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(54) **Lock with flat tumblers and changeable combination**

Schloss mit flachen Zuhaltungen und Wechselcombination

Serrure avec des gâchettes plattes et une combinaison modifiable

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Description

[0001] The present invention relates to a lock with flat tumblers and changeable combination.

[0002] Locks with flat tumblers and changeable combination are known in the art, for example from British patent no. 2,081,796, from International Application WO91/02871, from Italian patent Appln. no. 67729A/90, and from German patent no. 565,027.

[0003] In these known locks, the tumblers oscillate with respect to a fulcrum and changing the combination consists in varying the extent of said oscillation, for example by moving the tumblers with respect to the fulcrum.

[0004] In French patent no. 2,663,072 the combination is changed by varying the position of the tumblers with respect to the position of respective contrast elements.

[0005] All known locks share the drawback that in order to change the combination it is necessary to open the lock itself to reposition the tumblers. Since this operation requires disassembling the already-installed lock, it has turned out to be very difficult, in addition to the fact that repositioning the tumblers requires a certain skill on the part of the operator.

[0006] A principal aim of the present invention is now to provide a lock with flat tumblers and changeable combination that allows to obviate the above described drawbacks.

[0007] This aim is achieved by means of a lock with flat tumblers and changeable combination as defined in the appended claim 1.

[0008] Further characteristics and advantages will become apparent from the following detailed description of an embodiment, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

figure 1 is a view of the lock in operating condition;
figure 2 is a view of the same lock in the combination-changing position;
figure 3 is a sectional view, taken along the plane III-III of figure 1;
figures 4 and 5 are views of a detail of the lock of figures 1 and 2;
figures 6 and 7 are views of a safety device suitable to avoid possible jamming of the lock during combination changing;
figure 8 is a view of a different embodiment of the device of figures 6 and 7.

[0009] With reference to the above figures, the reference numeral 1 designates the faceplate of the lock casing which furthermore comprises the bottom 2, which is surrounded by a peripheral wall composed of the walls 3, 4, and 5, which are respectively referenced as upper, rear, and lower wall with reference to the drawing for the sake of convenience in description. The reference numeral 6 designates the cover that closes the casing.

[0010] The rectangular opening 7 is formed in the faceplate 1, and the bolt 8 protrudes outside through said opening, is slideable in the direction A, and extends inside the casing with the tang 9. The tang 9 is constituted by a flat bar which is less thick than the bolt 8 and lies on the centerline plane of said bolt. The tang 9 has, along its lower edge, multiple teeth 10 which form a rack on which the key acts to move the bolt. Two slots 11 and 12 are formed in the tang 9 and are elongated in the direction A; a threaded bush 13 engages in the first slot and rises from the bottom 2 of the casing to which it is fixed. The bush 13 allows to guide the bolt during its sliding and acts, together with other bushes 14, 15, and 16, as engagement element for the screws by means of which the cover 6 is fixed so as to close the lock casing. An equal number of flat tumblers is arranged on either side of the tang 9; one tumbler, generally designated by the reference numeral 17, is shown in the drawing.

[0011] In order to establish the conceptual situation, it is assumed that the total number of tumblers is six, divided into two groups of three adjacent tumblers: one group is on one side of the tang 9 and the other group is on the opposite side. Each tumbler 17 is composed of a rectangular part 18 and of a part 19 having a composite shape. The part 18 is hereinafter referenced as "changing strip" owing to its combination-changing function, as specified hereinafter, whereas the part 19 is termed "blocking lamina" owing to its ability to block the sliding of the bolt 8. The strip 18 has two slots 20 and 21 which are elongated in the direction B, at right angles to the direction A, and has a lower end 22 which is shaped so that it can be engaged by the web of a key 23 with double serrations which is inserted through an opening 26 of the bottom 2 or of the cover 6 of the casing and lifts the strip in the direction B. One edge of the strip 18 is straight, lies parallel to the slots 20 and 21, and has a set of teeth 24 suitable to mesh with a set of teeth 25 formed on a contiguous edge of the lamina 19. The lamina 19 comprises a central portion 27 which is rectangular and extends along the direction A; two rectangular wings 28 and 29 extend upwardly and downwardly from said central portion, and slots 30 and 31 are formed in said wings; said slots are elongated in a direction that is parallel to the slots 20 and 21.

[0012] The slots 30 and 31 are engaged by the bushes 13 and 16 so that the laminae 19 can only move in the direction B.

[0013] An opening 32 is formed in the central portion 27 of each lamina and is elongated in the direction A; a series of teeth 33 protrudes from the upper longitudinal edge of said opening and determines the combination of the lock together with a second series of teeth 34 which lies opposite and protrudes from the lower edge of the opening 32.

[0014] The teeth 33 form gaps between them which have a square shape and allow to engage between said teeth a pin 35 having a square cross-section and protruding on either sides of the tang 9 to which it is rigidly

coupled. The teeth 33 of each tumbler have alternately identical heights which are however different from the height of the teeth of the adjacent tumbler. The oppositely arranged ends of the upper teeth 33 and of the lower teeth 34 furthermore form a passage that allows the pin 35 to pass between the oppositely arranged teeth when the tumblers are actuated by the key 23.

[0015] The lamina 19 is completed by two notches 36 and 37 which are formed on the edge of the wing 28 which lies opposite to the set of teeth 25 and at the end of the opening 32 towards which the pin 35 moves when the bolt 8 is pushed out of the lock. The tumblers 17 (three on one side of the tang 9 and three on its other side) lie between two plates 38 and 39: the plate 38 is adjacent to the bottom 2 of the casing and is referenced to as "lower plate", whereas the other plate 39 (see figure 3) is referenced to as "upper plate" as it is meant to make contact with the cover 6. Since the plates 38 and 39 are identical, their details are described hereinafter with reference only to the lower plate 38 which, as shown by figures 1 and 2, substantially duplicates the profile of the tumblers 17.

[0016] The plates 38 and 39 in fact include a central portion 40 from which an expansion 41 extends upwards and from which an expansion 42 extends downwards.

[0017] The plates 38 and 39 are mutually fixed (at a distance that is equal to the thickness of the tumblers 17 and of the tang 9) by means of screws that engage in spacer bushes 43 and 43a which are driven through the slots 20 and 21 of the strips 18 of the tumblers. The mutual fixing of the plates 38 and 39 also secures a square pin 44 located between the expansions 41 in the vicinity of the wings 28 of the blocking laminae 19 but above the notch 37.

[0018] The plates 38 and 39 are suitable to perform small horizontal movements in the direction A when changing the combination of the lock. For this purpose, slots 45, 46 and 47, 48 are formed in the expansions 41 and 42 of the plates 38 and 39 and at the opposite ends of the central portion 40; said slots are elongated in the direction A and are suitable to be engaged respectively by the bushes 13 and 16 used to guide the laminae 19 vertically and by pins 49 and 50 protruding inwardly from the bottom 2 and from the cover 6. The height of the pins 49 and 50 does not exceed the thickness of the plates 38 and 39, so as to avoid protruding into the space between the plates 38 and 39 and so as to avoid interfering with the strips 18 and the laminae 19 of the tumblers. A tab 51 extends from each expansion 41 towards the upper wall 3 for mounting a support 52 for multiple spring-loaded pins 53; each pin 53 acts on a corresponding strip 18 and is thus capable of pushing the tumblers 17 downwardly to move and keep the pin 35 in engagement position between the upper teeth 33 and thus block the movement of the bolt 8.

[0019] Respective longitudinal recesses 54 are formed in the lower plate 38 and in the upper plate 39 at the pin 35 (see figures 4 and 5); these recesses allow the pin 35 to slide, and their length matches the length of the openings 32 of the tumblers. The recesses 54 of the lower plate 38 and of the upper plate 39 furthermore have, at the region where the teeth 24 and 25 mutually engage, a recess 55 which is shaped so as to form, in each plate 38 and 39, a tooth 56 which is located opposite to the notch 36 and is suitable to be struck by the pin 35 when the bolt 8 has extended fully out of the lock casing.

