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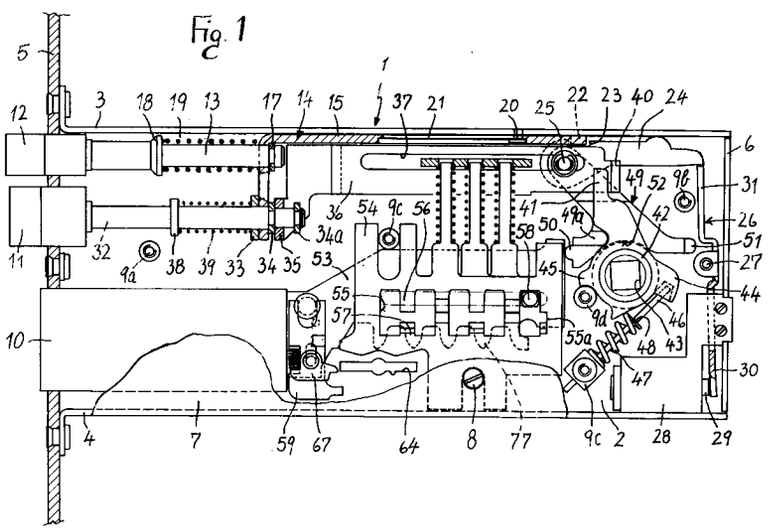
(54) Device for retaining an electric lock in open position.

(57) Device for retaining in open position an electric lock comprising a reloading piston (12), a spring latch (11) and a bolt (10), said spring latch and said reloading piston having stems (13, 32) guided in a slider (14) and being actuated so as to protrude by two respective springs (39, 19), one of which (19) acts between the slider (14) and the piston (12), the other spring (39) acting between the spring latch (11) and a fixed abutment (33). The slider (14) is lockable by means of a ratchet system (22-26) actuated by an electromagnet (28). An element (49) acts on the ratchet system and is operatively associated with the bolt (10), adapted to perform, by acting with the key, a further retracting movement starting from its position inside the lock, so as to act on said element (49) and move said ratchet system (22-26) into the release position of the slider (14), means (59, 67) being provided for retaining said bolt (10) in said position for the release of said element (49).

Fig. 1



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The present invention relates to a device for retaining in open position an electric lock.

As is known, electric locks comprise a reloading piston, a spring latch and a bolt. For example, in an electric lock proposed by the same Applicant in a co-pending patent application, entitled "Electric lock with opening acting directly on the spring latch", the reloading piston and the spring latch have stems guided within a slider lockable by means of a ratchet system controlled by an electromagnet. A return spring is arranged between the piston and the slider and operates by compression. A similar return spring is arranged between the spring latch and a stationary abutment. When the door is in closed position, the spring latch engages the related selvage, whereas the piston remains inserted in the lock casing and loads its own spring. In this manner, when the ratchet system is blocked by activating the electromagnet, the slider, being pushed by the spring compressed by the reloading piston, moves the spring latch inside the lock, compressing the spring of the spring latch, which is weaker than the spring of the piston.

The aim of the present invention is now to provide a device known as an "open detent", i.e., a device which, once installed in an electric lock of the described type, can prevent the spring latch from engaging the related selvage, so as to allow to open the door at any time after the bolt has been retracted into the lock.

This aim is achieved by a device for retaining in open position an electric lock comprising a reloading piston, a spring latch and a bolt, said spring latch and said reloading piston being provided with stems guided in a slider and actuated so as to protrude by two respective springs, one of which acts between the slider and the piston, the other spring acting between the spring latch and a fixed abutment, said slider being lockable by means of a ratchet system actuated by an electromagnet, characterized in that it comprises an element which acts on said ratchet system and is operatively associated with the bolt, and in that the bolt is adapted to perform, by acting with the key, a further retracting movement starting from its position inside the lock, so as to act on said element and move said ratchet system into the slider release position, means being provided for retaining said element in said release position.

Further characteristics of the present invention will become apparent from the following description of a preferred embodiment, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

figure 1 is a view of an electric lock provided with the device according to the invention, during normal operating conditions;

figure 2 is a view of said lock with the device in "open detent" position;

figures 3 and 4 are enlarged-scale views of an embodiment of the means provided to maintain the release position of the ratchet system, in the two operating conditions of figures 1 and 2.

With reference to the above figures, only the parts involved in the present invention are described.

