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(54) Lock system and building locking system

(57) The invention relates to a lock comprising a casing (410) arranged for receiving a locking mechanism (200) comprising a cam (204), a first bolt (420) movable by the cam (204) between an unlocked position in which the first bolt (420) is comprised by the casing (410) and a locked position in which the first bolt (420) is partially located outside the casing (410), a biasing element (426) for biasing the first bolt (420) towards the unlocked position, a bolt blocking member (430); the lock system further comprising an electromechanical actuator (250) couplable to a coupling member (440) movable between a first position in which it is held by the actuator (250) if the actuator (250) is not energised and in a second position if the actuator (250) is energised, said coupling member (440) moving the bolt blocking member (430) from the blocked to the unblocked position by moving from the first to the second position and said coupling member (440) being movable from the second to the first position by the cam (204).

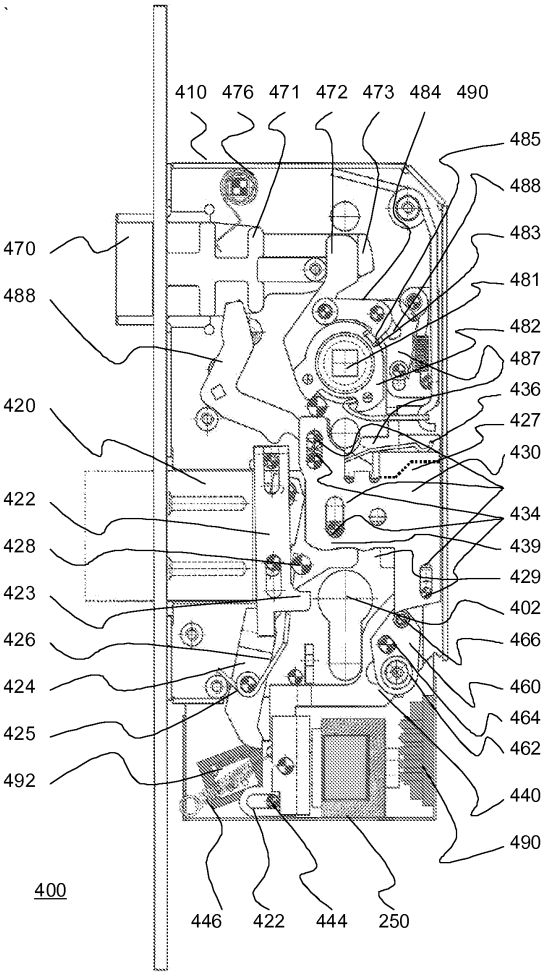

Fig. 4 A

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Description

FIELD OF THE INVENTION

[0001] The invention relates to the field of locks an in particular to the field of electrically actuable locks.

BACKGROUND OF THE INVENTION

[0002] EP0231532B1 discloses a lock comprising a locking house, a day bolt and a night bolt, each bolt slidable between an extended locking position and a retracted position, wherein the locking mechanism is designed as a packet of tumblers though which extends a locking pin projecting laterally from the night bolt, the actuating member for the locking mechanism is a tripper having a cam acting on the tumblers and having an arm projecting from the locking house, an electric magnet that, when energised, acts on said tripper arm to hold the tripper in a position wherein the tripper does not act on the tumblers, said tripper being spring-biased in a direction wherein the tripper loads the tumblers to the position releasing the night bolt, all this without influencing the day bolt. The tripper further includes a resetting arm which in the position in which the tumblers are swivelled beyond reach, and in the position wherein the tumblers are not influenced by the lever, is within reach of a member connected to a day-bolt-handle operated tumbler, the arrangement being such that a movement of the day-bolt handle is sufficient to move the tripper into its inoperative position fixed by the electric magnet, provided the electric magnet is energised. The resetting arm is operated through the day-bolt-handle tumbler.

OBJECT AND SUMMARY OF THE INVENTION

[0003] According to prior art, locking the lock after the electric magnet has been de-energised, requires first to operate the day-bolt-handle to bring the tripper arm back to the electric magnet to bring the cam back to a position wherein it does not influence the tumblers. Only after that action, the night bolt can be brought to the locking position by means of a key operating a notch of a locking cylinder. So after de-energising the electric magnet, two actions are required for locking the lock. It is preferred to have a lock that is more convenient to handle, preferably be reducing the number of actions required for resetting and locking the lock.

[0004] The invention provides in a first aspect a lock system comprising a mechanical lock comprising: a lock casing arranged for receiving a locking mechanism comprising a pivotable cam; a first bolt comprised by the lock casing, the first bolt being movable by the pivotable cam between an unlocked position in which the first bolt is substantially fully comprised by the lock casing and a locked position in which the first bolt is partially located outside the casing; a bolt biasing element for biasing the first bolt towards the unlocked position; and a bolt blocking member movable between a blocked position in which the blocking member blocks the first bolt in the locked position and an unblocked position in which movement of the first bolt is not blocked by the bolt blocking member; the lock system further comprising an electromechanical actuator couplable to a coupling member comprised by the mechanical lock, the coupling member being movable between a first position in which it is being held by the electromechanical actuator if the electromechanical actuator is energised and in a second position if the electromechanical actuator is not energised, said coupling member being arranged to move the bolt blocking member from the blocked position to the unblocked position by moving from the first position to the second position and said coupling member being movable from the second position to the first position by the pivotable cam.

[0005] By arranging the coupling member to be actuable by the same pivotable cam that moves the bolt, only one action is required for resetting and locking the lock system.

[0006] In an embodiment of the lock system according to the invention, the coupling member is movable in a substantially linear way that is substantially perpendicular to the movement of the bolt blocking member and the coupling member comprises a main coupling part movable substantially perpendicularly to the movement of the bolt blocking member; and a translation coupling element for translating a movement of the main part to a movement of the translation element having a component perpendicular to a movement of the main part.

[0007] By providing the translation coupling element, the lock system can be made more compact because not all interacting components are required to move in one line.

[0008] In a further embodiment of the lock system according to the invention, the translation coupling element is pivotably mounted on the main coupling part and a linear movement of the main coupling part results in a pivoting movement of the translation coupling element. A pivotably mounted translation coupling element does not require additional linear space in line with the element, though only some space aside of the element. This reduces the amount of space required and can therefore contribute to a compact design of the lock system.

[0009] Another embodiment of the lock system according to the invention comprises a coupling biasing element for biasing the coupling element to the second position. The coupling biasing element pulls the coupling element towards the second position as soon as the electromagnet is de-energised, directly moving the bolt blocking element to move to the unblocked position to enable the bolt to move to the unlocked position.

[0010] In yet a further embodiment of the invention, the bolt blocking member comprises an unblocking member arranged to be engaged by the pivotable cam for moving the bolt blocking member to the unblocked position. In this embodiment, the bolt blocking member can

be brought to the unblocked position and the bolt can be brought to the unlocked position by one and the same actuator, i.e. the pivotable cam.

