

(19)



(11)

EP 3 708 745 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
16.09.2020 Bulletin 2020/38

(51) Int Cl.:
E05B 47/06 (2006.01) **E05B 63/00 (2006.01)**
E05B 63/16 (2006.01) **E05B 47/00 (2006.01)**

(21) Application number: **19162525.0**

(22) Date of filing: **13.03.2019**

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

Designated Extension States:
BA ME

Designated Validation States:
KH MA MD TN

(72) Inventors:
• **PÄRUS, Fredrik**
632 39 ESKILSTUNA (SE)
• **JENSEN, Lars**
633 41 ESKILSTUNA (SE)

(74) Representative: **Kransell & Wennborg KB**
P.O. Box 27834
115 93 Stockholm (SE)

(71) Applicant: **Assa Abloy Opening Solutions Sweden AB**
631 05 Eskilstuna (SE)

(54) **ELECTROMECHANICAL LOCK ARRANGEMENT**

(57) An electromechanical lock arrangement comprising a split follower unit (1) and an actuator (2). The split follower unit comprises a first rotatable follower (30) which is connectable to a first manoeuvring device, a second rotatable follower (40) which is connectable to a second manoeuvring device and an intermediate rotatable follower (50) which is connectable to a lock bolt (12, 13). The first (30), the second (40) and the intermediate (50) followers are arranged axially aligned along a common rotational axis. The actuator (2) is arranged for selectively connecting and disconnecting the first (30) and the second (40) followers to and from the intermediate

follower (50). The actuator comprises an electrically driven, linearly displaceable slide (65). A first engagement member (80a) is connected to the slide (65) by means of a first compression spring (73a) and arranged to be brought in and out of simultaneous engagement with the first follower (30) and the intermediate follower (50). A second engagement member (80b) is connected to the slide (65) by means of a second compression spring (73b) and arranged to be brought in and out of simultaneous engagement with the second (40) follower and the intermediate follower (50).

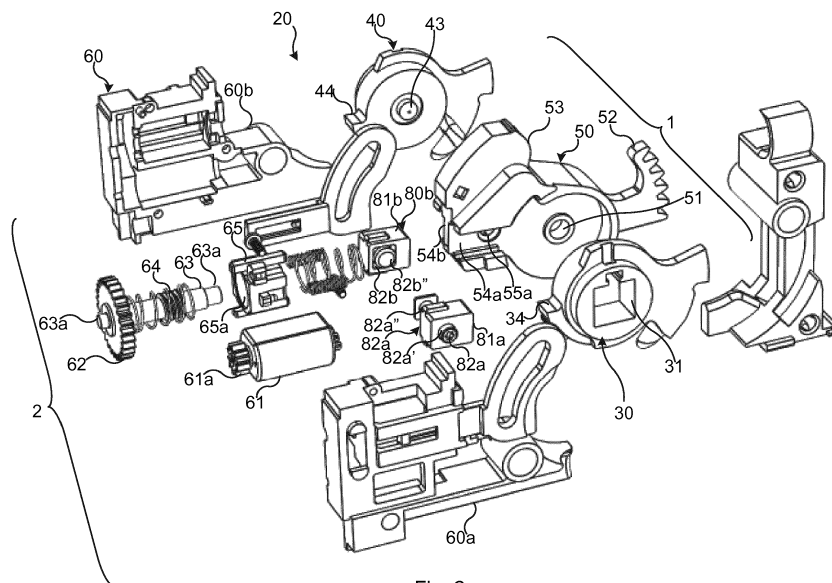


Fig. 2

EP 3 708 745 A1

Description

Technical field

[0001] The invention relates generally to electromechanical lock arrangements and particularly to a lock arrangement comprising a so called split follower unit and an actuator for selectively connecting and disconnecting different rotational followers in the split follower unit.

Background and prior art

[0002] For example at electromechanical mortise locks, it may be desirable to be able to separately engage and disengage an interior and an exterior door handle to the latch and/or dead bolt of the lock. Locks having such separately engageable handles are often referred to as "split spindle locks". By this it is meant that the shaft (usually a plain spindle) which connects the outer and inner handle with the locking mechanism is divided into two parts, so that the two handles can be rotated independently of one another.

[0003] In order to selectively transfer the respective handle movement to the locking mechanism, it is known to use a three-piece handle follower. This includes an outer handle follower which, via a first shaft is permanently coupled to the outer handle and an inner handle follower which is permanently coupled to the inner handle via a second shaft. An intermediate follower is arranged between the outer and the inner follower. The intermediate follower is connected to the lock's latch bolt and/or dead bolt for operation of these. The three followers are rotatable independently of each other about a common axis of rotation.

[0004] In order to allow selective connection, an electrically driven coupling arrangement is often used. The coupling device may comprise a first engagement member which can be brought in and out of simultaneous engagement with the outer handle follower and the intermediate follower. The coupling device further comprises a second engagement member which may correspondingly be brought into and out of simultaneous engagement with the inner handle follower and the intermediate follower. The two engagement members are driven in and out of engagement by means of a common actuator which for example may comprise a solenoid or an electric motor. The two engagement members may further be manually adjustable so that each separately can be set to permanently connect the respective outer or inner follower with the intermediate follower or to provide such a connection only when the actuator is activated for engagement.

[0005] EP 1 618 271 B1 describes such a three-part follower and an adjustable coupling device that enables connection and disconnection of two followers with a third follower. WO 2005/042886 discloses a similar alternative solution for such a "split spindle" lock.

[0006] With such three-part followers and coupling

devices, it is possible enable a free-swing function at which locking of the door is achieved by disconnecting one or both handles from the intermediate follower thereby disabling the respective handle from manoeuvring any bolt connected to the intermediate follower. After entering an authorization code, for example, by entering a code or presenting an authorized RFID tag, the actuator is activated such that either or both of the handle followers is/are connected with the intermediate follower. By this means the respective handle can be used to operate the latch bolt and/or the dead bolt.

[0007] Both of the above documents disclose embodiments wherein the engagement members are imparted a pivotal movement to be brought into and out of simultaneous engagement with respective handle follower and the intermediate follower. Furthermore, magnets are utilized in both solutions to bring the engagement members in and out of the simultaneous engagement. It has been found that such pivotal movement as well as the use of magnets cause certain disadvantages in the form of, inter alia, relatively large required space and low operational reliability.

[0008] WO 2014/028332 describes another type of electrically driven coupling device for an electromechanical lock. The coupling device is used to selectively block or allow rotation of a handle follower which is permanently connected to a handle and to a latch bolt and/or a dead bolt. Thus, in this type of coupling device, locking is not achieved by free-swing but, on the contrary, by the handle follower and hence the handle being selectively completely blocked from rotating.

[0009] The coupling device according to WO 2014/028332 comprises an inline motorized lock drive which is mountable within a lock housing to drive a sliding locking element between a locked and unlocked position. The lock drive includes a reversible motor having a shaft with an augur thereon to drive a lock spring, which drives the locking element. The sliding motion of the locking element is axially aligned with the motor axis to substantially reduce friction. A disadvantage of the device just described is that it can not be used to provide locking through free-swing. Another drawback is that, when the coupling device is used with a split hub, neither of the two hubs is blocked if one of the hubs would be misaligned during the blocking movement of the locking element, so that the coupling means can not engage with the rotating hubs. Thus, the lock will remain unlocked both from the outside and from the inside if, for example, only the internal hub is misaligned at the blocking movement.

Summary of the invention

[0010] An object of the present invention is to provide an enhanced electromechanical lock arrangement comprising a split follower unit and an actuator.

[0011] Another object is to provide such a lock arrangement which is reliable in use.