In figures 1 and 2, the reference numeral 1 generally designates the casing of the lock, comprising a back wall 2 around which a peripheral wall extends; said peripheral wall is composed of an upper wall 3, a lower wall 4, a front wall 5 and a rear wall 6. The numeral 7 designates the closure cover of the casing, fixed by means of screws 8 engaging in threaded bushes 9a, 9b, 9c and 9d which are rigidly associated with the bottom 2.

Three openings are formed in the front wall 5, and the bolt 10, the spring latch 11 and the reloading piston 12 protrude outside the casing through said openings.

The reloading piston 12 has a cylindrical stem 13 engaging, with one of its ends, a sliding element 14 hereinafter termed slider. Said slider 14 is constituted by an L-shaped strip with one portion 15 adjacent to the upper wall 3 and the other portion 16 normal to said wall 3.

The end of the stem 13 is guided in a hole of the portion 16 and is provided with a ring 17 meant to abut on the portion 16, so as to act as a shoulder. A collar 18 is formed on the stem 13 and acts as support for an end of a spring 19 fitted on the stem 13; the opposite end of said spring abuts against the portion 16 of the slider 14.

An elastic connection has thus been provided between the piston 12 and the slider 14; by virtue of this connection, the spring 19 keeps the portion 16 in abutment against the ring 17 but allows the stem 13 to move with respect to the portion 16 in contrast with the action of the spring 19.

The portion 15 of the slider is guided along the wall 3 of the casing by a pin 20 which slides in a slot 21 of the portion 15, and is provided, at the end of the edge adjacent to the bottom 2, with a tooth 22 sliding on the bottom 2.

The tooth 22 is suitable to engage a notch 23 formed on the edge of a pawl 24 which is articulated about a pivot 25 protruding from the bottom 2. The pawl 24 can oscillate between a position in which it engages the slider 14, which occurs when the tooth 22 is engaged in the notch 23 (position shown in the figure) and a position for the release of the slider 14, which occurs when the pawl 24 is rotated by an angle at which the tooth 22 is in a position in which it is disengaged from the notch 23 to allow the sliding of the portion 15 toward the rear wall 6.

The pawl 24 is retained in locking position by a lever 26 pivoted in a rocker-like manner on a pivot 27 and subjected to the action of an electromagnet 28 installed in the casing 1. The electromagnet 28 is provided with a core 29 actuated outward by an internal spring, so that it is in contact with the lower arm 30 of the lever 26. When the electromagnet 28 is de-energized, the core 29 acts by virtue of the internal spring on the lower arm 30 of the lever 26, so as to make the upper arm 31 oscillate into abutment with the bush 9b in the retention position of the pawl 24. Vice versa, when the electromagnet 28 is energized, the lever 26 rotates in the opposite direction, allowing the pawl 24 to oscillate downward until it abuts on the bush 9b; when this abutment occurs, the tooth 22 is disengaged from the notch 23.

The spring latch 11 is also provided with a stem 32 parallel to the stem 13 and guided through a plate 33 which is locked between the bottom 2 and the cover 7 of the casing and constitutes a stationary stop element. The end of the stem 32 is slidably guided through the portion 16 of the slider, and a lug 35 is rigidly coupled to said end between a pair of rings 34, 34a; said lug 35 is folded, at right angles to the bottom 2, by a bar 36 extending laterally to the side 15 of the slider 14. The rings 34, 34a are spaced by such an amount as to allow the lug 35 a certain play on the stem 32.

A slot 37 is provided in the bar 36, is parallel to the portion 15 of the slider 14 and is engaged by the pivot 25 which thus keeps the bar 36 guided.

A collar 38 is formed on the stem 32, and an end of a spring 39 rests against said collar; said spring is fitted on the stem 32 and rests against the plate 33 with its opposite end.

The spring 39 is less rigid than the spring 19 and keeps the spring latch 11 in a position in which it protrudes from the front wall; this position is defined by the abutment of the lug 35 on the plate 33, with the interposition of the portion 16, which remains secured between the plate 33 and the lug 35.

The end of the bar 36 which is opposite to the lug 35 has a wing 40 also folded at right angles to the bottom 2; a lever 41 can act on said wing 40 and is radially rigidly coupled to the hub 42; the knob for the manual actuation of the lock is rotatably coupled to said hub 42. The bar 36 is used to operatively connect the lever 41 to the stem 32 of the spring latch.

The hub 42 is rotatably supported in circular seats of the bottom 2 and of the cover 7 of the casing and is provided with a square hole 43 in which the square pivot of the handle engages with a prism-like coupling.