[0011] The invention provides in a second aspect a building locking system comprising: at least one lock system according to the invention and/or embodiments thereof and a lock control unit couplable to the lock system and enabled to actuate the electromechanical actuator of the lock system.

[0012] With such system, the advantages of the invention can be applied to a building or a part thereof and the lock system or lock systems can be controlled at a central point.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013]

Figure 1 A shows a lock in a lock position;

Figure 1 B shows a lock in an unlocked position;

Figure 2 shows lock cylinder;

Figure 3 A shows lock moving to a lock position;

Figure 3 A shows lock further moving to a lock position;

Figure 4 A shows a lock in an unlocked position in more detail;

Figure 4 B shows a detail of a lock in an unlocked position;

Figure 4 C shows a detail of a lock in a locked position; and

Figure 5 shows a lock system for a building.

DESCRIPTION OF PREFERRED EMBODIMENTS

[0014] Figure 1A and Figure 1B show a lock system 100 comprising a casing 110, a bolt 120, a blocking tumbler shaft 130, an unblocking tumbler shaft 140, an electromagnet 150 and a lock cylinder holding opening 102 for receiving a lock cylinder. Figure 2 shows a lock cylinder 200 comprising a cylinder housing 202, a key slit 208 and a cylinder cam 204 comprising a cylinder notch 206. For operating the lock cylinder 200, a key is stuck in the key slit 208. If the combination of the key fits the combination of the lock cylinder 200, the key can be turned, resulting in turning the cylinder cam 204 with the cylinder notch 206. The lock cylinder 200 can be received by the lock cylinder holding opening 102.

[0015] The bolt 120 is slidable from a locked position as depicted in figure 1A wherein the bolt 120 is partially located outside the lock casing 110 and an unlocked position as depicted in Figure 1B wherein the bolt 120 is fully comprised by the casing. The lock system 100 is preferably fit in a door, with the bolt 120 engaging with a hole in a doorpost for locking the door. The door is locked with the bolt 120 is in the locked position and the door is unlocked with the bolt 120 in the unlocked position or in any case substantially comprised by the lock casing 110 that the bolt 120 is not in the hole of the doorpost anymore.

[0016] The bolt 120 comprises a bolt slit 122 fitting around a bolt holding pin 124 that is fixed to the casing 110. The bolt holding pin 124 allows the bolt 120 to slide or move linearly from left to right and vice versa. The bolt 120 comprises a bolt spring pin 128 on which a bolt spring 126 exerts a spring force, biasing the bolt 120 in the unlocked position. The bolt spring 126 is attached to the casing 100. The bolt 120 also comprises a bolt recess 129 in which the notch 206 of the lock cylinder 200 fits. This enables the bolt 120 from being moved from the unlocked position to the locked position and back by turning the cam 204 by means of a key.

[0017] The blocking tumbler shaft 130 comprises a blocking tumbler slit 132 fitting around a blocking tumbler holding pin 134 that is fixed to the casing 110. The blocking tumbler holding pin 134 allows the blocking tumbler shaft 130 to slide or move linearly up and down. The blocking tumbler shaft comprises a blocking tumbler spring pin 138 on which a blocking tumbler spring 136 exerts a spring force, biasing the blocking tumbler shaft 130 in a blocking position as shown by Figure 1A. The blocking tumbler spring 136 is attached to the casing 100.

[0018] In the blocking position, the blocking tumbler shaft 130 blocks the bolt 120 from moving to the unlocked position towards which it is biased by the bolt spring 126. In the unlocked position of the bolt 120, the bolt 120 blocks the blocking tumbler shaft 130 from moving to the blocking position of the blocking tumbler shaft 130.The blocking tumbler shaft 140 further comprises an unblocking element 139 (drawn in intermitted lines for reasons of clarity). The unblocking element 139 is viewed from the top plane of Figure 1A provided on top of the bolt 120; in use the unblocking element 139 is located parallel to the bolt 120.

[0019] The unblocking tumbler shaft 140 comprises an unblocking tumbler slit 142 fitting around an unblocking tumbler holding pin 144 that is fixed to the casing 110. The unblocking tumbler holding pin 144 allows the unblocking tumbler shaft 140 to slide or move linearly from left to right and vice versa. The unblocking tumbler shaft 140 held in a blocking position by the electromagnet 150 that attracts the unblocking tumbler shaft 140 when energised. This position is depicted by Figure 1A. The unblocking tumbler shaft 140 is biased towards an unblocking position as depicted by Figure 1B by an unblocking tumbler spring 146. The unblocking tumbler spring 146 is attached to the casing 100.

[0020] If the electromagnet 150 changes from the energised state to a de-energised state by interruption of a

supply current to the electromagnet 150, the unblocking tumbler shaft 140 moves from the blocking position depicted by Figure 1A to the unblocking position depicted by Figure 1B by virtue of the force exerted by the unblocking tumbler spring 146. With the unblocking tumbler shaft 146 moving towards the unblocking position, an upper diagonal side 149 of the unblocking tumbler spring 146 pushes against the lower right corner of the blocking tumbler shaft 130.

[0021] This results in the blocking tumbler shaft 130 to be pushed upwards, towards the unblocking position of the blocking tumbler shaft 130 as depicted by Figure 1B. So the horizontal movement of the unblocking tumbler shaft 140 is translated to a vertical movement of the blocking tumbler shaft 130 with the upper diagonal side 149 acting as a translation element. With the blocking tumbler shaft 130 pushed in the unblocking position, the bolt 120 is not blocked anymore. This enables the bolt 120 to move to the unlocked position by virtue of the force exerted by the bolt spring 126.

[0022] In this way, changing the state of the electromagnet 150 from the energised state to the de-energised state by interrupting current supply results in unlocking of the lock system 100. Because the unblocking tumbler shaft 140 is kept in the unblocked position by the unblocking tumbler spring 146, the blocking tumbler shaft 130 is kept in the unblocked position. With the blocking tumbler shaft 130 blocked in the unblocked position, the blocking tumbler shaft 130 is not able to block the bolt 120 in the locked position.

[0023] So when the bolt 120 is moved from the unlocked position to the locked position by turning the cylinder cam 204 by means of a key, the bolt 120 will move back to the unlocked position by virtue of the force exerted by the bolt spring 126. This means that with the unblocking tumbler shaft 140 in the unblocking position, the lock system 100 cannot be locked. For the lock system 100 to be locked again, the unblocking tumbler shaft 140 has to be moved back to the blocking position.

[0024] In one embodiment, the unblocking tumbler shaft 140 cannot be moved back to the unblocking position by energising the electromagnet 150. This is because the magnetic field is at the distance between the unblocking tumbler shaft 140 and the electromagnet 150 not strong enough to counter the force exerted by the unblocking tumbler spring 146.

