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(54) **AUTOMATIC OPENING AND CLOSING DEVICE FOR DOORS**

(57) The invention relates to an automatic locking device for doors, which comprises a strike (2a, 2b) and at least one lock (1a), the strike comprising a lock plate (20, 35) joined to a door frame. The lock (1a) comprises a box (1) with an anchoring piece (11) attached to the box (1) rotatably with respect to an anchoring pin (5); a latch (7) connected to the box (1) rotatably with respect to a latch pin (4); a spring (8) that opposes the rotation of the latch; a spring (11) that opposes the rotation of the anchoring piece (5) and a rod (22) comprising a head (13) that protrudes with respect to the box (1); a spring (17); and a cover (14), wherein the cover (14) is in direct contact with a releasing piece (11), and wherein a stop (19) and the cover (14) resist the recovering force of the spring (17).

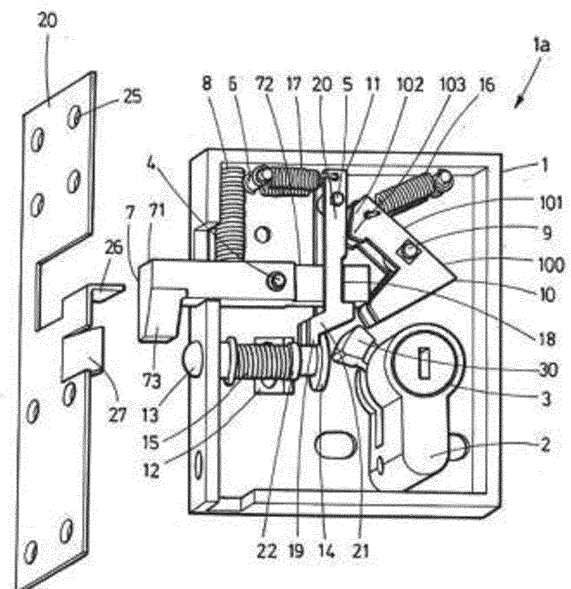


FIG.1

Description**OBJECT OF THE INVENTION**

[0001] This invention discloses an automatic closing and opening device for doors. More particularly, this invention discloses a more secure closing device that allows a door to be closed automatically without the need for a key, significantly reducing the force needed to be exerted on the door in order to execute the automatic closure, thus maximising safety and reliability. The device can also be opened with a key or by stimulating a remote electromagnet.

BACKGROUND OF THE INVENTION

[0002] Some automatic door closing devices, which do not require a key to execute the closure, are known in the state of the art. The devices known by the applicant are based on taking advantage of displacing a latch when closing the door and using this latch to force some springs so that, when closing the door, these springs release the bolts that are inserted into a keeper or closure plate and thus the door is immobilised. The disadvantage of this is that the latch needs to make more effort to retract and needs a greater effort to close the door, therefore a greater blow of the door against the frame is required when closing it. An example of this system is that disclosed in European patent application EP0280845 A2 "Lock with spring-loaded bolt with elastic accumulation".

[0003] There are other embodiments that disclose an automatic closure by means of a hook that rotates and is inserted into the keeper, which can be opened electromechanically. However, there are major drawbacks in their manufacture due to their complexity, as they need a large variety of components and parts. An example of these automatic closing systems is German patent application DE 2014104139.

[0004] Other types of automatic closure devices describe fixing the door from the keeper of the frame, opening from the frame and not the door, so they are not suitable for entrance doors but for other applications like anti-panic systems. These types of anti-panic devices are disclosed, for example, in patent application WO2017149544 and British patent GB1399058.

DESCRIPTION OF THE INVENTION

[0005] This invention aims to solve some of the problems mentioned in the state of the art.

[0006] More specifically, this invention discloses a highly secure, anti-theft closing and opening device for a door, which closes automatically without needing a key, exerting minimal effort on the door without the need for large blows or force on the door frame when closing, thus maximising safety and reliability.

[0007] More particularly, this invention discloses an automatic opening and closing device for doors, com-

prising a keeper and at least one lock, where the keeper includes a closure plate attached to the frame of a door, and the lock comprises:

- 5 - a box,
- a mounting bracket attached to the box, rotating around a mounting shaft that comprises a housing, an elongated pivot section and a guide located in the section, distal to the mounting bracket, with this guide presenting a stop,
- 10 - a latch connected to the box, rotating around a latch shaft, which comprises a section protruding from the box and a section housed inside the box, where the housed section inside the housing of the latch serves as a bearing point for this latch, and the protruding section interacts with the keeper to open or close the door,
- a mounting latch fixed to the box and attached to the mounting bracket to exert a recovering force that opposes the rotation of the mounting bracket when it is pushed by the cam,
- a mounting latch that exerts a recovering force that opposes the rotation of the latch when it is pushed by the cam,
- 25 - a rod that comprises a head protruding from the box, a base adjacent to the head, this base includes a spring and is attached to the box, the rod also includes a cover attached to this rod, where the cover is in direct contact with the stop of the mooring bracket, where the head with the cover has freedom of longitudinal movement with respect to the base attached to the box, and the contact with the stop and cover resist the recovering force of the mooring spring.
- 30
- 35

[0008] When the door is opened, the rod, when released from the keeper, is pushed by the spring to the outside and, consequently, the cover that is built into the rod is moved by pushing the mooring bracket to the outside, thus releasing the mooring bracket from the latch in such a way that it is designed to allow this latch to rise when it comes back into contact with the keeper as the door closes.

[0009] When the door closes, the head comes into contact with the closure plate attached to the door frame and consequently moves inside the box pushing the spring. This spring pushes the cover, releasing the mooring bracket of the stop from the cover, allowing the spring to exert a recovering force over the mooring bracket, displacing the bearing point of the mooring bracket on the latch, finally allowing the spring to exert a recovering force and rotate the latch, closing the door.

[0010] Note that exceeding the spring pressure of the mooring bracket does not require great efforts but the simple contact of the rod head with the door frame will start a simple mechanism where the spring pressure of the mooring bracket is released and consequently exerts the pressure of the latch spring to close the door, without

great efforts or blows on the frame, through a highly simple operation and assembly.

[0011] It is also worth noting that, once closed, the latch will have the effort of the latch spring and again the mooring of the mooring bracket, therefore it will have two alternative safety parts opposing the opening rotation of the latch, so if any of the springs break, the automatic closing device would remain closed with an important anti-theft security.

[0012] Preferably, an actuator element will be necessary to open the door that pushes the pivot of the mooring bracket and then pushes the end of the latch inside the box, consequently releasing the latch from the support that represents the housing in the mooring bracket, to later provide it with a torque that overcomes the force exerted by the latch spring.

[0013] More preferably, to execute the opening, at least one release cam connected to the box and rotating around a shaft may be used, designed to turn by means of an actuator element to push the pivot of the mooring bracket and subsequently the latch, opening the door.

[0014] The release cam may comprise a first cam section designed to be activated by an actuator element to make it rotate, a second cam section that has a first contact area to connect the pivot of the mooring bracket and make this mooring bracket rotate, and a second contact area to connect the housed area of the latch and make this latch rotate.

[0015] It may also comprise at least one spring fixed to the box and attached to the release cam to exert a recovering force that opposes the rotation of the cam and returns it to its initial rest position.

[0016] Note that when the latch has lowered to its closing position, the spring on the release cam pulls it, making it rotate to its initial or "vertical" position, anchoring the lock and preventing the latch from opening.

[0017] Preferably, the inside of the box may include a cylinder lock body that comprises a body and a small tube housed rotating inside the body, and has a housing to insert a key inside the housing in a first rotation direction of opening. This small tube comprises a cylinder lock cam that protrudes externally from the body to rotate along with the small tube when the key rotates inside the housing in a first rotation direction of opening. This cylinder lock cam would be the actuator element to rotate the release cam by turning a mechanical key.

[0018] Note that, when opening the door by turning the key in a first direction of rotation, the cylinder lock cam pushes the first section of the release cam by rotating the cam in the opposite direction until the contact area of the mooring bracket is pushed first, making it pivot by moving the bearing point on the latch, releasing it, and then the rotation of the cam pushes the latch, exceeding the recovering force of the latch spring and, as a consequence, it pivots in the first direction of rotation of opening, rising up to the stop defined by the geometry of the box, consequently allowing the door to open. The cam spring then exerts the recovering force over the cam,

returning to an initial rest position.

[0019] More preferably, and in combination with the mechanical opening with the cylinder lock, the device may have an electronic actuator element. This may be an electromagnet or a coil as an actuator element of the release cam, through a shaft activated by electrical stimulation with a remote control. In this case, the thrust of the shaft will actuate the mechanism explained above by means of the mechanical key.

[0020] Preferably, the keeper consists of a closure plate attached to the frame that comprises a variety of holes, an L-shaped stop configured to connect with the inclined distal end of the latch, and a protruding flange.

[0021] This keeper attached to the frame may present an elongated longitudinal distance from the frame with a variety of holes designed to close a door with a variety of latches from multiple locks arranged vertically.

[0022] Alternatively, the keeper may be on a hinge, U-shaped, more specifically, the keeper may also comprise:

- a contact plate designed to come into contact with the door, including two flaps that extend in a transverse direction to the contact plate, defining a rear flap and a front flap.
- a bar that joins the contact plate to the closure plate attached to the frame, designed to allow a hinge-type relative movement of the contact plate with the closure plate attached to the frame.
- a keeper spring inserted into the bar and configured to exert a unifying force between the contact plate and the closure plate, this spring allows a separation of approximately 5-30° between the plates, and the unifying force of the keeper spring is designed to keep the contact plate retracted against the closure plate attached to the frame. Preferably, this separation is 20°.

[0023] In this way, when the door is in an open position, the keeper spring keeps the closure plate and contact plate attached to each other to allow, when closing the door, the latch to enter an opening inside the contact plate, raising the latch.