The hub 42 is provided with two tabs 44, 45 arranged diametrically. A strut 46 acts on the tab 44, is loosely guided in the bush 9c and is actuated by a spring 47 acting between said bush 9c and a shoulder 48 of the strut 46. Due to the spring 47, the hub 42 is kept in an angular position determined by the abutment of the tab 45 on the bush 9d at which the lever 41 is disengaged from the wing 40.

Operation of the described lock is as follows.

In the door closure position, the spring latch 11 is engaged in the related selvage and thus protrudes from the front wall 5. At the same time, the piston 12 abuts on the doorjamb and is inside the casing. Since the electromagnet 28 is not energized, the core 29 pushes the lever 26 into abutment with the bush 9b, so as to prevent the oscillation of the pawl 24 and engage the sliding of the slider 14. As a consequence of this, during door closure, when the piston 12 retracts into the casing, the stem 13 slides with respect to the portion 16 of the slider and the spring 19 is compressed.

If one then wishes to open the door with an electric control, energization of the electromagnet 28 causes the rotation of the lever 26, so that the pawl 24 is free to rotate. Due to the compression of the spring 19 which occurred during door closure, the slider 14 acts with the tooth 22 against the edge of the notch 23, forcing the pawl 24, which is no longer engaged by the lever 26, to rotate into the position for the free sliding of the slider 14. The sliding of the slider 14 moves the spring latch 11 by virtue of the coupling of the portion 16 on the stem 32. Retraction of the spring latch 11 entails the compression of the spring 39, since as mentioned it is less rigid than the spring 19.

If instead one wishes to open the door manually, clockwise rotation of the hub 42 by acting on the knob engaged in the square hole 43 causes the movement of the bar 36 by means of the lever 41 and, together with said bar, of the stem 32 rigidly coupled in the lug 35. The movement of the bar 36 occurs independently of the movement of the slider 14, which remains locked, since the pawl 24 is kept in engagement position by the lever 26.

The movement of the stem 32 causes the retraction of the spring latch 11 and the compression of the spring 39 against the plate 33, so that when the action of the handle ceases, the spring 39 returns the spring latch to the protruding position.

The device allowing, according to the invention, to keep the ratchet system in released condition and provide the so-called "open detent" of the lock comprises a lever element 49 pivoted on the same articulation pivot 25 as the pawl 24 and is provided with a ridge 49a, which is in contact with the lever 41, and with two oppositely arranged protrusions 50, 51 between which a recess 52 is formed; the hub 42 loosely enters said recess. The play is such

as to allow the protrusion 51, when the lever 49 is actuated, to act on the arm 31 of the lever 26 and keep it in a position of disengagement of the pawl 24.

The protrusion 50 is shaped so that it makes contact with the tang 53 of the bolt 10 when said bolt, by means of the key, is made to retract into the lock. The numeral 54 designates the conventional tumblers or plates for engaging the bolt. These tumblers 54 are guided at right angles to the bolt and are provided with openings 55, from the opposite edges of which respective sets of oppositely arranged teeth 56, 57 protrude; said teeth define passages between the opposite ends and interspaces between the teeth which are meant to receive the bolt locking pivot 58.

It should be noted that when the bolt is fully inserted in the lock, as shown in figure 1, the protrusion 51 does not interfere with the rocker lever 26, which can oscillate freely. Besides, the bolt can perform, with respect to this total insertion position, a short additional stroke, since the openings 55 have, at one end, a recess 55a meant to receive the bolt locking pivot 58 when said bolt is actuated beyond the position of full insertion in the casing, shown in figure 2.

In order to ensure that the rocker lever 26, once it has been actuated by the lever element 49 into the "open detent" position, cannot return to the initial position and thus restore the normal operation of the lock, there are means retaining the element 49 in the position for releasing the lever 26 and thus the slider 14.

Said means (see figures 3 and 4) comprise a plate 59 guided on the tang 53 proximate to the bolt by a pair of pins 60, 60a; the pin 60 is fixed on the tang and slides in a slot 61 of the plate 59, whereas the other pin 60a is fixed on the plate and slides in a slot 62 of the tang 53 so as to guide the plate at right angles to the bolt.

The plate 59 is provided, on one side, with a tooth 63 extending below the tang 53 toward the keyhole 64 and, on the opposite side, with a rectangular recess 65 which, in an upward region, is delimited by a wing 66 protruding from the face of the plate.

A detent 67 is articulated to the pivot 60a on the plate 59 and is provided, on a portion directed toward the bolt, with a wing 68 engaging the recess 65, and with a tooth 69 oppositely to said recess.