[0012] A further object is to provide such a lock arrangement which provides high degree of security.

[0013] Yet another object is to provide such a lock arrangement which exhibits a high capability to withstand manipulation attacks by strokes and impacts applied to the lock.

[0014] Still another object is to provide such a lock arrangement wherein either or both of two manoeuvring followers may readily be set to be in permanent connection with a lock bolt or to be selectively connected to or disconnected from the lock bolt by means of an electric actuator.

[0015] A still further object is to provide such a lock arrangement, which requires only a low electrical power consumption.

[0016] These and other objects are provided by the electromechanical lock arrangement as set out in claim 1. The electromechanical lock arrangement comprises a split follower unit and an actuator. The split follower unit comprises a first rotatable follower which is connectable to a first manoeuvring device, a second rotatable follower which is connectable to a second manoeuvring device and an intermediate follower which is connectable to a lock bolt. The first, the second and the intermediate followers are arranged axially aligned along a common rotational axis. The actuator is arranged for selectively connecting and disconnecting the first and the second followers to and from the intermediate follower. The actuator comprises an electrically driven, linearly displaceable slide. A first engagement member is connected to the slide by means of a first compression spring and arranged to be brought in and out of simultaneous engagement with the first follower and the intermediate follower. A second engagement member is connected to the slide by means of a second compression spring and arranged to be brought in and out of simultaneous engagement with the second follower and the intermediate follower.

[0017] The compression springs allow for that energy may be stored in the compression springs in cases where either engagement member is hindered from reaching its position of simultaneous engagement with the respective outer rotatable follower and the intermediate follower. Such hindering of the engagement member may e.g. occur if the respective outer rotatable follower and/or the intermediate follower have/has not reached a correct rotational engagement position, when the actuator is activated for the simultaneous engagement. In such cases, the compression spring connected to the hindered engagement member will be compressed such that the hindered engagement member will be biased or urged towards the simultaneous engagement position. As soon as the outer follower and/or the intermediate follower again have/has reached the correct rotational engagement position, the so biased engagement member will be pushed into simultaneous engagement with the outer follower and the intermediate follower. Since both engagement members are connected to the slide by means of a respective compression spring, hindering of one of

the engagement members will not affect the other engagement member such that this second engagement member may still be brought into simultaneous engagement with the respective outer follower and the intermediate follower. This provides an important advantage since e.g. the lock may still be operated correctly from one side of the door also if the outer follower assigned to the other side of the door has been jammed.

The actuator may comprise an electric motor connected to a rotational shaft. This allows for an energy efficient and reliable electric actuation.

[0018] The slide may be arranged concentrically around the rotational shaft and comprise an internal thread portion which may engage an external thread portion on the rotational shaft for axial displacement of the slide along the rotational shaft. Hereby a reliable linear drive of the slide is provided.

[0019] The slide may be arranged to be driven out of threaded engagement with the external thread portion and the actuator may further comprise biasing means for urging the slide towards the external thread portion. By this means the electric motor may be driven for longer time periods than what is required for displacing the slide from one axial end position to the other. Such an arrangement reduces the wear and the risk of jamming of the rotational shaft and the slide. It also reduces load torque at start and stop of the motor, which in turn reduces the wear on the motor.

[0020] The motor may be connected to the rotational shaft by means of a gear arrangement. This may reduce space requirements and allows for that a comparatively small motor with low power consumption may be used.

[0021] At least one of the first and second engagement members may comprise a by-pass means for disconnecting the respective engagement member from the slide. By this means the at least one of the two outer followers may be set in a mode where it is permanently connected to the intermediate follower, thereby to by-pass electrical actuation of the connection between this outer follower and intermediate follower. It is e.g. possible to permanently connect the rotatable follower connected to an inside door handle with the intermediate follower such that the inside door handle is permanently operable for opening the door, whereas the follower connected to the outside door handle is only operable for opening the door when it has been electrically activated by the actuator. It should be noted that the term "permanent" here means that the engagement member is in simultaneous engagement with the rotatable follower in question and the intermediate follower, irrespective of the movement of the actuator and the slide, as long as the by-pass means has not been disconnected.

[0022] At least one of the first and second engagement members may be connected to its compression spring by means of a respective carrier. This facilitates arranging the connection between the engagement member and the compression spring.

[0023] The by-pass means may comprise a coupling

member which may be brought in and out of engagement with the respective carrier. By this means the by-pass function is accomplished in a simple and reliable manner. It also allows for the outer followers to readily be switched between the electric operable mode and the permanently connected mode of operation.

[0024] The coupling member may comprise a threaded screw which is threadedly engaged with the respective engagement member. This also facilitates switching the lock arrangement between the different modes of operation.

[0025] The intermediate follower may comprise first drive means for driving a first lock bolt.

[0026] The intermediate follower may further comprise second drive means for driving a second lock bolt.

[0027] The first and or second manoeuvring devices may be chosen from a group comprising a handle, a thumb turn, a key operated lock cylinder, a panic exit device, an electric motor and a solenoid.

[0028] According to one embodiment the electromechanical lock arrangement forms part of an electromechanical lock.

[0029] Generally, all terms used in the claims are to be interpreted according to their ordinary meaning in the technical field, unless explicitly defined otherwise herein. All references to "a/an/the element, apparatus, component, means, step, etc." are to be interpreted openly as referring to at least one instance of the element, apparatus, component, means, step, etc., unless explicitly stated otherwise. The steps of any method disclosed herein do not have to be performed in the exact order disclosed, unless explicitly stated.

Brief description of the drawings

[0030] The invention is now described, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a plan view of a lock case provided with a latch bolt, a dead lock bolt a lock mechanism and a lock arrangement according to an embodiment of the invention.

Fig. 2 is an exploded perspective view of the lock arrangement shown in fig. 1.

Fig. 3 is a perspective exploded view of an actuator comprised in the lock arrangement shown in fig 2.

Fig 4a is a perspective view of the lock arrangement shown in fig. 2 illustrating the locked state and fig. 4b is a corresponding view illustrating the un-locked state.

Fig 5a is a perspective view of an actuator comprised in the lock arrangement shown in fig. 1, with some parts removed and illustrating the locked state. Fig

5b is a corresponding view illustrating the un-locked state.

Detailed description of embodiments

[0031] The invention will now be described more fully hereinafter with reference to the accompanying drawings, in which certain embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided by way of example so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. Like numbers refer to like elements throughout the description.

[0032] Fig. 1 illustrates an electromechanical lock comprising a lock case 10 attached to a forend 11. A lock mechanism is arranged in the lock case 10. The lock mechanism comprises several components for manoeuvring a latch bolt 12 and a dead bolt 13 in the form of a swing bolt. The latch bolt 12 is linearly displaceable between the protruding position shown in fig. 1 and a retracted position where it does not protrude out through the forend. Correspondingly the dead bolt 13 is pivotally movable between the protruding position shown in fig 1 and a retracted position.

[0033] The lock case further houses an electromechanical lock arrangement 20 according to an embodiment of the invention. The lock arrangement 20 is shown exploded in fig. 2. It comprises a split follower unit 1 and an actuator 2.

[0034] The split follower unit 30 comprises a first rotatable follower 30, a second rotatable follower 40 and an intermediate rotatable follower 50. These rotatable followers are axially aligned along a common rotational axis and arranged such that they may rotate or pivot about the rotational axis independently of each other.

[0035] The first rotatable follower 30 exhibits a central recess 31 for receiving a plain spindle (not shown) by which it may be connected to a first handle (not shown). Correspondingly, the second rotatable follower 40 exhibits a central recess (hidden in the figures) for connection to a second handle (not shown). The first follower further comprises a first radially protruding engagement seat 34 and the second follower comprises a corresponding second radially protruding engagement seat 44. These engagement seats 34, 44 will be explained more in detail below.

