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

(11) **EP 3 118 397 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
18.01.2017 Bulletin 2017/03

(51) Int Cl.:
E05B 63/12 *(2006.01)* ***E05B 65/08*** *(2006.01)*

(21) Application number: **16179777.4**

(22) Date of filing: **15.07.2016**

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

(30) Priority: **17.07.2015 IT UB20152278**

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(54) LOCK FOR SLIDING DOOR

(57) A lock (1) for a sliding door (2), comprises a containing box body (3), suitable for being housed in a cavity (4) of an abutting edge (5) of the door (2); a hooking element (6) suitable for engaging with a retaining unit (7) mounted on a jamb (8) in a position facing the abutting edge (5); driving means (9, 10, 11A, 11B) for moving the hooking element (6) from a retracted position (P_R) in the containing box body (3) - that permits a free sliding movement of the sliding door (2) along an opening/closing direction (D) - to a prominent engagement position (P_P), in which the hooking element (6) protrudes outside the box body (3) to hook onto the retaining unit (7) and prevent opening of the sliding door (2). The driving means (9, 10, 11A, 11B) is configured for giving the hooking element (6) a linear protrusion/retraction movement along a first rectilinear trajectory (T1) that is parallel to the opening/closing direction (D) of the door (2), and a second linear engagement/release movement along a second rectilinear trajectory (T2) that is transverse to the opening/closing direction (D).

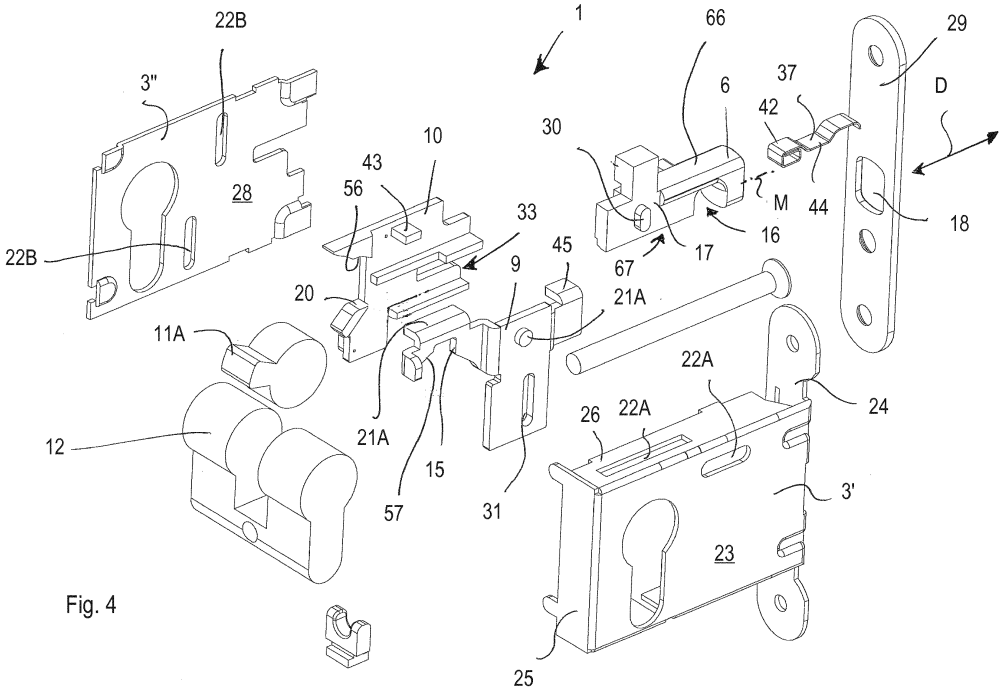

Fig. 4

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Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a lock for a door, in particular a lock suitable for being inserted into the abutting edge of a sliding door.

PRIOR ART

[0002] Locks for slidable doors are known comprising a containing box body, intended for being inserted into a cavity of the abutting edge of the door, and inside which a latch, or hooking element is housed that is movable and suitable for engaging with a retaining plate that is correspondingly fixed on the jamb.

[0003] The hooking element is movable from a first position in which it is retracted inside the box body, to permit the door to be opened, to a second position in which it exits from the box body and protrudes to engage with the retaining plate and lock the door in a closed position.

[0004] Inside the box body a mechanism is provided that moves the hooking element from one position to the other and is driven by a rotation that is imposed by a handle or a cylinder housing a key. This lock is configured with a mechanism that imposes on the hooking element a rotary movement in the passage from the retracted position to the protruding engagement position, and this implies limits in functional terms. In particular, the rotary movement has the effect that in the retracted position the hooking element is flush with the front surface of the abutting edge of the door, and faces the retaining plate. During the closing operation the hook easily interferes with the plate owing to the movement with rotation that pushes the hook to descend immediately from the start. There are thus difficulties in assembly in particular in the operations of aligning the retaining plate with the hooking element, as it is necessary both to permit the latter to penetrate easily the hole of the retaining plate - which requires a suitable space to be provided upwards, and to be able to hook to the lower part of the retaining plate.

[0005] The type of use of this product on the market requires three different types of lock: 1) lock with handle, 2) lock with key 3) lock with safety cylinder.

[0006] Today, such locks have different internal kinematics, depending on the model, and this sometimes requires different types of perforation in the door. The perforations in the door (in addition to the front perforation where the lock is located) are made for housing facings, such as "rosette", or round handles, into which the handle or the key or the cylinder is inserted. In current internal kinematics, the handles or selvages are staggered with respect to the axis of the closing hook; in conclusion, a box is obtained with dimensions that are anything but modest and sometimes the round handles are in different positions, depending on the type of lock.

[0007] Other locks are known from DE272467, US2253496 and AU4997064.

[0008] In order to overcome the drawbacks associated with current lock, in the past a lock has been proposed that is disclosed in Italian patent 1381694 (application n. MI2007A000376), the mechanism of which is configured for closing the hooking element so as to impose thereupon a substantially horizontal advancement movement outwards, and subsequently a rotary movement downwards to engage with the retaining plate. In this lock, however, the model with cylinder in the same dimensions as the other versions is not achievable.

[0009] Although this type of lock that has just been disclosed shows itself to be much more versatile and effective than conventional locks, having many advantages, both from the structural and functional point of view, it is desirable to provide locks with additional improvements to facilitate the mounting and the closing manoeuvre, providing in the same dimensions also the cylinder version by unifying the three models required by the market in a single lock of modest dimensions.

OBJECTS OF THE INVENTION

[0010] The object of the present invention is thus to provide a new and different solution for a lock for sliding doors, that meets the aforementioned constructional and functional needs.

[0011] In particular it is intended to:

a) facilitate the mounting and centring of the lock with respect to the retaining plate;
b) provide a lock that permits facilitated locking;
c) use the same operating principle for the three models required by the market so as to unify containing boxes and perforations on the door and have control mouths (handle, key, cylinder) aligned on the hook;
d) provide a product that is particularly versatile and suitable also for applications with design needs;
e) provide a lock with a constructionally simpler and more compact solution, with clear associated advantages also from the economic point of view, that is functionally more secure and versatile and is also aesthetically very pleasing.

SHORT DESCRIPTION OF THE INVENTION

[0012] The present invention thus intends to achieve the aforesaid objects and overcome the drawbacks of conventional locks for sliding doors by a solution according to claim 1.

SHORT DESCRIPTION OF THE DRAWINGS

[0013] The invention and some preferential embodiments thereof will be disclosed in greater detail here below, with reference to the drawings, in which:

Figures 1 and 2 are two different perspective views of a first lock embodiment, according to the invention,

in an assembled configuration;
Figures 3 and 4 are two different exploded views of the lock in Figures 1 and 2 in a disassembled condition;
Figures 5 to 7 show three different operating positions of the lock mounted in a sliding door;
Figure 8 is a fragmentary enlarged detail of a hooking element of the lock shown in the movement from a retracted position to a prominent engagement position;
Figure 9 shows schematically, according to a possible embodiment of the operating mode of the lock, a first horizontal rectilinear trajectory and a second tilted horizontal rectilinear trajectory, travelled by the hooking element in translation movement from the retracted position to the prominent engagement position;
Figures 10 and 11 are two different views of part of the first lock embodiment;
Figures 12 to 18 show the lock part in Figure 9, in different operating positions;
Figure 19 is a side view of a second lock embodiment in an assembled configuration;
Figure 20 is an exploded view of the lock in Figure 19;
Figure 21 shows a cam element, included in an embodiment of the lock, with which a cylinder for a cross-shaped key is coupled;
Figures 22 and 23 are two different views of a cross-shaped key for driving the cylinder in Figure 21;
Figures 24 to 27 show the lock in Figure 19 in three different operating positions, as in Figures 5 to 8;
Figures 28 to 30 show in greater detail, with different views, the hooking element included in the lock according to the invention;
Figures 31 and 32 are a front view and a side view of a retaining unit to be mounted on a jamb to receive and engage with the hooking element in the closed position of the sliding door;
Figures 33 and 34 are two different perspective views of a template unit associated with the lock according to the invention and usable for facilitating the drilling operation required for mounting, on the jamb, the retaining unit;
Figure 35 shows the template unit of Figure 33 in a position coupled with the hooking element.

DETAILED DESCRIPTION OF THE INVENTION

[0014] A lock 1 according to the invention is disclosed below, which lock 1 is suitable for being mounted, in particular, on a sliding door 2 for indoors, but which can also be applied in furniture with doors or more in general sliding closing elements.

[0015] With reference to figures 1 to 18, a first embodiment of the lock 1 is disclosed. The lock 1 comprises a containing box body 3, for example made of pressed sheet metal, suitable for being housed in a cavity 4 obtained in the abutting edge 5 of the sliding door 2. The containing box body 3 consists of a first part, comprising a first side wall 23, a front wall 24, a rear wall 25, an upper wall 26 and a lower wall 27, and a second part consisting of a second side wall 28 suitable for being coupled with the aforesaid first part to enclose in the space of the box body 3 the various components that will be disclosed below. A closing front plate 29 is provided that, once the box body 3 is inserted inside the cavity 4 of the abutting edge 5, is applied to the front wall 24 and fixed by the screws that fix the lock to the door.