A spring 70 is interposed between the wing 66 of the plate 59 and the wing 68 of the detent 67, secures the wing 68 in abutment with the lower edge of the recess 65 and elastically locks the detent in a position in which the tooth 69 is superimposed on the tooth 63.

A tab 71 and a pin 72 are respectively rigidly coupled to the teeth 63 and 69 and extend below the tang 53 at right angles to the bottom 2.

Above the plate 59 there is a ridge 73 having a concavity 74 directed toward the bolt. Said ridge is suitable to cooperate with a protrusion or stud 75, fixed to the internal face of the cover 7 which frontally closes the casing; the stud protrudes inward until it skims the plate 59.

When one wishes to activate the "open detent", which as mentioned above allows to set the lock in the condition in which the door can always be opened, by inserting the key 76 in the keyhole 64 and turning it clockwise, the key acts on the rack 77 of the tang 53 and moves the bolt 10 so that it is fully inside the casing (see figure 1).

Then, with a further action on the key, the tang 53 is moved to the position in which the pivot 58 engages the recess 55a of the opening 55. This entails a small additional stroke of the bolt, causing the advancement of the detent 67 until it interferes with the keyhole (position A of figure 3). The tang 53 of the bolt, in this position, acts on the protrusion 50 of the element 49 which moves the rocker lever 26 into the position for the release of the pawl 24 and for the free sliding of the slider 14. Simultaneously, the tooth 49a of the lever 49 acts on the lever 41, which very slightly moves the bar 36 but does not produce any effect due to the play between the lug 35 of the bar and the stem 32 of the spring latch.

As already described above, the spring latch is forced to follow the reloading piston and thus cannot engage the related selvage in the doorjamb, since the piston 12, when the door is closed, abuts on the doorjamb and remains inside the casing.

Besides, if at this point the thrust applied by the key 76 on the bolt were to cease, the spring 39 would retract the bar 36, which by means of the wing 40 would make the lever 41 oscillate and, by means of the tooth 49a and the protrusion 50, would act on the bolt, pushing it outward again. At the same time, the protrusion 51 would leave the lever 26, which could thus resume the position for engaging the pawl 24, eliminating the effect of the "open detent".

To prevent this occurrence, when the square pivot 58 is engaged in the recess 55a of the opening 55, while keeping the bolt still from outside, for example by means of the pressure of a finger, the key is turned counterclockwise, in the direction opposite to the bolt retraction direction, so that the key first acts on the pin 72, tilting the detent 67 (position B of figure 3) in contrast with the action of the spring 70 and then engaging below the pin which, being passed by the key, returns to position A.

At this point, by turning the key clockwise, one acts on the detent 67 which, since it cannot rotate due to the abutment of the wing 68 against the

edge of the recess 65, is pushed upward, pulling along the plate 59 and making the ridge 73 align in the position for the engagement of the stud 75 of the closure in the concavity 74 of the ridge 73 (position of figure 4). The bolt thus remains locked in the position in which the element 49 keeps the rocker lever 26 disengaged from the pawl 24, so that the slider 14 can slide freely.

It should be noted that the position in which the ridge 73 and the stud 75 are aligned corresponds to the position in which the teeth 69 and 63 are respectively above and below the keyhole 64; the key can thus be removed without compromising the "open detent" condition of the lock and can be inserted again to restore the operation of the lock.

In fact, by inserting the key again and turning it counterclockwise, one acts on the tab 71, pulling the plate toward the lower wall (position C in dashed lines of figure 4) and thus eliminating the alignment between the ridge 73 and the stud 75, so as to allow the bolt to protrude again by an extent corresponding to the depth of the recess 55a and allow the square pivot 58 to resume its engagement position between the tumbler levers.

The fundamental prerogative of the present invention is constituted by the fact that for setting the lock to the "open detent" mode there are no additional buttons, as in conventional locks, but only the very key actuating the lock. In this manner, setting to the "open detent" mode can be performed only by authorized individuals.

The invention thus conceived is susceptible to numerous modifications and variations, all of which are within the scope of the inventive concept.

All the details may furthermore be replaced with other technically equivalent elements.

In practice, the materials employed, as well as the contingent shapes and dimensions, may be any according to the requirements.