[0024] When the door continues the closing movement, it comes into contact with the rear flap of the door, exerting pressure on the contact plate and consequently exceeding the force of the keeper spring, forcing the contact plate to move against the lateral or transversal surface of the door.

[0025] Consequently, the contact plate displaces the head of the lock and this head moves to the interior, triggering the closure of the lock explained above until the latch spring rotates the latch to a lower position, closing the lock and, consequently, the door attached to the contact plate.

[0026] Finally, when the door closes, the distal section of the latch, which is L-shaped, moves the contact plate into a closed position, exceeding the force of the keeper spring, and the two flaps project to the inside and outside

of the door, allowing greater security against possible thefts, making it difficult to access the interior to force the latch.

[0027] When the door is opened by mechanical means or by electromagnet, the opening mentioned above is activated, the latch rises and the L-shaped distal section of the latch stops holding the contact plate, allowing the door to open.

[0028] Note, therefore, that the unifying force exerted by the keeper spring will favour the opening of the door by exerting a recovering force that tries to join the contact plate to the closure plate, consequently facilitating a comfortable opening of the door.

[0029] Preferably, the keeper comprises a rotating keeper stop connected to the closure plate, located between the contact plate and closure plate, specifically above the latch when the door is closed, with the latch rotated in a lower position.

[0030] Moreover, the contact plate may have a stop opening in the shape of the transverse geometry of the stop, and this opening is located in a position higher than the keeper stop.

[0031] Consequently, when the lock is opened, the latch pushes the keeper stop, this stop, by rotating the contact plate, enters through the stop opening, allowing the free movement of the contact plate and, therefore, the keeper spring exerts a unifying force without opposing the closure stop or the L-shaped distal section of the latch.

[0032] Note that, when the door is closed, this closure stop exerts additional security, given that, if the latch is forced or even cut with a saw, the stop will keep the keeper in a closed position, consequently blocking a possible forced opening as it prevents the closure plate from joining the contact plate.

[0033] The hinge-type keeper may also have a movable stop with a spring, and this stop is attached to a small plate. The movable stop can be moved longitudinally along a cylinder situated on the closure plate attached to the frame so that, if inserted inside the hinge-type keeper, it is situated just above the keeper stop. In this way, the movable stop rotates and the end protruding from the small plate is anchored on the movable stop of the keeper, preventing it from pulling back due to the force of the spring.

[0034] Note that being in this position prevents the door opening from the outside, even with the key, as by preventing the keeper stop from lifting, this also prevents the latch from lifting and the door cannot be opened, neither from the outside nor the inside, even if using a key. If the stop rotates until it detaches the small plate from the closure stop, the movable stop is moved by the force of the spring into a position in which the closure stop is free, and therefore the door can be opened from both the inside and the outside.

[0035] Note that this is an added security for people who want complete security when they are inside their house, as it prevents entry from the outside if the keeper

is not unlocked.

[0036] Combinable with any of the above, the closure plate attached to the frame keeper may present an elongated longitudinal distance from the frame with a variety of holes designed to close a door with a variety of latches from multiple locks arranged vertically.

[0037] The device can simultaneously close all locks using a linked or "multipoint" mechanism. Preferably, each release cam may have a rigidly coupled gear mechanism, which rotates together with this release cam, moving a drive whilst turning the key or the electromagnet for closing, communicating the same movement to a variety of lock boxes arranged vertically by means of movement strips.

[0038] Preferably, the multipoint lock may have a different configuration in relation to the release rod, which although similar and performs the same function explained above, in this case the rod spring is inside this rod and pushes both the rod towards the outside of the lock and a locking part of a rack-and-pinion drive inwards. This rack-and-pinion drive interlocks with a gear mechanism placed on the same release cam shaft and transmits movement to the different locks placed.

[0039] This rack-and-pinion drive has a slotted area where a protruding area from the locking piece of the drive is inserted when the door is closed because this locking part is pushed by the rod spring to the inside of this slot, preventing the movement of the rack-and-pinion drive and therefore the forcing of the lock if it was somehow possible to activate any of the drive elements between the different locks.

[0040] To open the lock, this is done by turning the small tube in the cylinder lock by means of a key. When turning the small tube, it initially carries a cam, here we have represented it outside the small tube, but it may also be preferably carried out inside the keyhole to facilitate the placement of the keyhole inside the lock. This cam, by turning the small tube, displaces a locking piece, taking it out of the slot and allowing the small tube to continue rotating by connecting the keyhole cam to the release cam and opening the lock as described above, having unlocked the rack-and-pinion drive.

[0041] More preferably, and in combination with the mechanical opening with the cylinder lock, the device may have an electronic actuator element. These may be two electromagnets or a few coils as an actuator element of the release cam and the locking piece, through a shaft activated by electrical stimulation with a remote control. In this case, the thrust of the shaft of the electromagnet will first act by unlocking the rack-and-pinion drive and then the electromagnet movement of the release cams will activate the mechanism explained above by means of a mechanical key.

DESCRIPTION OF THE DRAWINGS

[0042] To complement the description being made and in order to aid towards a better understanding of the char-

acteristics of the invention, in accordance with a preferred example of practical embodiment thereof, a set of drawings is attached as an integral part of said description wherein, with illustrative and non-limiting character, the following has been represented:

Figure 1. Shows a front view of inside the lock box in a first embodiment for the automatic door closure.

Figure 2. Shows a front view of the closure plate in the opening process according to the previous embodiment.

Figure 3. Shows a perspective view of the keeper, which includes a closure plate attached to the frame according to the previous embodiment.

Figure 4. Shows a front view of inside the lock box in a second embodiment, which clearly shows an electronic actuator element that comprises an electromagnet and an actuator shaft electronically stimulated by this electromagnet.

Figure 5. Shows a rear perspective view of a third embodiment of a U-shaped keeper with hinge-type movement.

Figure 6. Shows a front perspective view of the embodiment of the above figure of a U-shaped keeper with hinge-type movement.

Figure 7. Shows a front view of inside the lock box according to the previous embodiment, which clearly shows the gear mechanism, the drive of vertical movement for the simultaneous opening of the locks.

Figure 8. Shows a front view of the keeper according to a fourth embodiment of the device with the simultaneous or multipoint opening of multiple vertically arranged locks that can be combined with any of the above.

Figure 9. Shows a front view of a fifth embodiment of a simultaneous or multipoint opening, which clearly shows the locking piece and an additional electronic actuator element to unlock the drive.

Figure 10. Shows a front view of a sixth embodiment of inside the lock box, which has a longer mooring and a hole where the drive shaft enters.

Figure 11. Shows a front view of the embodiment of Figure 10, where the bolt stop is rotated resting on the rotary bolt.

Figure 12. Shows a perspective view of the embodiment of Figure 10, which shows the rotating bolt, the bolt stop and the release cam.

Figure 13. Shows a perspective view of the embodiment of Figure 10, which shows the keeper latch and the window where the rotating bolt enters.

Figure 14. Shows a side perspective view of a seventh embodiment with a U-shaped keeper.

PREFERED EMBODIMENT OF THE INVENTION

[0043] Figure 1 shows a front view of inside the box (1) of a lock (1a) in a first embodiment of the automatic door closing device, which clearly shows inside the box (1) of a lock (1a) when it is in a closed state. This box (1) comprises a cylinder lock (2) with a cam (30) designed as an actuator element for the opening mechanism, by turning a mechanical key.

[0044] This box also comprises a mounting bracket (11) attached to the box (1), rotating around a mounting shaft (5) that comprises a housing (18), an elongated pivot section (20) and a guide (21) located in the section, distal to the mounting bracket (5), with this guide (21) that presents a stop (19).

[0045] The box (1) also contains a latch (7) connected to the box (1) turning around a latch shaft (4), which comprises a section protruding (71) from the box (1) and a section housed (72) inside the box (1), where the housed section (72) is inside the housing (18) of the mounting bracket (11), and where this housing (18) serves as a bearing point and lock for the latch (7). In a distal section, the protruding section (71) presents a transverse and inclined protrusion (73) with respect to the box (1).

[0046] The box (1) also comprises a release cam (10) connected to the box (1), rotating around a shaft (9) designed to rotate by actuating the cam (3) by turning a mechanical key. This cam comprises a first section of the cam (100) designed to be activated by the key to make it rotate, a second section of the cam (101) that has a first contact area (102) to connect with the section (20) of the mooring bracket and make this mooring bracket (11) turn, and a second contact area (103) to connect with the housed area of the latch (72) and make this latch (7) turn.

[0047] Figure 1 also shows a spring (17) fixed to the box (1) and attached to the mooring bracket (11) to exert a recovering force that opposes the rotation of the mounting bracket (11) when it is pushed by the cam (10), a spring (8) that exerts a recovering force that opposes the rotation of the latch when it is pushed by the cam (10), and a spring (16) fixed to the box (1) and attached to the release cam (10) to exert a recovering force that opposes the rotation of the release cam (10).

[0048] So, as shown in Figure 2, when opening the door by turning the key in the cylinder lock (2) in a first direction of rotation, the cam (30) pushes the first section (100) of the release cam (10) by rotating the cam in the opposite direction until the pivot (20) of the mounting bracket (11) is pushed first, making it pivot by moving the bearing point of the housing (18) on the latch (7), and

then the rotation of the release cam (11) pushes the housed area (72) of the latch (7), exceeding the recovering force of the latch spring (8) and, as a consequence, it pivots in the first direction of rotation of opening, rising up to the stop defined by the geometry of the box (1), consequently allowing the door to open.

[0049] Once opened, the cam spring (16) exerts the recovering force on the release cam (10), returning to an initial rest position, whereby the mooring bracket (11) returns to its initial vertical position.

[0050] Figure 3 shows a view of the keeper (2a) from the previous embodiment, which shows a closure plate (20) designed to be attached to the door frame, this closure plate (20) comprises a variety of holes (25), an L-shaped stop (26) designed to connect to the inclined distal end of the latch (73), and a protruding flange (27).