[0016] The lock 1 comprises a hooking element 6, suitable for engaging with a retaining unit 7 that is mounted on a jamb 8 in a position facing the abutting edge 5 of the sliding door 2. The hooking element 6 is housed in the containing box body 3 and, as will be disclosed better below, is drivable to protrude outside the containing box body 3, traversing an outlet opening 18 obtained on the front wall 24 and correspondingly also on the closing front plate 29.

[0017] The lock 1 comprises driving means 9, 10, 11A, 11B configured for moving the hooking element 6 from a retracted position P_R inside the box body 3, to a prominent engagement position P_P in which the hooking element 6 protrudes outside the box body 3. The hooking element 6, in the retracted position P_R, shown for example in figures 1 and 5, permits a free sliding movement of the sliding door 2 along an opening/closing direction D. In the prominent engagement position P_P, the hooking element 6, traversing the outlet opening 18, protrudes outside the containing box body 3 so as to hook on the retaining unit 7 and prevent opening of the sliding door 2.

[0018] As detailed below, the driving means 9, 10, 11A, 11B is configured for giving the hooking element 6 a translational movement. More specifically, the driving means 9, 10, 11A, 11B imposes on the hooking element 6 a linear protrusion/retraction movement along a first rectilinear trajectory T1, in a direction that is parallel to the opening/closing direction D of the sliding door 2, and a linear engagement/release movement along a second rectilinear trajectory T2 that is transverse to the aforesaid opening/closing direction D. The linear protrusion movement along the first rectilinear trajectory T1 and the subsequent linear engagement movement along the second rectilinear trajectory T2 occur during locking of the sliding door 2 on the retaining unit 7 located on the jamb 8. The linear release movement upwards along the second rectilinear trajectory T2, and the subsequent linear retraction movement along the first rectilinear trajectory T1 occur during unlocking, i.e. release of the hook element 6 from the retaining unit 7 that enables the sliding door 2 to open. More specifically, the driving means comprises a first driving unit 9, configured for moving the hooking element 6 along the first trajectory T1, and a second driving unit 10 configured for moving the hooking element 6 along the second trajectory T2. In particular, the first driving unit comprises a first driving cursor 9 and the second driving unit comprises a second driving cursor 10, suitably configured for obtaining the translating motion of the

hooking element 6. The first 9 and second 10 driving cursors are shaped according to respective suitably shaped plate elements. More specifically, the first driving cursor 9 is configured for moving the hooking element 6 along the first trajectory T1 - in a horizontal direction parallel to the opening/closing direction D of the sliding door 2 - between the retracted position P_R and an intermediate position P_I protruding from containing box body 3. The second cursor 10 is configured for moving the hooking element 6 along the second rectilinear trajectory T2 - in a vertical direction orthogonally to the first rectilinear trajectory T1 - between the aforesaid intermediate position P_I and the lower prominent position P_P for engaging with the retaining unit 7. In one possible embodiment, with reference to Figure 9, the second cursor 10 is configured for moving the hooking element 6 along the second rectilinear trajectory T2 - in a tilted direction with respect to the first rectilinear trajectory T1 - from the aforesaid outermost intermediate position P_I to the lower prominent position P_P most shifted towards the containing box body 3 to engage with the retaining unit 7. This configuration, during the closing and locking step, enables possible mechanical clearance to be recovered (up to about 3 mm) in a horizontal direction, ensuring a perfect engagement of the hooking element 6 with the inner surface of the retaining unit 7. The manner in which this operation is made possible is disclosed below.

[0019] As shown better in figures 12 to 18, the first driving cursor 9 is linearly movable from a first position W1, further from the front wall 24, to a second position W2, nearer the front wall 24, to translate the hooking element 6 along the first rectilinear trajectory T1 to the outside of the containing box body 3 during closure of the sliding door 2. On the other hand, the first driving cursor 9 moves linearly from the second position W2 to the first position W1 to translate the hooking element 6 inside the containing box body 3 during opening of the sliding door 2. The second driving cursor 10 is movable linearly from a third position W3 that is higher to a fourth position W4, which is lower, to translate the hooking element 6 along the second rectilinear trajectory T2 downwards to engage the hooking element 6 with the retaining unit 7 to thus achieve locking of the sliding door 2 in a closed position; vice versa, the second driving cursor 10 is movable linearly upwards from the fourth position W4 to the third position W3 to disengage the hooking element 6 from the retaining unit 7 to release the sliding door 2, permitting the opening thereof.

[0020] The driving means further comprises a control pushing element 11A, 11B configured for moving selectively in sequence the first driving cursor 9 and subsequently the second driving cursor 10 during the closing operation, and vice versa, for moving in sequence the second driving cursor 10 and subsequently the first driving cursor 9 during the opening operation. The control pushing element, in a first embodiment, (shown in figures 1 to 18) comprises a bit element 11A, that is part of a cylinder 12 for locks that is controllable by a key. In a second embodiment, (shown in figures 19,24-26) the control pushing element comprises a cam element 11B, that is mounted rotatably in the containing box body 3, and is couplable with and controllable by, a suitable handle to be inserted into the square opening 35. In a third embodiment of the lock 1, the cam element 11B is coupled with a cylinder 13 for a lock, which is drivable by a cross-shaped key 14, shown in figures 21 to 23. The pushing element embodiment configured as a control cam element 11B, has greater advantages than the embodiment configured as a bit element 11A. In particular, the cam element 11B has a cam profile that extends angularly by a quantity greater than 45° and this enables the first 9' and second 10' driving cursors to be moved, imposing on the cam element 11B angular rotations that are less than those required for the bit element 11A, which on the other hand has a reduced extension contact profile. In particular, the cam element 11B comprises a first pushing part 61, more radially protruding, suitable for pushing the first cursor 9', and a second pushing part 62, which is suitable for acting on the second cursor 10'.

[0021] The solution of the cam element 11B combined with the cylinder 13 with a cross-shaped key 14, in addition to be very pleasing from the aesthetic point of view, also enables greater convenience of use to be obtained; in fact, with this type of cylinder 14, a rotation of only 90 degrees is possible, as requested in the embodiments with handle and with key to enable the key 14 to be extracted.

[0022] Apart from the specific embodiment, all the aforesaid control pushing elements 11A, 11B share the feature of being rotatable around a rotation axis R that is transverse to the first rectilinear trajectory T1 and to the second rectilinear trajectory T2. The pushing element 11A, 11B is configured for rotating in a closing direction C, by a first angular amount for pushing and transferring the first driving cursor 9 from the first position W1 to the second position W2 along a first stroke to which a horizontal translation corresponds of the hooking element 6 from the retracted position P_R to the protruding intermediate position P_I, and subsequently, by a second angular quantity for pushing and transferring the second driving cursor 10 from the third position W3 to the fourth position W4 along a second stroke to which a vertical translation corresponds of the hooking element 6 from th intermediate position P_I to the lower prominent engagement position P_P.

[0023] The rotation axis R of the control pushing element 11A, 11B falls substantially in a zone comprised between the median axis M of the hooking element 6, and a horizontal plane lying on the upper surface 66 of the hooking element 6 when the latter is in the retracted position P_R or in the intermediate position P_I.

[0024] In particular, in the lock 1 embodiment with the pushing element 11B, the rotation axis R of the latter is in a height position corresponding horizontally to the height position of the median axis M. In other words, in this case, the rotation axis R is orthogonal and incident

to the aforesaid median axis M.

[0025] Owing to what has been disclosed above, it is possible to mount the control handles in such a manner that the centre thereof is perfectly in line with the hooking element 6, for any lock embodiment, (with handle, key or cylinder). Owing to this configuration of reciprocal alignment of the control handles with the outlet opening 18 a pleasing aesthetic effect of alignment is obtained that is very appreciated for this type of article. Further, there is a significant and advantageous reduction in in the overall dimensions of the lock 1, in particular in the height dimensions (about 40 mm compared with over 100 mm of the prior-art locks). This entails a smaller quantity of material to be removed from the abutting edge 5 of the door 2 to obtain the housing cavity 4 for the lock 1, thus less machining time and also less weakening of the structure of the door 2.

[0026] The first driving cursor 9 comprises, behind, i. e. nearer the rear wall 25, a first abutting portion 15 shaped for coming into contact with, and receiving a pushing action from the control pushing element 11A to move from the first position W1 to the second position W2 and vice versa, and in which the second driving cursor 10 comprises a second abutting portion 20 shaped for coming into contact with, and receiving a pushing action from the control pushing element 11A to move from the third position W3 to the fourth position W4 and vice versa. The first 9 and second 10 driving cursors are slidably coupled with the containing box body 3 by respective guiding lugs 21A, 21B slidably housed in corresponding slot openings 22A, 22B obtained on the containing box body 3. The hooking element 6 is coupled with the first driving cursor 9 by first engaging means 30, 31 configured for permitting a degree of freedom of movement of the hooking element 6 with respect to the first driving cursor 9 in a direction that is orthogonal to the opening/closing direction D, and such as to constrain the hooking element 6 to the first driving unit 9 in the movement along the first rectilinear linear trajectory T1. The hooking element 6 is coupled with the second driving cursor 10 by second engaging means 33, 66, 67 configured for permitting a free movement of the hooking element 6 with respect to the second driving cursor 10 in a direction that is parallel to the opening/closing direction D, and such as to constrain the hooking element 6 to the second driving cursor 10 in the movement along the second rectilinear linear trajectory T2. More specifically, the first engaging means comprises a pin protrusion 30 provided on an inner portion 17 of the hooking element 6 and a coupling slot 31 obtained on the first driving cursor 9 and extending orthogonally to the opening/closing direction D of the sliding door 2. If it is desired to obtain the second trajectory T2 tilted, as mentioned previously, and with reference to Figure 9, the slot 31, instead of being arranged vertically, extends correspondingly in a tilted manner, to impose on the suitably formed pin protrusion 30 the desired movement direction.