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. Device for retaining in open position an electric lock comprising a reloading piston (12), a spring latch (11) and a bolt (10), said spring latch and said reloading piston being provided with stems (13, 32) guided in a slider (14) and actuated so as to protrude by two respective springs (39, 19), one of which (19) acts between the slider (14) and the piston (12), the other spring (39) acting between the spring latch (11) and a fixed abutment (33), said slider (14) being lockable by means of a ratchet system (22-26) actuated by an electromagnet (28), characterized in that it comprises an element (49) which acts on said ratchet system and is operatively associated with the bolt (10) and in that the bolt is adapted to perform, by acting with the key, a further retracting movement starting from its position inside the lock, so as to act on said element (49) and move said ratchet system (22-26) into the release position of the slider (14), means (59, 67) being provided for retaining said bolt (10) in said position for the release of said element (49).

2. Device according to claim 1, characterized in that said element is constituted by an articulated lever (49) having a first protrusion (50) which can be engaged by a tang (53) of the bolt (10) and a second protrusion (51) suitable to engage a lever (26) of the ratchet system which is controlled by the electromagnet (28).

3. Device according to claim 2, characterized in that said retention means comprise a plate (59) guided on the tang (53) of the bolt (10) at right angles to its sliding direction and provided with a ridge (73), a detent (67) which is articulated on said plate (59) in contrast with elastic means (70), said detent (67) and said plate (59) being provided with superimposed teeth (63, 69, 71, 72) and said key being suitable to assume a position of engagement between said teeth when the bolt (10) is kept at the stroke limit of said additional movement and the key is turned against said detent; said key, in said engagement position, being suitable, in one direction of rotation, to act on the tooth (69, 72) of the detent (67) to move the plate (59) into the position for engaging said ridge (73) with a fixed protrusion (75) of the lock at which said bolt keeps said ratchet system (22-26) in the position for releasing the slider (14) and, in the other direction of rotation, to act on the tooth (63, 71) of the plate (59) to move the plate into the position for the free sliding of the bolt (10), at which said ratchet system (22-26) locks said slider (14).

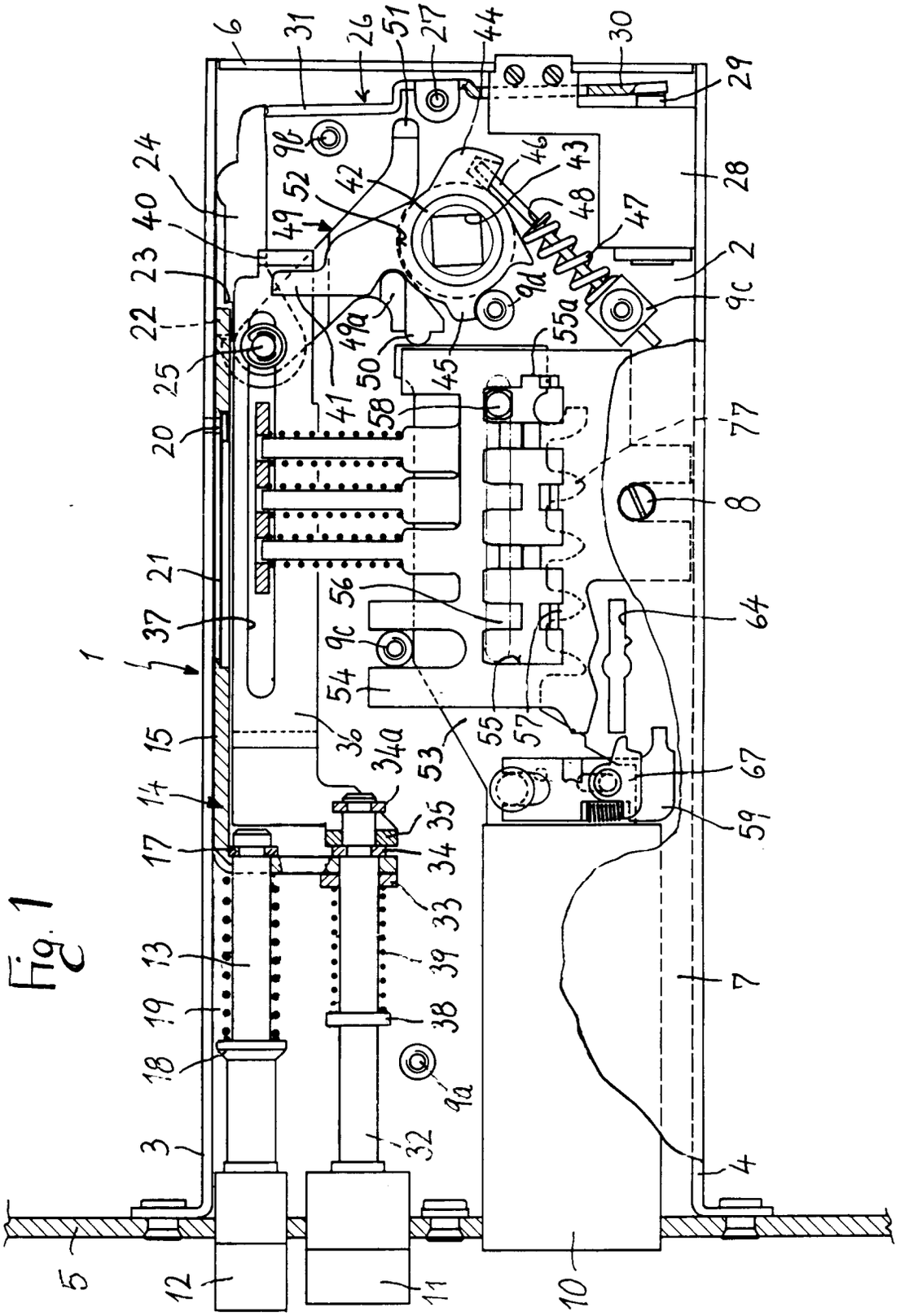
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Fig. 1