[0036] As best seen in fig. 1, the first 30 and second 40 followers are rotationally biased by a respective return spring 32 arranged in the lock case 10, for returning the followers 30, 40 to their initial rotational position after the respective handle has been depressed and released. The first and second followers 30, 40 each comprises a central shaft journal 43 which is rotationally received in a respective central recess 51 arranged in the intermediate follower. By this means the first 30 and second 40

followers are kept aligned with the intermediate follower 50.

[0037] The intermediate follower 50 comprises a first drive means in the form of a cogged radially extending arm 52 for connection with the dead bolt 13. In the example shown in fig. 1 the intermediate follower 50 is connected to a cylinder follower 14 via a rod coupling mechanism. Such coupling between the intermediate follower 50 and the dead bolt 13 is known per se and not described more in detail here. The intermediate follower 50 further comprises a second drive means in the form of a radially protruding cam 53 for connection with the latch bolt 12. In the example shown in fig. 1 the cam 53 cooperates with a bolt latch 12 at the rear end of the latch bolt 12 for retracting the latch bolt 12 when the intermediate follower 50 is rotated in the clockwise direction, as seen in figs. 1 and 2.

[0038] The intermediate follower 50 further comprises a first engagement recess 54a and a second engagement recess 54b. Each engagement recess 54a, 54b exhibit a generally U-shape cross section which is open towards the first 30 and second 40 follower respectively. In the bottom of each recess 54a, 54b there is provided a respective threaded hole 55a. The threaded holes 55a extend in parallel with the rotational axis of the followers 30, 40, 50.

[0039] The actuator 2 comprises a housing 60 comprising two housing halves 60a, 60b which are joined along a longitudinal central plane of the actuator 2. The active components of the actuator are arranged inside and outside the housing and some of them are guided by guide means arranged on the housing halves 60a, 60b. An electrical motor 61 with a output shaft provided with a first gear 61a is received in the housing 60. The first gear 61a meshes with a second gear 62 having a larger diameter than the first gear 61a. The second gear 62 is fixed to a drive shaft 63 which is rotatable about a rotational axis arranged in the longitudinal central plane of the housing, perpendicular to the rotational axis of the followers 30, 40, 50. The drive shaft 63 exhibits an external thread portion 64. The external thread portion 64 extends axially along only a limited portion of the drive shaft's 63 length and is arranged at or in proximity to the axial centre of the drive shaft 63. Each end of the drive shaft 63 forms a shaft journal 63a which is received in a respective journal bearing 60' formed by the housing halves 60a, 60b (see fig. 4a).

[0040] A slide 65 with a central bore 65a is threaded onto the drive shaft 63. An internal thread portion 65b is arranged in the bore 65a. The internal thread portion 65b is arranged to threadedly engage and disengage the external thread portion 64 of the drive shaft 63. When the internal thread portion 65a engages the external thread portion 64, rotation of the drive shaft will displace the slide axially in a direction corresponding to the rotational direction of the drive shaft 63. The slide 65 further comprises a first 66a and a second 66b driver which protrude laterally in opposite directions. A first 67 and a second

68 biasing spring are arranged at a respective axial end of the slide 65. The biasing springs 67, 68 are supported by respective support surfaces of the housing 60 and are arranged to urge the slide in a respective direction towards the thread portion 64 of the drive shaft 63.

[0041] A first 70a and a second 70b carrier are arranged laterally outside the slide 65. The first carrier 70a is guidedly received in a guide channel of the first housing half 60a such that the first carrier may be axially displaced in parallel with the drive shaft's 63 rotational axis, relative to the housing 60. Correspondingly, the second carrier 70b is guidedly received in a guide channel of the second housing half 60b such that the second carrier may be axially displaced in parallel with the drive shaft's 63 rotational axis, relative to the housing 60. Each carrier 70a, 70b exhibits a longitudinal slot 71a, 71b which receives a respective driver 66a, 66b of the slide 65. Each carrier 70a, 70b further exhibits a respective arched slot 72a, 72b.

[0042] Each longitudinal slot 71a, 71b comprises a first end 71a', 71b' which is arranged distal to the first 30, second 40 and intermediate 50 followers. The longitudinal slots 71a, 71b also exhibit a respective second end 71a", 71b" which are arranged proximal to said followers 30, 40, 50. The first longitudinal slot 71a receives the first driver 66a of the slide 65 and a first compression spring 73a, which is arranged between the first driver 66a and the second end 71a" of the slot. Correspondingly, the second longitudinal slot 71b receives the second driver 66b of the slide 65 and a second compression spring 73b, which is arranged between the second driver 66b and the second end 71b" of the slot.

[0043] The actuator further comprises a first engagement member 80a and a second engagement member 80b (best seen in fig. 2). Each engagement member 80a, 80b comprises a generally cuboid body 81a, 81b and a threaded screw 82a, 82b which extends through a threaded hole in the body 81a, 81b. Each screw 82a, 82b comprises a head 82a', 82b' and a threaded stem 82a", 82b". The engagement members 80a, 80b are arranged such that the heads 82a', 82b', by rotating the screws 82a, 82b, may assume a protruding position and a recessed position relative to the body 81a, 81b. In the protruding position, the heads 82a', 82b' are received in the arched slot 72a, 72b of a respective carrier 70a, 70b and the threaded portions 82a", 82b" do not protrude essentially from the opposite side of the respective body 81a, 81b. In the recessed position the heads 82a', 82b' are recessed in the respective body 81a, 81b such that they can not be received in the arched slots 72a, 72b of the carriers 70a, 70b. Instead, in the recessed position, the threaded stems 82a", 82b" protrude from the respective body 81a, 81b such that they may be treaded into the a respective threaded hole 55a of the intermediate follower 50.

[0044] Operation of the electromechanical lock arrangement will now be explained with reference to figs. 4a-b and 5a-b. Figs. 4a and 5a illustrates the lock ar-

rangement when in locked condition where neither the first follower 30 nor the second follower 40 may be used for operating the latch bolt 12 or the dead bolt 13.

[0045] At this condition, the motor 61 has been rotated in a first rotational locking direction such that the slide 65 has been axially displaced to that end of the drive shaft 63 which is distal to the followers 30, 40, 50. As best seen in fig 5a, the slide 65 has been displaced so far that it has been brought out of threaded engagement with the thread portion 64 of the drive shaft 63. During this displacement the first driver 65a and the second driver 65b have, in contact with a corresponding first end 71a', 71b' of the respective longitudinal slot 71a, 71b, driven the carriers 7a, 70b to the locked position where the carriers are in a distal position relative to the followers 30, 40, 50. The screw heads 82a', 82b' of the engagement members 80a, 80b are in the protruding position such that they are received in the arched slots 72a, 72b of the carriers 70a, 70b. By this means also the engagement members 80a, 80b have been displaced away from the followers 30, 40, 40, such that the engagement members do not engage the engagement seats 34, 44 of the first 30 and second 40 follower or the engagement recesses 54a, 54b of the intermediate follower 50. Thus, as best seen in fig. 4a, the first 30 and second 40 follower may be rotated clockwise as seen in fig. 4a, without bringing about any rotation of the intermediate follower. Thereby, the first 30 and second 40 followers may not be used for retracting the latch bolt or the dead bolt 13 and the lock arrangement is thus locked.

