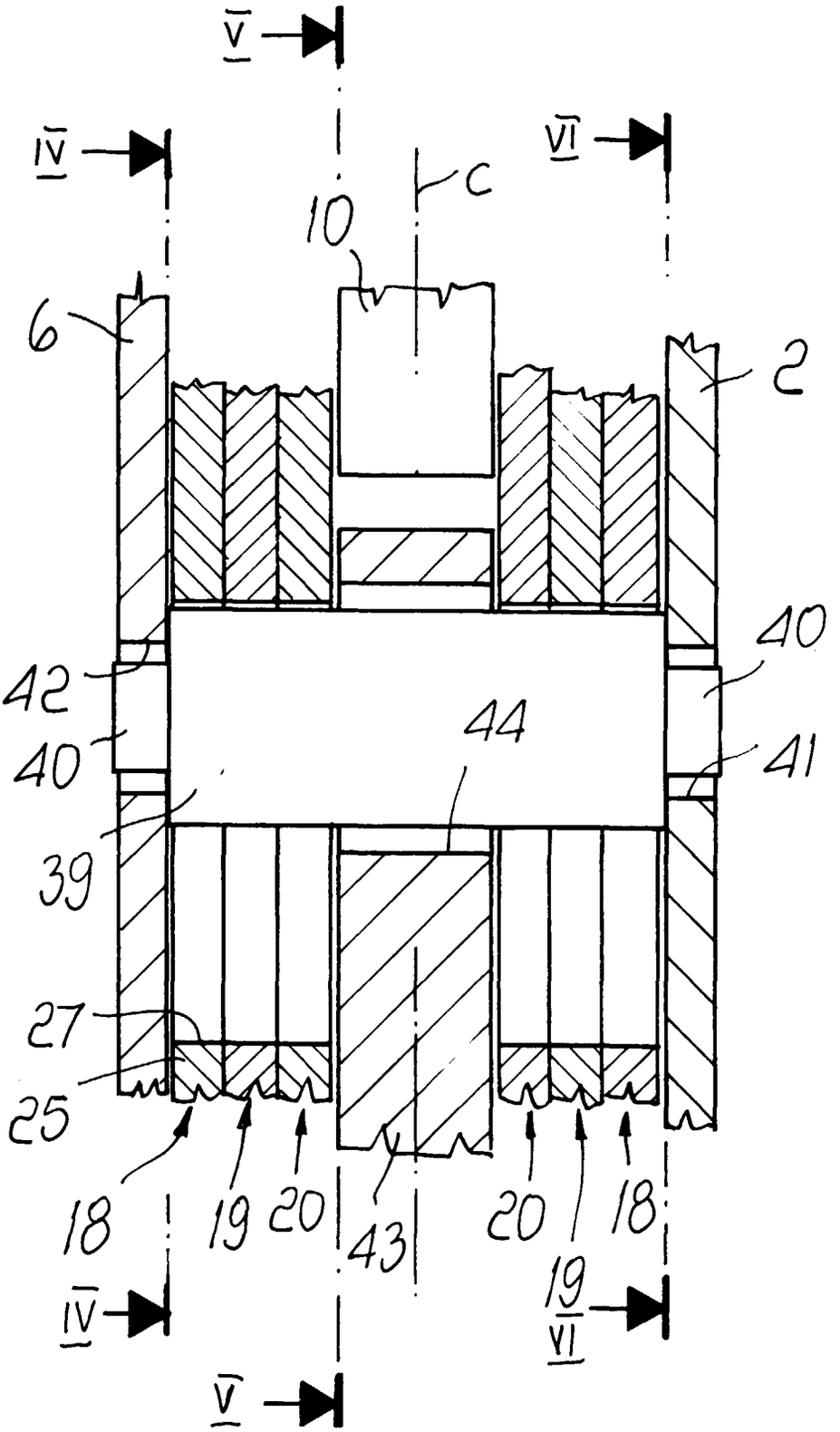


FIG.3

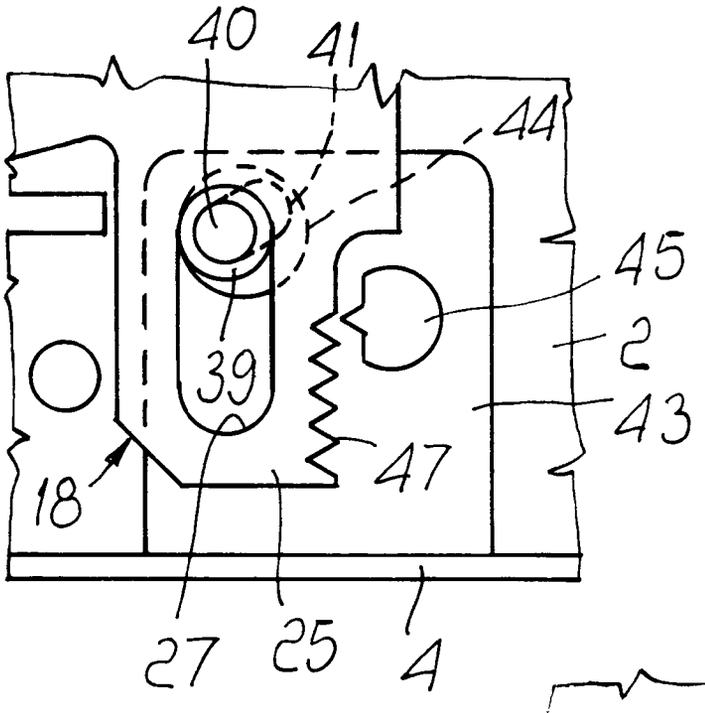


FIG. 4