[0051] Figure 1 also shows a rod (22) that comprises a head (13) protruding from the box (1), a base (12) adjacent to the head (13), this base (12) comprises a spring (15) and is attached to the box (1). The rod (22) also comprises a cover (14), where the cover (14) is in direct contact with the stop (19) of the release bracket (11), when the lock (1a) is closed or open but not when it is the process of opening, in such a way that this contact between the stop (19) and the cover (14) resist the recovering force of the spring (17) by keeping the mooring bracket (11) at rest and vertical. When in the process of opening, the head (13) comes out of the lock and therefore releases the latch (7) from the mooring bracket (11) through the force exerted on the area (19) by the cover (14), allowing this latch to rise.

[0052] When the door is closed, the stop (26) on the closure plate (20) comes into contact with the inclined face of the latch (7), forcing it to rise. The head (13) and cover (14) have freedom of longitudinal movement with respect to the base (12) attached to the box (1), whereby the head (13) then comes into contact with the flange protruding (27) from the closure plate (20) attached to the door frame and consequently moves inside the box (1), pushing the spring (15) that in turn pushes the cover (14), freeing the mooring bracket (11) from the stop (14) and consequently allowing the spring (17) to exert a recovering force over the mounting bracket (11), displacing the bearing point of the latch (7) over the mooring (11), finally allowing the spring (8) to exert the recovering force and rotate the latch, closing the door.

[0053] Note that, once the lock (1a) is closed, it has two independent safety systems. The first is the latch spring (8) and, as an auxiliary system, the housing (18) of the mooring bracket (11) in a vertical position acts as a bearing point and prevents the forced opening of the latch (7).

[0054] Figure 4 shows a front view of inside the lock box in a second embodiment, where the lock also comprises an electronic actuator element formed by an electromagnet and an actuator shaft electronically stimulated by this electromagnet.

[0055] Figure 5 shows a perspective view of a third

embodiment of the device, which comprises the lock described above and an alternative U-type keeper with hinge-type movement. The third embodiment shown by Figure 5 comprises a keeper (2b) formed by a contact plate (31) designed to come into contact with the door and where this contact plate (31) includes two flaps (32, 33) that extend in a transverse direction to the contact plate, defining a rear flap (33) and a front flap (32). This contact plate also includes a slot (43) designed to allow the head (13) of the lock rod (22) to penetrate.

[0056] Figure 6 shows a bar (34) that joins the contact plate (31) to the closure plate (35), designed to allow a hinge-type relative movement of the contact plate (31) with the closure plate (35) attached to the frame.

[0057] The keeper (2b) also comprises a keeper spring (36) inserted into the bar (34) and configured to exert a unifying force between the contact plate (31) and the closure plate (35), this spring (36) allows a separation between the plates (35, 31) and the unifying force of the keeper spring is designed to keep these plates together by means of a recovering force exerted by this spring (36).

[0058] Therefore, when the door is in an open position, the keeper spring (36) keeps the closure plate (35) and contact plate (31) attached to each other to allow, when closing the door, the latch (71) to enter an opening (37) inside the contact plate (31), raising the latch (71) by means of the inclination it presents in its distal section (73).

[0059] When the door continues the closing movement, it comes into contact with the rear flap (33) of the door, exerting pressure on the contact plate (31) and consequently exceeding the force of the keeper spring (36), forcing the contact plate (31) to move against the transversal or lateral surface of the door.

[0060] As a consequence, the contact plate displaces the head of the lock and this head (13) moves to the inside, triggering the closure of the lock explained above until the recovering force of the latch spring (8) turns the latch (71) towards a lower position, closing the lock.

[0061] Finally, when the door closes, the distal section of the latch (73), which is L-shaped, moves the contact plate (31) into a closed position, overcoming the force of the keeper spring (36), and the two flaps (32, 33) project to the inside and outside of the door, respectively, allowing greater security against possible thefts, making it difficult to access the interior to force the latch.

[0062] When the door is opened by mechanical means or by electromagnet, the opening mentioned above is activated, the latch (7) rises and the L-shaped distal section (73) of the latch stops holding the contact plate (31), allowing the door to open.

[0063] Note, therefore, that the unifying force exerted by the keeper spring (36) will favour the opening of the door by pushing the contact plate (31) against the closure plate (35), facilitating an easy opening.

[0064] Figure 6 shows a lateral view of the described embodiment, which shows that the keeper (1b) compris-

es a rotating keeper stop (38) connected to the closure plate (35), located between the contact plate (31) and closure plate (35), specifically above the latch (71) when the door is closed, with the latch (71) rotated in a lower position.

[0065] Figure 6 also shows that the contact plate (31) has a stop opening (37), which defines the transversal geometry of the stop (38), and this opening (37) is located in a position higher than the keeper stop (38).

[0066] Consequently, when the lock is opened, the latch (71) pushes the keeper stop (38), this keeper stop (38) enters through the stop opening (37), allowing the free movement of the contact plate (31) and, consequently, the keeper spring (36) exerts a unifying force without the opposition that the closure stop previously exerted before being pushed by the latch, nor by the fastening exerted by the L-shaped distal section (73) of the latch (7), consequently allowing the door to be opened comfortably.

[0067] Note that, when the door is closed, this closure stop (38) acts as an additional security, because if the distal section protruding from the latch (7) is forced or even cut with a saw, the keeper stop (38) will keep the keeper (2b) in a closed position, preventing any possible forced opening.

[0068] In the preferred embodiment of the hinge-type keeper described above, the keeper also comprises a movable stop (42) with a spring (41), and this stop (42) is attached to a small plate (40). The movable stop (42) is designed to be moved longitudinally along a cylinder situated on the closure plate attached to the frame so that, if inserted inside the hinge-type keeper, it is situated just above the keeper stop (38). In this way, the movable stop (42) rotates and the end protruding from the small plate (40) is anchored on the movable stop (42) of the keeper, preventing it from pulling back due to the force of the spring (41).

[0069] Note that being in this position prevents the door opening from the outside, even with the key, as by preventing the keeper stop from lifting, this also prevents the latch from lifting and the door cannot be opened, neither from the outside nor the inside, even if using a key. If the stop (42) rotates until it detaches the small plate (40) from the closure stop (38), the movable stop (42) is moved by the force of the spring into a position in which the closure stop is free, and therefore the door can be opened from both the inside and the outside.

[0070] Note that this is an added security for people who want complete security when they are inside their house, as it prevents entry from the outside if the keeper is not unlocked.

[0071] Figures 7 and 8 show a fourth embodiment of the device that allows all locks to be simultaneously closed by a linked or "multipoint" mechanism. This embodiment has a second rear release cam that has a coupled gear mechanism (201), which rotates together with this second release cam, moving a drive (200) whilst turning the key or the electromagnet for closing and for com-

municating the same movement to a variety of lock boxes arranged vertically, through the drive (200).

[0072] Figure 9 shows a fifth embodiment, more specifically of the "multipoint" type, which comprises a different configuration in relation to the release rod (22), which although similar and performs the same function explained above, in this case the spring (207) is inside the rod and pushes both the rod towards the outside of the lock and a locking part (202) inwards. The rack-and-pinion drive (200) interlocks with a gear mechanism (201) placed on the same shaft of the release cams and transmits movement to different locks arranged vertically.

[0073] This multipoint embodiment, with rack-and-pinion drive, has a slotted area (206) where a protruding area from the locking piece (202) of the drive is inserted when the door is closed because this locking part (202) is pushed by the spring (207) to the inside of this slot (206), preventing the movement of the rack-and-pinion drive (200) and therefore the forcing of the lock if it was somehow possible to activate any of the drive elements between the different locks.

[0074] To open the lock, this is done by turning the small tube in the cylinder lock (3) by means of a key. According to this embodiment, the cylinder lock (3) comprises a cam (203) that rotates integrally, this cam (203), by turning the cylinder lock (3), displaces a locking piece (202), taking it out of the slot (206) and allowing rotation to continue by connecting the cam (203) to the release cams and opening the lock as described above, having unlocked the rack-and-pinion drive.

[0075] In this preferred embodiment, the device also comprises two electromagnets (204 and 205) as an actuator element of the release cam and the locking piece (202), through a shaft activated by electrical stimulation with a remote control. In this case, the thrust of the shaft of the electromagnet (205) will first act by unlocking the rack-and-pinion drive and then the electromagnet movement of the release cams (204) will activate the mechanism described above by means of a mechanical key.

[0076] Figures 10 and 11 show a sixth embodiment of the device in which the mooring (11) is amended to be longer and adding a hole where the drive shaft (305) enters. A rotating bolt (300) is added that has a stop area (300a), which supports the rotating bolt stop (301) that rotates on the mooring shaft (5) and that has a thrust area (301a) adapted to be pushed by the flange (104) on the release cam (10). The bolt drive (302) is also added, which is attached rotating to the rotating bolt (300) by the second drive shaft (303).

[0077] Note that the spring (16) that, in previous embodiments, impeded anti-clockwise rotation of the release cam (10), in this embodiment it helps it.

[0078] The operation is similar to the previous embodiments, but in this case when the door is open, the rod (13) is outside the box forcing through the cover (14). When the mooring is rotating, in this position and due to this rotation, the bolt (300) enters inside the box (1). At this time the bolt stop (301) is rotated resting on the ro-

tating bolt (300), as shown in Figure 11.

[0079] Figure 13 shows that a keeper latch (320) has been added to the closure plate (20) and a window (321) has been created where the rotating bolt (300) enters.

[0080] When closing the door, the latch (7) comes into contact with the L-shaped stop (26). The latch lifts and continues to rotate the door. The rod (13) comes into contact with the protruding flange (27), starting to enter inside the box (1), in doing so, the mooring should go backwards to become vertical, but in this embodiment, the spring (16) keeps the release cam (10) supported on the latch (7) so that the mooring (11) cannot rotate and thus the rotating bolt is kept retracted until the latch (7) can lower. The door keeps rotating and the latch (7) collides with the keeper latch (320), raising it.