[0046] It should be noted in this position that the actuator prevents manipulating the lock arrangement by so called bumping, i.e. by applying strokes or impacts to the arrangement. This is prevented by the fact that the slide 65 is mechanically blocked from moving towards the followers 30, 40, 50 since it is out of threaded engagement with the thread portion 64 of the drive shaft 63 on the side of the thread portion which is distal to the followers 30, 40, 50. Additionally, the drivers 65a, 65b are in direct contact, without any intermediate spring or other resilient element, with the first distal ends 71a', 71b' of the carriers' 70a, 70b longitudinal slots 71a, 71b. Hence, by this means the engagement members 80a, 80b can not be displaced towards the followers and they are thus securely prevented from being brought into engagement with the engagement seats 34, 44 and the engagement recesses 54a, 54b.

[0047] For unlocking the lock arrangement, the first follower 30 should first be returned to its normal initial position shown in fig. 4b. In cases where the first follower 30 is connected to a door handle, the handle should be released such that the return sprig rotates the first follower 30 anti-clockwise from the position shown in fig. 4a to the position shown in fig. 4b.

[0048] Thereafter, the motor is activated to rotate in a second rotational unlocking direction, which is opposite to the rotational locking direction. The second biasing spring 68 urges the slide 65 towards the thread portion

64 of the drive shaft 63 such that the slide 65 threadedly engages the thread portion 64. Continued rotation then displaces the slide 65 towards the followers 30, 40, 50 until the slide 65 disengages the thread portion 64 at the opposite end portion of the drive shaft 63. During this axial displacement of the slide 65, the drivers 66a, 66b push the carriers 70a, 70b towards the followers, via the respective compression spring 73a, 73b. During this axial displacement of the carriers 70a, 70b the engagement of the screw heads 82a', 82b' in the arched slots 72a, 72b drives the first engagement member 80a into simultaneous engagement with the first engagement seat 34 and the first engagement recess 54a. Correspondingly the second engagement member 80b is brought into simultaneous engagement with the second engagement seat 44 and the second engagement recess 54b. By this means both the first 30 and the second follower are mechanically connected with the intermediate follower 50, by means of the respective engagement member 80a, 80. Rotation of either of the first 30 and second 40 follower will thus cause the intermediate follower 50 to rotate and thereby to retract the latch bolt and the dead bolt. Hence, at this position the lock arrangement has been unlocked.

[0049] A particular advantage resides in that each engagement member 80a, 80b is independently connected to the slide via a respective compression spring 73a, 73b. If one of the engagement members 80a, 80b is hindered from assuming the simultaneous engagement position with the respective first 30 or second follower and the intermediate follower 50, the other engagement member may still be fully axially displaced to the simultaneous engagement position. Such hindering of one of the engagement members 80a, 80b may e.g. occur if the corresponding follower has been rotated to the position shown in fig. 4a such as by depressing a handle connected to the first follower 30. In such cases the compression spring 73a, 73b assigned to the hindered engagement member 80a, 80b, will allow continued axial displacement of the slide 65, while being compressed and thereby store the energy for displacing the corresponding carrier 70a, 70b and engagement member 80a, 80b. As soon as the hindering follower has assumed the normal, initial position, the compression spring will expand thereby to complete the axial displacement of the previously hindered carrier 70a, 70b and engagement member 80a, 80b.

[0050] In the operational description above both engagement members 80a, 80b are set in an electric operable mode. This mode is effected when the screw heads 82a', 82b' are in the protruding position, where the heads protrude into the respective arched slot 72a, 72b and the treaded stems 82a", 82b" do not protrude essentially from the body 81a, 81b of the respective engagement member 80a, 80b. When it is desired to by-pass the electrical mode of operation of either or both of the first and/or second follower 30, 40 into a permanently connected mode of operation, the corresponding screw 82a, 82b is simply screwed further into the corresponding

body 81a, 81b. By this means the screw head 82a', 82b' is disengaged from the corresponding arched slot 72a, 72b such that axial displacement of the corresponding carrier, will not cause any axial displacement of that engagement member 80a, 80b. Simultaneously, the stem 82a", 82b" will be threaded into engagement with the corresponding threaded hole 55a of the intermediate follower 50. In this way either or both of the first 30 and second 40 followers will be permanently connected to the intermediate follower by means of the respective engagement member 80a, 80b thereby bypassing the electrical mode of operation for that/those followers. For resetting the follower to the electrical mode of operation, the corresponding screw 82a, 82b is simply unscrewed such that its head 82a', 82b' again engages the corresponding arched slot 72a, 72b and the stem 82a", 82b" is disengaged from the threaded hole 54a in the intermediate follower.

[0051] The invention has mainly been described above with reference to a few embodiments. However, as is readily appreciated by a person skilled in the art, other embodiments than the ones disclosed above are equally possible within the scope of the invention, as defined by the appended patent claims.

[0052] For instance, in the described examples the first and second followers are intended to be connected to a respective handle, one on each side of a door in which the electromechanical lock is arranged. However, the first and/or second follower may also be arranged to be connected to other types of manoeuvring devices, such as a thumb turn, a key operated lock cylinder, a panic exit device, an electric motor or a solenoid.

[0053] At a not shown embodiment the electrical motor may be replaced by another drive means, such as a solenoid for driving the slide.

Claims

1. An electromechanical lock arrangement comprising a split follower unit (1) and an actuator (2), wherein the split follower unit comprises
 - a first rotatable follower (30) which is connectable to a first manoeuvring device,
 - a second rotatable follower (40) which is connectable to a second manoeuvring device and
 - an intermediate rotatable follower (50) which is connectable to a lock bolt (12, 13), wherein the first (30), the second (40) and the intermediate (50) followers are arranged axially aligned along a common rotational axis; wherein the actuator (2) is arranged for selectively connecting and disconnecting the first (30) and the second (40) followers to and from the intermediate follower (50), and wherein the actuator comprises
 - an electrically driven, linearly displaceable slide (65),

- a first engagement member (80a) which is connected to the slide (65) by means of a first compression spring (73a) and arranged to be brought in and out of simultaneous engagement with the first follower (30) and the intermediate follower (50), and

- a second engagement member (80b) which is connected to the slide (65) by means of a second compression spring (73b) and arranged to be brought in and out of simultaneous engagement with the second (40) follower and the intermediate follower (50).

2. A lock arrangement according to claim 1, wherein the actuator (2) comprises an electric motor (61) connected to a rotational shaft (63).
3. A lock arrangement according to claim 2, wherein the slide (65) is arranged concentrically around the rotational shaft (63) and comprises an internal thread portion (65b) which may engage an external thread portion (64) on the rotational shaft (63) for axial displacement of the slide (65) along the rotational shaft (63).
4. A lock arrangement according to claim 3, wherein the slide (65) is arranged to be driven out of threaded engagement with the external thread portion (64) and wherein the actuator (2) further comprises biasing means (67, 68) for urging the slide (65) towards the external thread portion (64).
5. A lock arrangement according to any of claims 2-4, wherein the motor (61) is connected to the rotational shaft by means of a gear arrangement (61a, 62).
6. A lock arrangement according to any of claims 1-5, wherein at least one of the first (80a) and second (80b) engagement members comprises a by-pass means (82a, 82b) for disconnecting the respective engagement member (80a, 80b) from the slide (65).
7. A lock arrangement according to any of claims 1-6, wherein at least one of the first (80a) and second (80b) engagement members is connected to its compression spring (73a, 73b) by means of a respective carrier (70a, 70b).
8. A lock arrangement according to claims 6 and 7, wherein the by-pass means comprises a coupling member (82a, 82b) which may be brought in and out of engagement with the respective carrier (70a, 70b).
9. A lock arrangement according to claim 8, wherein coupling member comprises a threaded screw (82a, 82b) which is threadedly engaged with the respective engagement member (80a, 80b).