[0027] The second engaging means comprises an upper surface 66 and a lower surface 67 that are provided on the hooking element 6 and a channel seat 33 obtained on the second driving cursor 10 for slidably housing the aforesaid surfaces 66, 67. The channel seat 33 extends in such a manner as to permit a degree of freedom of movement of the hooking element 6 parallel to the opening/closing direction D and to constrain the hooking element 6 to the second driving cursor 10 in the movement along the second rectilinear linear trajectory T2.

[0028] The lock 1 further comprises spring means 37, 38, that opposes a greater resistance at the start of each rotation of the control pushing element 11A or 11B, to subsequently substantially decrease in an tripped manner both during opening and closing of the lock 1 so as to provide the user with tactile feedback that is useful for indicating to the user that a complete opening or closing of the lock 1 operation has been reached. In the lock 1 embodiment of figures 1 to 18, the spring means comprises a first flexure spring 37, having an anchoring end 42 engaging a protruding tooth 43 of the second driving cursor 10. The first flexure spring 37 comprises a blade portion having a recess zone 44, that houses a tab 45 of the first driving cursor 9 when the latter is in the retracted first position W1. The blade portion further comprises a raised zone 46 that is suitable for being pressed down by the tab 45: the raised zone 46 opposes, to the forward movement of the first cursor 9, a certain resistance that is maintained only in a first initial step of the closure, this resistance dropping suddenly to generate a trip effect in the operation of locking the door 2. Vice versa, during opening of the door 2, the first flexure spring 37 opposes to the upward movement of the second cursor 10 a certain resistance that is maintained only in a first initial step of the closure, when the tab 45 acting on the raised zone 46 of the blade portion opposes a lifting movement to the latter. This resistance drops suddenly in trip mode as the subsequent retraction movement of the first driving cursor 9 has started, in which the transfer of the tab 45 from the raised zone 46 to the recess zone 44 occurs. As already mentioned, this configuration with variable elastic resistance supplies, both during rotation in one direction and in the opposite direction of the control pushing element 11A, a pleasant tactile feedback that gives the user the sensation of having performed completely and correctly the operation of locking and unlocking the door 2.

[0029] Figures 19 to 27 refer to other lock embodiments; thus in these figures the same reference numbers have been used as in the preceding figures to indicate similar or equivalent parts. In particular, figures 19 to 27 refer to the lock embodiment with a drive by a handle and to the embodiment with a cylinder with a cross-shaped key, as already referred to. For these embodiments, what has been disclosed for the first lock embodiment in figures 1 to 18 applies, the corresponding operating principle being identical. In particular, the first driving cursor 9' and the second driving cursor 10' have small variations of geometrical shape with respect to the first cursor 9 and to the second driving cursor 10 of the first lock embodi-

ment, which nevertheless do not entail any difference from the operational point of view. In this case, the spring means arranged for supplying the tactile feedback, analogously to what has been disclosed for the first embodiment, comprises a second flexure spring 38, having a rotated "V" shape, provided with a base strip 39 resting on the lower wall 27 of the containing box body 3 and engaging in a slit 47 of the lower wall 27, and a pushing strip 48, that is in contact with and exerts a force of pressure on, an abutting profile 60 of the cam element 11B. The abutting profile 60 is suitably shaped so as to define a cam with zones at a variable distance from the rotation axis R, so that the second flexure spring 38 opposes to the rotation of the cam element 11B, resistance of an intensity that is variable according to the angular position of the cam element 11B, to obtain the tactile feedback, analogously to what has been disclosed for first flexure spring 37.

[0030] The operation of the lock 1 is now disclosed with reference to the embodiment shown in figures 5 to 18.

[0031] Figure 5 shows the sliding door 2 whilst it is moved slidingly near the jamb 8 along the direction of closure D, so as to bring the lock 1 to the retaining unit 7. In this approaching step, the control pushing element 11A, i.e. the bit element 11A, is still in a rest position, the first driving cursor 9 is in the first position W1, and the second driving cursor 10 is in the third position W3. Once the door 2 has been brought to the jamb 8, the bit element 11A is rotated to make the bit element 11A interact with the abutting portion 15 of the first cursor 9, in particular with the substantially vertical surface 54, as shown better in figures 12 and 13.

[0032] The rotation of the bit element 11A, anticlockwise with reference to Figure 6, and the thrust action thereof on the front zone 15' of the abutting portion 15, causes a progressive rectilinear translation of the first driving cursor 9 from the first position W1 to the second position W2, which is matched by the horizontal rectilinear exit movement of the hooking element 6, which then passes from the inner retracted position P_R to the outer intermediate position P_I, travelling the first rectilinear trajectory T1. At this point the hooking element 6 protrudes inside the retaining seat 50 bounded by the retaining unit 7, after traversing the engagement opening 51 of the retaining unit 7.

[0033] At this point, by continuing with the rotation, the bit element 11A detaches from the first cursor 9, as shown in sequence in figures 14 and 15, and reaches the second abutting portion 20, in particular the lower surface 55, of the second driving cursor 10, and starts to push the latter down, moving the latter linearly from the third position W3 to the fourth position W4, as shown in sequence in figures 16 and 17.

[0034] This movement of the second cursor 10 is matched by the vertical downward movement of the hooking element 6, which then moves from the intermediate position P_I, to the engagement position P_P, travelling along the second rectilinear trajectory T2 to hook up to the lower portion of the edge bounding the engagement opening 51 of the plate or retaining unit 7. Figure 8 shows schematically the translational movement of the hooking element 9, with a horizontal rectilinear first portion and a vertical rectilinear second portion. The first rectilinear trajectory T1 and the second rectilinear trajectory T2 are arranged reciprocally angularly at 90°. Figure 9 shows on the other hand the path with the second trajectory T2 arranged in a tilted manner.

[0035] In the final rotation step, the bit element 11A is positioned on the tilted surface 19 located in a lower zone of the first abutting portion 15, as shown better in figures 7, 17 and 18. In this position, an undesired or forced upward movement imposed from outside to the hooking element 6 is prevented owing to the contrasting action imposed by the bit element 11A. In fact, the angular position adopted by the bit element 11A in this locking configuration, in synergy with the particular arrangement of the tilted surface 19, means that the relative exchange of forces does not give rise to any movement of the second cursor 10 or of the bit element 11A. In particular, in the event of an attempt to forcibly lift the hooking element 6, thus the second cursor 10, the resultant of the pressure action exerted on the bit element 11A by the tilted surface 19, has an application straight line passing below the rotation axis R of the bit element 11A, generating in this manner anticlockwise torque in Figure 7, which thus maintains in a stably lowered position the protrusion of the bit element 11A, preventing any movement at the lock 1, in particular at the hooking element 6. The particular configuration of the second driving cursor 10 thus enables an additional safety and anti-tampering locking function to be obtained from the bit element 11A. The cylinder, which is a particular standard cylinder that is available on the market, must be of the standard European type, which enables the key to be extracted when the bit element is in the position as shown in Figure 7.

[0036] The safety and anti-tampering locking function that has just been disclosed with reference to the bit element 11A is performed in like manner also by the cam element 11B included in the other lock embodiments 1, as disclosed further on.

[0037] The operating principle that has just been disclosed also applies to the lock 1 in the embodiment with cam element 11B as shown in figures 24 to 26. In this case, for the closing operation, the cam element 11B is rotated so that the first pushing part 61 abuts on the rear abutting portion 15 of the first cursor 9' and pushes the latter to the second position W2, which is matched by the outer intermediate position P_I of the hooking element 6. Subsequently, the first pushing part 61 disengages from the first driving cursor 9', whereas the radial surface 63 of the second pushing part 62, situated lower down as shown in Figure 25, or at least the outermost edge of this radial surface 63, engages with, and pushes, the abutting surface 53 translating the second cursor 10' from the third position W3 to the fourth position W4, with a corresponding vertical and rectilinear translation movement

of the hooking element 6 downwards, as shown in Figure 26. A last rotation fraction of the cam element 11B means that part of the cylindrical surface 64, bounding the second pushing part 62, couples with the tilted surface 19, which can have a suitable concave shape to engage in a mating manner with the aforesaid cylindrical surface 64 part. Also for this embodiment, in this manner the safety and anti-tampering locking function is performed by the cam element 11B interacting with the second cursor 10' in a similar manner to what has been disclosed previously for the bit element 11A of the preceding lock 1 embodiment.

[0038] In order to perform the opposite operation of unlocking and opening of the lock 1, the control pushing element 11A or 11B is rotated in the opposite direction to what has been disclosed before for the closing and locking operation. In a manner that is functionally identical to what has already been seen for the closing operation, the control pushing element 11A or 11B first interacts with an upper zone 56 of the second abutting portion 20 of the second cursor 10, 10', translating the latter upwards to the position W3. At this point, the hooking element 6 is transferred from the lower engagement position P_P to the upper intermediate position P_I. Subsequently, the control pushing element 11A or 11B, disengaged from the second cursor 10, 10', engages with a rear zone 57 of the first abutting portion 15 of the first cursor 9, 9', translating the latter from the second position W2 to the retracted first position W1. At this point the hooking element 6 is transferred from the intermediate position P_I to the retracted position P_R inside the containing box body 3.

[0039] As can be easily intuited from what has been disclosed and shown, the particular driving method of the hooking element 6, of purely translating type, thus devoid of rotation movement components, above all enables the lock 1 to be simplified structurally and functionally, and enables the general overall dimensions of the lock 1 to be reduced further.

[0040] With reference to Figures 33, 34, 35, according to the invention, an auxiliary template unit 40 is also provided for operations of drilling through the jamb 8 to mount the retaining unit 7 thereupon. The template unit 40 is couplable in a releasable manner with an outer end of the hooking element 6, when the latter is in an extracted position from the containing box body 3, to impose on the jamb 8 a reference mark for the aforesaid drilling. In particular, the template unit 40 is hood-shaped, is provided with a tip portion 41 for marking the reference mark on the jamb 8, and is provided with elastic fins 42 to hook into a recess 16 provided on the hooking element 6. Once the template unit 40 has been coupled with the hooking element 6, as shown in Figure 35, the door 2 is brought near the jamb 8 in such a manner that the tip portion 41 hits the correct zone on which the drilling has to be made, thus providing assistance to an assembler of the retaining unit 7, with consequent acceleration of the installation operations.