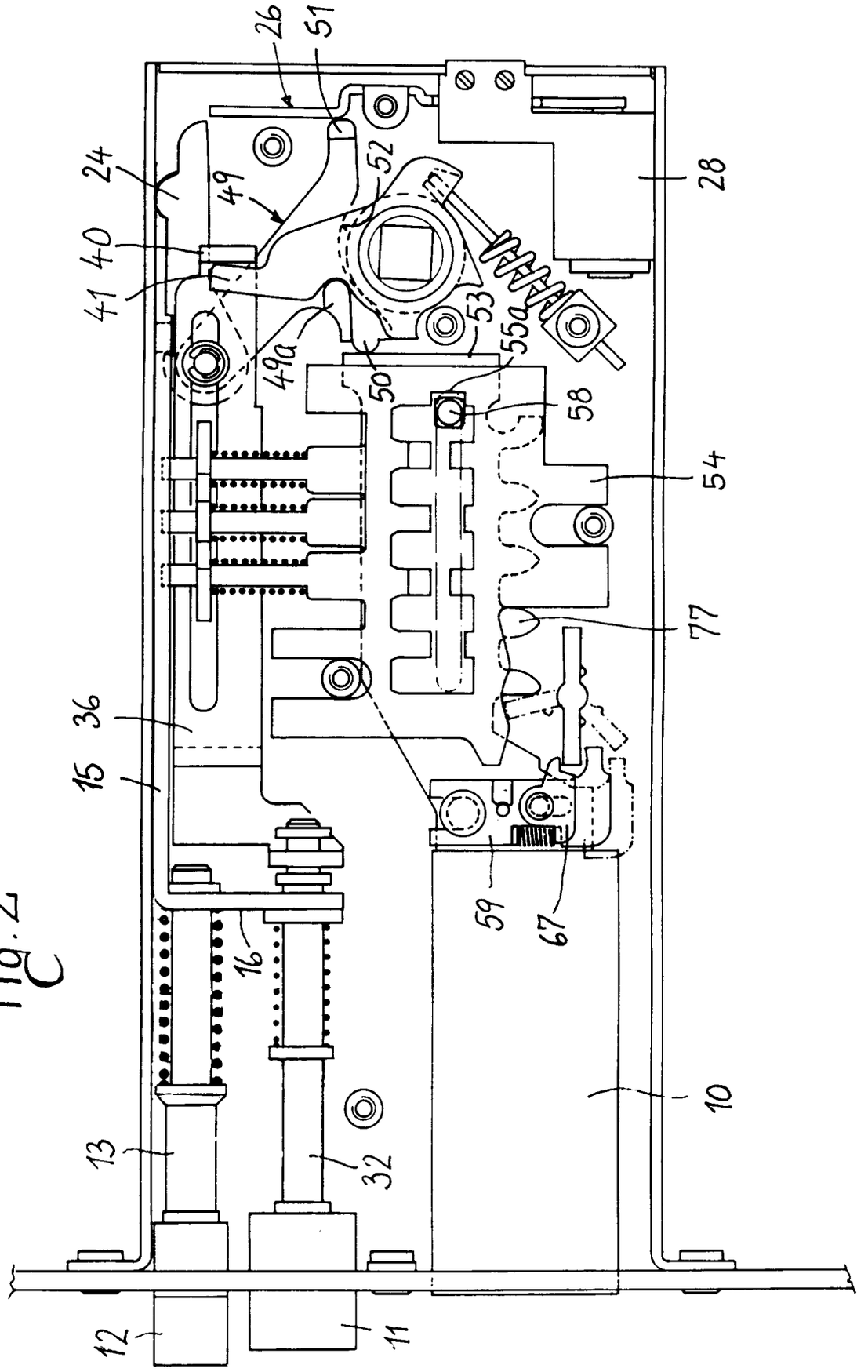
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Fig. 2

