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ACTUATOR, CLOSING MECHANISM, ELECTROMECHANICAL DOOR LOCK, AND
USE AND METHOD FOR SAME

[0001] The invention relates to an actuator, in particular, an
5 actuator for an electromechanical door lock, according to the
preamble of claim 1.

[0002] The invention further relates to a locking mechanism, in
particular, an electromechanical locking mechanism, according to
the preamble of claim 5.

10 [0003] In addition, the invention relates to an electromechanical
door lock, which comprises an electrically and/or
electromechanically actuatable locking mechanism, according to the
preamble of claim 11.

[0004] The invention also relates to a use of an actuator or of a
15 locking mechanism with an actuator in a lock cylinder or an
electromechanical lock, according to claim 13.

[0005] Finally, the invention relates to methods for producing a
locking mechanism and/or an electromechanical door lock
according to claim 14.

20 [0006] In general, actuators for lock cylinders,
electromechanical door locks, locking mechanisms, closing
devices and the like and their manufacturing procedures are
known from the prior art. In particular, electromotors and
actuators for blocking and/or releasing a locking mechanism
25 connected or interacting with them are used for
electromechanical lock cylinders and/or electromechanical door
locks.

[0007] From WO 2017/021410 A1 an actuating element for a rim lock of a door with an output shaft and a handle is known, which have a common axis of rotation and are connected to each other by means of an electromechanical clutch, wherein the output shaft
5 has, on the side facing the handle, a recess for a clutch element that can be moved axially between an open position and a closed position in a motorized manner, and the handle has, opposite the recess, a receptacle for the clutch element, wherein the motor drives a shaft, on and/or in which at least
10 one coil spring arranged in rotationally fixed manner with respect to the stator of the motor is arranged coaxially, wherein the shaft has at least one driver that reaches into an intermediate space between two adjacent turns of the coil spring such that rotation of the shaft axially moves the coil spring,
15 and the coil spring acts on the clutch element such that axial movement of the coil spring preloads the clutch element at least in the direction corresponding to the movement.

[0008] From US 6,640,594 B1 an electronic lock is known which requires low performance and consumes less power, including an
20 outer frame, an inner frame, a locking axis unit and a drive unit. The outer frame is fastened to a door on the outside of a closure rod. The outer frame has an outer handle, a keypad and a key path on the outside, and has the interior for the housing of the locking axis unit and the drive unit, in order to couple to
25 the inner frame. The drive unit comprises a motor, a spring, a sleeve, a sliding plate and retaining plate. The drive unit is coupled to an L-shaped lever, in order to generate lever movements. Users can enter an electronic password to activate the motor, in order to execute the locking and unlocking
30 function. The lock has an actuator with a spindle shaft.

[0009] From EP 2 927 396 A1 a coupling arrangement for a lock cylinder is known, with a housing, a shift element arranged in the housing, a drive device arranged in the housing and with a coupling device that is displaceable between a coupling position and a decoupling position, wherein the shift element can be rotated around a shifting axis by means of the drive device, wherein the shift element is fixed in axial direction with respect to the shifting axis, wherein the shift element is designed as a shaft, and wherein the shaft is and connected in rotationally fixed manner to a coil spring displaceably on the shaft in axial direction with respect to the shifting axis, wherein the coupling arrangement has two stops for limiting a travel path of the coil spring on the shaft, wherein the coupling device has a carrier element that is displaceably mounted in rotationally fixed manner and parallel to the shifting axis, wherein the carrier element engages with the coil spring for the implementation of a rotating movement of the shift element in an axial movement of the carrier element with respect to the shifting axis, and wherein the coupling device further has at least two pin elements, wherein each pin element is moveably coupled to the carrier element parallel to the shifting axis.