[0041] From what has been disclosed and shown in the drawings, it is clear that the lock 1 according to the invention enables the declared objects to be reached.

[0042] What has been said and shown in the attached drawings has been provided by way of illustration of the innovative features of the lock 1 for a sliding door according to more possible embodiments.

[0043] Modifications can be made to the lock 1, or parts thereof without thereby falling outside the scope of the claims.

[0044] In practice, the materials, inasmuch as they are compatible with the specific use and with the respective single components for which they are intended, can be chosen opportunely in function of the requested requirements of the available prior art.

[0045] It is further possible to configure and dimension the lock 1 and adopt materials according to need and variations on and/or additions to what has been disclosed and illustrated in the attached drawings are possible.

Claims

1. Lock for a sliding door (2), comprising

- a containing box body (3), suitable for being housed in a cavity (4) of an abutting edge (5) of said sliding door (2),
- a hooking element (6) suitable for engaging with a retaining unit (7) mounted on a jamb (8) in a position facing said abutting edge (5),
- driving means (9, 10, 11A; 9' 10', 11B) for moving said hooking element (6) from a retracted position (P_R) in said containing box body (3) - that permits a free sliding movement of said sliding door (2) along an opening/closing direction (D) - to a prominent engagement position (P_P), in which said hooking element (6) protrudes outside said containing box body (3) through an exit opening (18) to hook onto said retaining unit (7) and prevent opening of said sliding door (2), said driving means (9, 10, 11A; 9' 10', 11B) comprising:
- a first driving cursor (9; 9') linearly movable from a first position (W1) to a second position (W2), for giving said hooking element (6) a linear protrusion/retraction movement along a first rectilinear trajectory (T1) that is parallel to said opening/closing direction (D) of said sliding door (2), said first driving cursor (9; 9') being configured to translate said hooking element (6) along said first rectilinear trajectory (T1) to the outside of said containing box body (3) during the closing operation of said sliding door (2), and from said second position (W2) to said first position (W1) to translate said hooking element (6) to inside said containing box body (3) during the opening operation of said sliding door (2),
- a second driving cursor (10; 10'), linearly mov-

able from a third position (W3) to a fourth position (W4) for giving said hooking element (6) a linear engagement/release movement along a second rectilinear trajectory (T2) that is transverse to said opening/closing direction (D), said second driving cursor (10; 10') being configured to translate said hooking element (6) along said second rectilinear trajectory (T2) downwards to engage with said retaining unit (7) to lock said sliding door (2) in a closed position, and upwards from said fourth position (W4) to said third position (W3) to disengage said hooking element (6) from said retaining unit (7) to release said sliding door (2),

- said hooking element (6) being coupled with said first driving cursor (9; 9') by first engaging means (30, 31) configured for permitting a degree of freedom of movement of said hooking element (6) with respect to said first driving cursor (9) in a direction that is orthogonal to said opening/closing direction (D), and such as to constrain said hooking element (6) to said first driving cursor (9) in the movement along said first rectilinear linear trajectory (T1),
- said hooking element (6) being coupled with said second driving cursor (10; 10') by second engaging means (33, 66, 67) configured for permitting a degree of freedom of movement of said hooking element (6) with respect to said second driving cursor (10) in a direction that is parallel to said opening/closing direction (D), and such as to constrain said hooking element (6) to said second driving cursor (10; 10') in the movement along said second rectilinear linear trajectory (T2).

2. Lock according to claim 1, wherein said driving means (9, 10, 11A; 9' 10', 11B) are configured for moving, with translatory motion, said hooking element (6) along said first trajectory (T1) in a horizontal direction parallel to said opening/closing direction (D) between said retracted position (P_R) and an intermediate position (P_I) protruding from said containing box body (3), and along said second rectilinear trajectory (T2) in a direction that is orthogonally vertical to said first rectilinear trajectory (T1) between said intermediate position (P_I) and said lower prominent position (P_P) for engaging with said retaining unit (7).

3. Lock according to claim 1, wherein said driving means (9, 10, 11A; 9' 10', 11B) are configured for moving, with translatory motion, said hooking element (6) along said first trajectory (T1) in a horizontal direction parallel to said opening/closing direction (D) between said retracted position (P_R) and an intermediate position (P_I) protruding from said containing box body (3), and from said intermediate position (P_I) to said lower prominent position (P_P) along said second rectilinear trajectory (T2) that is tilted with respect to said first trajectory (T1) such that said hooking element (9), in transferring from said intermediate position (P_I) to said lower prominent position (P_P), engages with said retaining unit(7) by recovering mechanical clearance horizontally.

4. Lock according to any preceding claims, wherein said driving means comprise a control pushing element (11A; 11B) configured for selectively moving in succession said first driving cursor (9; 9') and said second driving cursor (10; 10') and vice versa, and configured for locking said second driving cursor (10; 10') in said fourth position (W4) to prevent an undesired or forced lifting of said hooking element (6).

5. Lock according to claim 4, wherein said control pushing element (11A; 11B) is rotatable around a rotation axis (R) transverse to said first rectilinear trajectory (T1) and to said second rectilinear trajectory (T2), and is configured for rotating, in a closing direction (C), by a first angular amount to push said first driving cursor (9) from said first position (W1) to said second position (W2) along a first stroke resulting in a horizontal translating of said hooking element (6) from said retracted position (P_R) to said intermediate protruding position (P_I), and, subsequently, by a second angular amount to push said second driving cursor (10; 10') from said third position (W3) to said fourth position (W4) along a second stroke resulting in a vertical translation of said hooking element (6) from said intermediate position (P_I) to said lower prominent engagement position (P_P).

6. Lock according to claim 5, wherein said control pushing element (11A; 11B) is arranged in such a manner that said rotation axis (R) is placed in a zone comprised between a median axis (M) of said hooking element (6) and a horizontal plane lying on an upper surface (66) of said hooking element (6) when said hooking element (6) is in said retracted position (P_R) or in said intermediate position (P_I).

7. Lock according to any one of claims 4 to 6, wherein said first driving cursor (9; 9') comprises a first abutting portion (15) shaped for coming into contact with, and receiving a thrusting action from, said control pushing element (11A; 11B) to move from said first position (W1) to said second position (W2) and vice versa, and wherein said second driving cursor (10) comprises a second abutting portion (20) shaped for coming into contact with, and receiving a thrusting action from, said control pushing element (11A; 11B) to move from said third position (W3) to said fourth position (W4) and vice versa, said first (9; 9') and second (10;10') driving cursors being slidably coupled with said containing box body (3) by respective

guiding lugs (21A, 21B) slidably housed in corresponding slot openings (22A, 22B).

8. Lock according to any one of claims 4 to 7, wherein said control pushing element comprises a bit element (11A) included in a lock cylinder (12) that is controllable by a key.

9. Lock according to any one of claims 4 to 7, wherein said control pushing element comprises a cam element (11B) that is couplable with, and controllable by, a handle.

10. Lock according to any one of claims 4 to 7, wherein said control pushing element comprises a cam element (11B) that is coupled with a cylinder (13) for a cross-shaped key (14) or for a key having another shape.

11. Lock according to any preceding claims, wherein said first engaging means comprise a pin protrusion (30) provided on an inner portion (17) of said hooking element (6) and a coupling slot (31) obtained on said first driving cursor (9; 9') and extending transversely with respect to said opening/closing direction (D) of said sliding door (2), and wherein said second engaging means comprises an upper surface (66) and a lower surface (67) provided on said hooking element (6) and a channel seat (33) obtained on said second driving cursor (10; 10') to slidably house a part of said hooking element (6), said channel seat (33) extending so as to permit a certain degree of freedom of movement of said hooking element (6) parallel to said opening/closing direction (D) and to constrain said hooking element (6) to said second driving cursor (10) in the movement along said second rectilinear linear trajectory (T2).

12. Lock according to any preceding claim further comprising a template unit (40) that is releasably couplable with an outer end of said hooking element (6) in said lower prominent position (P_P) to impress on said jamb (8) a reference mark for the drilling operation required for fitting said retaining unit (7) onto said jamb (8).

13. Lock according to claim 12, wherein said template unit (40) is hood-shaped, is provided with a tip portion (41) to cut said reference mark into said jamb (8) and is provided with elastic fins (42) to hook into a recess (16) provided on said hooking element (6).