[0020] A lever 57 is accommodated in the recess 55 of the lower plate 38 and is articulated to a pivot 58 rigidly coupled to the bottom 2. The lever 57 is thus co-planar with respect to the plate 38, has a thickness that does not exceed the thickness of the plate 38, and is L-shaped, with an arm 59 that extends horizontally and a vertical arm 60. The vertical arm 60 is shaped at its end so that it is in contact with the rear flank of the tooth 56, i.e. on the side opposite to the one where the pin 35 acts. The horizontal arm 59 instead has a cam 61 suitable to cooperate with the pin 35, as more clearly shown hereinafter. An identical lever 57 is also accommodated in the recess 55 of the upper plate 39 and is articulated in the cover 6 and thus cooperates with the pin 35. Said lever, however, is not shown in the drawings.

[0021] The operation of the described lock is as follows.

[0022] Each user has a key that is used for normal opening and closing operations, and an auxiliary key, hereinafter referenced to as "combination-changing key" since it is used to change the combination.

[0023] The first user of course has a combination-changing key which he does not need to change the combination, since the combination of the lock has been set in the factory. However, this combination-changing key (hereinafter referenced to as "old combination-changing key") must be stored in order to allow subsequent combination changing. Said combination changing can be performed, for example, when a new user of the lock wishes to prevent the previous user from opening the lock.

[0024] The new combination entails the use of a new combination-changing key and of a new normal key. The old combination-changing key only allows to prepare the tumblers for combination changing, which is performed with the new combination-changing key as follows.

[0025] By operating the lock with the old key, the bolt is moved to the fully extracted position shown in figure 1, which is achieved after four turns in the example shown. In this position, the opposite ends of the pin 35 are adjacent to the teeth 56 of the plates 38 and 39, and the cams 61 of the levers 57 rest on top of said ends. It should be noted that during the sliding of the bolt 8 the movement of the plates 38 and 39 is prevented by the abutment of the pin 44 against the wings 28 of the laminae 19, which can move only in the direction B due to the bushes 13 and 16 which are guided in the slots 30 and 31.

[0026] At this point the old combination-changing key

is inserted and turned, acting on the tumblers 17 to raise them to the level at which the notches 36 and 37 face the pins 35 and 44. In particular, the notches 36 lie above the teeth 56.

[0027] When the old combination-changing key turns again, the bolt 8 performs an additional movement, since the pins 35 and 44 can now engage the notches 36 and 37. However, the pin 35 acts on the teeth 56 of the plates 38 and 39, which are thus moved by an extent equal to the depth of the notches 36 and 37, carrying the strips 18 with them and spacing them from the laminae 19, which cannot follow the movement of the plates 38 and 39 because they are restrained by the bushes 13 and 16. Following the separation of the strips 18 from the laminae 19, the teeth 24 disengage from the teeth 25. At the same time, the teeth 56 of the plates 38 and 39, by acting on the arms 60 of the levers 57, force said levers to oscillate into the position in which the cams 61 engage the pin 35. The lock is now in the configuration shown in figure 2, ready for combination changing.

[0028] At this point the old combination-changing key is removed and the new key is inserted; said new key is actuated so as to retract the bolt 8 inside the casing. A first angle of rotation of the new combination-changing key raises the strips 18 according to the new combination set by the new combination-changing key. Once the new arrangement of the strips 18 has been achieved, the further rotation of the new combination-changing key moves the bolt 8 and thus the pin 35 which, by acting on the cams 61, forces the levers 57 to rotate in the direction in which the arms 60 act on the rear flank of the teeth 56 of the plates 38 and 39. In this manner, the entire pack formed by the plates 38 and 39 and by the strips 18 is returned to a position in which it is adjacent to the laminae 19, causing the teeth 24 to engage between the teeth 25 before the pins 35 and 44 leave the notches 36 and 37.

[0029] As soon as the pins 35 and 44 have left the notches 36 and 37, by removing the new combination-changing key the pin 35 engages between the upper teeth 33 due to the spring-loaded pins 53 which, by pushing the strips 18 downwardly, also move the laminae 19 downwardly by virtue of the meshing of the teeth 24 and 25.

[0030] It is evident that the mutual displacement of the strips 18 and of the laminae 19 modifies the tumblers 17 according to a new combination that corresponds to the combination of the new combination-changing key; said combination can entail a new arrangement of one or more strips 18 relative to the respective laminae.

[0031] The lock is now ready to be operated with the new normal key, which has such a profile that when the tumblers 17 are raised the passage formed between the opposite teeth 33 and 34 is aligned with the pin 35 to allow the turn strokes of the bolt. In summary, the combination-changing key allows the bolt to perform the stroke for separating the strips 18 from the laminae 19 at a level that is set by the notches 36 and 37. Said level thus becomes a combination variable together with the profile of the combination-changing key.

[0032] The described invention is susceptible to numerous modifications and variations, all of which are within the scope of the inventive concept.

[0033] In particular there are provisions which while ensuring on one hand higher precision in the movement of the strips 18 and thus in the selection of the new combination, on the other hand prevent the incorrect insertion of a key other than the combination-changing key, owing to user error, from compromising the operation of the lock.

[0034] According to the invention, this higher precision in strip movement can be obtained by providing, on the tooth 10 that performs the last turn (i.e. outward stroke) of the bolt 8 (see figures 6 and 7), a tab 62 on which the old combination-changing key C, by rotating in the direction F, can act with a central portion D of its web. The height of the portion D is such that said portion passes below the end of the teeth 10, so that the contact point of the key on the tab 62 with respect to the rotation axis of the key has a smaller radius than it would have if the key acted on the flank of the tooth as in the embodiment of figures 1-5. Indeed, in view of the play of the key in the opening 26 and of the machining and assembly tolerances of the various parts in the lock, there remains a certain margin of error in the movement of the bolt and thus in the placement of the strips 18 which can lead to significant variations in the stroke of the strips, such as to compromise the meshing of the set of teeth 24 in the set of teeth 25 when the new combination is set with the new combination-changing key. The tab 62, by reducing the actuation radius of the key, reduces the error in the movement of the bolt and thus of the strips 18 to values that always ensure the meshing of the sets of teeth 24 and 25.

[0035] In the lock of figures 1 to 5 there is a critical period that occurs when the lock is in the configuration of figure 2, in which the old combination-changing key, after disengaging the set of teeth 24 from the set of teeth 25, has been removed. In this configuration, if one inserts a key other than the new combination-changing key, for example the new lock actuation key, the sets of teeth 24 and 25 mesh in a manner that does not take into account the profile of the new actuation key with respect to the profile of the new combination-changing key.

[0036] This no longer allows to align the pin 35 with the passage between the teeth 33 and 34, and the lock is therefore blocked. A similar problem would occur in case of impacts which, by causing an accidental movement of the plates 38 and 39, displace the correct meshing of the sets of teeth 24 and 25.

[0037] In order to avoid the above mentioned problems, below the opening 26 of the key there is a lever 63 that oscillates about a fulcrum 63a on a plane that coincides with the plane of the tang 9.

[0038] The lever 63 has, at the end that lies opposite

to the fulcrum 63a, a lug 64 that lies at right angles to the plane of oscillation of said lever and engages in a recess 65 formed in at least one of the lower expansions 42 of the plates 38 and 39.

[0039] The recess 65 forms a supporting tooth 66 and an engagement tooth 67.

[0040] A spring 68 acts on the lever 63 and tends to lift it so as to move the lug 64 into engagement position behind the tooth 67.

[0041] The lever 63 has, in the region below the opening 26 for the key, an expansion 69 that extends upwards and in which there is a curved slot 70 whose center of curvature lies at the fulcrum 63a.