[0010] From EP 3 272 976 A1 a coupling mechanism for a mechatronic locking system and the corresponding mechatronic locking system is known. The coupling mechanism has an outer coupling part which is pivotably mounted around an axis of rotation, an inner coupling part, which is pivotably mounted relative to the outer coupling part, a coupling intermediate piece, a coupling element, which can be moved along a radial axis to the axis of rotation, and a drive. The drive is set up

to move the coupling intermediate piece from a first position to a second position and from the second to the first position. The coupling mechanism is characterized in that the drive has a spring shaft, via which it moves the coupling intermediate piece
5 between the first and the second position. Further, the coupling element is guided such by the coupling intermediate piece that its position along the radial axis is defined completely by the coupling intermediate piece. In so doing, the coupling element does not connect the outer coupling part to the inner coupling
10 part when the coupling intermediate piece is in the first position, and it connects the outer coupling part to the inner coupling part when the coupling intermediate piece is in the second position.

[0011] One problem addressed by the invention is that of creating
15 an actuator, a locking mechanism, an electromechanical lock and a method for its production and a use in which an improved cooperation between the driver and the coil spring is ensured and in which a simpler production is possible, wherein a low installation space and lower material costs are realized.

[0012] This and other problems are solved by an actuator, a
20 locking mechanism, a lock cylinder, an electromechanical lock and a method for its production and a use to this end.

[0013] Advantageous further developments of the invention are
25 stated in the dependent claims or will be stated below in conjunction with the description of the figures.

[0014] The invention includes the technical teaching that in the
case of an actuator, in particular in the case of actuator for
an electromechanical door lock, comprising a motor which drives
a shaft, in and/or on which at least one coil spring is
30 arranged, wherein the shaft has at least one driver engaging in

an intermediate space between two adjacent turns of the coil spring, with the result that a rotation of the shaft axially displaces the coil spring, the coil spring acts on a slide such that an axial displacement of the coil spring preloads the slide at least in the direction corresponding to a displacement, provision is made that the motor has a drive shaft and the shaft is arranged in a non-coaxial manner with, in particular parallel to, and/or not in series and/or not in an aligned manner with the drive shaft. The motor drives the shaft via an interposed gear mechanism, wherein the two ends of the coil spring are fixed in a freely axially displaceable, i.e. not stationary, manner, wherein the slide has a receptacle in the form of a slotted through-opening, through which the shaft projects in the assembled state. The driver is in the form of at least one external thread, extending at least partially circumferentially around the shaft, on the shaft, the slide is in the form of a bridge-like slide with two lateral walls that are spanned in a bridge-like manner by a bridge portion.

[0015] In one embodiment the actuator comprises at least one motor. The motor is preferably in the form of an electromotor or e-motor for short. Said e-motor is provided with the appropriate energy - here electrical power, via an energy source, which is preferably provided in an installation situation in and/or on a door lock. Among other things, the motor has a stator and a drive shaft. In operation the motor transfers a torque to the at least one shaft. In one embodiment the shaft is arranged in a non-coaxial manner to the drive shaft of the motor. Preferably, the shaft is arranged in a non-coaxial manner with and/or not in series and/or not in an aligned manner with the drive shaft of the motor. In one embodiment the shaft is

arranged parallel to the drive shaft of the motor. Other
embodiments provide diagonal arrangements, wherein a parallel
arrangement is preferred. In one embodiment, the drive shaft and
the shaft are not arranged in series, in particular, not
5 arranged in series in axial direction of the drive shaft. This
means that the drive shaft and the shaft overlap at least
partially in axial direction. In particular, in one preferred
embodiment, no free space is provided in axial direction between
the drive shaft and the shaft. Correspondingly, the shafts are
10 arranged transversely, in particular perpendicularly, offset to
one another to an axial direction. In a further embodiment, the
shaft and the drive shaft are arranged in non-aligned manner to
each other. This means the two axes of the shafts - drive shaft
and shaft - do not point at each other. For such a space-saving,
15 in particular parallel arrangement to be possible, a gear
mechanism is required. The gear mechanism causes a power
transmission between the drive shaft and the shaft.