[0025] Figure 3A depicts the lock system 100 where the cylinder cam 204 with the cylinder notch 206 is turn a quarter round counter-clockwise. In this position, the unblocking tumbler shaft 140 is slid back to the unblocking position. If the electromagnet 150 is energised, the unblocking tumbler shaft 140 is kept in the unblocking position. Subsequently, the cylinder cam 204 is turned another quarter counter-clockwise as depicted in Figure 3B.

[0026] Figure 3B depicts the cylinder notch 206 having been displaced in the bolt recess 129, taking along the bolt 120 towards the locked position. Turning the cylinder cam 204 another half round counter-clockwise results in the bolt being slid further towards the locked position until the blocking tumbler shaft 130 is free to move to the blocking position. By virtue of the force exerted by the blocking tumbler spring 136, the blocking tumbler shaft 130 moves to the blocking position. With the blocking tumbler shaft 130 in the blocking position, the bolt 120 is kept in the locked position even when the cylinder notch is back to its original lower position.

[0027] Besides being unlocked by de-energising the electromagnet 150, the lock system 100 can also be unlocked by means of a key engaged with the lockcylinder 200. Starting with the status of the lock system as depicted by Figure 1A, the key in the lock cylinder 200 is turned half a round clockwise. This results in the cylinder cam 204 with the cylinder notch 206 engaging with the bolt recess 129, taking along the bolt 120. This is depicted by Figure 3B.

[0028] Before the bolt 120 is taken along, the blocking tumbler shaft 130 is to be moved in the unblocking position. While turning the cylinder cam 204 clockwise, the cylinder notch 206 also engages with the unblocking element 139. The unblocking element 139 is moved upward and with that movement, the full blocking tumbler shaft 130 by which the unblocking element 139 is comprised, is moved upward towards the unblocking position. With the blocking tumbler shaft 130 in the unblocking position, the bolt 120 can be moved to the unlocked position by the cylinder cam 204 and the cylinder notch 206.

[0029] Figure 4A shows a lock system 400 comprising a casing 410 comprising a lock cylinder holding opening 402, a bolt 420, a blocking tumbler shaft 430, an unblocking tumbler shaft 440, a spring latch 470, an electromagnet 450, a latch coupling tumbler 488, a latch operating lever 472, a connector 490 and a sensor 492. The lock system 400 is shown in unlocked position. The lock system is operable with a key by inserting the lock cylinder 200 in the lock cylinder holding opening 402.

[0030] The bolt 420 is shown in an unlocked position, with the bolt 420 substantially fully comprised by the casing 410. Dotted lines indicate the position of the bolt 420 in locked position, in which position the bolt 420 is partly located outside the lock casing 410. The bolt 420 is biased towards the unlocked position by a bolt spring 426, engaging with a bolt spring pin 428.

[0031] The blocking tumbler shaft 430 is depicted in an unblocking position. The blocking tumbler shaft 430 is configured to be linearly slidable from the position depicted by Figure 4A to a lower position and vice versa. This movement is enabled by three blocking tumbler slits 432 engaging with three blocking tumbler holding pins 434. In a lower - blocking - position, the blocking tumbler shaft 430 blocks the bolt 420 in the locked position. If the bolt 420 is in the unlocked position, it blocks the blocking tumbler shaft 430 from moving to the blocking position.

[0032] The blocking tumbler shaft 430 is biased towards the blocking position by a blocking tumbler spring 436. This results in the blocking tumbler shaft 430 to

move to the blocking position if the bolt 420 is in the locked position, provided the blocking tumbler shaft 430 is not blocked by other elements of the lock system 400, as will become apparent from the rest of the description. In the blocking position, the blocking tumbler shaft 430 blocks the bolt 420 from moving to the unlocked position.

[0033] The unblocking tumbler shaft 440 is depicted in an unblocking position. The unblocking tumbler shaft 440 is configured to be linearly slidable from the position depicted by Figure 4A to a more right position and vice versa. This movement is enabled by an unblocking tumbler slit 442 engaging with an unblocking tumbler holding pin 444. In the unblocking position, the unblocking tumbler shaft 440 blocks the blocking tumbler shaft 430 in the unblocking position.

[0034] This is in particular effectuated by means of an unblocking tumbler 460. The unblocking tumbler 460 is pivotably connected to the unblocking tumbler shaft by means of a tumbler coupling pin 464 and pivotably connected to the casing by means of a case coupling pin 462. The unblocking tumbler 460 also comprises an unblocking lever pin 466 engaging with the lower side of the blocking tumbler shaft 430 for moving the blocking tumbler shaft 430 to the unblocking position and keeping the blocking tumbler shaft 430 in that position.

[0035] In the blocking position, wherein the unblocking tumbler shaft 440 is located more to the right than depicted on Figure 4A, the unblocking tumbler 460 is pivoted clockwise. The unblocking tumbler 460 is pivoted around the tumbler coupling pin 464, resulting in the unblocking lever pin 466 to be in a lower position in which it does not block the blocking tumbler shaft 430 anymore from moving to the blocking position anymore. With the blocking tumbler shaft 430 not being blocked by the unblocking lever pin 466, the blocking tumbler shaft 430 is enabled to move to the blocking position if the bolt 420 is in the locked position.

[0036] In common use, the unblocking tumbler shaft 440 is in the blocking position, i.e. in a position more to the right than depicted on Figure 4A. In this position of the unblocking tumbler shaft 440, the unblocking tumbler shaft 440 is kept in place by the electromagnet 450 that is in a normal state energised. In energised state, the electromagnet 450 has a current flowing through a coil comprised by the electromagnet 450, resulting in a magnetic flux in a core comprised in the coil. In this position of the unblocking tumbler shaft 440, the unblocking tumbler 460 is swivelled to the right over the tumbler coupling pin 464 compared to the position depicted by Figure 4A.

[0037] The bolt 420 is in common use either in the locked or unlocked position. The blocking tumbler shaft 430 is in common use in a position corresponding to the position of the bolt. This means that if the bolt 420 is in the locked position, the blocking tumbler shaft 430 is in the blocking position and if the bolt 420 is in the unlocked position, the blocking tumbler shaft 430 is in the unblocking position.

[0038] In case of an emergency, the current supply to the electromagnet 450 is interrupted. The current supply can either be interrupted by a central control system, due to fire consuming the power supply cable or by other causes. Interruption of current supply to the electromagnet 450 results in loss of magnetic flux and therefore in loss of magnetic force exerted on the unblocking tumbler shaft 440. The unblocking tumbler shaft 440 is biased to the unblocking position by an unblocking tumbler spring 446. By virtue of this biasing force, the unblocking tumbler shaft 440 moves to the left.