[0081] When the door reaches the end of its travel, the latch (7) rotates to its lowest position, forced by the latch spring (8) and in doing so, the keeper latch (320) also rotates until it is supported on the latch (7), and this latch also blocks the lock (1a). When the latch (7) rotates to its lowest position, in doing so it forces the release cam (10) to rotate clockwise and this forces the rotating bolt to rotate (300) through the connection with the mooring shaft (11) of the bolt drive (302), so that when the latch (7) has rotated to its lowest position, the rotating bolt enters the window of the closure plate (20) and is positioned just above the keeper latch (320).

[0082] Upon reaching this position, the rotating bolt (300) has been placed just above the keeper latch (320), preventing the two latches from being raised. On the other hand, when the rotating bolt (300) has reached its final position, the rotating bolt stop is pulled by the spring (306), turning it until it is positioned over the stop zone (300a). In this position, it blocks the rotation of the rotating bolt (300), preventing its movement if an attempt is made to force it.

[0083] This is why in this embodiment, the security of the lock is very high because it has two latches that prevent its opening, both are blocked by the rotating bolt that prevents forced entry and the rotating bolt also has a stop that prevents forced entry. In addition to this, the latch (7) cannot be lifted without forcing the mooring (11).

[0084] Figure 14 shows a seventh embodiment in which the above lock (1) is combined with a U-shaped keeper.

[0085] In this embodiment, the door starts rotating with the lock also in the open position, with the head (13) outside the box (1) and the mooring (13) in the rotated position with the rotating bolt (300) inside the box (1).

[0086] When rotating the door, the latch (7) firstly connects with the opening (37), touching the edge and lifting. The door opens, almost touching the rear flap (33). The door continues rotating and the head (13) enters through the slot (43), then the latch connects with the stop (38), lifting it. When the door has almost reached the end of its travel, it collides with the front flap (32), rotating the contact plate (31) so that it embraces the door with the two front and rear flaps. In this rotation of the contact

plate (31), this plate pushes the rod (13) towards the inside of the box (1), performing the same function as previously explained.

[0087] The rod (13) comes into contact with the contact plate (31), starting to enter inside the box (1), in doing so, the mooring should go backwards to become vertical, but in this embodiment, the spring (16) keeps the release cam (10) supported on the latch (7) so that the mooring (11) cannot rotate and thus the rotating bolt is kept retracted until the latch (7) can lower.

[0088] A little before the door reaches the end of its travel, the latch (7) may lower to be behind the contact plate. At this moment, it lowers and also allows the stop (38) to lower. When the latch (7) is lowered by the force of the spring (8), it also forces the release cam (10) to be in its high position, allowing the mooring (11) to become vertical and turning the rotating bolt (301) into its final closed position, placed on top of the stop (38) preventing its rotation and also that of the latch (7).

[0089] The stop (38), when in its low position, prevents the contact plate from being able to go back, as it collides with the bolt stop (38) in the final area of the window (390). In this position, if we turn the movable stop (42) 180 degrees, we make the small plate (40) position itself just above the stop (38), preventing the door from being opened from the outside and the inside, neither with the key nor from the inside with the handle as it does not allow the latches to rise, so it blocks the entire lock. This is important if someone who is inside does not want to allow anyone to enter, as they can turn the movable stop so nobody has access from outside.

[0090] To open the lock, turn the key and the release cam (10) starts to turn. Firstly, the pin (104) of the release cam (10) pushes the rotating bolt stop (301) into the stop thrust area (301a), lifting the rotating bolt stop (301). Keep turning the key and the area (101) of the release cam (10) pushes the mooring (11) turning it, which causes the rotating bolt (300) to enter the box (1). After the mooring (11) pushed by the release cam (10) reaches its maximum turning point, the rotating bolt is completely inside the box (1). The cam keeps turning and finally pushes the latch (7) with the area (103). Doing this raises the stop (38) from the keeper. At this moment, the keeper spring (36) pushes the contact plate, helping it rotate. With a gentle push, the contact plate (31) rotates and the door opens.

[0091] The stop (38) with a flange is the one that acts as a stop against the contact plate (31) at the moment when both plates have come together, and this flange is supported on the lower part of the window (39).

[0092] In this position, the head (13) has come out, which, by means of the spring (15) and the cover (14), pushes the release cam (11) and maintains it whilst the door is open in the position shown in Figure 11.

[0093] We note the advantages of this U-shaped keeper with the lock:

- When the door is closed, it has the security of the

latch (7) that cannot be lifted because the mooring (11) prevents it.

- When the door is closed, the stop (38) prevents it from opening as the contact plate cannot rotate due to being prevented by this stop. 5
- If one wants to force the door by pushing on it, all force is concentrated against this stop (38), and this protects the lock from forcing any effort on either the rotating bolt (300) or the latch (7). This is really important as in current locks on the market, this effort is supported by the lock through the bolts and the latch, which is a considerable advantage. 10
- The rotating bolt (300) blocks both the stop (38) and the latch (7) and forcing them is very difficult as it requires bending the front flange (33) to gain access and also the stop (38) is behind the contact plate (31), so forcing it is not easy. 15
- It has a rotating bolt stop (301) that blocks the rotating bolt (300), preventing it from being forced. 20
- Closure is automatic, it occurs without the need for a key.
- It is opened without great effort on the key, as all parts involves rotate around a shaft, so their movements do not require effort. For example, the spring on the rotating bolt stop (301) is very weak, it only needs to force the rotating bolt stop (301) to rotate until it rests against the bolt stop area (300a) of the rotating bolt (300). Really it would lower by gravity, but we must ensure its rotation with a small spring. The same occurs with the spring (16) on the release cam (10). 25
- Likewise, the efforts of the key in the turn are staggered, first the mooring spring (17) is forced, which also does not need a great effort to move the rotating stop (300) and the mooring (11), and when complete, the rotation of the mooring (11) starts to raise the latch (7), which does require a somewhat stronger spring, but at that moment the release cam (10) supports most of the effort of the mooring spring (17). Therefore, the effort to be made on the key is little more than that required to raise the latch (7). This is one of the biggest advantages over the current locks that, if they are multipoint, usually require 2 to 5 turns of the key to close the various bolts on the door. 30
- Moreover, as all interior movements of the lock are rotations between parts, it is a silent lock. 35
- This ease of opening helps a simple motor or electromagnet perform the opening, as no great effort is required. 40
- When the door is closed, the keeper spring (36) acts as a shock absorber and when the door is opened, it facilitates this opening as it tends to bring the two keeper plates closer, facilitating opening. 45

Claims

1. Automatic opening and closing device for doors,

comprising a keeper (2a, 2b) and at least one lock (1a), wherein the keeper (2a, 2b) includes a closure plate (20,35) attached to the frame of a door, **characterised in that** the lock (1a) comprises:

- a box (1),
- a mounting bracket (11) attached to the box (1), rotating around a mounting shaft (5) that comprises a housing (18), an elongated pivot section (20) and a guide (21) located in the distal section of the mounting shaft (5), with this guide (21) presenting a stop (19),
- a latch (7) connected to the box (1), rotating around a latch shaft (4), which comprises a protruding section (71) protruding from the box (1) and a housed section (72) housed inside the box (1), where the housed section (72) inside the housing (18) of the mooring bracket (11) serves as a bearing point for this latch (7), and the protruding section (71) interacts with the keeper (2a, 2b) to open or close the door,
- a spring (17) fixed to the box (1) and attached to the mounting bracket (11) to exert a recovering force that opposes the rotation of the mounting bracket (11),
- a spring (8) that exerts a recovering force that opposes the rotation of the latch when it is in a closed position, and
- a rod (22) that comprises a head (13) protruding from the box (1), a base (12) adjacent to the head (13), said base (12) comprises a spring (15) and it is attached to the box (1), the rod (22) also comprises a cover (14), where the cover (14) is in direct contact with the stop (19) of the release bracket (11), in a closed position, where contact between the stop (19) and the cover (14) resist the recovering force of the spring (17).

2. Automatic opening and closing device for doors according to claim 1, **characterised in that** it comprises a release cam (10) connected to the box (1), in a rotating manner with respect to a shaft (9) intended to rotate by activating an actuator element to push the pivot (20) and subsequently the housed area of the latch (7), opening the door.
3. Automatic opening and closing device for doors, according to claim 2, **characterised in that** it comprises a spring (16) fixed to the box (1) and attached to the release cam (10) to exert a recovering force that opposes the rotation of the cam (10) designed to return the release cam (10) to its initial position.
4. Automatic opening and closing device for doors, according to claim 3, **characterised in that** it comprises a cylinder lock with a cam as actuator element to act on the release cam (10) by turning a mechanical key.