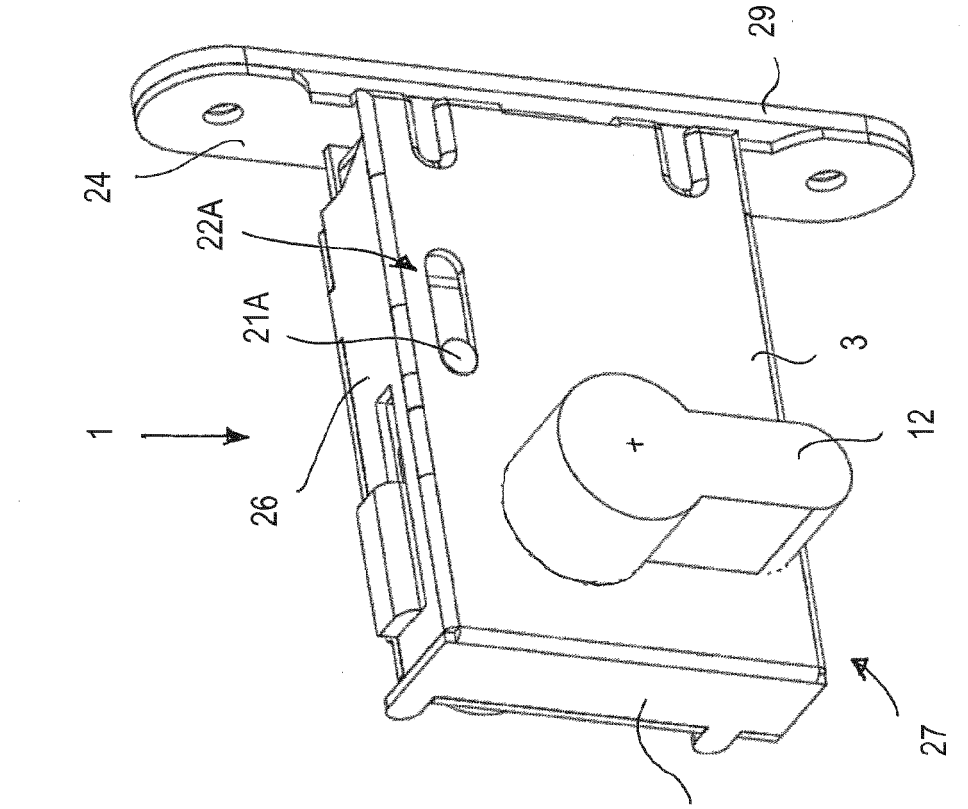

29
24
22A
21A
3
1
12
26
27
25

Fig. 2

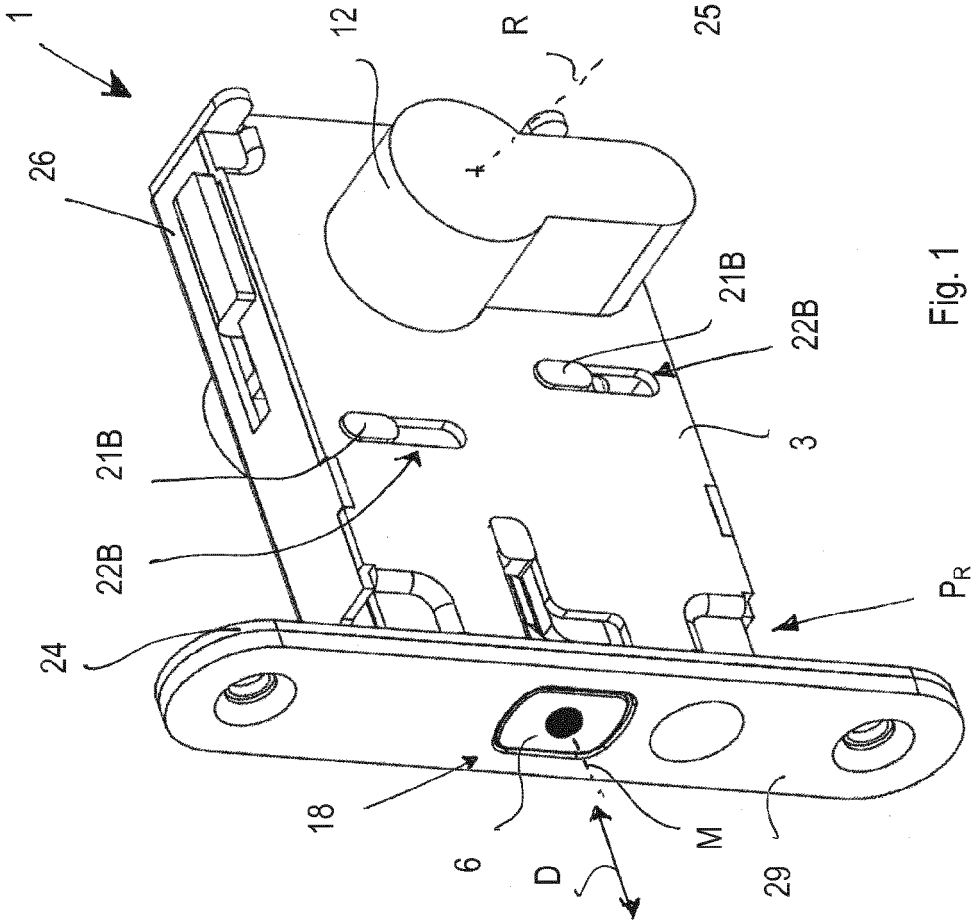

1
12
R
26
21B
22B
3
21B
22B
24
P_R
18
6
D
M
29

Fig. 1

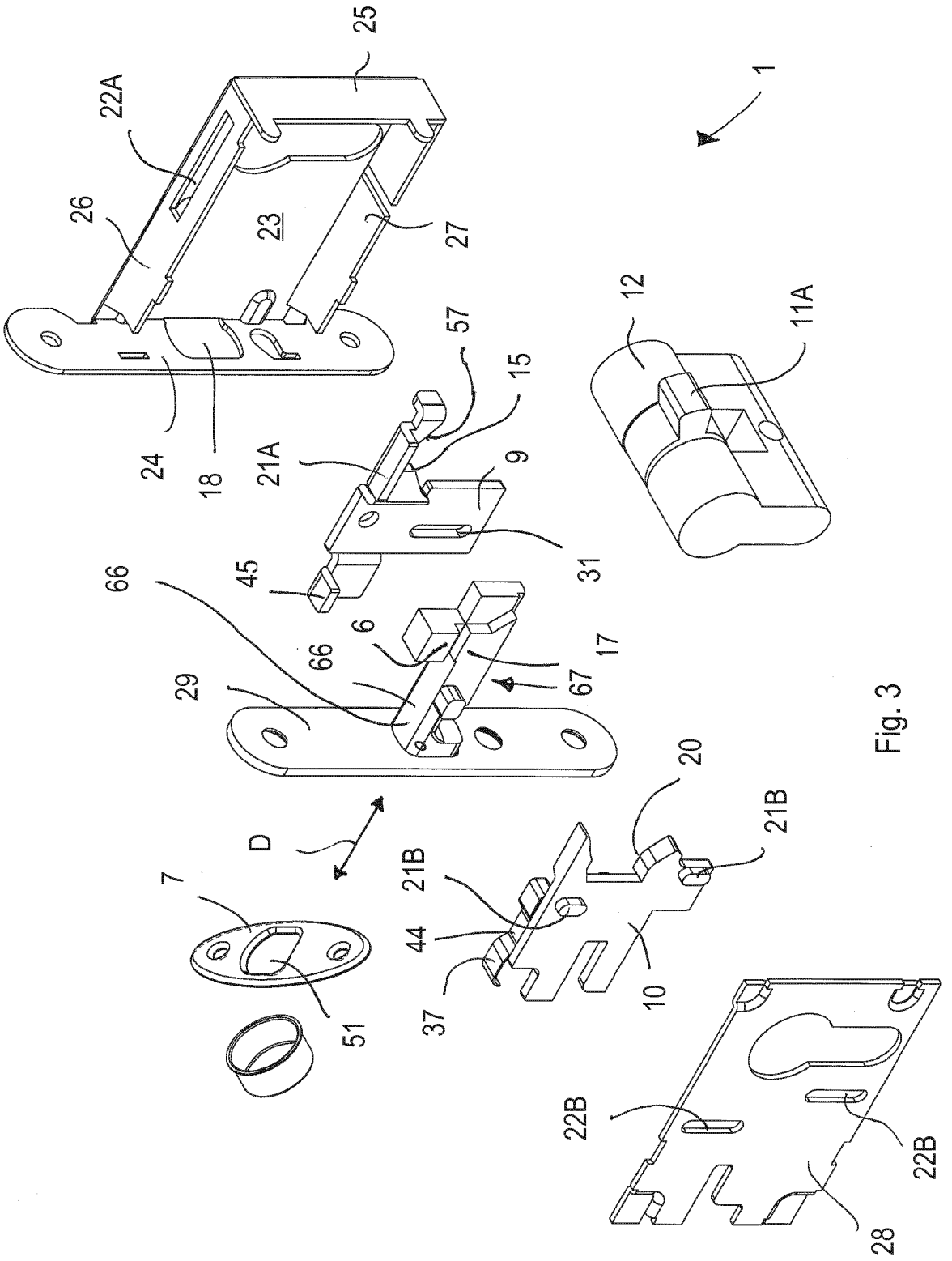

25
22A
26
23
27
1
12
11A
57
15
24
18
21A
9
45
31
66
6
66
17
29
67
D
20
21B
21B
7
44
37
10
51
22B
22B
28

Fig. 3