[0039] The moving of the unblocking tumbler shaft 440 to the left results in the unblocking tumbler 460 pivoting to the left in a more upright position. In this way, horizontal movement of the unblocking tumbler shaft 440 is translated to movement in a direction that has a component that is perpendicular to the movement of the unblocking tumbler shaft 440, with the unblocking tumbler 460 acting as translation element. In particular, this perpendicular component of movement is in the upward direction in the view of Figure 4A, towards the blocking tumbler shaft 430.

[0040] If the bolt 420 is in the locked position and the bolt blocking member 430 in the blocking position, the pivoting of the unblocking tumbler 460 will cause the unblocking lever pin 466 to engage with the lower side of the blocking tumbler shaft 430. The unblocking lever pin 466 moves towards the blocking tumbler shaft 430 and move the blocking tumbler shaft 430 to the unblocking position. Subsequently, by virtue of the bolt spring 426, the bolt 420 will move to the unlocked position. This will unlock a door in which the lock system 400 is fit.

[0041] As the unblocking tumbler shaft 440 will be kept in the unblocking position, blocking the blocking tumbler shaft 430 from moving to the blocking position, the bolt 420 will either stay in the unlocked position or move directly back to the unlocked position. This is because the blocking tumbler shaft will not be able to move to the blocking position for blocking the bolt 420 to remain in the locked position.

[0042] If during interruption of the current supply to the electromagnet 450 the bolt 420 is in the unlocked position, only the unblocking tumbler shaft 440 with the unblocking tumbler 460 will move to the unblocking position and other components will remain in their positions.

[0043] In one embodiment, the magnetic field provided by the electromagnet 450 is not strong enough to attract the unblocking tumbler shaft 430 towards the electromagnet to bring it back to the blocking position. This means that even though current would be supplied again to the electromagnet 450, the blocking tumbler shaft 430 would still be blocked in the unblocking position. This means that the lock system 400 cannot be blocked anymore. Therefore, the unblocking tumbler shaft 440 is at the upper left side aligned with the right side of the lock cylinder holding opening 402.

[0044] When the lock system 400 is intended to be locked by means of a key, turning the key and with that the cam 204 with the notch 206 of the lock cylinder fit in the lock cylinder holding opening 402 in a counter-clock-

wise direction, the notch 206 will first engage with the upper left side of the unblocking tumbler shaft 430, moving the unblocking tumbler shaft 430 to the blocking position. Subsequently, by turning the key further counterclockwise, the notch 206 will engage with a bolt recess 429, taking along the bolt 420 towards the locked position.

[0045] For unlocking the lock system 400 with a key, the notch 206 of the cam 204 is turned clockwise. In the locked position, the bolt recess 429 is located more to the left than depicted by Figure 4 And the blocking tumbler shaft 430 will be in a lower position. While turning the notch 206 clockwise in an upward direction, the notch 206 will engage with the lower left part 439 or unblocking member of the blocking tumbler shaft 430 and the bolt recess 429. The blocking tumbler shaft 430 will move to the unblocking position, allowing the bolt 420 to be moved to the unlocked position by the notch 206 engaging with the bolt recess 429.

[0046] The bolt 420 has a bolt tumbler 424 connected to it that is pivotable over a bolt tumbler connecting pin 425 that is connected to the casing 410. The lower part of the bolt tumbler, below the bolt tumbler connecting pin 425, engages with the sensor 492. The sensor 492 is a micro switch. With the bolt 420 in the unlocked position, a button of the sensor 492 is pressed and with the bolt 420 in the locked position, the button of the sensor 492 is not pressed. In this way, the position of the bolt 420 can be detected. Sensor data can be read through the connector 490. Furthermore, the connector 490 also provides contacts for current supply to the electromagnet 450.

[0047] As discussed, the lock system 400 also comprises the spring latch 470. The spring latch is slidably movable to a locked position as depicted in Figure 4 And an unlocked position in which the spring latch 470 is fully comprised in the casing 410. The spring latch 470 is biased towards the locked position by a latch spring 476, engaging with a first latch protrusion 471. If the bolt 420 is in the unlocked position, a latch tumbler shaft 422 can be slid from the position depicted by Figure 4A to a higher position. This is done by the notch 206 of the lock cylinder 200 inserted in the lock cylinder holding opening 402, turning the cam 204 clockwise. The notch engages with a latch tumbler shaft notch 423, lifting the latch tumbler shaft 422. The latch tumbler shaft 422 engages with a lower side of the latch coupling tumbler 488. As a result of this, the latch coupling tumbler 488 pivots clockwise and the upper part of the latch coupling tumbler 488 engages with the first latch protrusion 471. This, in turn, results in the spring latch 470 to move to the unlocked position.

[0048] The spring latch 470 is also operable by a handle fit in a square spring latch operating hole 481. The spring latch operating hole 481 is provided in a flange 482 that is pivotably operable by turning a handle fit in the spring latch operating hole 481. The flange 482 is provided with a flange recess 483 in which a coupling notch 485 of a coupling catch 484 is accommodated. The coupling catch 484 is coupled to the latch operating lever 472. The upper part of the latch operating lever is arranged to engage with a second latch protrusion 473.

[0049] Swivelling a handle fit in the spring latch operating hole 481 clockwise results in swivelling of the flange 482. Due to the flange 482 being coupled to the coupling catch 484 via the flange recess 483 and the coupling notch 485, the coupling catch 484 is also swivelled in a clockwise direction. The coupling catch 484 takes along the latch operating lever 472 which in turn slides the spring catch 470 towards the unlocked position. Releasing the handle will result in the spring latch 470 sliding back to the locked position by virtue of the force exerted by the latch spring 476 on the first latch protrusion 471.

[0050] If the bolt 420 is in the locked position, the flange and the coupling catch 484 are decoupled. The coupling catch 484 is coupled to a coupling tumbler shaft 487. If the bolt 420 is in the unlocked position as depicted by Figure 4A, the coupling tumbler shaft 487 is in the lower position as depicted by Figure 4A. If the bolt 420 moves to the locked position, an upper protrusion 427 provided on the upper side of the bolt 420 moves to the left, viewed from the drawing plane, engaging with a coupling tumbler that in turn engages with a lower left part of the coupling tumbler shaft 487. As a result of this, the coupling tumbler shaft 487 is moved up.

[0051] Figure 4B and Figure 4C depict this action in further detail. Figure 4B depicts the bolt 420 in the unlocked position. The coupling tumbler 438 rests with its lower right corner against the upper protrusion 427. The coupling tumbler shaft 487 rests with its lower part upon a coupling tumbler protrusion 437. The coupling tumbler 438 is pivotably mounted on a blocking tumbler holding pin 434.

[0052] Upon the bolt 420 moving to the locked position, the upper protrusion 427 acts upon the lower right part of the coupling tumbler 428, resulting in a pivoting action of the coupling tumbler 428. This is depicted in Figure 4C. The pivoting action yields an upward movement of the coupling tumbler protrusion 437, moving in turn the coupling tumbler shaft 487 upward. Though this construction is considered to be effective, the coupling tumbler 428 may be omitted in other embodiments, where the upper protrusion directly engages with the lower left part of the coupling tumbler shaft 487.