5. Automatic opening and closing device for doors, according to claim 3, **characterised in that** it comprises an opening cylinder lock (21) as an actuator element of the release cam (10) said cylinder lock (21) having a shaft activated by electrical stimulation. 5
6. Automatic opening and closing device for doors, according to claim 1, **characterised in that** the closure plate (20) comprises a stop (26) designed to come into contact with the section protruding from the latch (71). 10
7. Automatic opening and closing device for doors, according to claim 6, **characterised in that** the closure plate (20) comprises a flange (27) designed to come into contact with the head (13) of the rod (15). 15
8. Automatic opening and closing device for doors, according to claim 1, **characterised in that** the keeper (2b) comprises a contact plate (31) and a bar (34), allowing a hinge-type movement between the contact plate (31) and the closure plate (35). 20
9. Automatic opening and closing device for doors, according to claim 8, **characterised in that** the closure plate (31) comprises two flaps (32, 33) designed to extend to the front and rear of the door. 25
10. Automatic opening and closing device for doors, according to claim 8, **characterised in that** the keeper (2b) comprises a keeper spring (36) designed to exert a unifying force between the contact plate (31) and the closure plate (35). 30
11. Automatic opening and closing device for doors, according to claim 8, **characterised in that** the keeper (2b) comprises a rotating keeper spring (38) connected to the closure plate (35), designed to be pushed by the latch (7) upon opening. 35
12. Automatic opening and closing device for doors, according to claim 9, **characterised in that** the contact plate (31) comprises an opening (39) designed to introduce the transversal section of the keeper stop (38). 40
13. Automatic opening and closing device for doors, according to claim 1, characterised because it comprises a second release cam (10) attached to a gear mechanism (201), configured to move a rack-and-pinion drive (200) to simultaneously open multiple vertically adjacent lock boxes (1b). 45
14. Automatic opening and closing device for doors, according to claim 12, characterised because it comprises a locking piece (202) and a slot (206). 50
15. Automatic opening and closing device for doors, ac-

cording to claim 13, characterised because it comprises an electronic actuator element (205) configured to unlock the drive.

- 5 16. Automatic opening and closing device for doors, according to claim 8, characterised because it comprises a movable stop (42) and a spring (41) designed to prevent the lock (1a) from being opened from the outside. 10

Amended claims under Art. 19.1 PCT

1. Automatic opening and closing device for doors, comprising a keeper (2a, 2b) and at least one lock (1a), wherein the keeper (2a, 2b) includes a closure plate (20,35) attached to the frame of a door, **characterised in that** the lock (1a) comprises:
 - a box (1),
 - a mooring bracket (11) attached to the box (1), rotating around a mounting shaft (5) that comprises a housing (18), an elongated pivot section (20') and a guide (21) located in the distal section of the mounting shaft (5), with this guide (21) presenting a stop (19),
 - a latch (7) connected to the box (1), rotating around a latch shaft (4), which comprises a protruding section (71) protruding from the box (1) and a housed section (72) housed inside the box (1), so that when the housed section (72) is inside the housing (18) the latch (7) is blocked such that the movement of said latch (7) is prevented,,, and the protruding section (71) interacts with the keeper (2a, 2b) to open or close the door,
 - a spring (17) fixed to the box (1) and attached to the mooring bracket (11) to exert a recovering force that opposes the rotation of the mooring bracket (11),
 - a spring (8) that exerts a recovering force that opposes the rotation of the latch when it is in a closed position, and
 - a rod (22) that comprises a head (13) protruding from the box (1), a base (12) adjacent to the head (13), said base (12) comprising a spring (15) and the base (12) is attached to the box (1), the rod (22) also comprises a cover (14) so that during the closing of the door:
 - the rod (22) protrudes from the box (1) due to the force of the spring (15) while the door is still open and the mooring bracket (11) is forced to rotate clockwise against the force of the spring (17) due to the contact between the cover (14) and the stop (19),
 - the latch (7) therefore is forced to rise by coming in contact with the closure plate (20,35) and the rod (22) is thereafter forced to move inwards

- by the contact between the head (16) and a protruding flange of the closure plate (20) against the force of the spring (15),
 - the cover (14) is thereby moved inwards away from the stop (19) so that the mooring bracket (11) is free to move counter clockwise, and
 - when the latch (7) rotates downwards assisted by the force of the spring (8) the housed section (72) of the latch (7) is blocked against moving upwards.,
2. Automatic opening and closing device for doors according to claim 1, **characterised in that** it comprises a release cam (10) connected to the box (1), in a rotating manner with respect to a shaft (9) intended to rotate by activating an actuator element to push the pivot section (20') and subsequently the housed area of the latch (7), opening the door.
 3. Automatic opening and closing device for doors, according to claim 2, **characterised in that** it comprises a spring (16) fixed to the box (1) and attached to the release cam (10) to exert a recovering force that opposes the rotation of the cam (10) designed to return the release cam (10) to its initial position.
 4. Automatic opening and closing device for doors, according to claim 3, **characterised in that** it comprises a cylinder lock with a cam as actuator element to act on the release cam (10) by turning a mechanical key.
 5. Automatic opening and closing device for doors, according to claim 3, **characterised in that** it comprises an opening cylinder lock (21) as an actuator element of the release cam (10) said cylinder lock (21) having a shaft activated by electrical stimulation.
 6. Automatic opening and closing device for doors, according to claim 1, **characterised in that** the closure plate (20) comprises a stop (26) designed to come into contact with the section protruding from the latch (71).
 7. Automatic opening and closing device for doors, according to claim 6, **characterised in that** the closure plate (20) comprises a flange (27) designed to come into contact with the head (13) of the rod (15).
 8. Automatic opening and closing device for doors, according to claim 1, **characterised in that** the keeper (2b) comprises a contact plate (31) and a bar (34), allowing a hinge-type movement between the contact plate (31) and the closure plate (35).
 9. Automatic opening and closing device for doors, according to claim 8, **characterised in that** the closure plate (31) comprises two flaps (32,33) designed to extend to the front and rear of the door.
 10. Automatic opening and closing device for doors, according to claim 8, **characterised in that** the keeper (2b) comprises a keeper spring (36) designed to exert a unifying force between the contact plate (31) and the closure plate (35).
 11. Automatic opening and closing device for doors, according to claim 8, **characterised in that** the keeper (2b) comprises a rotating keeper spring (38) connected to the closure plate (35), designed to be pushed by the latch (7) upon opening.
 12. Automatic opening and closing device for doors, according to claim 9, **characterised in that** the contact plate (31) comprises an opening (39) designed to introduce the transversal section of the keeper stop (38).
 13. Automatic opening and closing device for doors, according to claim 1, characterised because it comprises a second release cam (10) attached to a gear mechanism (201), configured to move a rack-and-pinion drive (200) to simultaneously open multiple vertically adjacent lock boxes (1b).
 14. Automatic opening and closing device for doors, according to claim 12, characterised because it comprises a locking piece (202) and a slot (206).
 15. Automatic opening and closing device for doors, according to claim 13, characterised because it comprises an electronic actuator element (205) configured to unlock the drive.
 16. Automatic opening and closing device for doors, according to claim 8, characterised because it comprises a movable stop (42) and a spring (41) designed to prevent the lock (1a) from being opened from the outside.