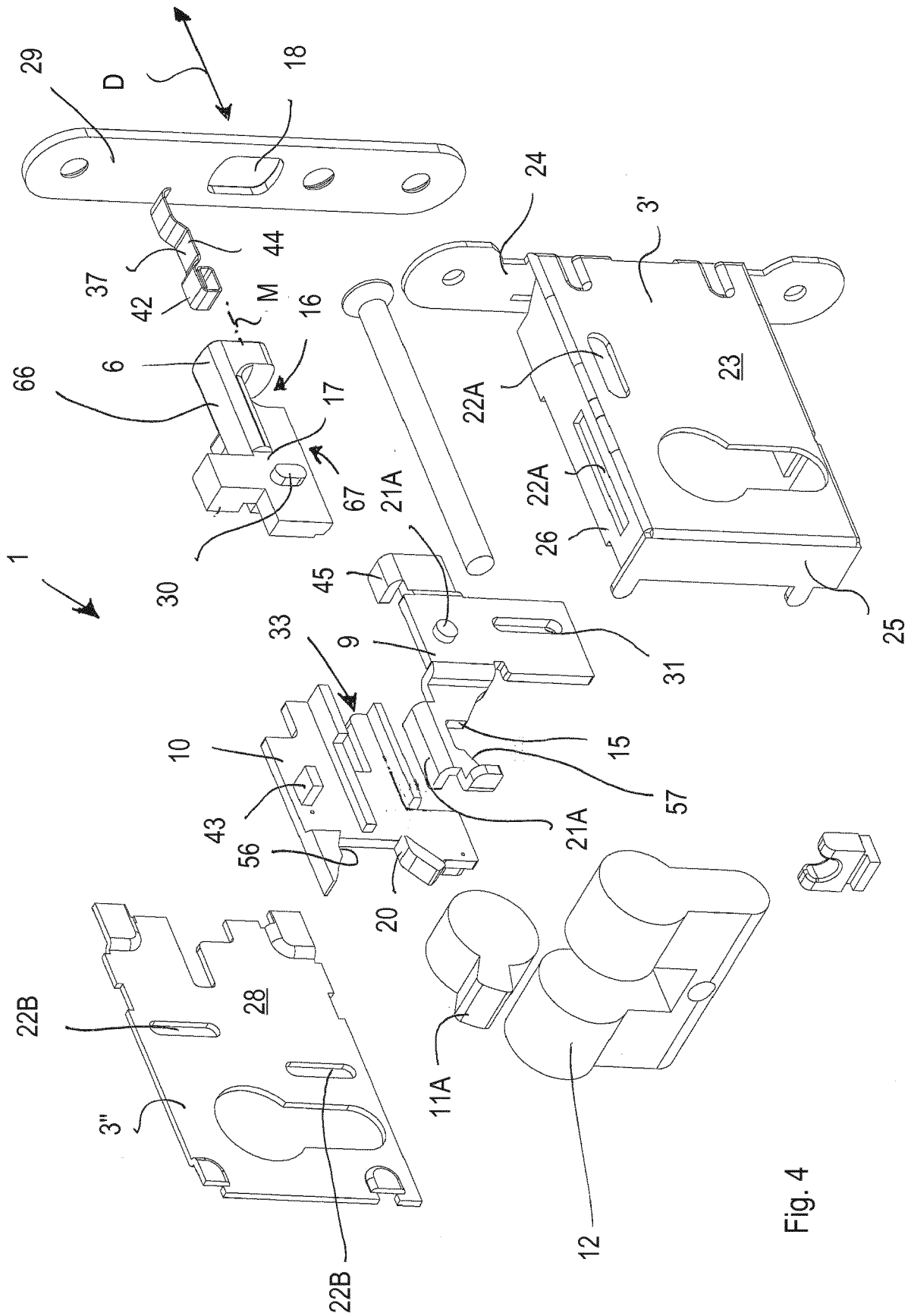
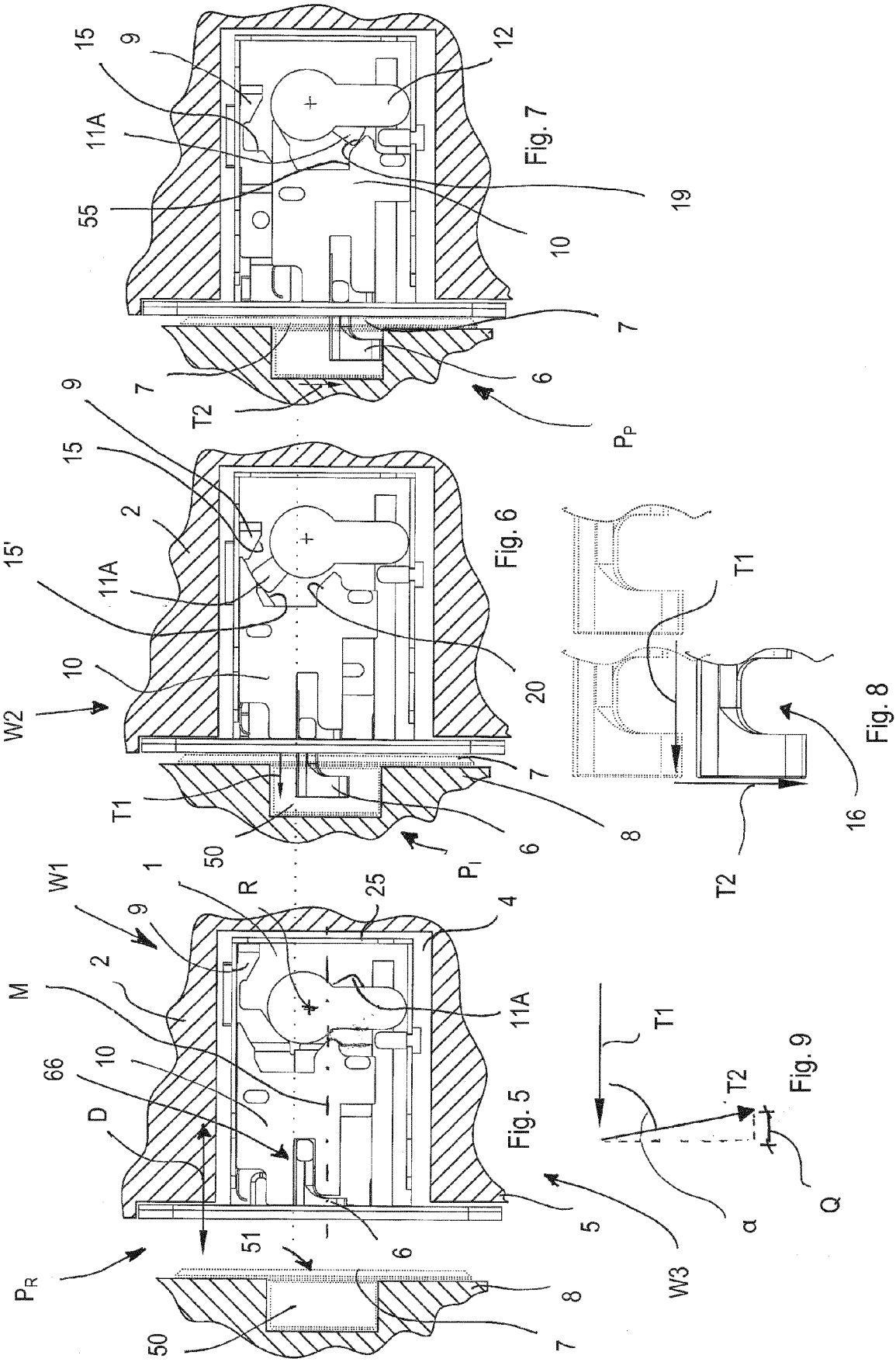

29
D
18
24
3'
44
37
42
M
16
6
66
17
67
21A
22A
23
1
30
45
33
9
31
10
15
43
57
56
21A
20
22B
28
3"
11A
12
22B
25
26

Fig. 4


15
9
11A
55
12
19
10
7
6
T2
P_P
Fig. 7
15'
W2
2
20
T1
8
16
Fig. 8
P_I
Fig. 6
W1
M
66
D
R
25
4
5
W3
T1
T2
a
Q
Fig. 9
P_R
51
Fig. 5
50