10. A lock arrangement according to any of claims 1-9, wherein the intermediate follower (50) comprises first drive means (52) for driving a first lock bolt (13).
11. A lock arrangement according to claim 10, wherein the intermediate follower (50) comprises second drive means (53) for driving a second lock bolt (12). 5
12. A lock arrangement according to any of claim 1-11, wherein the first and or second manoeuvring devices are chosen from a group comprising a handle, a thumb turn, a key operated lock cylinder, a panic exit device, an electric motor and a solenoid. 10
13. An electromechanical lock comprising an electromechanical lock arrangement according to any of claims 1-12. 15

20

25

30

35

40

45

50

55

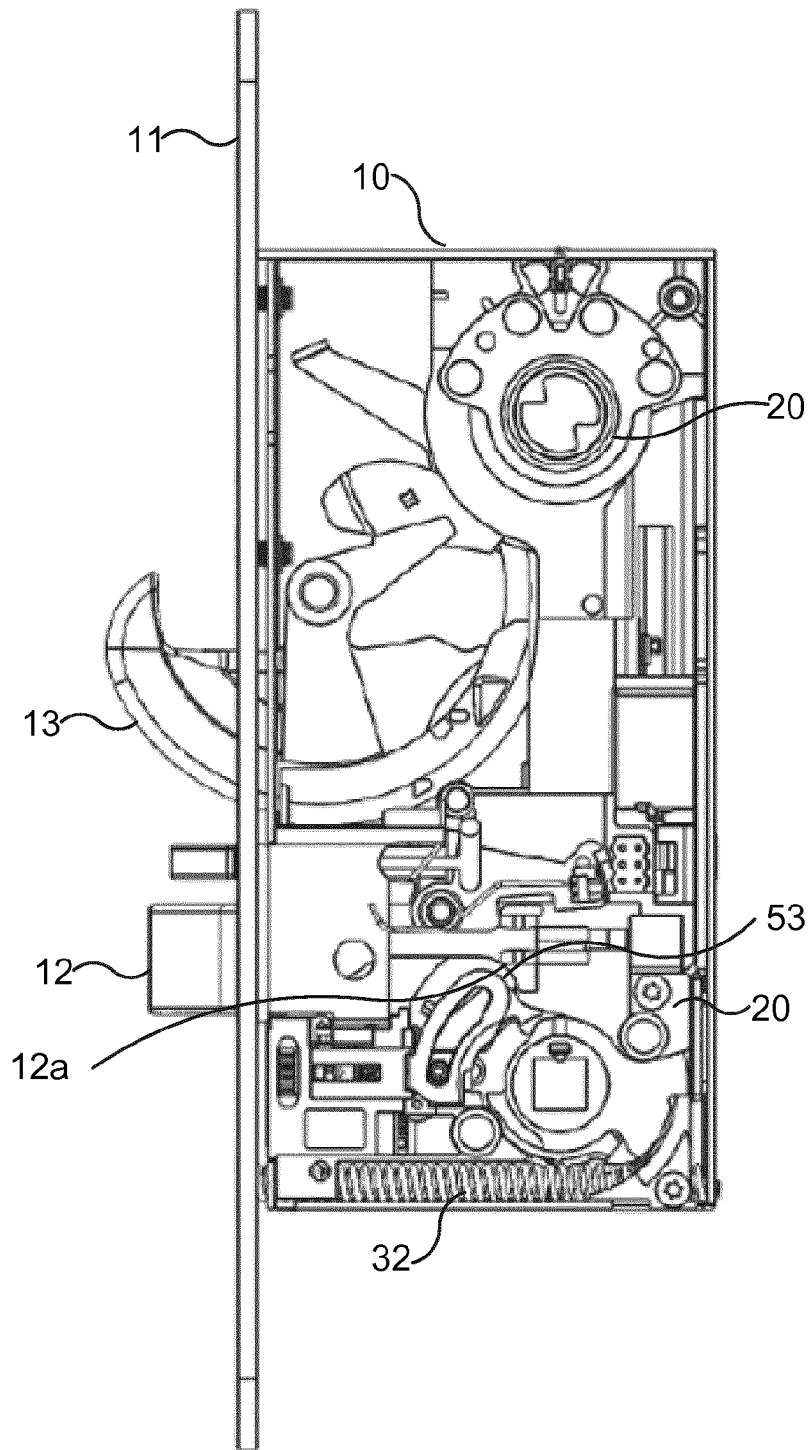


Fig. 1