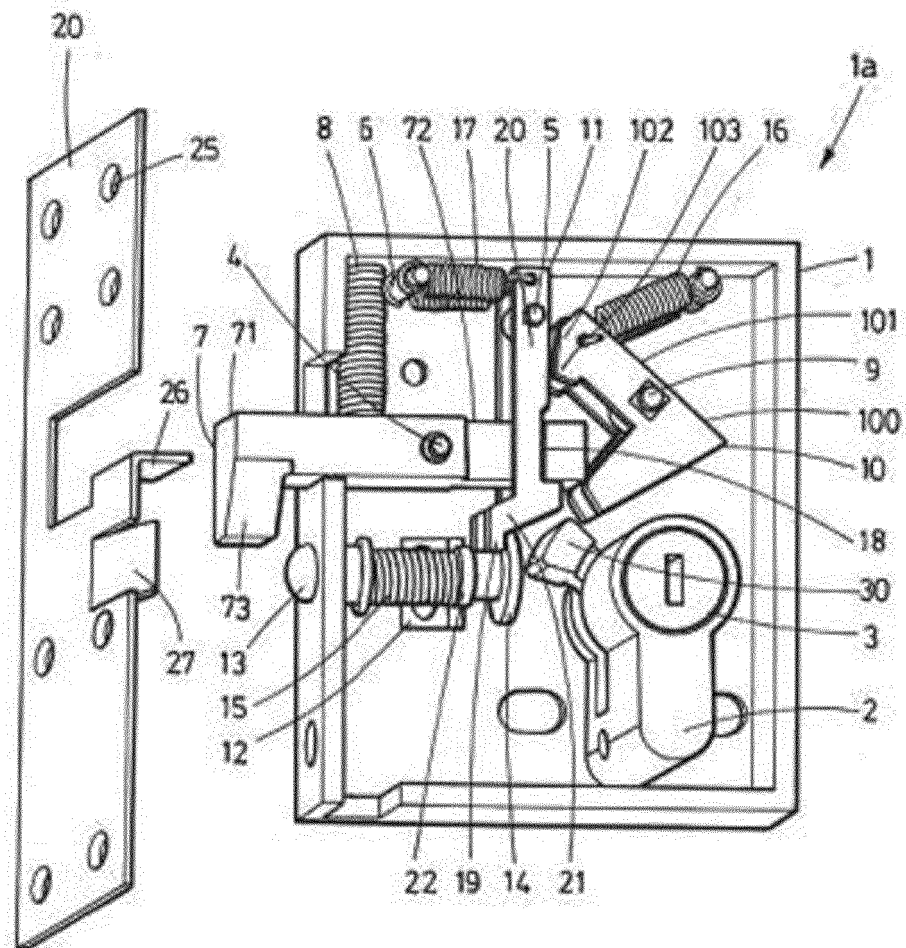


FIG.1

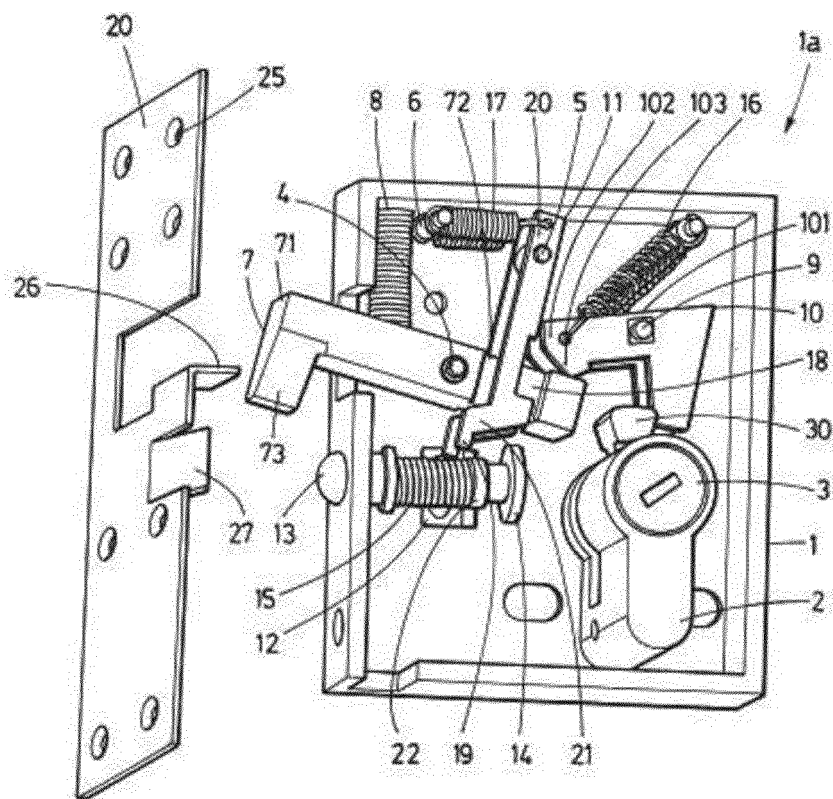
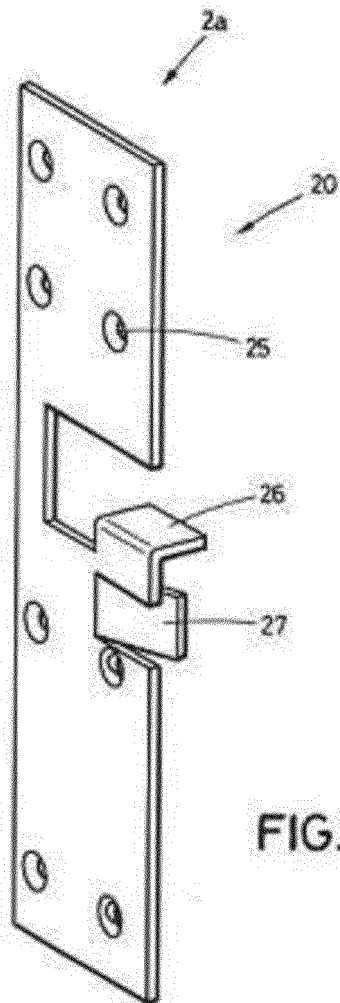