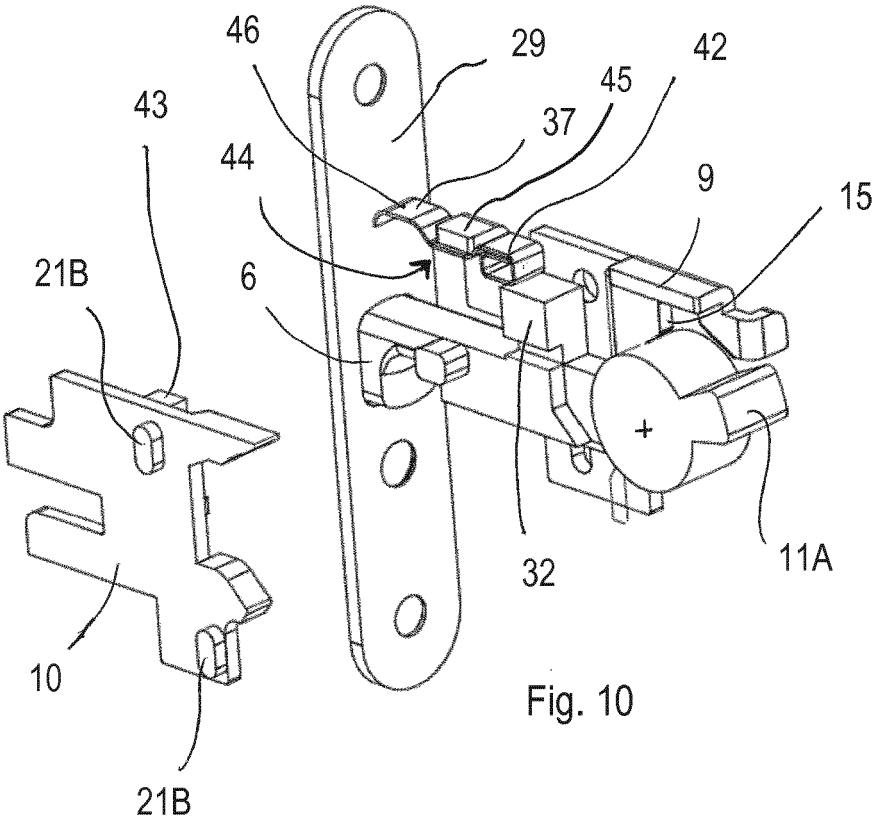

46
29
42
43
45
37
44
9
15
21B
6
32
11A
10
21B

Fig. 10

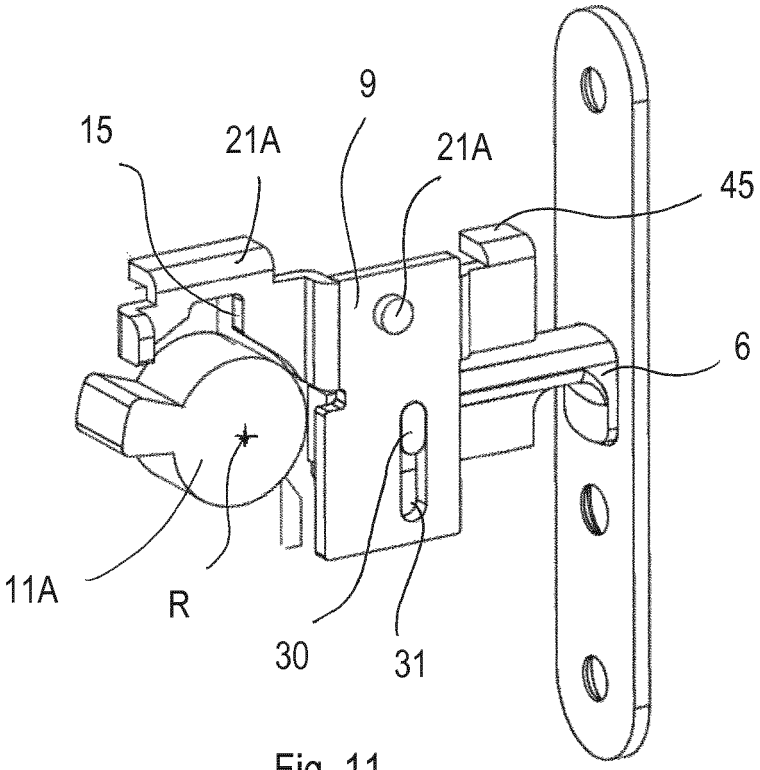

9
15
21A
21A
45
6
11A
R
30
31

Fig. 11

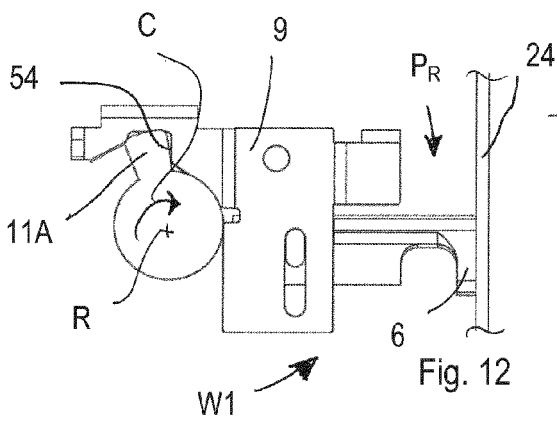


Fig. 12

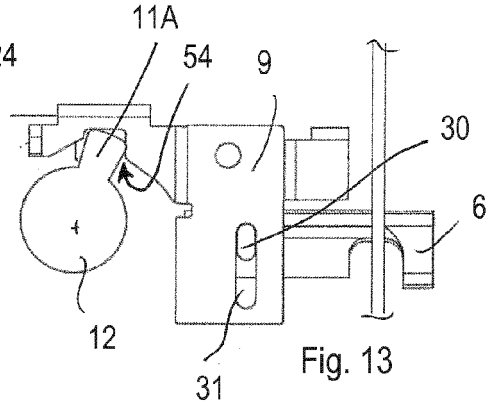


Fig. 13

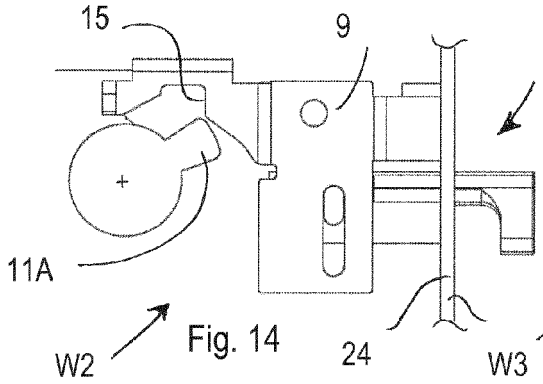


Fig. 14

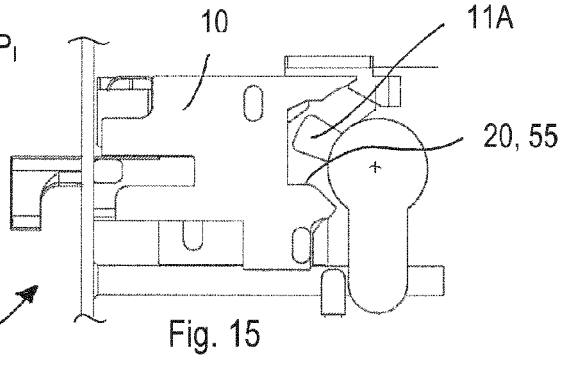


Fig. 15

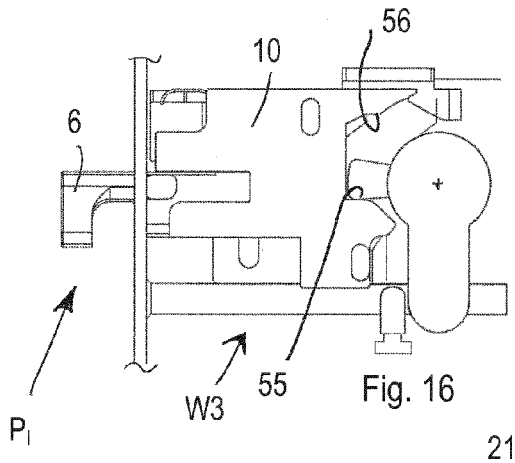


Fig. 16

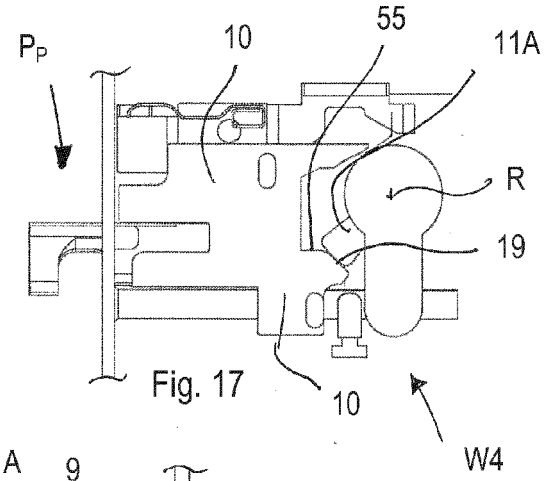


Fig. 17

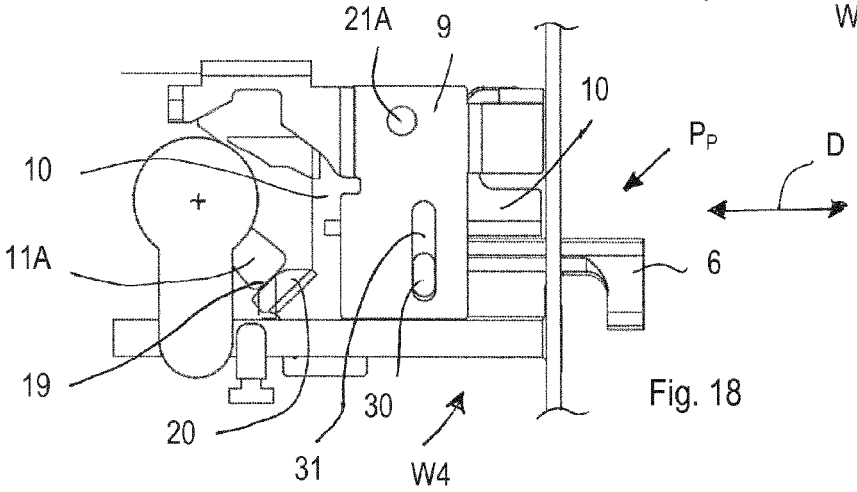
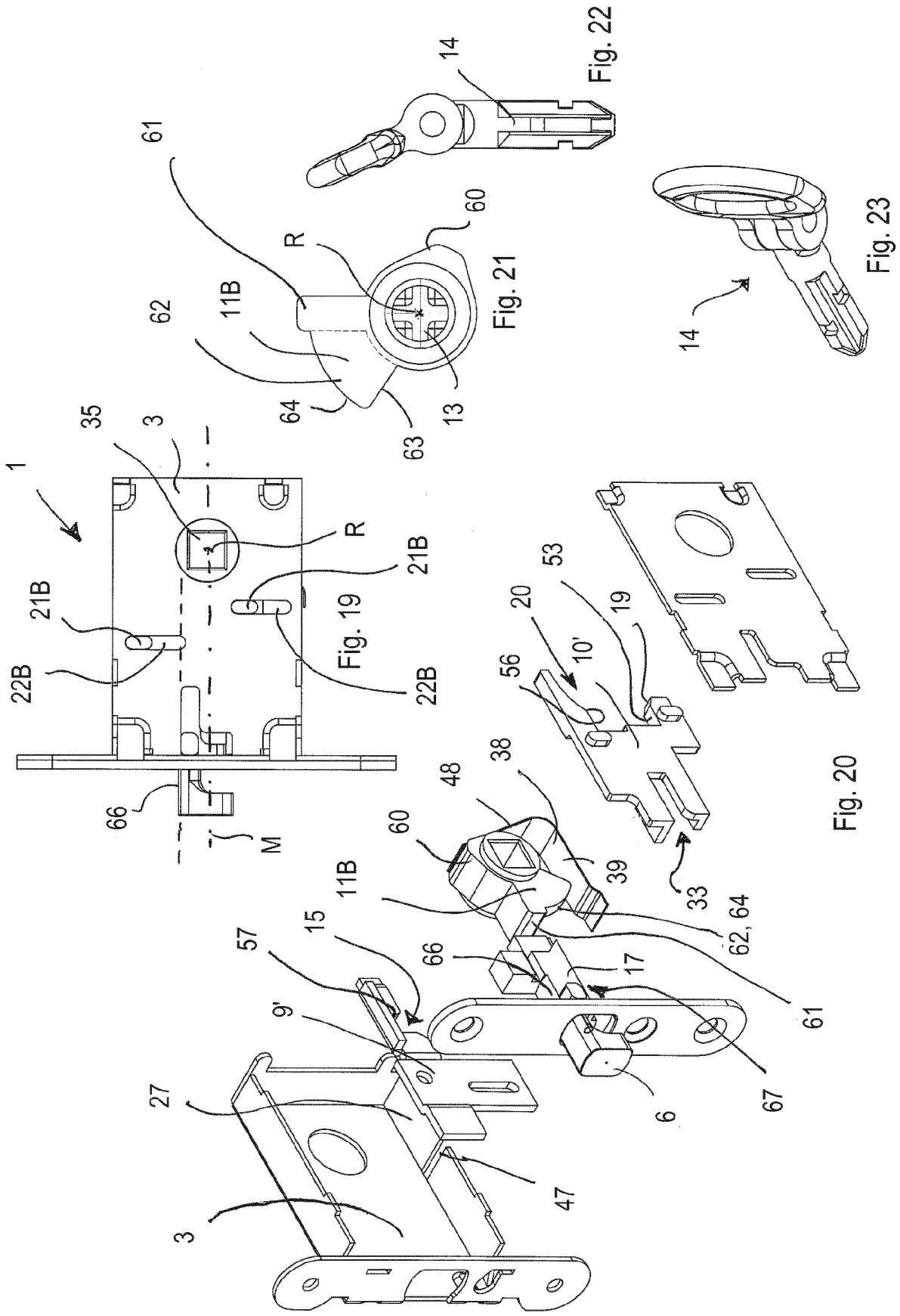