[0053] The coupling tumbler shaft 487 is coupled to the coupling catch 484 via a coupling pin provided on the coupling catch that fits in a coupling slit 488 provided in the coupling tumbler shaft 487. With the coupling tumbler shaft 487 moving up, the coupling catch 484 is moved up as well. This results in the coupling notch 485 being lifted from the flange recess 483, thus removing the coupling between the flange 482 on one side and the coupling catch 484 and the spring latch 470 on the other. Operation of a handle fit in the spring latch operating hole 481 will have not effect than the mere swivelling of the handle and the flange 482.

[0054] The coupling between the flange 482 and the handle in the spring latch operating hole is reinstated again upon the bolt 420 moving back to the unlocked position, with the upper protrusion 427 sliding back to the left. This allows the coupling tumbler shaft 487 to slide down again to the position depicted by Figure 4A. With the coupling tumbler shaft 487 moving down, the coupling notch 485 falls back in the flange recess 483. This means that the coupling catch 484 and operation of the spring catch 470 is coupled to the handle fit in the spring latch operating hole 481 again.

[0055] Figure 5 discloses a building locking system 500 fit in a building. The building locking system 500 comprises a plurality of locks systems 502 fit in the building. The lock systems 502 may be lock systems as discussed before or other embodiments of the lock system according with the invention. The building locking system 500 further comprises a lock control unit 510 comprising a sensor communication circuit 512, a lock actuating circuit 514, a control circuit 516 and a general communication unit 518. The control circuit 516 is operatively coupled to the sensor communication circuit 512, the lock actuating circuit 514 and the general communication unit 518. The sensors and in particular the micro switches of the lock systems 502 are coupled to the sensor communication unit 512 and the actuators like electromagnets of the lock systems 502 are coupled to the lock actuating circuit 514.

[0056] By means of the sensor communication unit 512, the lock control unit is enabled to detect the positions of bolts and blocking tumbler shafts of the lock systems 502. By means of the lock actuating circuit 514, the electromagnets of the lock systems 502 can be actuated. The general communication unit 518 allows the lock control unit 510 to be coupled to a fire detection system or another emergency detection system. Additionally or alternatively, the general communication unit 518 enables the control unit 510 to be coupled to other computer or control units, either dedicated to a special function or general purpose. The lock control unit 510 normally operates in a normal state, if there is no emergency situation. In this state, lock control unit 510 is in standby state and the lock systems 502 are not operated.

[0057] Upon detection and communication of an emergency like a fire, the lock control unit 510 switches to an emergency state in which the electromagnets of the lock systems 502 are operated to unlock the lock systems 502. As discussed before, this is done by de-energising the electromagnets by interrupting the current supply to those electromagnets to allow bolts of the lock systems 502 to be retracted. Correct execution of this action is verified by reading out positions of various sensors and in particular micro switches in the lock systems 502 detecting positions of bolts and/or positions of blocking tumbler shafts. This operation of the building lock system 500 is controlled by the control circuit 516 that can be a microcontroller, a microprocessor or a similar control unit.

[0058] Expressions such as "comprise", "include", "incorporate", "contain", "is" and "have" are to be construed in a non-exclusive manner when interpreting the description and its associated claims, namely construed to allow for other items or components which are not explicitly defined also to be present. Reference to the singular is also to be construed in be a reference to the plural and vice versa.

[0059] In the description above, it will be understood that when an element such as layer, region or substrate is referred to as being "on" or "onto" another element, or an element is connected to another element, the element is either directly on or directly connected to the other element, or intervening elements may also be present.

[0060] Furthermore, the invention may also be embodied with less components than provided in the embodiments described here, wherein one component carries out multiple functions. Just as well may the invention be embodied using more elements than depicted in the Figures, wherein functions carried out by one component in the embodiment provided are distributed over multiple components.

[0061] A person skilled in the art will readily appreciate that various parameters disclosed in the description may be modified and that various embodiments disclosed and/or claimed may be combined without departing from the scope of the invention.

[0062] It is stipulated that the reference signs in the claims do not limit the scope of the claims, but are merely inserted to enhance the legibility of the claims.

[0063] The invention relates to a lock comprising a casing arranged for receiving a locking mechanism comprising a cam, a first bolt movable by the cam between an unlocked position in which the bolt is comprised by the casing and a locked position in which the first bolt is partially located outside the casing, a biasing element for biasing the bolt towards the unlocked position, a bolt blocking member; the lock system further comprising an electromechanical actuator couplable to a coupling member movable between a first position in which it is held by the actuator if the actuator is energised and in a second position if the actuator is not energised, said coupling member moving the bolt blocking member from the blocked to the unblocked position by moving from the first to the second position and said coupling member being movable from the second to the first position by the cam.

Claims

1. Lock system comprising a mechanical lock comprising:

   a) a lock casing arranged for receiving a locking mechanism comprising a pivotable cam;

   b) a first bolt comprised by the lock casing, the first bolt being movable by the pivotable cam between an unlocked position in which the first bolt is substantially fully comprised by the lock

casing and a locked position in which the first bolt is partially located outside the casing;
c) a bolt biasing element for biasing the first bolt towards the unlocked position; and
d) a bolt blocking member movable between a blocked position in which the blocking member blocks the first bolt in the locked position and an unblocked position in which movement of the first bolt is not blocked by the bolt blocking member;

the lock system further comprising an electromechanical actuator couplable to a coupling member comprised by the mechanical lock, the coupling member being movable between a first position in which it is being held by the electromechanical actuator if the electromechanical actuator is energised and in a second position if the electromechanical actuator is not energised, said coupling member being arranged to move the bolt blocking member from the blocked position to the unblocked position by moving from the first position to the second position and said coupling member being movable from the second position to the first position by the pivotable cam.

2. Lock system according to claim 1, wherein the coupling member is movable in a substantially linear way that is substantially perpendicular to the movement of the bolt blocking member and the coupling member comprises:

a) a main coupling part movable substantially perpendicularly to the movement of the bolt blocking member; and
b) a translation coupling element for translating a movement of the main part to a movement of the translation element having a component perpendicular to a movement of the main part.

3. Lock system according to claim 2, wherein the translation coupling element is pivotably mounted on the main coupling part and a linear movement of the main coupling part results in a pivoting movement of the translation coupling element.

4. Lock system according to claim 3, wherein the translation coupling element is pivotably coupled to the lock casing.

5. Lock system according to claim 1, further comprising a coupling biasing element for biasing the coupling element to the second position.

6. Lock system according to claim 1, wherein the bolt blocking member comprises an unblocking member arranged to be engaged by the pivotable cam for moving the bolt blocking member to the unblocked position.