FIG.2



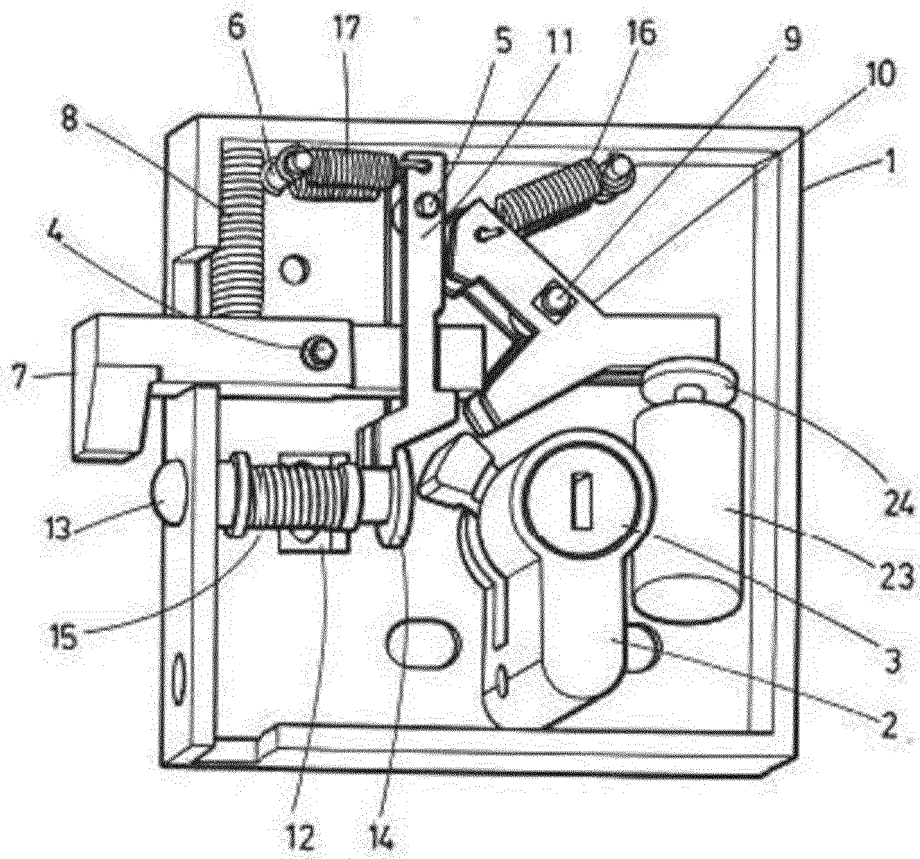


FIG.4

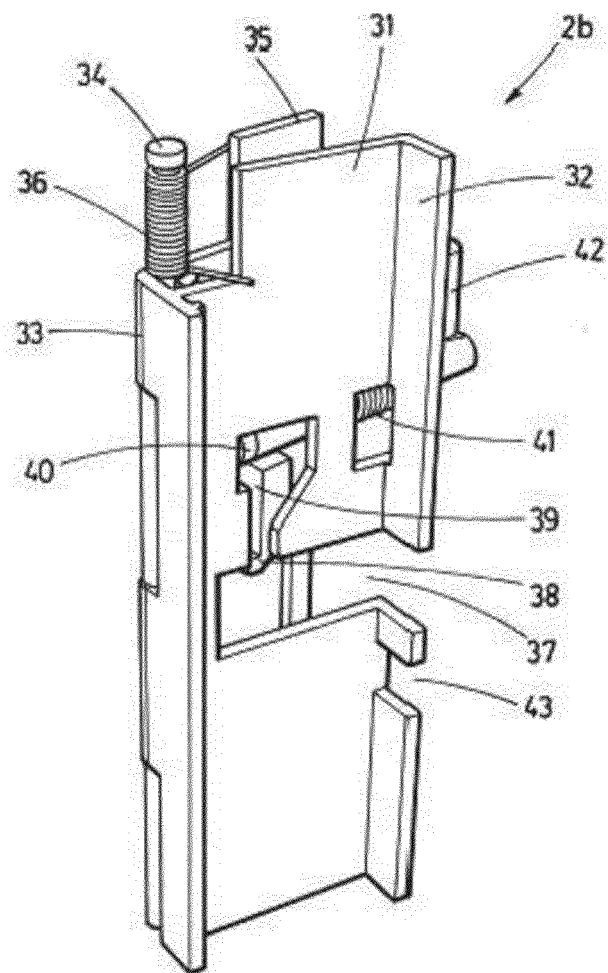


FIG.5

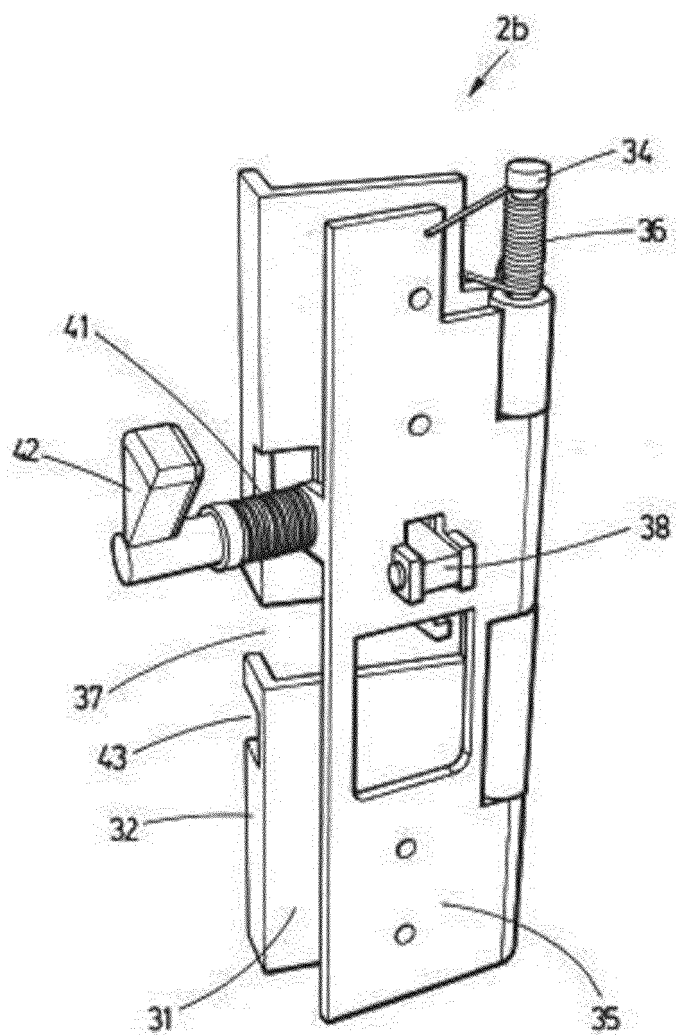


FIG.6

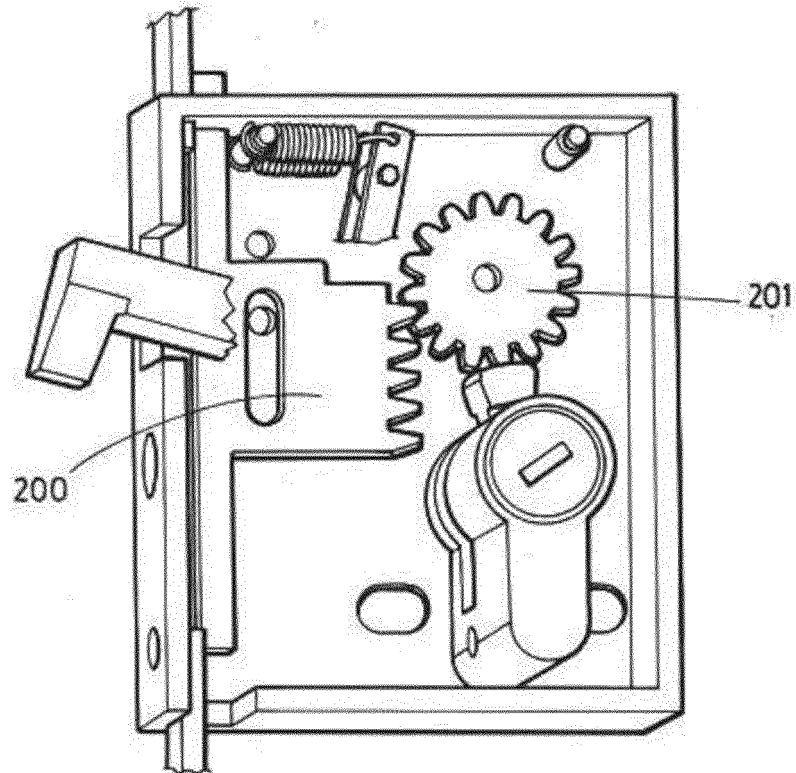
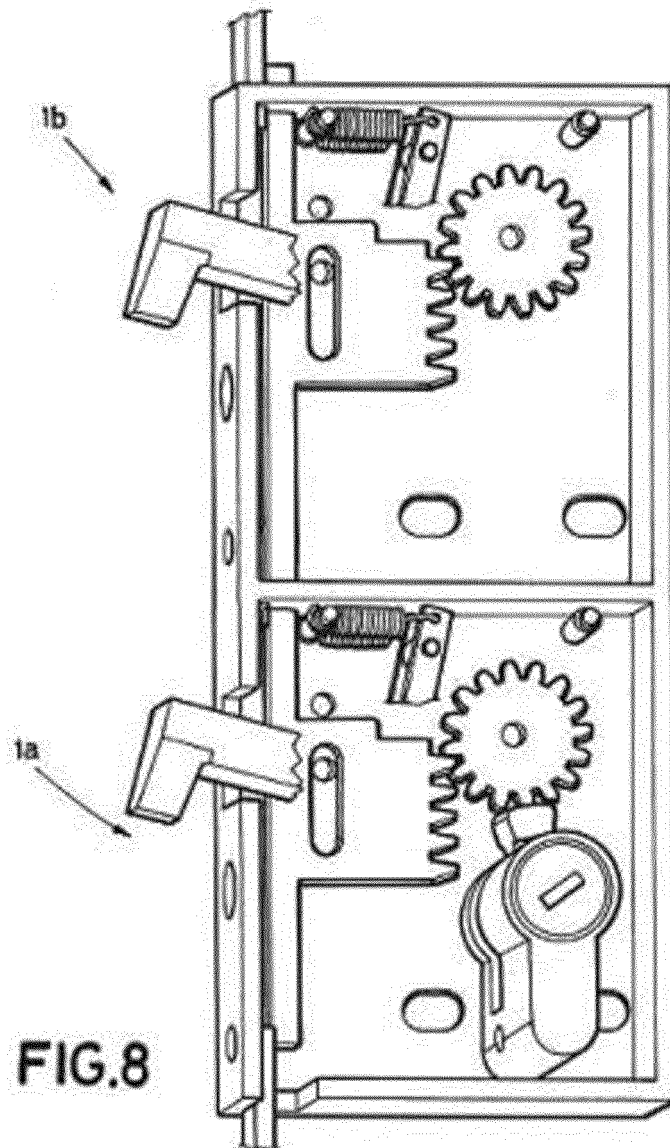


FIG.7



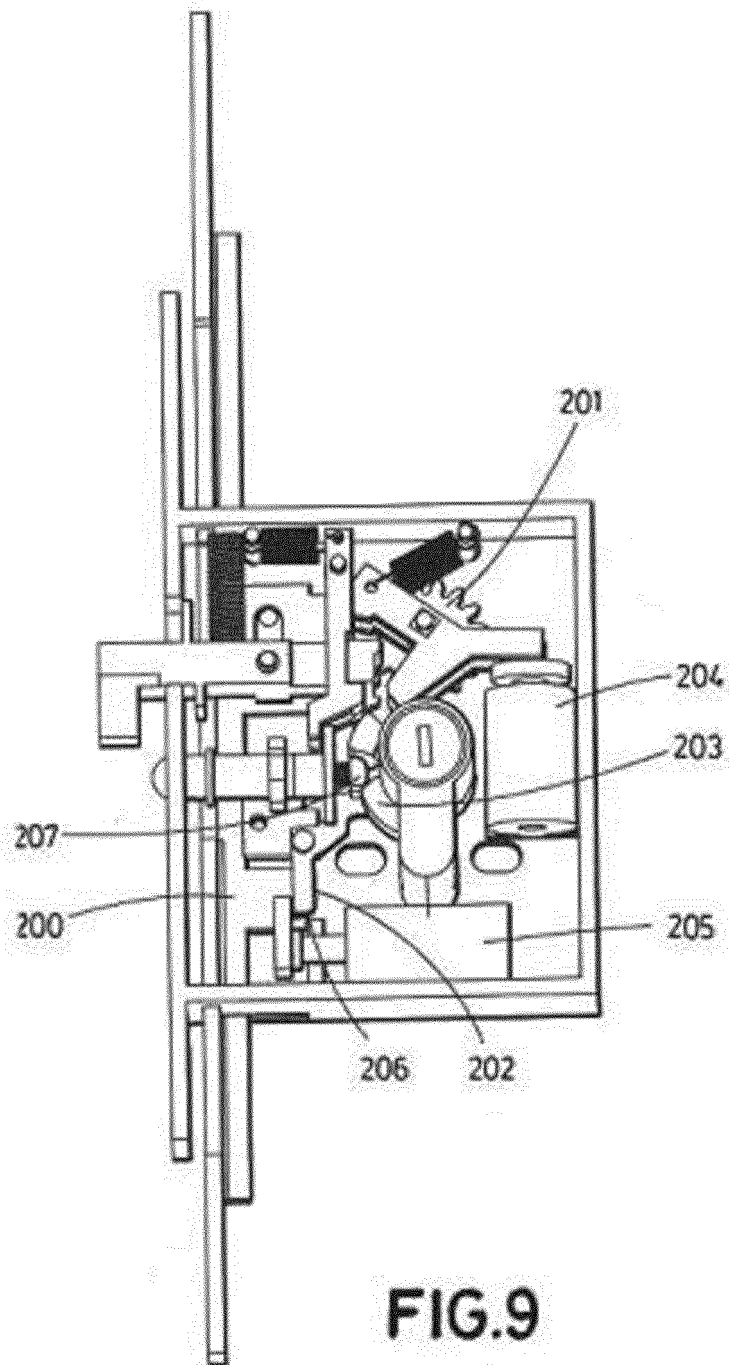


FIG.9

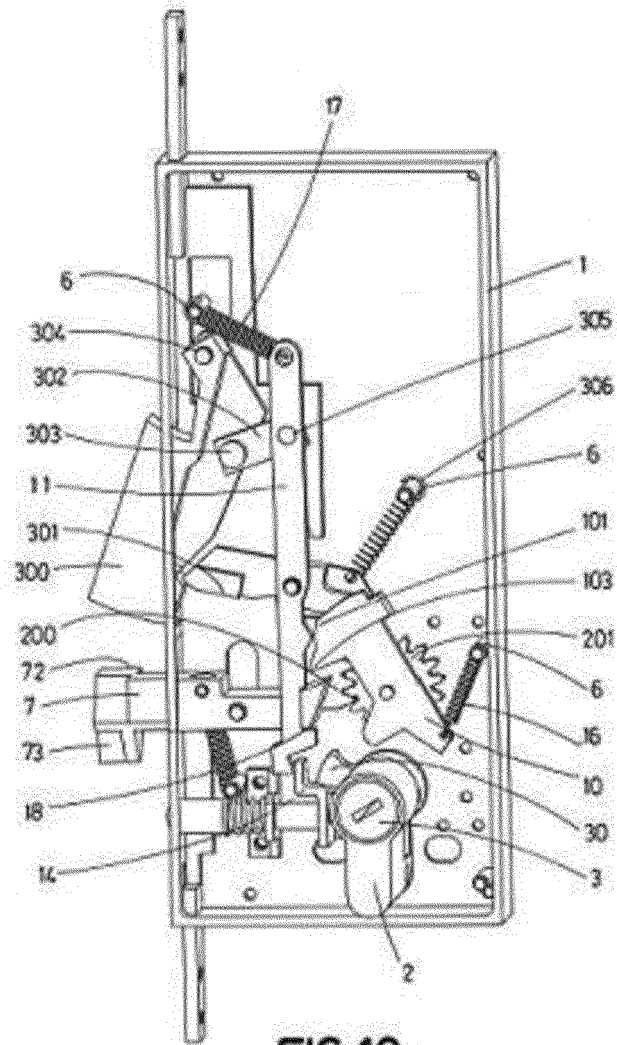
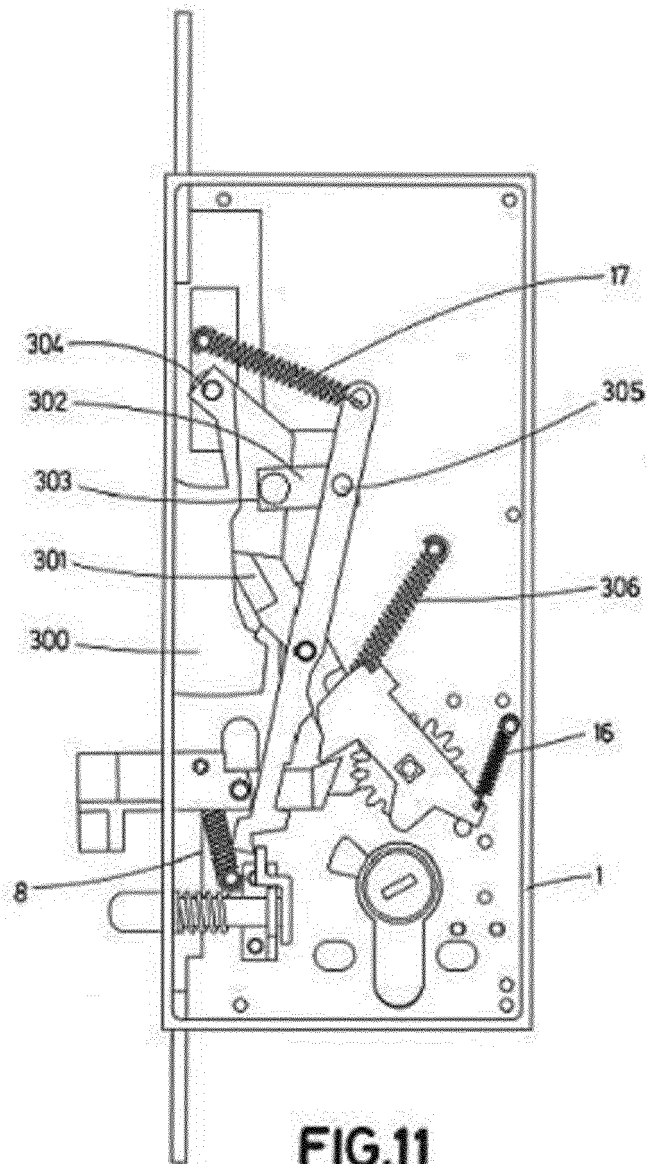