Fig. 18


1
35
3
R
21B
22B
66
M
Fig. 19
61
62
11B
64
63
60
13
Fig. 21
14
Fig. 22
14
Fig. 23
53
20
19
10'
56
38
48
60
39
11B
15
57
9'
27
3
47
66
17
61
62, 64
33
6
67
Fig. 20

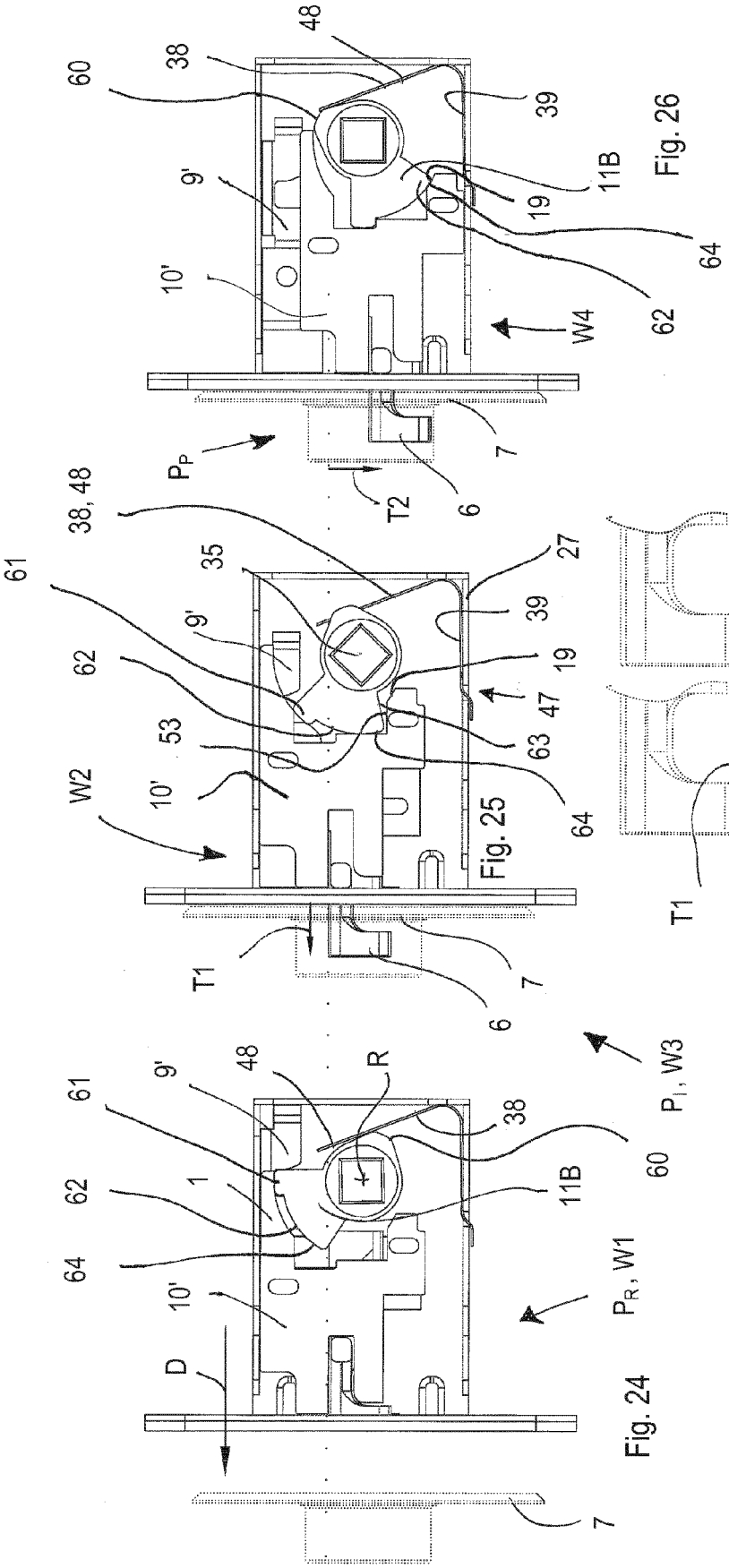


Fig. 26

Fig. 25

Fig. 24

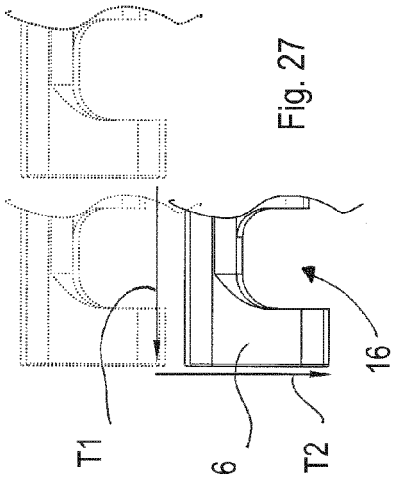


Fig. 27

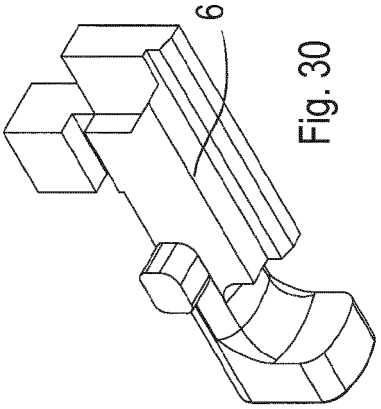


Fig. 30

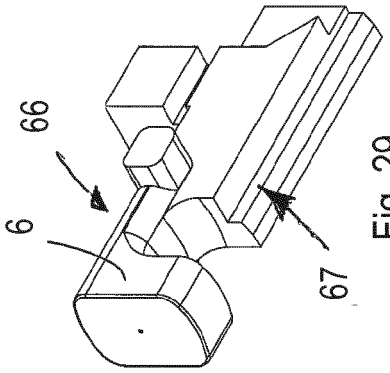


Fig. 29

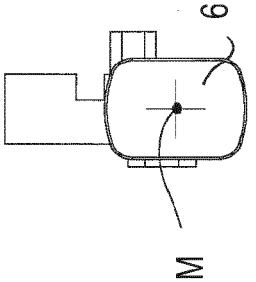


Fig. 28

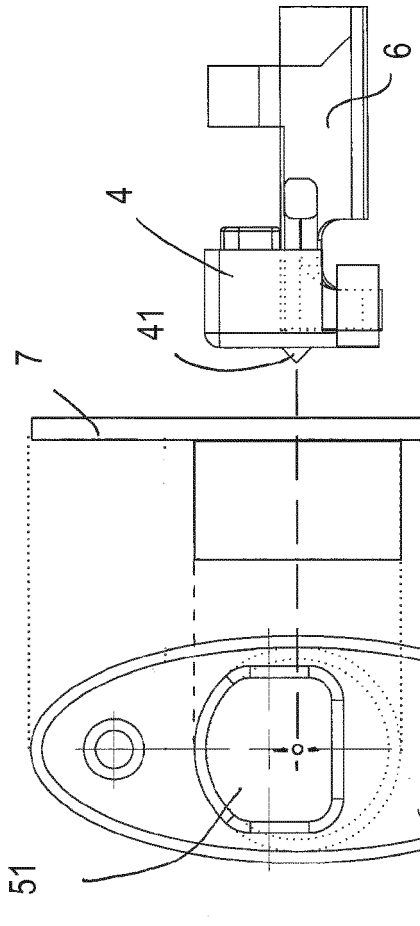


Fig. 35

Fig. 32

Fig. 31

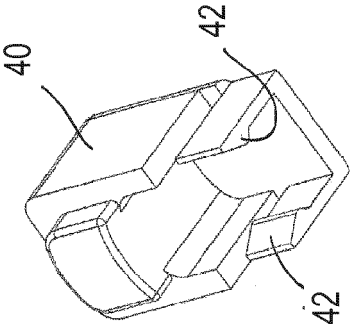


Fig. 34

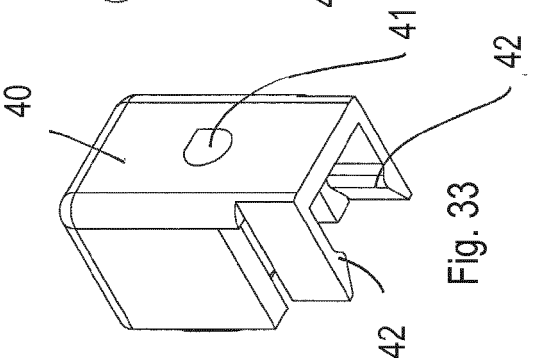


Fig. 33

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EUROPEAN SEARCH REPORT

Application Number
EP 16 17 9777

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A,D	DE 272 467 C (DAMM & LADWIG M.B.H.) 1 April 1914 (1914-04-01) * the whole document *	1	INV. E05B63/12 E05B65/08
A,D	US 2 253 496 A (HANCIL CORDREY ET AL) 26 August 1941 (1941-08-26) * the whole document *	1	
A,D	AU 49970 64 A (ROTH EMIL) 6 April 1967 (1967-04-06) * the whole document *	1	
A	US 1 422 820 A (ALEXANDER BLOCK) 18 July 1922 (1922-07-18) * the whole document *	1	
A	US 1 406 437 A (ALEXANDER BLOCK) 14 February 1922 (1922-02-14) * the whole document *	1	
A	GB 630 379 A (ERNEST CYRIL HANSOR) 12 October 1949 (1949-10-12) * the whole document *	1	TECHNICAL FIELDS SEARCHED (IPC) E05B E05C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	7 November 2016	Westin, Kenneth

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07-11-2016

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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