7. Lock system according to claim 1, further comprising a blocking biasing element for biasing the bolt locking member to the blocked position enabling the first bolt to be blocked upon moving to the locked position.

8. Lock system according to claim 1, wherein the first bolt blocks in the unlocked position the bolt blocking member from moving to the blocked position.

9. Lock system according to claim 1, wherein the first bolt and the bolt blocking member are movable in a substantially linear way and the directions of movement of the first bolt and the bolt blocking member are substantially perpendicular to one another.

10. Lock system according to claim 1, wherein the lock casing further comprises a second bolt movable between an unlocked position in which the second bolt is substantially fully comprised by the lock casing and a locked position in which the second bolt is partially located outside the casing, the second bolt being movable by operating a spindle if the second bolt and the spindle are connected, the second bolt and the spindle being connected by a spindle connecting member which is connected to the bolt blocking member and which spindle connecting member connects the second bolt and the spindle if the bolt blocking member is in the unblocked position and which spindle connected member does not connect the second bolt and the spindle if the bolt blocking member is in the blocked position.

11. Building locking system comprising:

a) at least one lock system according to claim 1; and
b) a lock control unit couplable to the lock system and enabled to actuate the electromechanical actuator of the lock system.

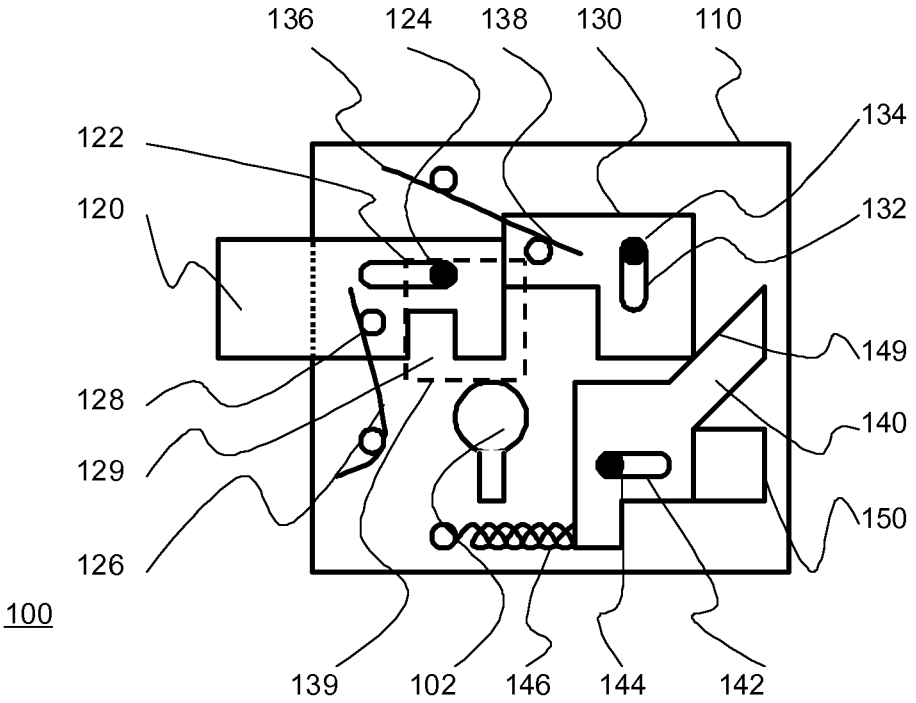
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Fig. 1 A

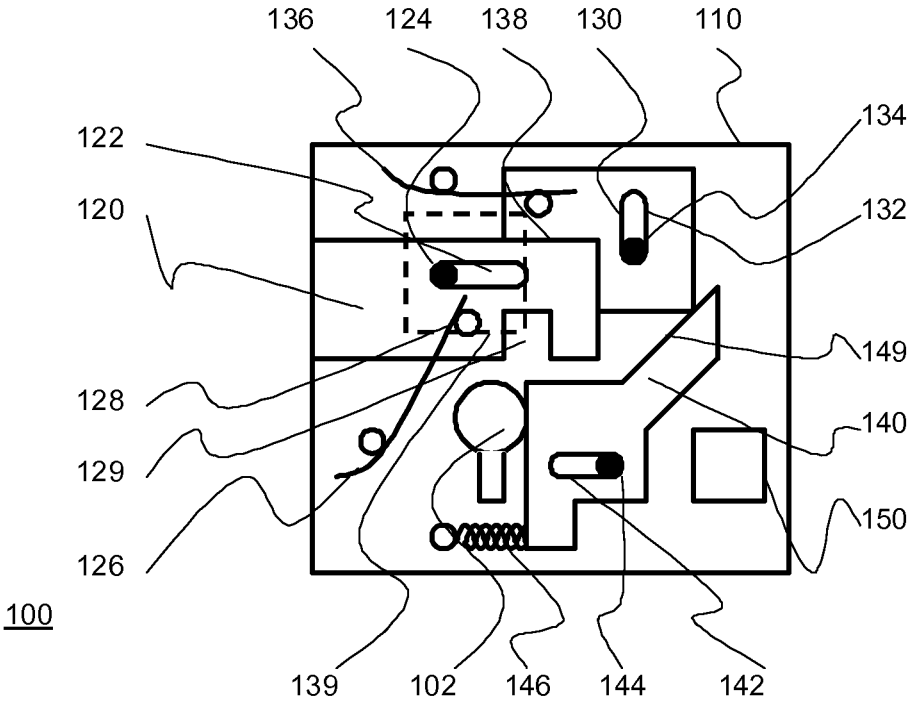
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Fig. 1 B