[0042] A pin 71 engages in the slot 70 and keeps the lever 63 guided in its plane, preventing it from shifting laterally. According to what has been shown by the above description, in normal operating conditions the plates 38 and 39 are blocked in their movement by the abutment of the pin 44 against the expansions 28 of the laminae 19, and the spring 68 keeps the lever 63 in the raised position in which the lug 64 lies outside the recess 65.

[0043] Accordingly, when the normal actuation key of the lock is inserted in the opening 26, the bolt 8 is moved forward or backward and the lever 63 oscillates idly, causing no effect. When instead the combination is being changed, the outward movement of the bolt into the position of figure 6, which is a consequence of the rotation of the old combination-changing key C in the direction F and of the action of the portion D on the tooth 62 (vertical position in figure 6), the plates 38 and 39 are moved towards the faceplate 1. The plates 38 and 39, by moving from the position shown in dashed lines in figure 6 to the position shown in solid lines, cause the insertion of the lug 64 in the recess 65, so that when the combination-changing key is returned to the extraction position the lug 64, by virtue of the action of the spring 68, rises and engages behind the tooth 67, retaining the plates 38 and 39 and preventing them from performing, as a consequence of accidental impacts, movements that might make the set of teeth 24 mesh with the set of teeth 25, blocking the lock.

[0044] If the new combination-changing key C1 is now inserted to set the new combination, said key, during a first rotation angle in the direction G, acts on the expansion 69 (see the inclined position in figure 6) so as to lower the lever 63 into the position for disengaging the lug 64 from the tooth 67; during a subsequent rotation angle, it spaces the plates 38 and 39 from the lug 64, which exits from the recess 65. It should be noted that both the new combination-changing key and the old combination-changing key must have portions D that have the same height and can pass below the teeth 10.

[0045] If instead another key, for example the new actuation key, is inserted by mistake instead of the new combination-changing key after the plates 38 and 39 have been moved with the old combination-changing key into the position in which the lug 64 engages in the recess 65 and before the new combination has been set with the new combination-changing key, the actuation of the incorrect key causes the abutment of the lug 64 on the supporting tooth 66 and blocks the rotation of the key because said incorrect key has a central portion that is higher than the portion D of the combination-changing keys in order to be able to act on the actuation teeth 10. The user can thus notice the mistake he has made and replace the wrong key with the right one before the sets of teeth 24 and 25 are moved so as to mutually mesh, blocking the lock.

[0046] In a different embodiment of the invention, a secondary plate 72 (see Figure 8) is used instead of the oscillating lever 63; said secondary plate is guided beneath the opening 26 by the engagement of the pins 73 and 74 in slots 75 and 76 that allow the secondary plate to slide in the direction B. The secondary plate is actuated by a spring 77 that rests on the wall 5 so as to move the top part 78 to the level for cooperating with the webs of the combination-changing and actuation keys and allow a lateral tooth 79 to engage in the recess 65 according to what has been described above with reference to figures 6 and 7.

[0047] As is evident, the described lock perfectly achieves the intended aim and objects. A considerable advantage resides in the fact that regardless of the combination that has been set, the strips 18 abut against the bushes 43 and 43a when the key is not inserted in the lock, so that the lower edges of the ends 22, on which the serrations of the key act, all remain at the same level, making it impossible to decipher the combination by detecting the tumblers through the opening 26.

[0048] 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 scope of each element identified by way of example by such reference signs.

Claims

1. Lock with flat tumblers and changeable combination, comprising a box-like body (2-6) which slidingly accommodates a bolt (8) provided with a tang (9) that has teeth (10) for moving the bolt by means of an actuation key with double bit serrations, said tang (9) also comprising a transverse pin (35) that engages in openings (32) of the tumblers (17) which extend in the direction (A) along which the bolt (8) slides and have, along their longitudinal edges, oppositely arranged teeth (33) that form passages through which said pin (35) advances by successive turns; characterized in that each tumbler (17) is composed of a first part (19), which is provided with said openings (32) and is guided at right angles to said tang (9) between a position for blocking said

bolt (8), in which said pin (35) engages between the teeth (33) of said opening (32), and a position for the sliding of the bolt (8), wherein said pin (35) can slide through said passages; and of a second part (18), which is mounted between two plates (38, 39) which are mutually rigidly coupled and are guided in a direction that is parallel to the sliding direction (A) of said bolt (8); in that said second parts (18) are guided between said plates (38, 39) parallel to said first parts (19) and can be actuated by virtue of key means with double bit serrations; in that said first and second parts (18, 19) of each tumbler (17) have mutually opposite sets of teeth (24, 25) which are adapted to mesh with each other in order to keep said parts (18, 19) coupled in a direction (B) that lies at right angles to the bolt (8); in that at least one (38) of said plates (38, 39) has a recess (54) which allows the pin (35) of the bolt (8) to slide freely and forms an abutment tooth (56) for said pin (35) when the bolt (8) is fully projected from said box-like body (2-6); the lock being such that a first combination-changing key (C) of said key means is suitable to lift the tumblers (17) into a position in which said pin (35) is in front of a notch (36) which is located at a different level relative to said passages between the teeth (33), the first combination-changing key (C) acting thus on the tang (9) of the bolt (8) so as to move said pin (35) such that it acts on said abutment tooth (56) and therefore moves said plates (38, 39) into a position in which the sets of teeth (24, 25) of the first and second parts (18, 19) are mutually disengaged; the lock being further such that a second combination-changing key (C1) of said key means, by acting on said second part (18) of the tumblers (17), raises them subsequently according to a new combination; lever means (57) being furthermore provided, said lever means cooperating with said pin (35) so that when said second combination-changing key (C1) is actuated so as to retract said bolt (8) into said box-like body (2-6) said lever means (57), moved by the pin (35), act on at least one of said plates (38, 39) to move said second parts (18) of the tumblers (17) into a position in which their sets of teeth (24) mesh with the sets of teeth (25) of said first parts (19), so as to preset the tumblers (17) according to the combination of a new actuation key with double bit serrations.

2. Lock according to claim 1, characterized in that said lever means are constituted by a lever (57) which is articulated in the box-like body (2-6) and is accommodated in a recess (55) of said plate (38-39) which has said tooth (56), said lever (57) comprising a first arm (59), which lies substantially parallel to the sliding direction (A) of the bolt (8), and a second arm (60), which engages said tooth (56) on the side that is opposite to the one where said pin (35) abuts, said first arm (59) forming a cam (61) that cooperates with said pin (35) so that when said second combination-changing key (C1) returns the bolt (8) inside the box-like body (2-6) said pin (35) acts on said cam (61) so as to cause the rotation of the lever (57) in the direction in which said second arm (59) acts on said plate (38, 39) to restore the mutual meshing of the sets of teeth (24, 25) of said first and second parts (18, 19) of the tumblers (17).

3. Lock according to claim 1 or 2, characterized in that said plates (38, 39) support spring-loaded pins (53) that act on said second parts (18) of the tumblers (17) to move said tumblers into the position for blocking the bolt (8).

4. Lock according to one of claims 1 to 3, characterized in that said first parts (19) have a notch (37) that can be engaged by a pin (44) lying between said plates (38, 39) simultaneously with the engagement of the pin (35) of the bolt (8) in the respective notch (36).

5. Lock according to one of the preceding claims, characterized in that said plates (38, 39) have slots (45, 48) which are elongated in a direction that is parallel to the sliding direction (A) of the bolt (8) and are engaged by pins (13, 16, 49, 58) which are fixed to the box-like body (2-6), said slots (45-48) having a length that determines the movement stroke of the plates (38, 39).

6. Lock according to one of the preceding claims, characterized in that the last of the teeth (10) that move the bolt (8) has a tab (62) that is suitable to be engaged by a portion (D) of the combination-changing keys (C, C1) which has, with respect to the key rotation axis, a radius that is smaller than the radius between said axis and the end of the teeth (10) of the bolt (8).