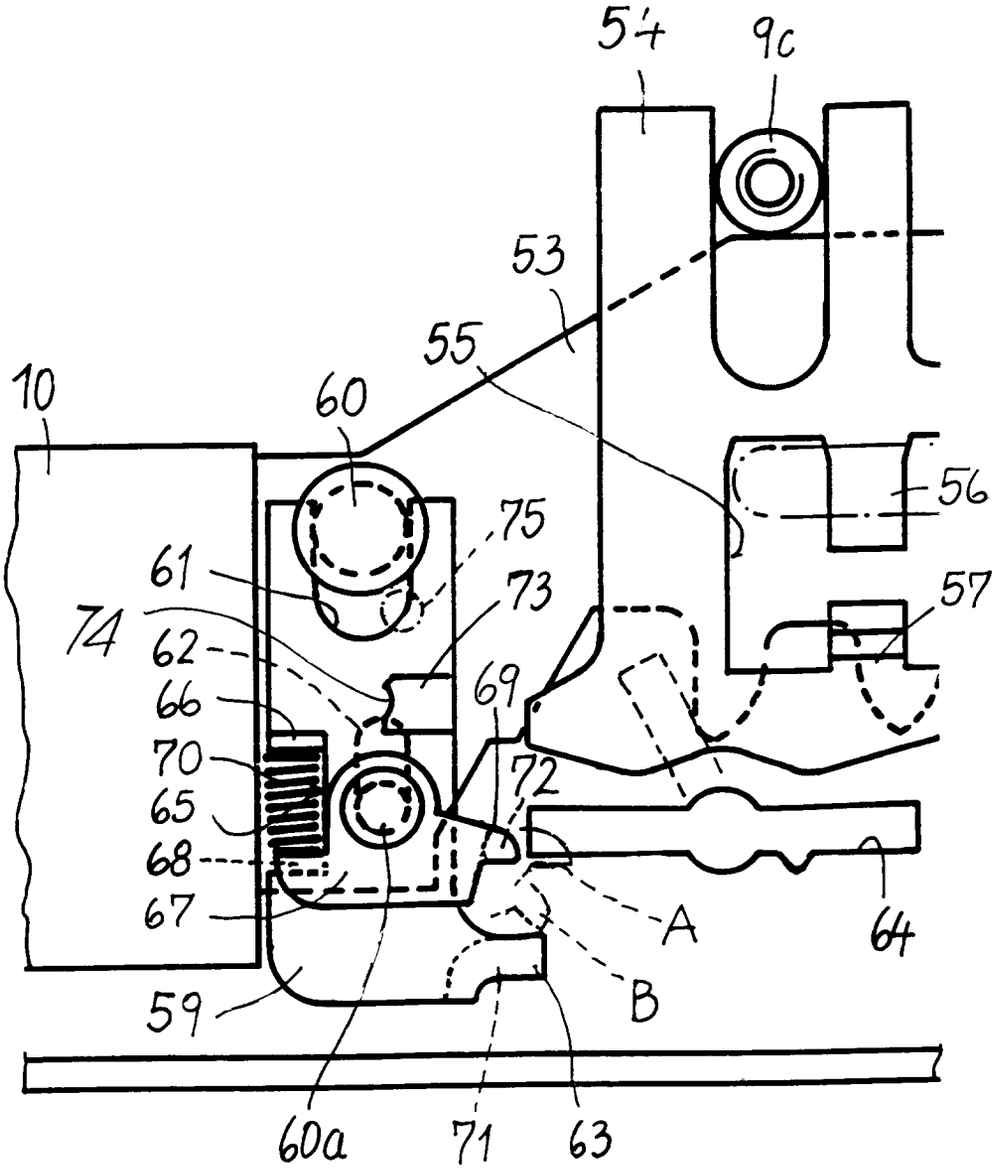
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Fig. 3