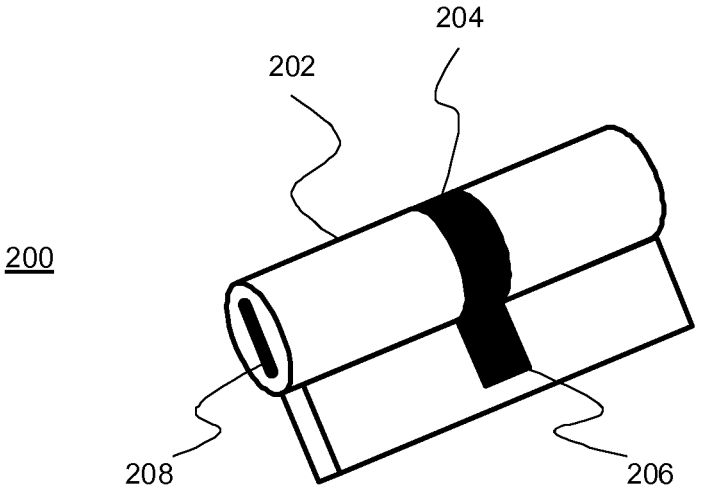

Fig. 2

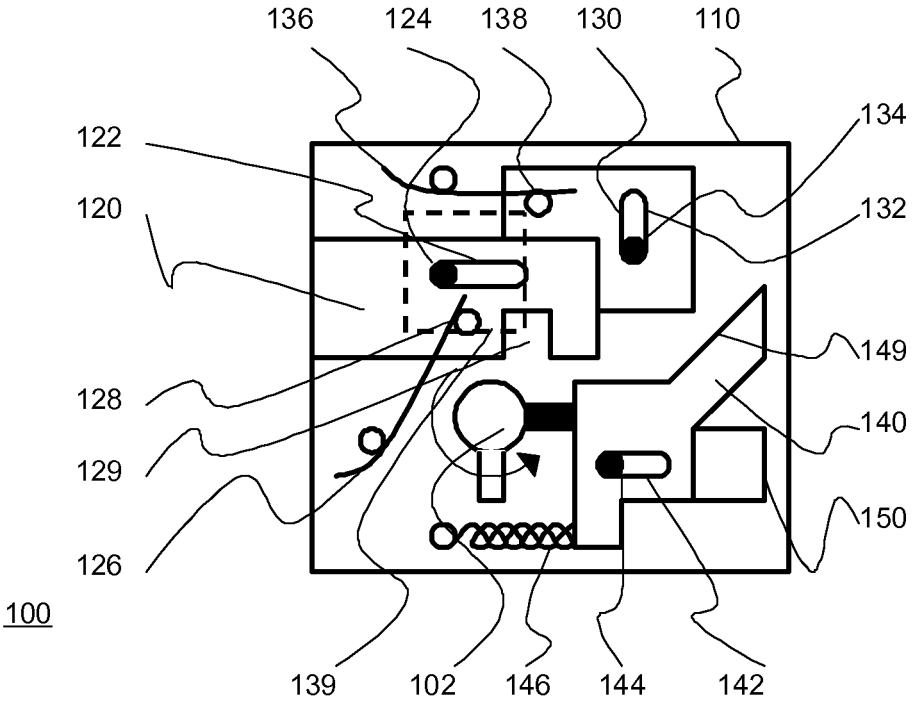
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Fig. 3 A

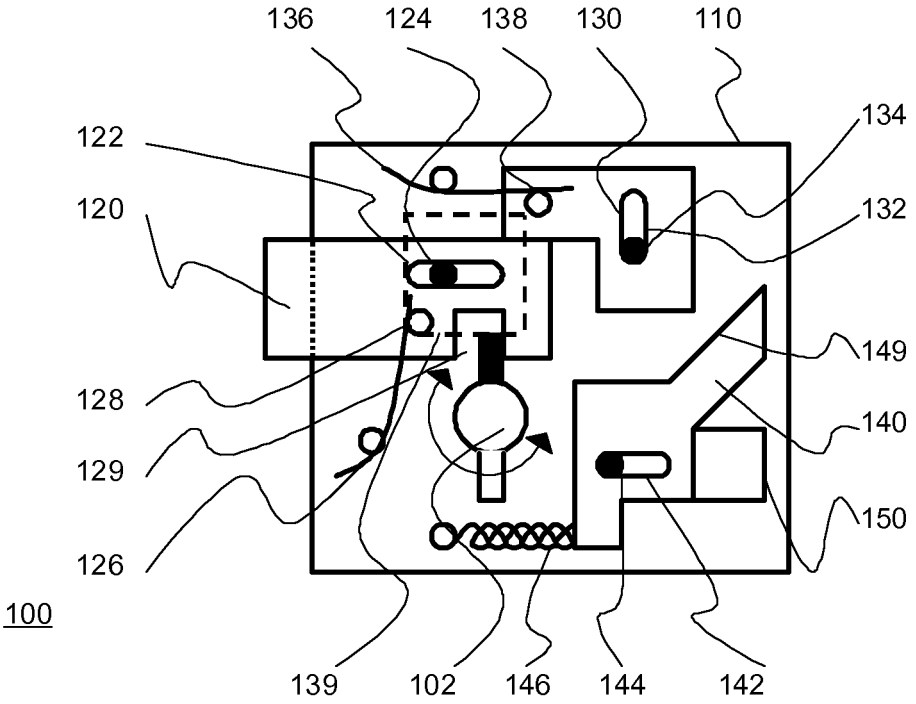
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Fig. 3 B

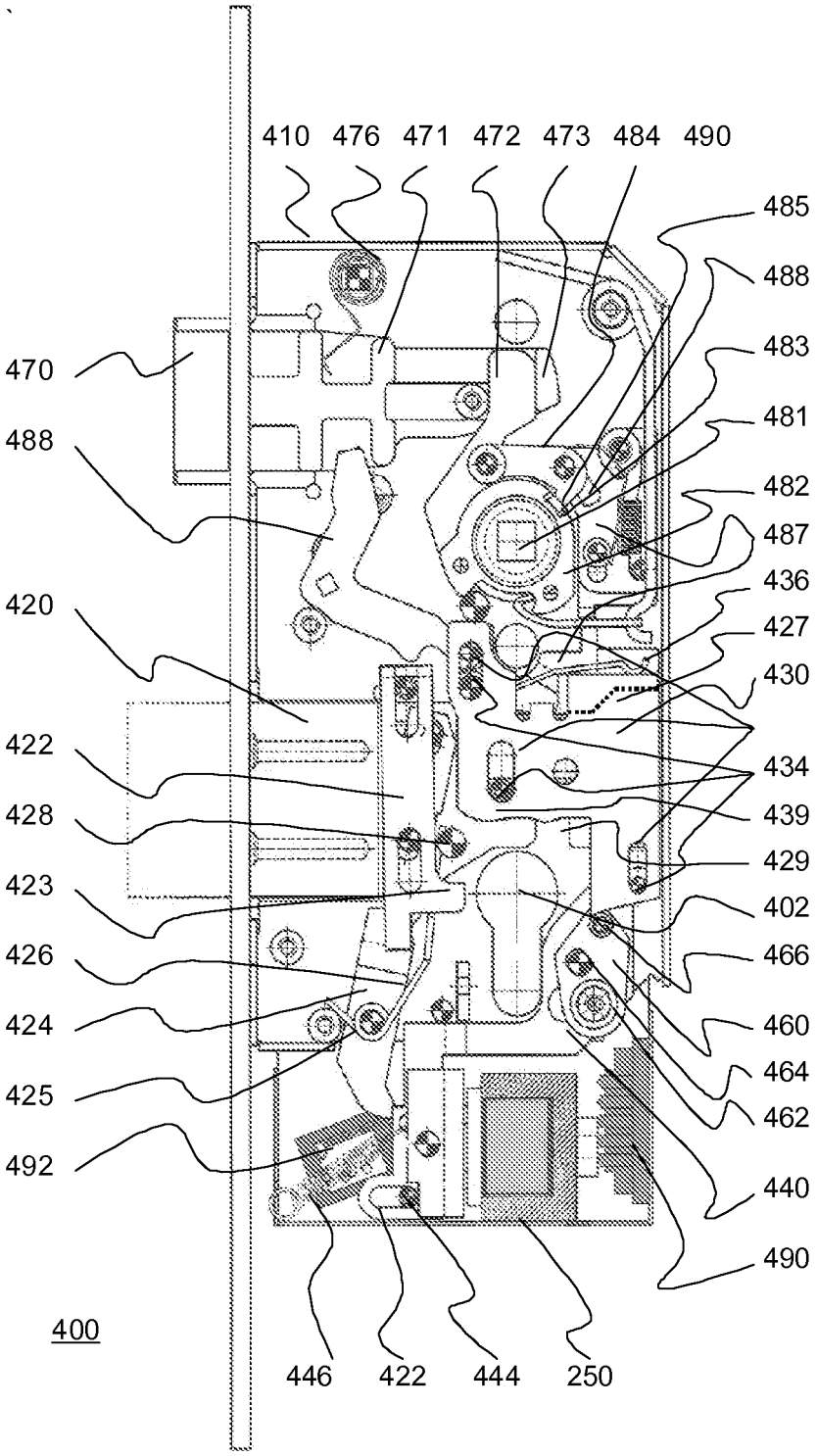
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Fig. 4 A