7. Lock according to claim 6, characterized in that it comprises a movable element (63, 72) which has a lug (64, 79) that is suitable to engage in a recess (65) of at least one of said plates (38, 39), said recess (65) having a supporting tooth (66) and an engagement tooth (67), said movable element (63, 72) having an expansion (69, 78) that cooperates with said portion (D) so that said lug (64, 79) assumes a position in which it engages said engagement tooth (67) to retain the plate (38, 39) when the sets of teeth (24, 25) of the first and second parts (18, 19) of the tumblers (17) have been spaced by said first combination-changing key (C) in order to change the combination, and a disengagement position when one acts on the movable element (63, 72) with the second combination-changing key (C1), said lug (64, 79) being suitable to assume a position in which it abuts against said supporting tooth (66)

when one acts on the movable element (63, 72) with a key other than the second combination-changing key (C1) after the separation of the first and second parts (18, 19) performed by the first combination-changing key (C).

8. Lock according to claim 7, characterized in that said movable element is constituted by a lever (63) that oscillates in contrast with elastic return means (68).

9. Lock according to claim 8, characterized in that said movable element is constituted by a plate (72) which is guided in contrast with elastic return means (77).

Patentansprüche

1. Schloß mit flachen Zuhaltungen und Wechselkombination, mit einem kastenartigen Gehäuse (2-6), in dem ein Riegel (8) verschiebbar untergebracht ist, der mit einem Schieber (9) versehen ist, welcher Zähne (10) zum Bewegen des Riegels mit einem Betätigungsschlüssel mit Doppelrastzahnung hat, wobei der Schieber (9) zudem einen Querstift (35) enthält, der in Öffnungen (32) der Zuhaltungen (17) eingreift, welche in Richtung (A), entlang welcher der Riegel (8) gleitet, verlaufen und entlang ihrer Längskanten einander gegenüberliegend angeordnete Zähne (33) haben, die Durchgänge bilden, durch die sich der Stift (35) durch aufeinander folgende Drehungen bewegt, dadurch **gekennzeichnet**, daß jede Zuhaltung (17) aus einem ersten Teil (19) besteht, der mit den Öffnungen (32) versehen und im rechten Winkel zu dem Schieber (9) geführt ist zwischen einer Position zum Sperren des Riegels (8), in der der Stift (35) zwischen den Zähnen (33) der Öffnung (32) eingreift, und einer Position zum Verschieben des Riegels (8), in der der Stift (35) durch die Durchgänge gleiten kann; und aus einem zweiten Teil (18), der zwischen zwei Platten (38, 39) befestigt ist, die fest miteinander gekoppelt und in Richtung parallel zur Verschiebungsrichtung (A) des Riegels (8) geführt sind, daß die zweiten Teile (18) zwischen den Platten (38, 39) parallel zu den ersten Teilen (19) geführt sind und mit einer Schlüsselanordnung mit Doppelrastzahnung betätigt werden können, daß der erste und der zweite Teil (18. 19) jeder Zuhaltung (17) einander gegenüberliegende Zahnsätze (24, 25) haben, die zum gegenseitigen Eingreifen geeignet sind, um die Teile (18, 19) in Richtung (B) rechtwinklig zum Riegel (8) gekoppelt zu halten, daß mindestens eine (38) der Platten (38, 39) eine Aussparung (54) hat, die das freie Gleiten des Stiftes (35) des Riegels (8) gestattet und einen Anschlagzahn (56) für den Stift (35) bildet, wenn der Riegel (8) aus dem kastenartigen Gehäuse (2-6) vollkommen herausragt, wobei das Schloß ermöglicht, daß ein erster Kombinationswechselschlüssel (C) der Schlüsselanordnung zum Anheben der Zuhaltungen (17) in eine Position geeignet ist, in der sich der Stift (35) vor einer Nut (36) befindet, die relativ zu den Durchgängen zwischen den Zähnen (33) auf einer anderen Ebene angeordnet ist, wodurch der erste Kombinationswechselschlüssel (C) auf den Schieber (9) des Riegels (8) einwirkt, um den Stift (35) derart zu bewegen, daß er auf den Anschlagzahn (56) einwirkt und dadurch die Platten (38, 39) in eine Position bewegt, in der die Zahnsätze (24, 25) des ersten und des zweiten Teils (18, 19) entkoppelt sind, wobei das Schloß ferner ermöglicht, daß ein zweiter Kombinationswechselschlüssel (C1) der Schlüsselanordnung durch Einwirken auf die zweiten Teile (18) der Zuhaltungen (17) diese anschließend gemäß einer neuen Kombination anhebt, und daß ferner Hebelmittel (57) vorgesehen sind, welche mit dem Stift (35) so zusammenarbeiten, daß bei Betätigen des zweiten Kombinationswechselschlüssels (C1) zum Rückführen des Riegels (8) in das kastenartige Gehäuse (2-6) die durch den Stift (35) bewegten Hebelmittel (57) auf mindestens eine der Platten (38, 39) einwirken, um die zweiten Teile (18) der Zuhaltungen (17) in eine Position zu bewegen, in der ihre Zahnsätze (24) mit den Zahnsätzen (25) der ersten Teile (19) im Eingriff sind, um die Zuhaltungen (17) gemäß der Kombination eines neuen Betätigungsschlüssels mit Doppelrastzahnung einzustellen.

2. Schloß nach Anspruch 1, dadurch **gekennzeichnet**, daß die Hebelmittel aus einem Hebel (57) gebildet sind, der in dem kastenartigen Gehäuse (2-6) gelenkig befestigt und in einer Aussparung (55) der den Zahn (56) enthaltenden Platte (38, 39) untergebracht ist, wobei der Hebel (57) einen ersten, im wesentlichen parallel zur Verschiebungsrichtung (A) des Riegels (8) liegenden Arm (59) und einen zweiten, in den Zahn (56) auf der der Anschlagseite des Stiftes (35) gegenüberliegenden Seite eingreifenden Arm (60) hat, wobei der erste Arm (59) einen Nocken (61) bildet, der mit dem Stift (35) so zusammenarbeitet, daß bei Rückführen des Riegels (8) in das kastenartige Gehäuse (2-6) durch den zweiten Kombinationswechselschlüssel (C1) der Stift (35) auf den Nocken (61) einwirkt, um das Drehen des Hebels (57) in der Richtung zu bewirken, in der der zweite Arm (59) auf die Platte (38, 39) einwirkt zwecks Wiederherstellung des gegenseitigen Eingriffs der Zahnsätze (24, 25) der ersten und der zweiten Teile (18, 19) der Zuhaltungen (17).

3. Schloß nach Anspruch 1 oder 2, dadurch **gekennzeichnet,** daß die Platten (38, 39) federvorgespannte Stifte (53) tragen, die auf die zweiten Teile (18) der Zuhaltungen (17) einwirken, um die Zuhal-

tungen in die Position zum Sperren des Riegels (8) zu bewegen.

4. Schloß nach einem der Ansprüche 1 bis 3, dadurch **gekennzeichnet,** daß die ersten Teile (19) eine Aussparung (37) haben, in die gleichzeitig mit dem Eingriff des Stiftes (35) des Riegels (8) in die jeweilige Nut (36) ein zwischen den Platten (38, 39) liegender Stift (44) eingreifen kann.

5. Schloß nach einem der vorhergehenden Ansprüche, dadurch **gekennzeichnet**, daß die Platten (38, 39) Schlitze (45, 48) haben, die in Richtung parallel zur Verschiebungsrichtung (A) des Riegels (8) länglich sind und in die an dem kastenartigen Gehäuse (2-6) befestigte Stifte (13, 16, 49, 58) eingreifen, wobei die Schlitze (45-48) eine den Bewegungshub der Platten (38, 39) bestimmende Länge haben.

6. Schloß nach einem der vorhergehenden Ansprüche, dadurch **gekennzeichnet,** daß der letzte der den Riegel (8) bewegenden Zähne (10) einen Fortsatz (62) hat, der zum Eingriff mit einem Abschnitt (D) der Kombinationswechselschlüssel (C, C1) geeignet ist, welcher bezogen auf die Schlüsselrotationsachse einen Radius hat, der kleiner als der Radius zwischen der Achse und dem Ende der Zähne (10) des Riegels (8) ist.