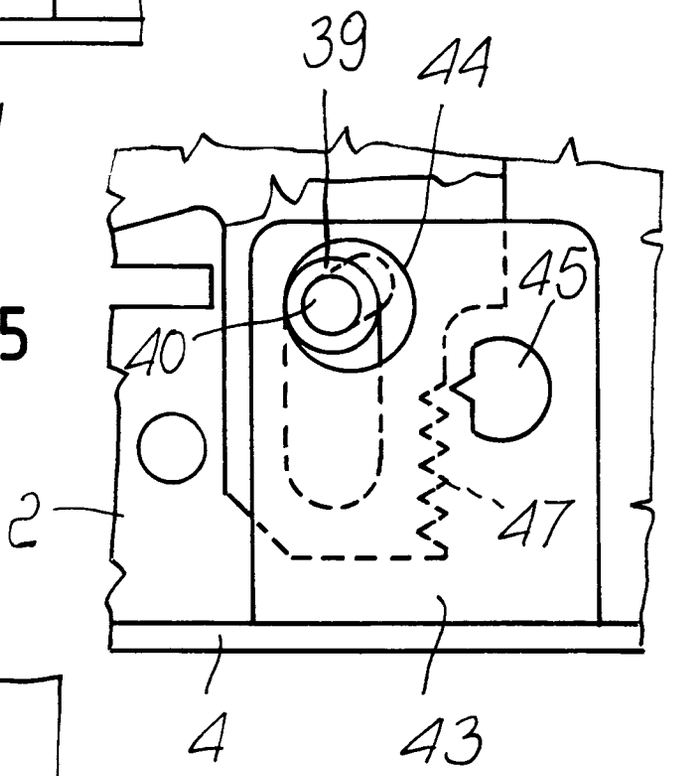


FIG. 5

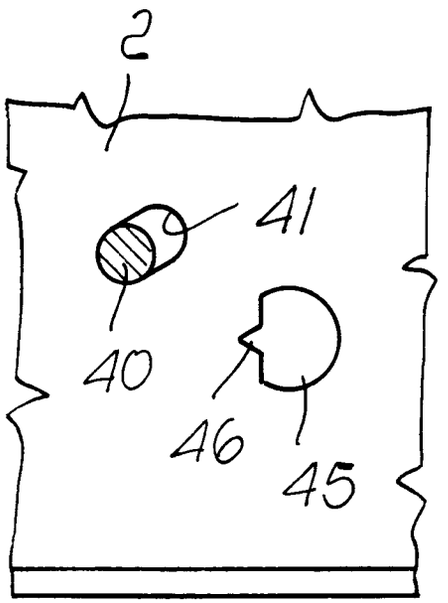


FIG. 6

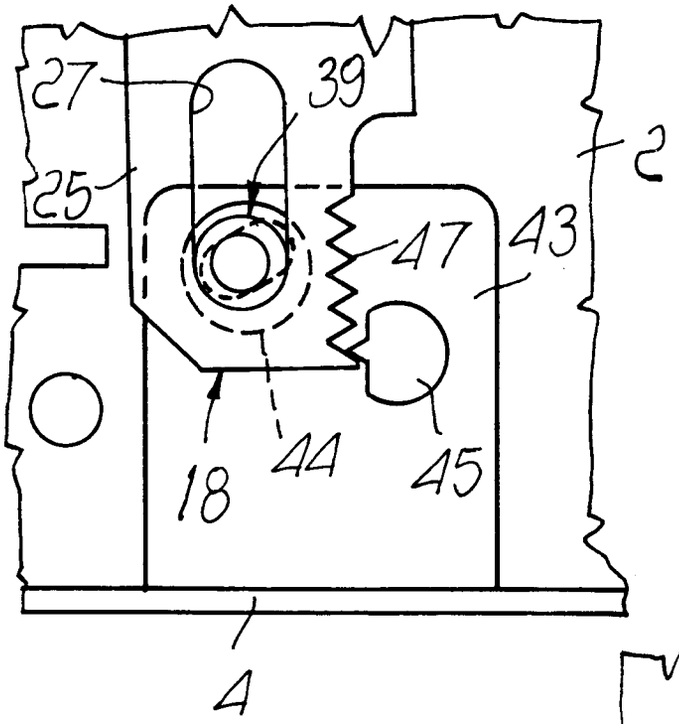