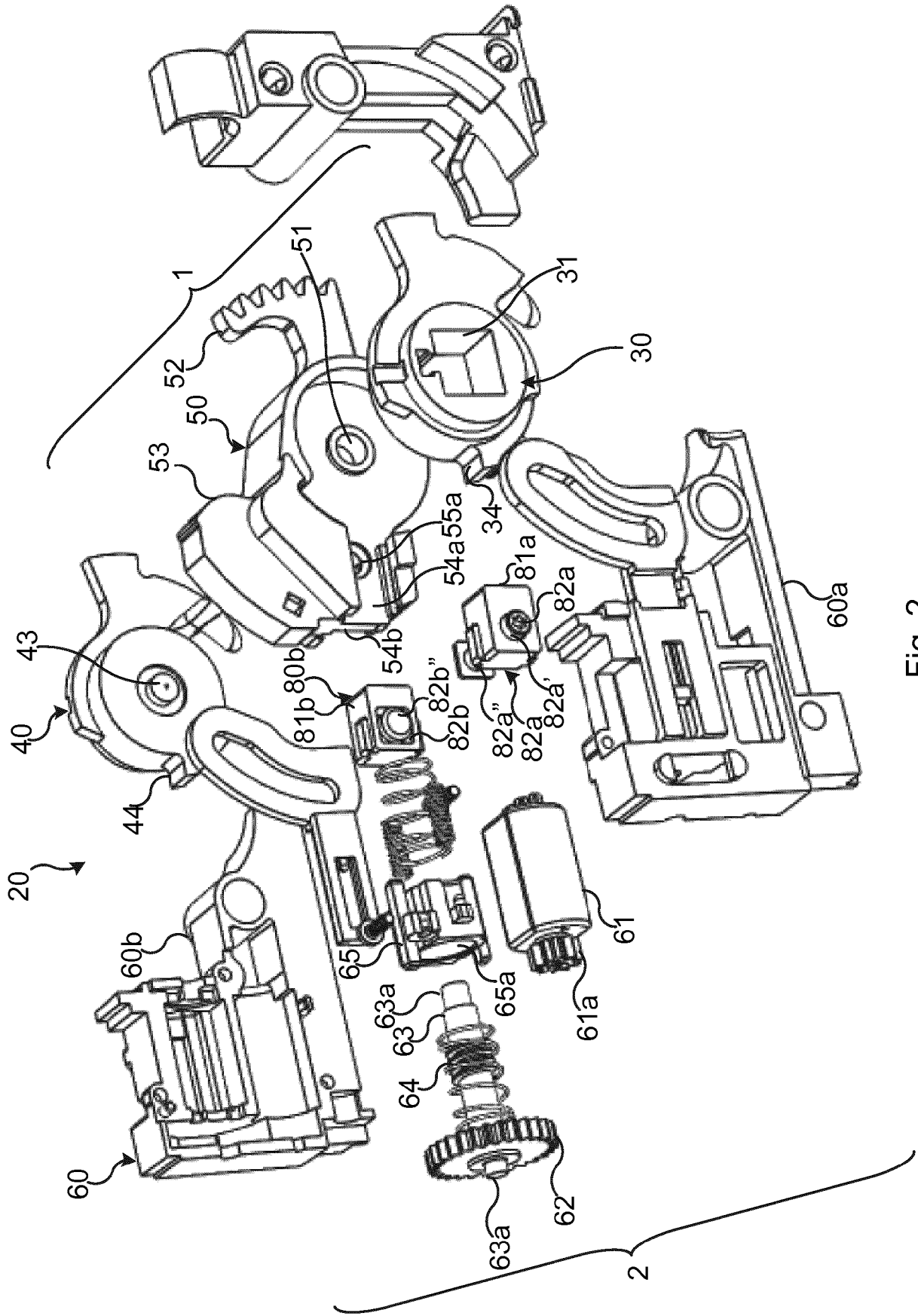


Fig. 2

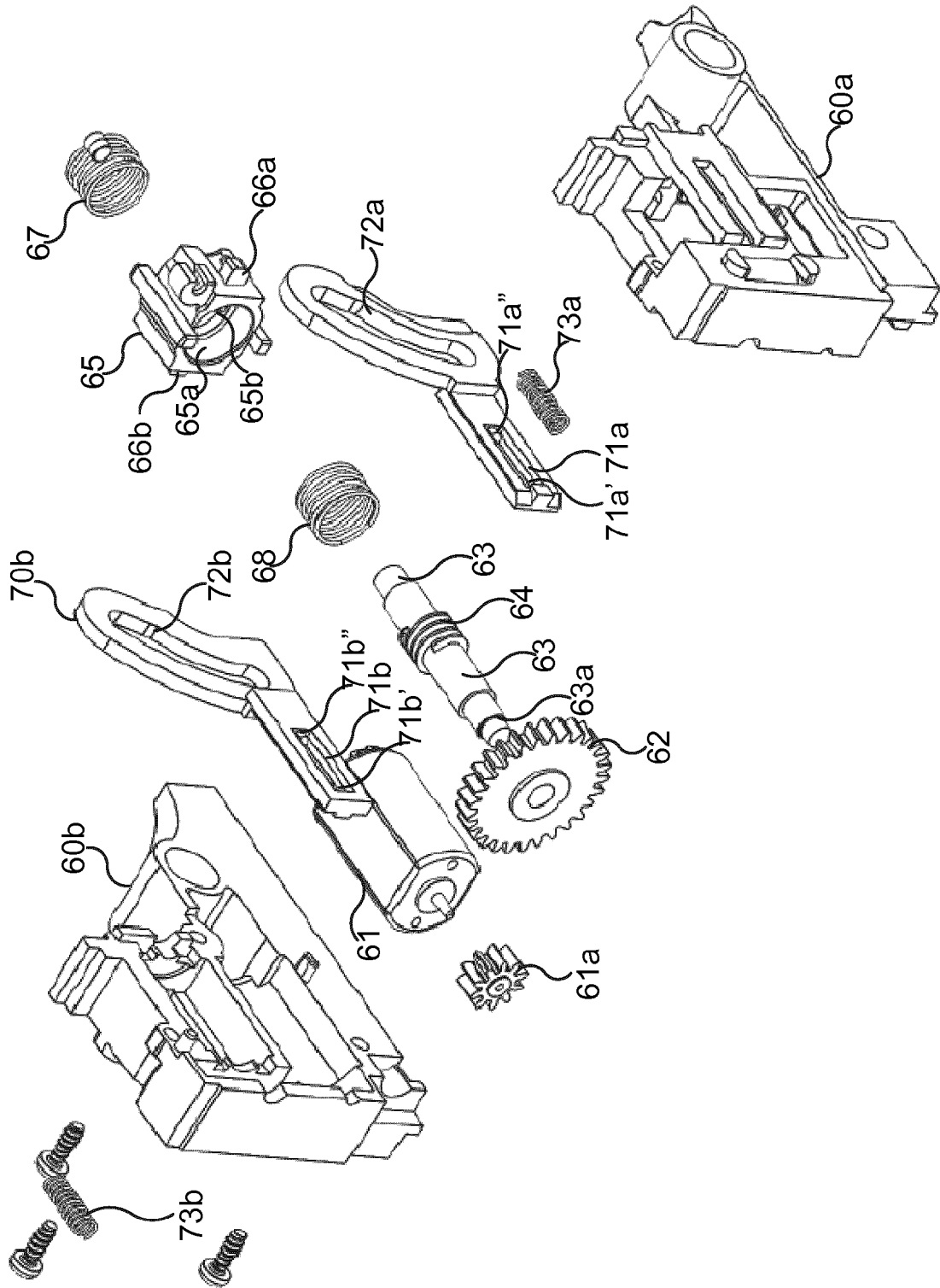


Fig. 3

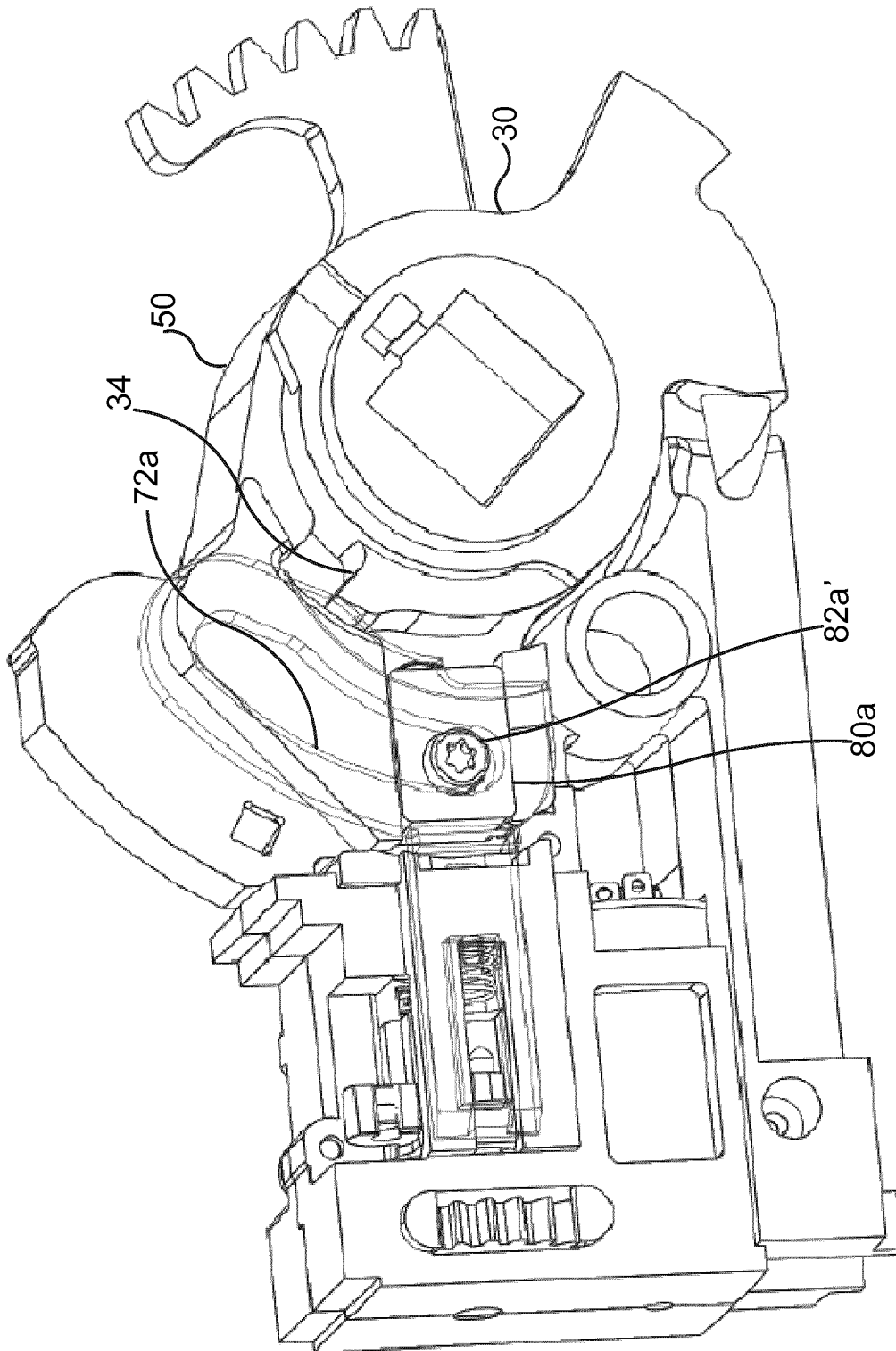


Fig. 4a

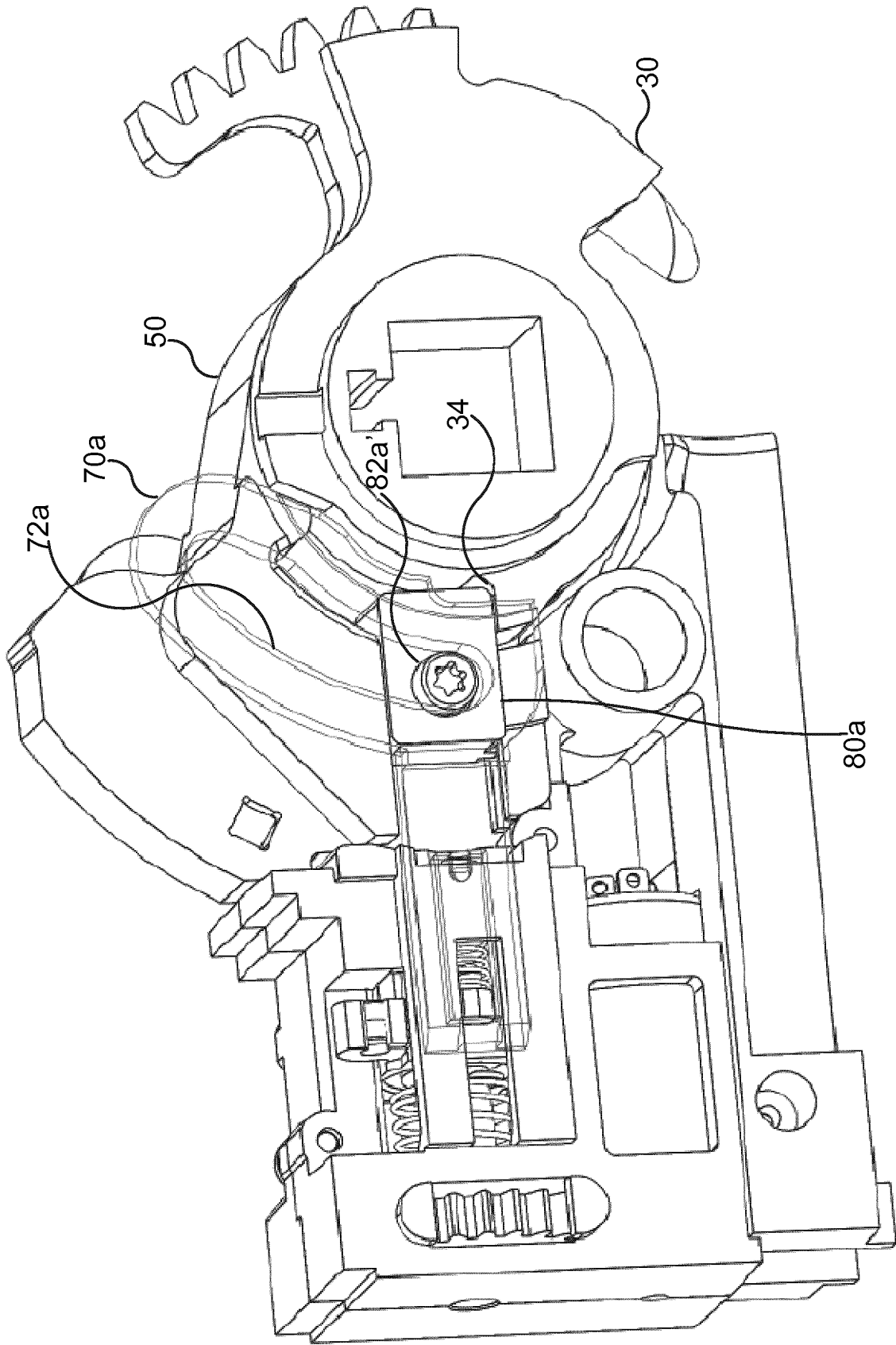


Fig. 4b

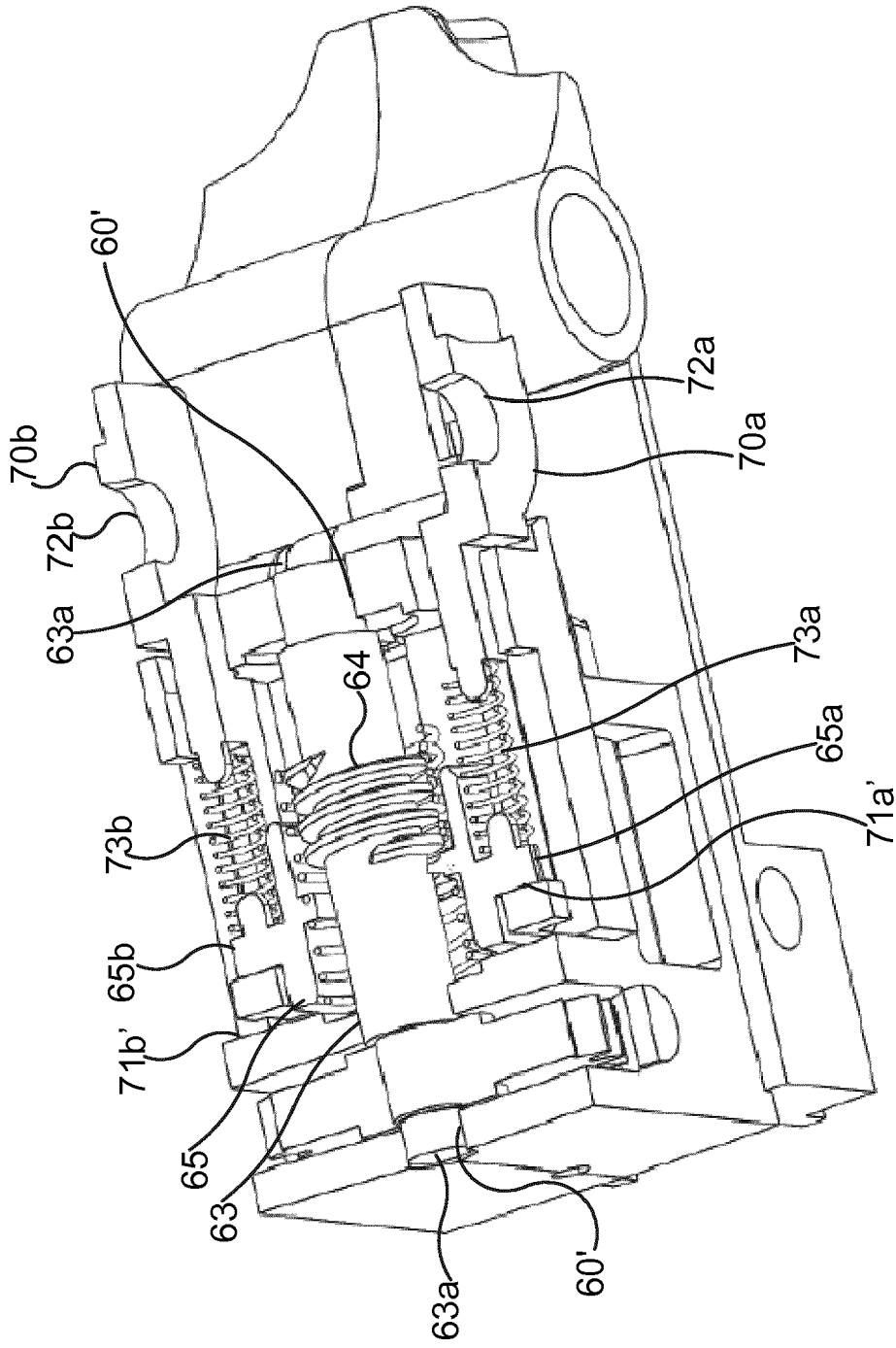


Fig. 5a

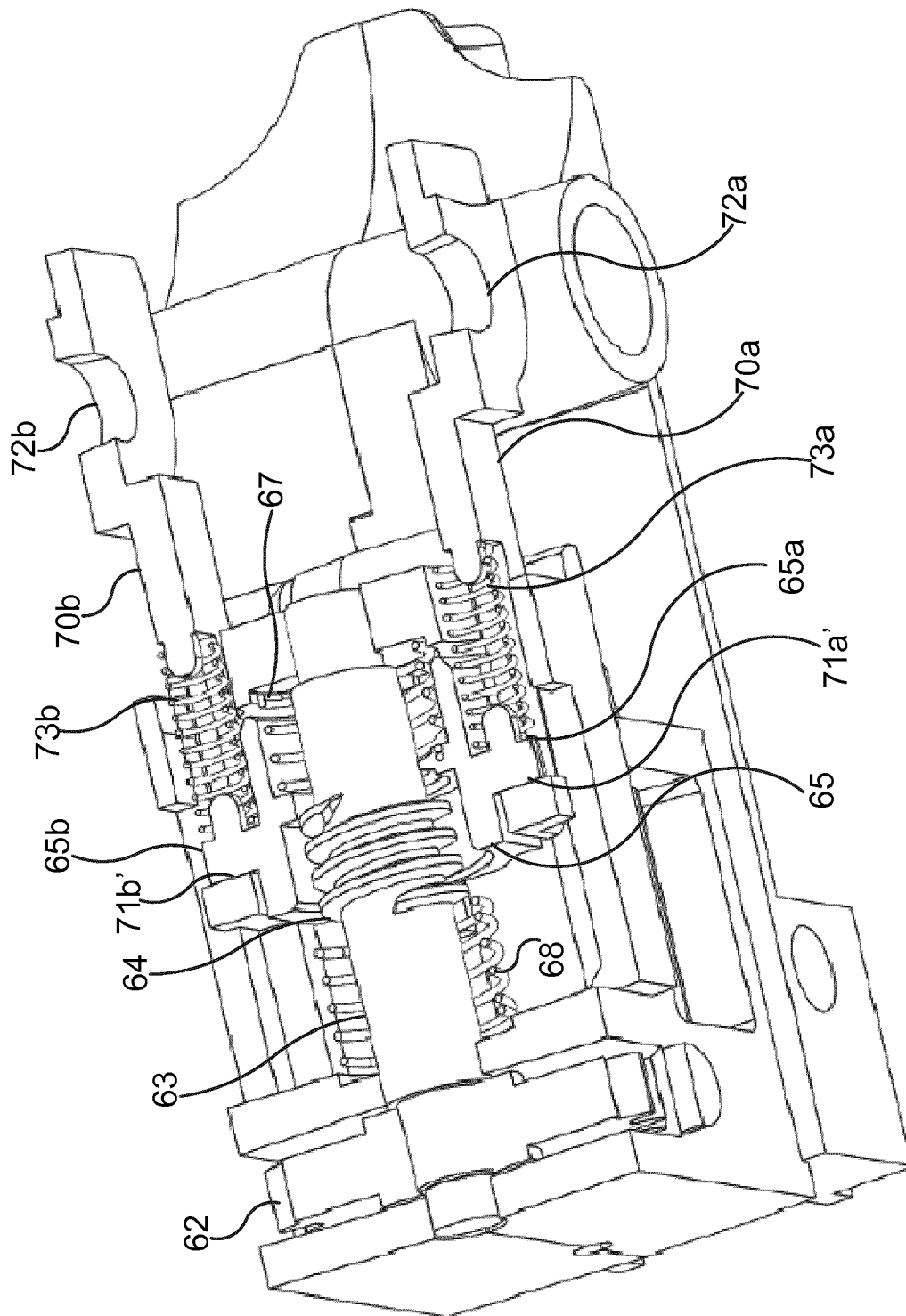


Fig. 5b



EUROPEAN SEARCH REPORT

Application Number
EP 19 16 2525

5

10

15

20

25

30

35

40

45

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2018/158476 A1 (SALTO SYSTEMS SL [ES]) 7 September 2018 (2018-09-07) * paragraph [0023] - paragraph [0130]; figures 1-16 *	1-13	INV. E05B47/06 E05B63/00 E05B63/16 E05B47/00
A	WO 2005/124069 A1 (ASSA AB [SE]; COLLIN KJELL [SE]) 29 December 2005 (2005-12-29) * pages 1-7; figures 1-6c *	1-13	