7. Schloß nach Anspruch 6, dadurch **gekennzeichnet**, daß es ein bewegbares Element (63, 72) enthält, das eine zum Eingreifen in eine Aussparung (65) mindestens einer der Platten (38, 39) geeignete Nase (64, 79) hat, wobei die Aussparung (65) einen Stützzahn (66) und einen Eingriffszahn (67) hat, und daß das bewegbare Element (63, 72) eine Erweiterung (69, 78) hat, die mit dem Abschnitt (D) so zusammenarbeitet, daß die Nase (64, 79) eine Position einnimmt, in der sie in den Eingriffszahn (67) eingreift zum Halten der Platte (38, 39), wenn die Zahnsätze (24, 25) der ersten und der zweiten Teile (18, 19) der Zuhaltungen (17) durch den ersten Kombinationswechselschlüssel (C) zwecks Kombinationswechsel beabstandet wurden, und eine Entkopplungsposition einnimmt, wenn mit dem zweiten Kombinationswechselschlüssel (C1) auf das bewegbare Element (63, 72) eingewirkt wird, wobei die Nase (64, 79) geeignet ist, eine Position einzunehmen, in der sie an den Stützzahn (66) anschlägt, wenn mit einem anderen Schlüssel als dem zweiten Kombinationswechselschlüssel (C1) auf das bewegbare Element (63, 72) nach der durch den ersten Kombinationswechselschlüssel (C) durchgeführten Trennung der ersten und der zweiten Teile (18, 19) eingewirkt wird.

8. Schloß nach Anspruch 7, dadurch **gekennzeichnet,** daß das bewegbare Element aus einem Hebel (63) gebildet ist, der gegen federnde Rückführmittel (68) schwingt.

9. Schloß nach Anspruch 8, dadurch **gekennzeichnet**, daß das bewegbare Element aus einer Platte (72) gebildet ist, die gegen federnde Rückführmittel (77) geführt ist.

Revendications

1. Serrure ayant des gorges plates et une combinaison pouvant être changée, comportant un corps analogue à une boîte (2-6) qui reçoit de manière coulissante un pêne (8) muni d'une queue (9) qui a des dents (10) pour déplacer le pêne par l'intermédiaire d'une clé d'actionnement ayant des dentelures d'attaque doubles, ladite queue (9) comportant aussi un axe transversal (35) qui vient en prise dans des ouvertures (32) des gorges (17) qui s'étendent dans la direction (A) le long de laquelle le pêne (8) coulisse et ont, le long de leurs bords longitudinaux, des dents agencées de manière opposée (33) qui forment des passages à travers lesquels ledit axe (35) avance par tours successifs, caractérisée en ce que chaque gorge (17) est constituée d'une première partie (19), qui est munie desdites ouvertures (32) et est guidée à angle droit sur ladite queue (9) entre une position destinée à bloquer ledit pêne (8), dans laquelle ledit axe (35) vient en prise entre les dents (33) de ladite ouverture (32), et une position destinée au coulissement du pêne (8), dans laquelle ledit axe (35) peut coulisser à travers lesdits passages, et une seconde partie (18), qui est montée entre deux plaques (38, 39) qui sont reliées mutuellement de manière rigide et sont guidées dans une direction qui est parallèle à la direction de coulissement (A) dudit pêne (8), en ce que lesdites secondes parties (18) sont guidées entre lesdites plaques (38, 39) parallèlement auxdites premières parties (19) et peuvent être actionnées par l'intermédiaire de moyens formant clé ayant des dentelures d'attaque doubles, en ce que lesdites premières et secondes parties (18, 19) de chaque gorge (17) ont des ensembles de dents mutuellement opposées (24, 25) qui sont adaptées pour engrener les unes avec les autres afin de maintenir lesdites parties (18, 19) reliées dans une direction (B) qui se trouve à angle droit par rapport au pêne (8) ; en ce qu'au moins une (38) desdites plaques (38, 39) a une cavité (54) qui permet à l'axe (35) du pêne (8) de coulisser librement et forme une dent de butée (56) pour ledit axe (35) lorsque le pêne (8) fait entièrement saillie à partir dudit corps analogue à une boîte (2-6), la serrure étant telle qu'une première clé (C) de changement de combinaison desdits moyens formant clé est adaptée pour lever les gorges (17) jusqu'à une position dans laquelle ledit axe (35) est

en avant d'une encoche (36) qui est positionnée à un niveau différent par rapport auxdits passages entre les dents (33), la première clé (C) de changement de combinaison agissant ainsi sur la queue (9) du pêne (8) de manière à déplacer ledit axe (35) de sorte qu'il agisse sur ladite dent de butée (56) et par conséquent déplace lesdites plaques (38, 39) jusqu'à une position dans laquelle les ensembles de dents (24, 25) des premières et secondes parties (18, 19) sont mutuellement libérés ; la serrure étant en outre telle qu'une seconde clé (C1) de changement de combinaison parmi lesdits moyens formant clé, en agissant sur ladite seconde partie (18) des gorges (17), les lève par la suite conformément à une nouvelle combinaison; des moyens formant levier (57) étant de plus fournis, lesdits moyens formant levier coopérant avec ledit axe (35) de sorte que lorsque ladite seconde clé (C1) de changement de combinaison est actionnée de manière à rétracter ledit pêne (8) dans ledit corps analogue à une boîte (2-6), lesdits moyens formant levier (57), déplacés par l'axe (35), agissent sur au moins une desdites plaques (38, 39) pour déplacer lesdites secondes parties (18) des gorges (17) jusqu'à une position dans laquelle leurs ensembles de dents (24) engrènent avec les ensembles de dents (25) desdites premières parties (19) de manière à préétablir les gorges (17) conformément à la combinaison d'une nouvelle clé d'actionnement ayant des dentelures d'attaque doubles.

2. Serrure selon la revendication 1, caractérisée en ce que lesdits moyens formant levier sont constitués par un levier (57) qui est articulé sur le corps analogue à une boîte (2-6) et est reçu dans un évidement (55) de ladite plaque (38, 39) qui comporte ladite dent (56), ledit levier (57) comportant un premier bras (59), qui se trouve sensiblement parallèle à la direction de coulissement (A) du pêne (8), et un second bras (60) qui vient en contact avec ladite dent (56) sur le côté qui est opposé à celui où ledit axe (35) vient en butée, ledit premier bras (59) formant une came (61) qui coopère avec ledit axe (35) de sorte que lorsque ladite seconde clé de changement de combinaison (C1) ramène le pêne (8) à l'intérieur du corps analogue à une boîte (2-6), ledit axe (35) agit sur ladite came (61) de manière à provoquer la mise en rotation du levier (57) dans la direction dans laquelle ledit second bras (59) agit sur ladite plaque (38, 39) pour reconstituer l'engrènement mutuel des ensembles de dents (24, 25) desdites premières et secondes parties (18, 19) des gorges (17).

3. Serrure selon la revendication 1 ou 2, caractérisée en ce que lesdites plaques (38, 39) supportent des axes chargés par ressort (53) qui agissent sur lesdites secondes parties (18) des gorges (17) pour déplacer lesdites gorges jusqu'à la position destinée à bloquer le pêne (8).

4. Serrure selon l'une quelconque des revendications 1 à 3, caractérisée en ce que lesdites premières parties (19) ont une encoche (37) qui peut venir en prise avec un axe (44) situé entre lesdites plaques (38, 39) simultanément à la prise de l'axe (35) du pêne (8) dans l'encoche respective (36).

5. Serrure selon l'une quelconque des revendications précédentes, caractérisée en ce que lesdites plaques (38, 39) ont des fentes (45, 48) qui sont allongées dans une direction qui est parallèle à la direction de coulissement (A) du pêne (8) et sont en prise avec des axes (13, 16, 49, 58) qui sont fixés sur le corps analogue à une boîte (2-6), lesdites fentes (45-48) ayant une longueur qui détermine la course de déplacement des plaques (38, 39).