FIG.10



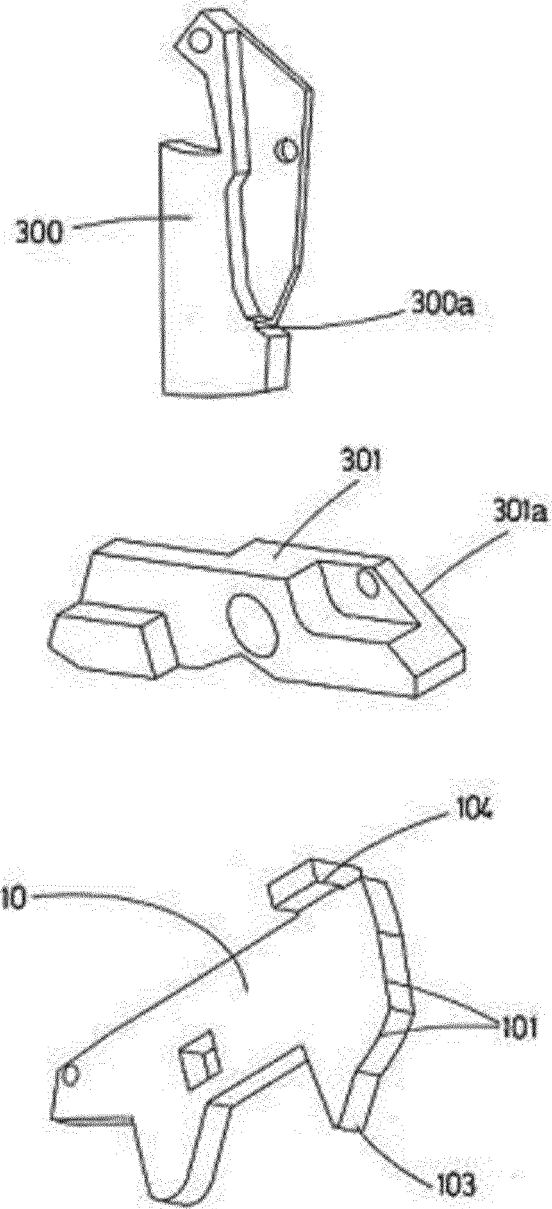


FIG.12

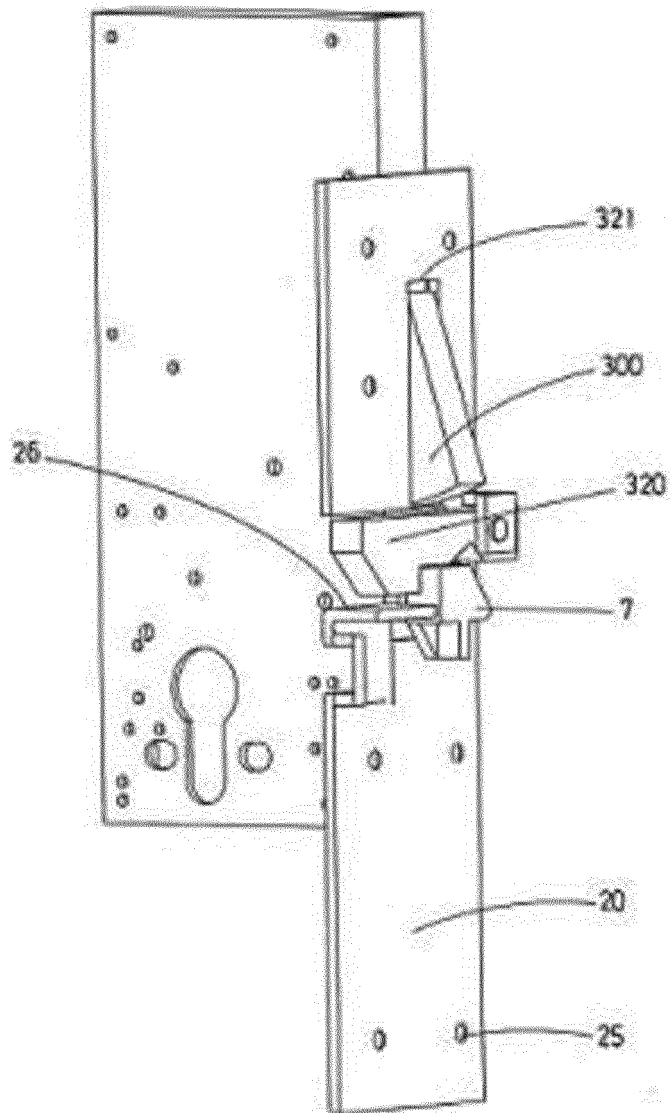
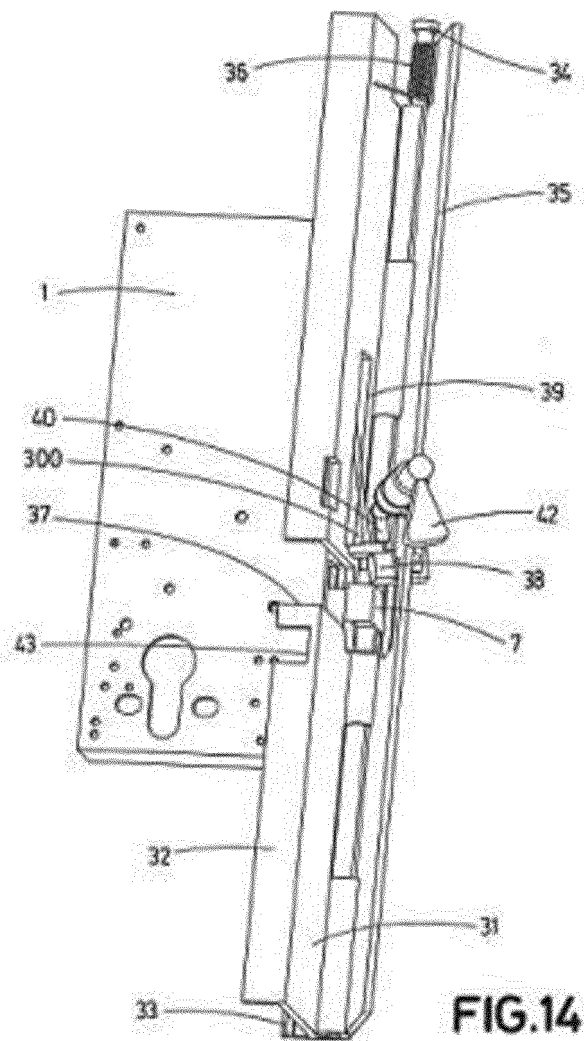


FIG.13



INTERNATIONAL SEARCH REPORT

International application No
PCT/ES2020/070167

5	A. CLASSIFICATION OF SUBJECT MATTER INV. E05B15/02 E05B57/00 E05B63/24 E05C3/30 ADD.		
According to International Patent Classification (IPC) or to both national classification and IPC			
10	B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) E05B E05C		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched			
15	Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EP0-Internal		
20	C. DOCUMENTS CONSIDERED TO BE RELEVANT		
	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
25	A	WO 2007/096921 A1 (CEFIS GIOVANNI [IT]) 30 August 2007 (2007-08-30) page 8, paragraph 3 - paragraph 4; figure 10	1-16
	A	----- KR 2002 0074933 A (LEE BYEONG NO [KR]) 4 October 2002 (2002-10-04) figures	1-16
30	A	----- EP 0 312 654 A1 (DRIM LTD [GB]) 26 April 1989 (1989-04-26) the whole document	1-16
35		-----	
40	<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
45	* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
50	Date of the actual completion of the international search 24 August 2020		Date of mailing of the international search report 02/09/2020
55	Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer Westin, Kenneth

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/ES2020/070167

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KR 20020074933 A	04-10-2002	NONE	
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REFERENCES CITED IN THE DESCRIPTION

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