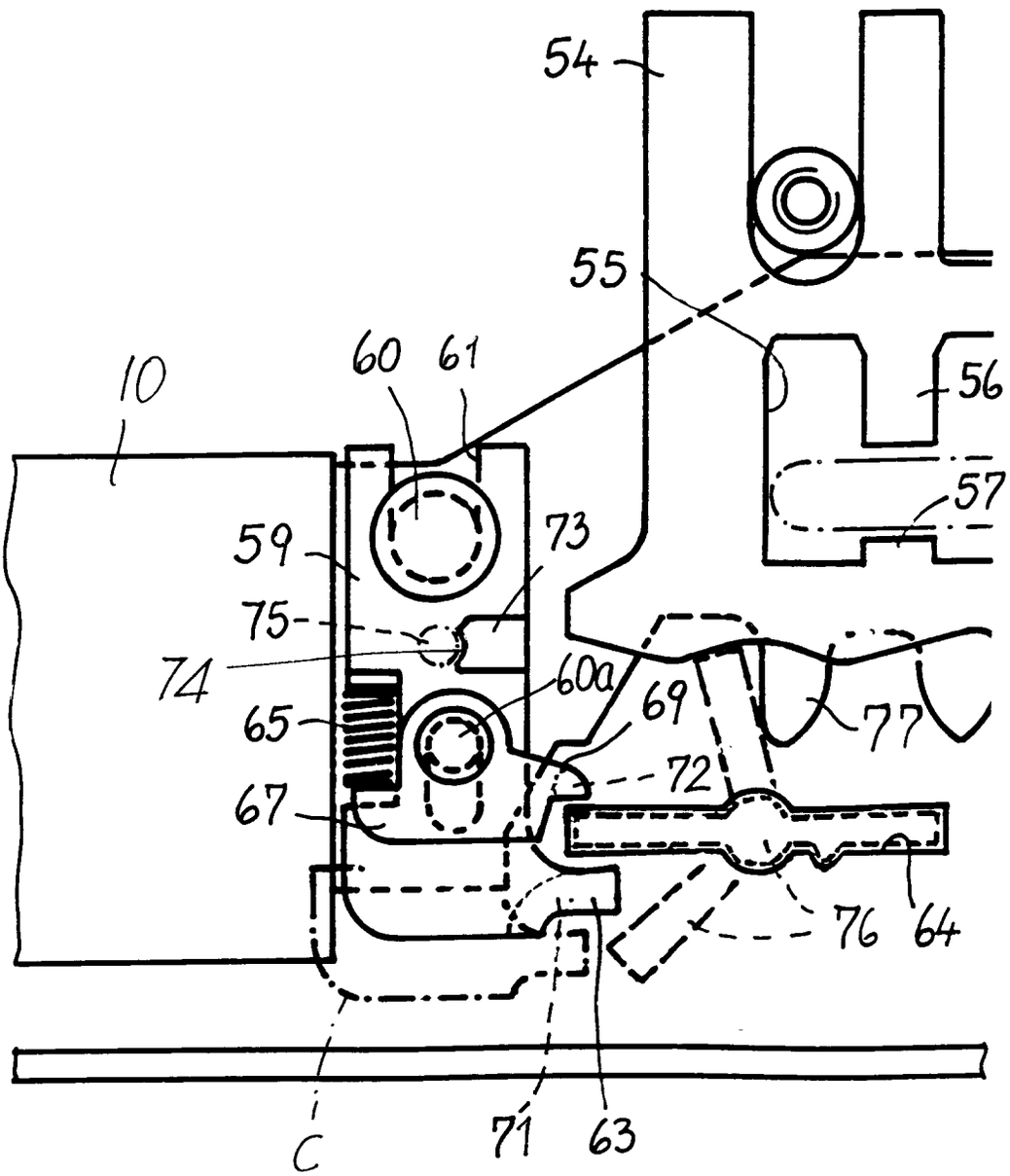

Fig. 4
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EUROPEAN SEARCH REPORT

Application Number

EP 93 10 4733

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	FR-A-2 381 156 (GUIDOTTI) * the whole document *	1	E05B59/00 E05B47/06
A	EP-A-0 292 361 (CREATIONS D. GUIDOTTI) * column 5, line 24 - line 43; figures *	1	
A	DE-A-1 678 099 (SCHLOSSFABRIK SCHULTE-SCLAGBAUM AG) * page 1, line 4 - line 6; figures * * page 3, line 9 - page 4, line 9 *	1	
A	FR-A-1 394 247 (C.I.S.A. S.P.A.) * figures *	1	
A	EP-A-0 378 124 (C.I.S.A. S.P.A.) * abstract; claim 1; figure 1 *	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

E05B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	02 JULY 1993	GIMENEZ BURGOS R.

CATEGORY OF CITED DOCUMENTS

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