6. Serrure selon l'une quelconque des revendications précédentes, caractérisée en ce que la dernière des dents (10) qui déplace le pêne (8) comporte une patte (62) qui est adaptée pour venir en contact avec une partie (D) des clés de changement de combinaison (C, C1) qui a, par rapport à l'axe de rotation de clé, un rayon qui est plus petit que le rayon existant entre ledit axe et l'extrémité des dents (10) du pêne (8).

7. Serrure selon la revendication 6, caractérisée en ce qu'elle comporte un élément mobile (63, 72) qui a une patte (64, 79) qui est adaptée pour venir en prise dans un évidement (65) d'au moins une desdites plaques (38, 39), ledit évidement (65) ayant une dent de support (66) et une dent de prise (67), ledit élément mobile (63, 72) ayant une excroissance (69, 78) qui coopère avec ladite partie (D) de sorte que ladite patte (64, 79) prend une position dans laquelle elle vient en prise avec ladite dent de prise (67) pour retenir la plaque (38, 39) lorsque les ensembles de dents (24, 25) des premières et secondes parties (18, 19) des gorges (17) ont été écartés par ladite première clé de changement de combinaison (C) afin de changer la combinaison, et une position de libération dans laquelle on agit sur l'élément mobile (63, 72) avec la seconde clé de changement de combinaison (C1), ladite patte (64, 79) étant adaptée pour prendre une position dans laquelle elle vient en butée contre ladite dent de support (66) lorsqu'on agit sur l'élément mobile (63, 72) à l'aide d'une clé autre que la seconde clé de changement de combinaison (C1) après la séparation des premières et secondes parties (18, 19) effectuée par la première clé de changement de combinaison (C).

8. Serrure selon la revendication 7, caractérisée en ce

que ledit élément mobile est constitué par un levier (63) qui oscille à l'encontre de moyens de rappel élastiques (68).

9. Serrure selon la revendication 8, caractérisée en ce que ledit élément mobile est constitué par une plaque (72) qui est guidée à l'encontre de moyens de rappel élastiques (77).

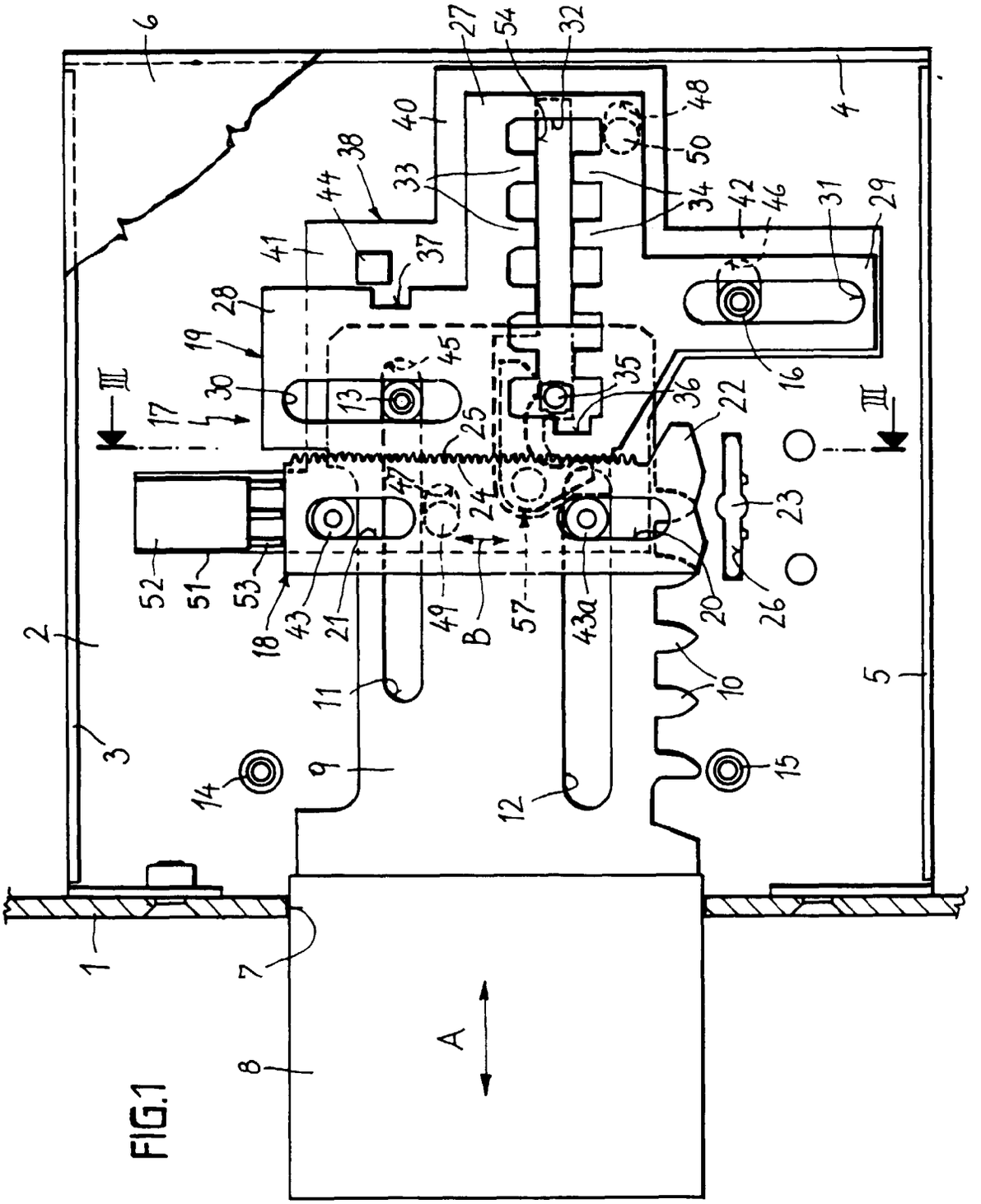
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FIG.1

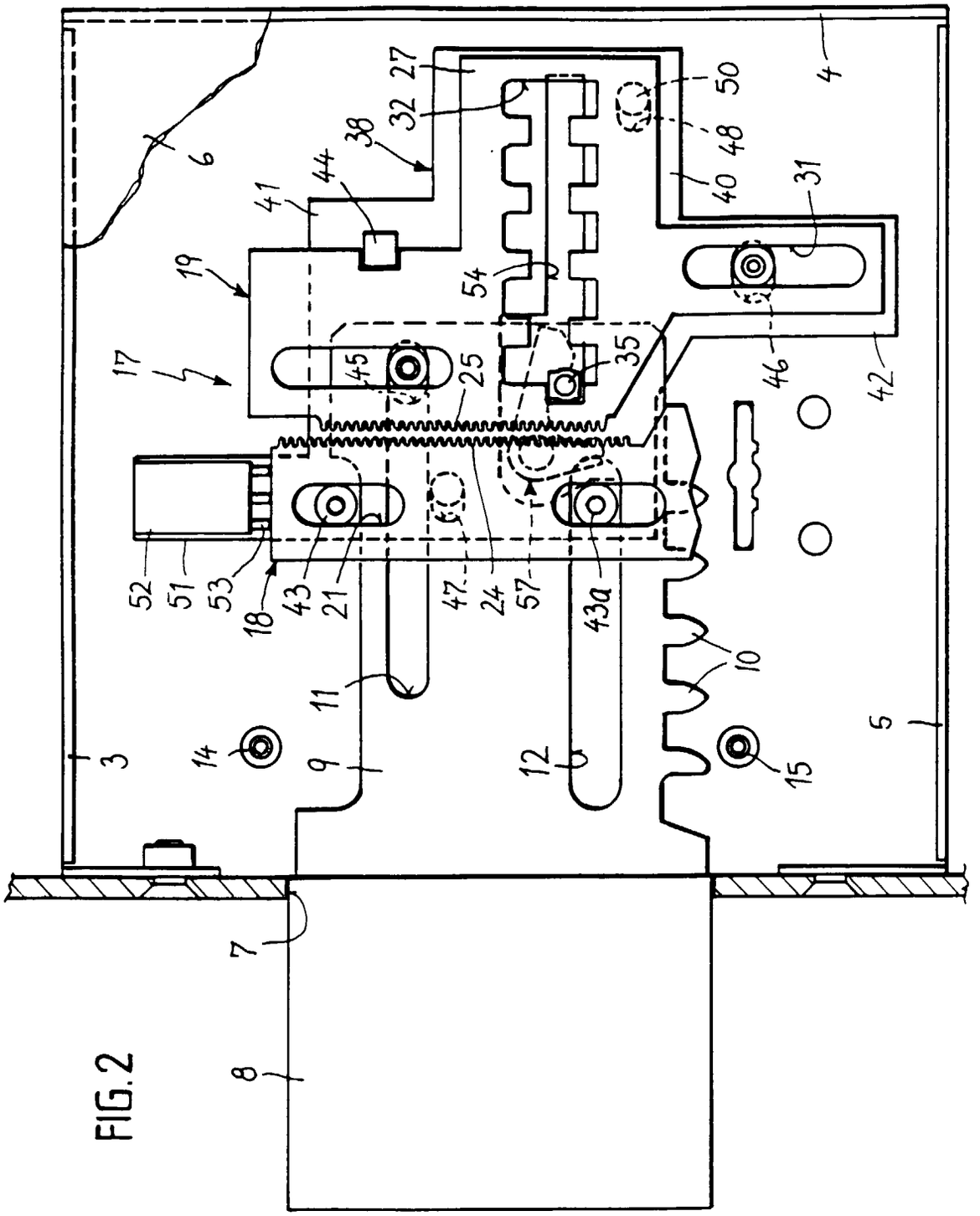
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FIG.2