FIG.7

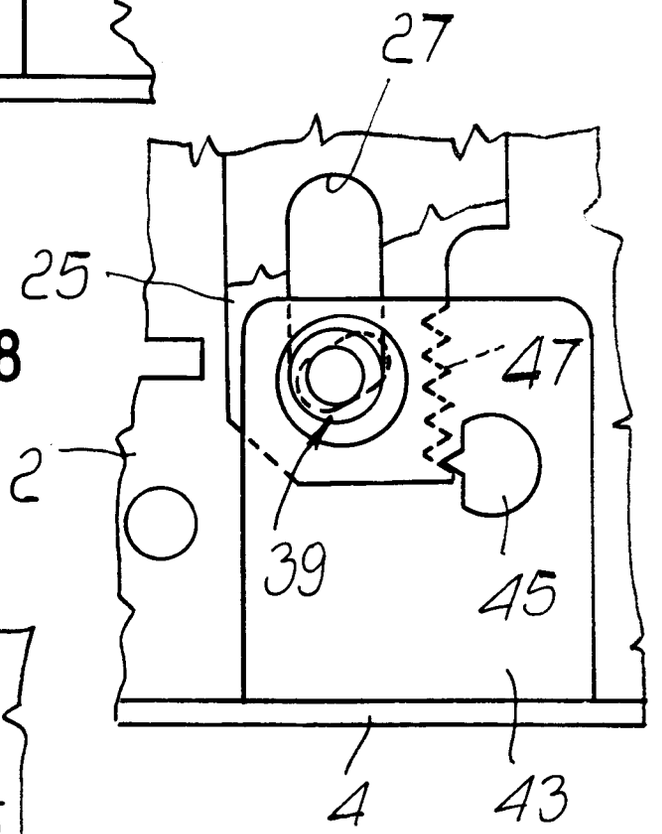


FIG.8

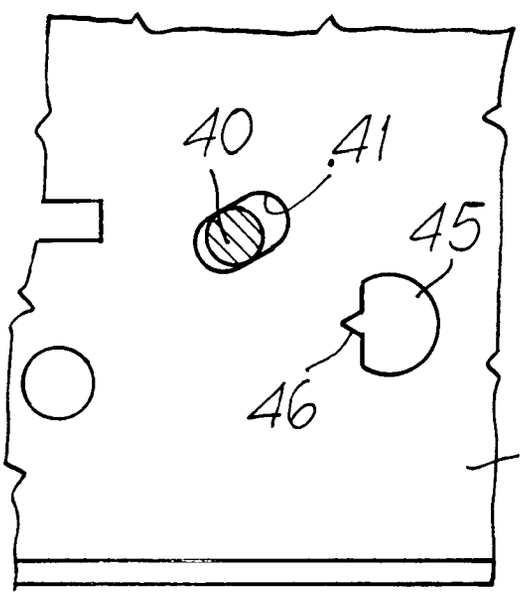


FIG.9