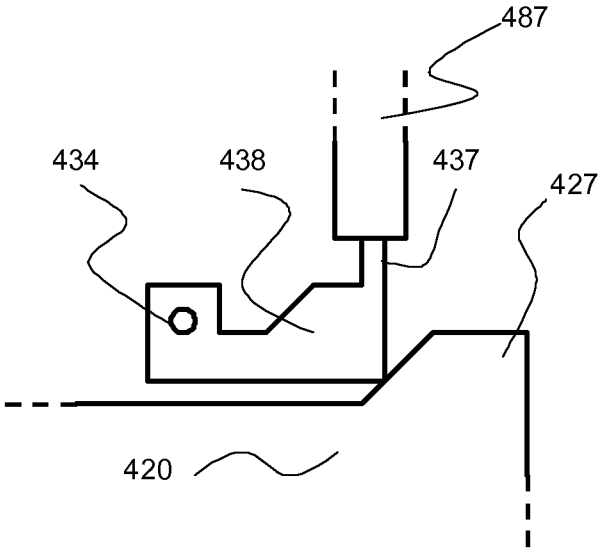

Fig. 4 B

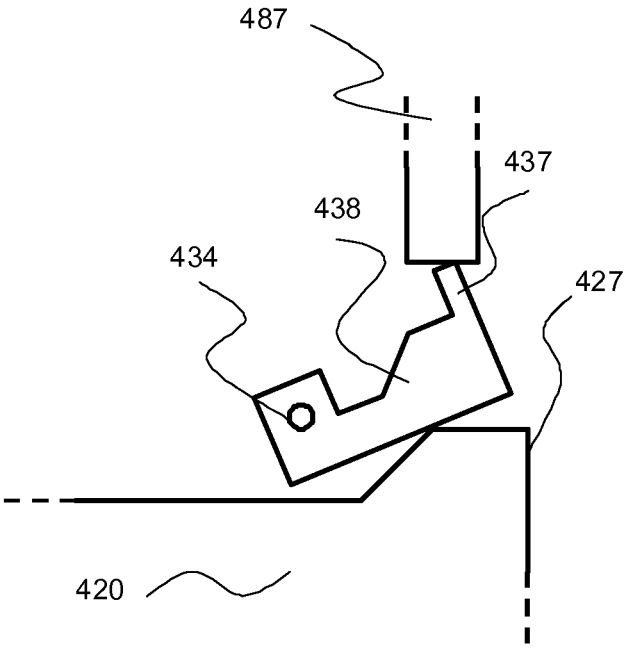

Fig. 4 C

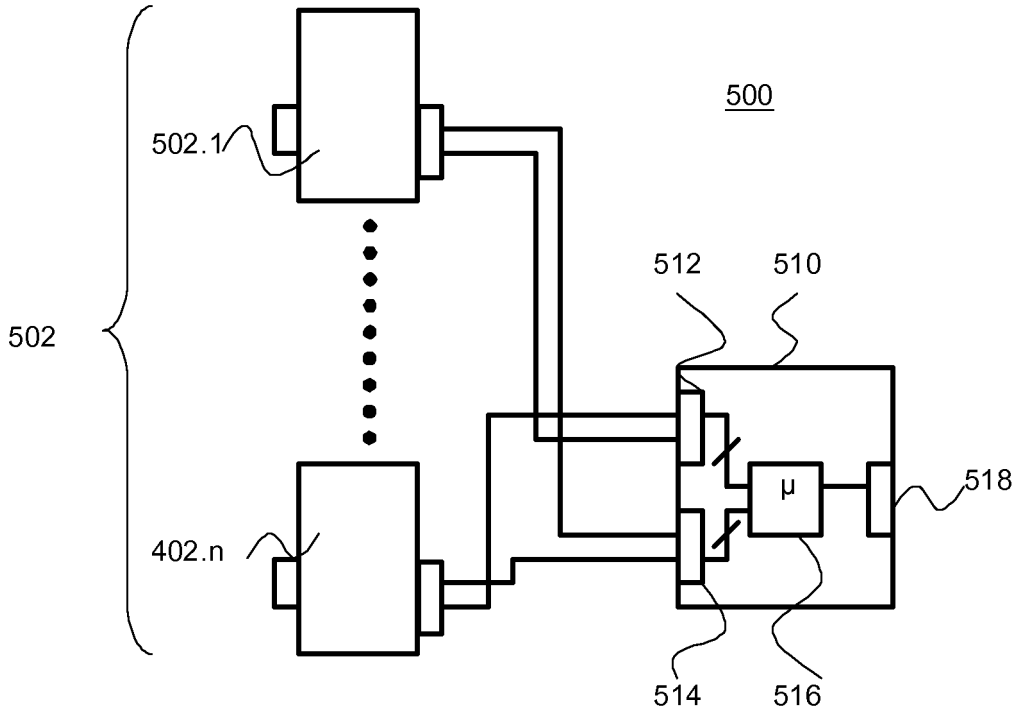

Fig. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 10 17 4545

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X A	EP 0 248 488 A2 (CHUBB LIPS NEDERLAND BV [NL]) 9 December 1987 (1987-12-09) * column 2, line 15 - column 4, line 57; figures 1-8 *	1,5,6,8, 11 10	INV. E05B47/06 E05B59/00 E05B65/10 E05B55/10
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TECHNICAL FIELDS SEARCHED (IPC)

E05B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	10 February 2011	Perez Mendez, J

CATEGORY OF CITED DOCUMENTS

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REFERENCES CITED IN THE DESCRIPTION

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