FIG.3

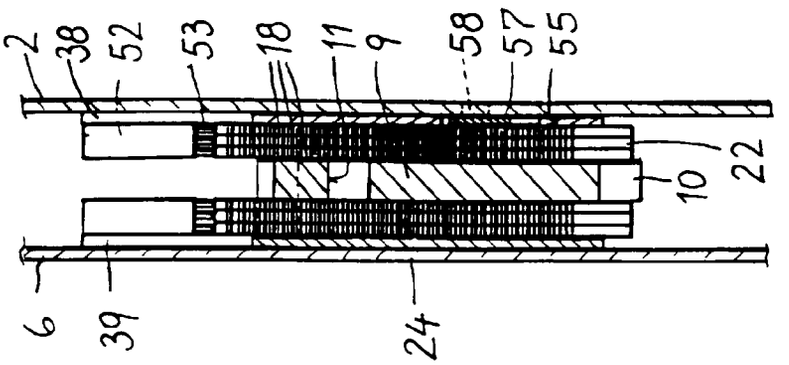


FIG.5

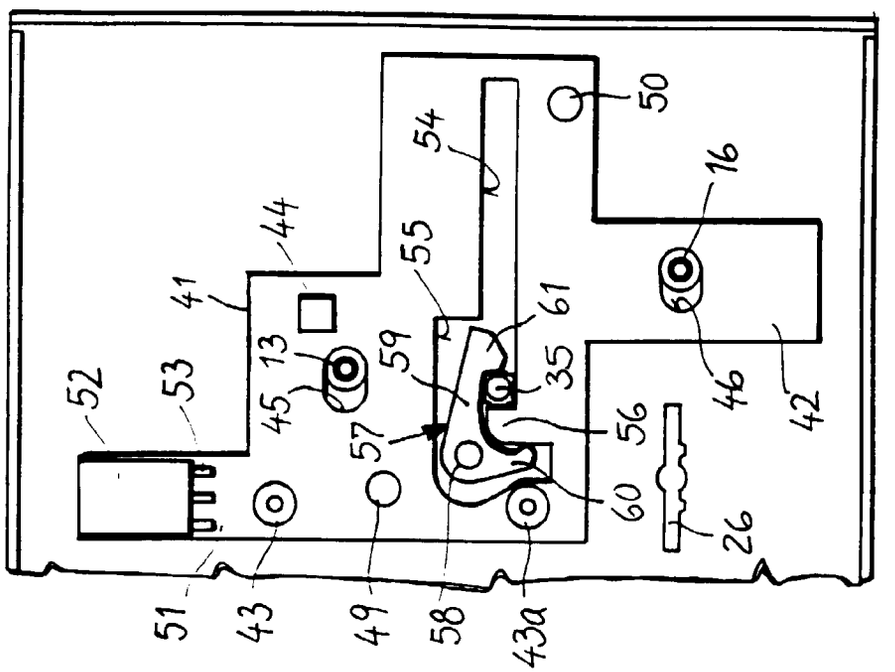
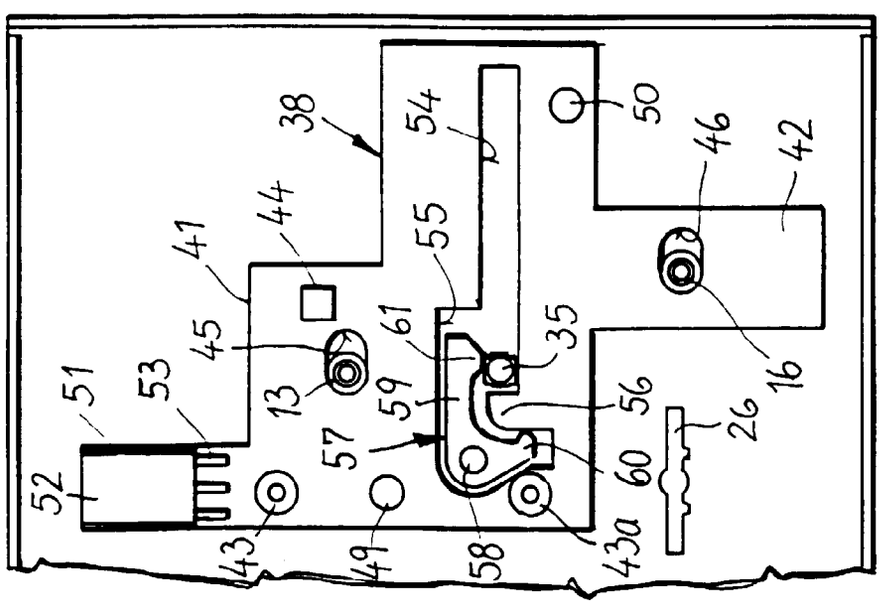