A	US 6 619 705 B2 (SCHLAGE LOCK CO [US]) 16 September 2003 (2003-09-16) * column 4, line 34 - column 8, line 65; figures 1-13 *	1-13	
A	WO 2015/058254 A1 (ASSA ABLOY AUSTRALIA PTY LTD [AU]) 30 April 2015 (2015-04-30) * paragraph [0039] - paragraph [0045]; figures 1-16 *	1-13	
A,D	EP 1 618 271 A1 (ASSA AB [SE]) 25 January 2006 (2006-01-25) * the whole document *	1-13	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			E05B
Place of search		Date of completion of the search	Examiner
The Hague		5 September 2019	Boufidou, Maria
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.

EP 19 16 2525

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

05-09-2019

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2018158476 A1	07-09-2018	AU 2018228797 A1	05-09-2019
		ES 2689376 A1	13-11-2018
		FR 3064017 A3	21-09-2018
		WO 2018158476 A1	07-09-2018

WO 2005124069 A1	29-12-2005	AT 463643 T	15-04-2010
		AU 2005254927 A1	29-12-2005
		CN 101014750 A	08-08-2007
		DK 1774124 T3	02-08-2010
		EP 1774124 A1	18-04-2007
		HK 1110372 A1	25-05-2012
		NZ 552507 A	31-07-2009
		WO 2005124069 A1	29-12-2005

US 6619705 B2	16-09-2003	NONE	

WO 2015058254 A1	30-04-2015	AU 2014339761 A1	07-04-2016
		CN 105658886 A	08-06-2016
		HK 1219765 A1	13-04-2017
		SG 11201602121T A	28-04-2016
		WO 2015058254 A1	30-04-2015

EP 1618271 A1	25-01-2006	AT 453032 T	15-01-2010
		EP 1618271 A1	25-01-2006
		SE 0300984 A	05-10-2004
		WO 2004088069 A1	14-10-2004

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 1618271 B1 [0005]
- WO 2005042886 A [0005]
- WO 2014028332 A [0008] [0009]