FIG.4



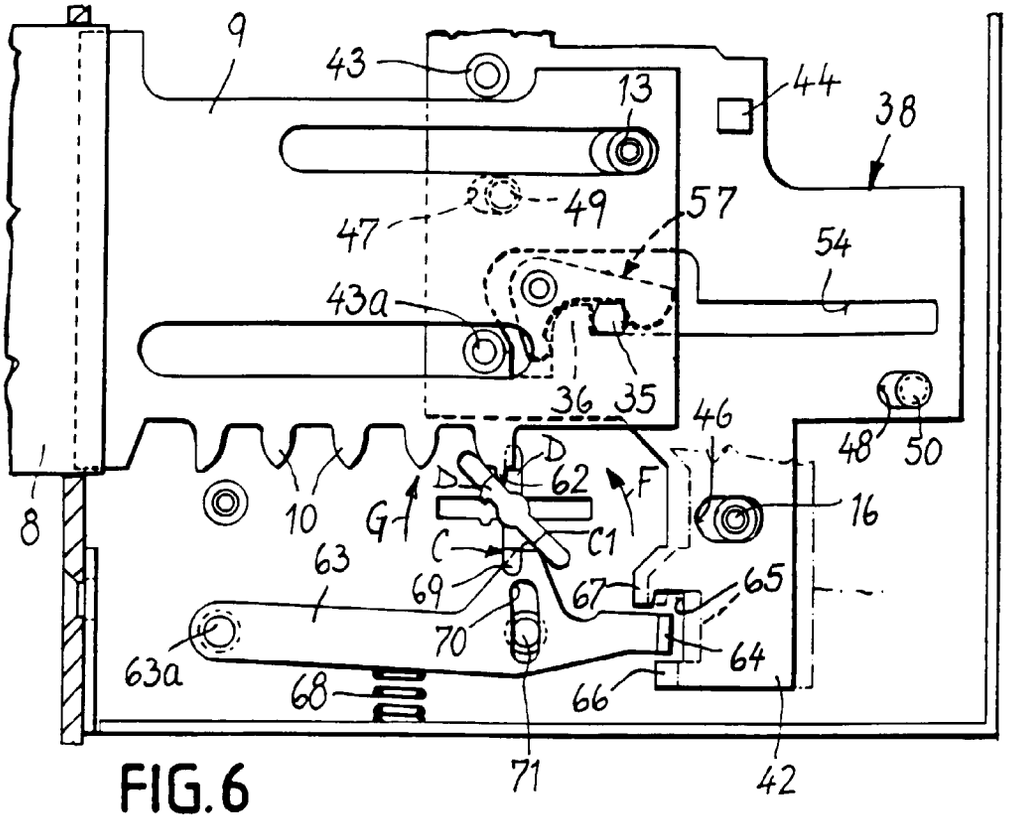

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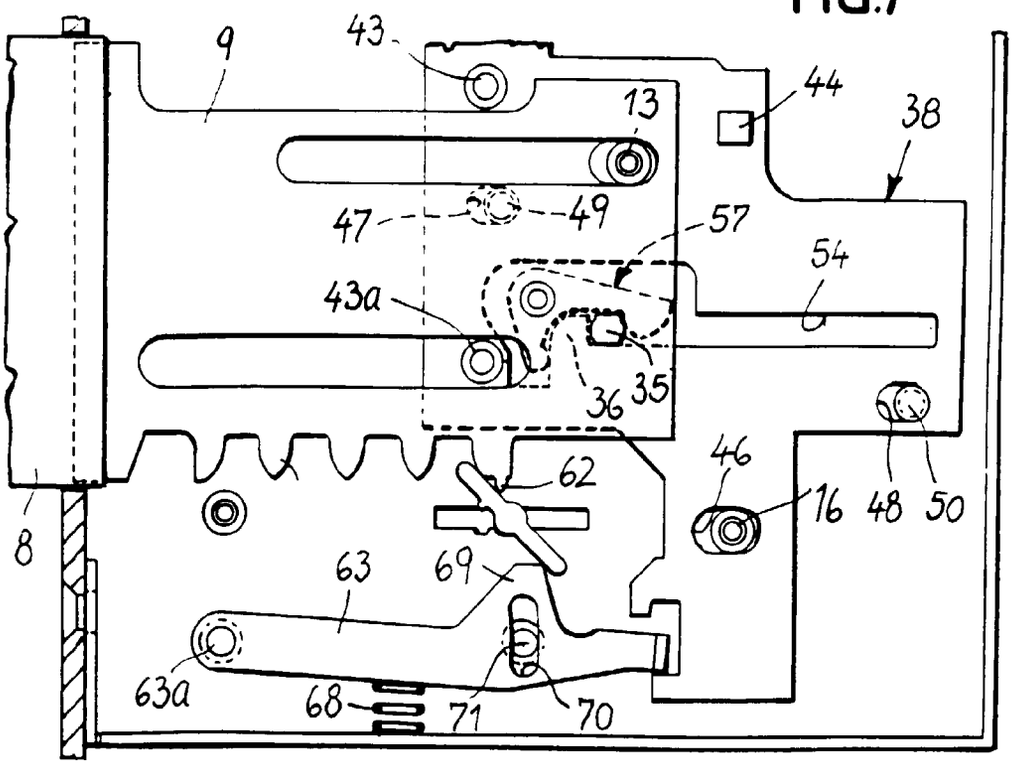
FIG.6

FIG.7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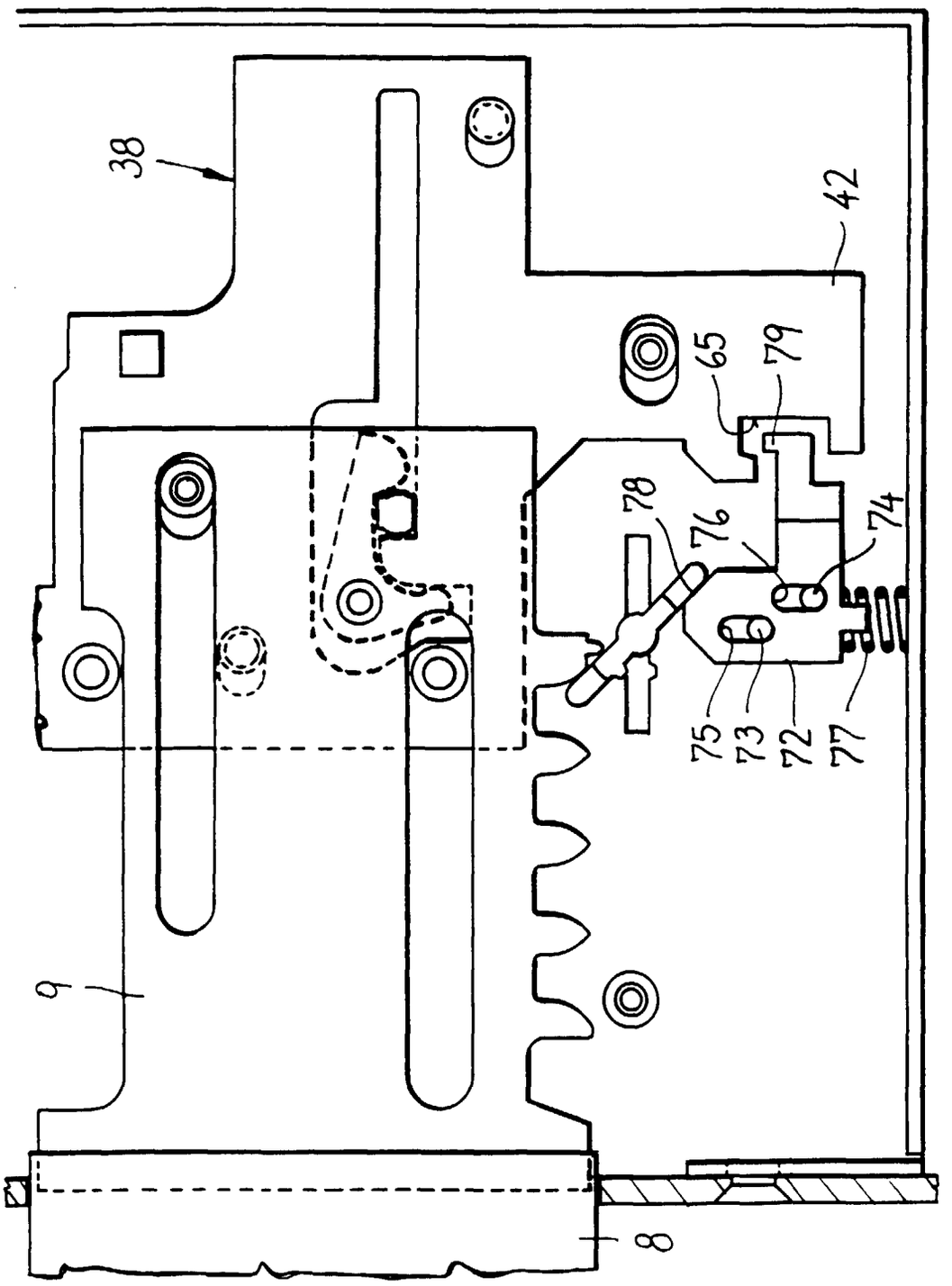

FIG.8