[0016] A spiral or coil spring is arranged on, in or at the
shaft. The spiral or coil spring can be in the form of any
20 spiral- or coil spring. In the process, the coil spring has
several turns. The turns are preferably equidistant, but can
also be of an unequal distance, for example at a closer distance
to one end or both ends. Between the turns, more precisely,
between two adjacent turns, a distance or free space is formed,
25 into which the at least one driver protrudes for cooperation
with the spring. According to the invention, one driver is
provided. In other embodiments, a plurality of drivers can be
provided. The driver and spring interact for example like a
threaded spindle and threaded nut and facilitate the transfer of
30 a rotational movement to a translational movement. As

distinguished from a threaded spindle, however, the spring enables a preloading. To this end, the spring is secured from an unintentional shifting of the shaft on and/or in the shaft, for example by a surrounding housing. Thus, the actuator has a sort of spring shaft, which is driven or loaded by a motor. The spring shaft is realized by a driver seated on a shaft and engaging into the spring as a freely displaceable spiral- or coil spring. The shaft, upon which the coil spring is arranged, hence the spring shaft, is not arranged concentrically to the drive or motor shaft, but rather parallel and/or diagonally thereto.

[0017] According to the invention, provision is made that the driver is in the form of at least one external thread, extending at least partially circumferentially around the shaft, on the shaft. The driver itself thus forms a type of external thread on the shaft, so that the shaft in this region is in the form of a screw - that is, a screw with an external thread. In the process, the external thread is designed such that it interacts with the circumferential free space of the coil spring in the form of a helix, at least in sections. Preferably the external thread extends at least through more than or equal to 45° , further preferably by more than or equal to 90° , even further preferably by more than or equal to 180° and most preferably by more than or equal to 360° around the circumference of the shaft, so that the driver is formed as a partial or complete external thread or beyond. In further embodiments the driver designed as an external thread extends in circumferential direction in the manner of helix or screw by more than 360° , for example by an integral multiple of 360° , wherein values between are also possible. The external thread can otherwise have any

form, for example with different pitches, profiles and the like, wherein the external thread is always designed for cooperation with the coil spring. In one embodiment the external thread has a profiled tooth design, which, in particular, tapers away from the shaft and/or toward its sides.

[0018] According to the invention, provision is made that the two ends of the coil spring are fixed in a freely axially displaceable, i.e. not stationary, manner. The ends of the coil spring are arranged at least partially rotatable with respect to a stator of the motor and/or axially displaceably on, in or at the shaft. A coil or spiral spring rotatable and/or axially displaceable with respect to the stator of the motor is provided on, in or at the shaft. Said coil or spiral spring has on each side respectively an end extending downward from the spiral or coil shape. At least one of the ends, preferably both ends, are not fixed, so that an at least partial axial displacement along the axis of the coil spring and preferably also along the shaft is made possible. In one embodiment, at least one of the screw ends, preferably both screw ends protrude into a space which at least partially limits a rotation of the ends around the axis of the spring. In this way a rotating movement of the coil spring is limited. By means of the provided displacement freedom of the spring an improved cooperation with the driver is realized. In addition, an easier assembly is ensured.

[0019] Another embodiment provides that the motor drives the shaft via an interposed gear mechanism or that to this end a gear mechanism is interposed between the motor and shaft. The gear mechanism preferably comprises a gear seated on the drive shaft of the motor, which meshes with a gear seated on the shaft. Further gears can be provided between the drive shaft

gear and the shaft gear, so that a multi-stage gear mechanism is realized. Other gear mechanism types can be interposed.

[0020] In a further embodiment, provision is made that a housing is provided, in which at least the slide is accommodated so as to be guided in translation. A housing is provided for a compact design and a simplified installation. The housing accommodates at least the motor. In one embodiment, several components of the actuator, preferably all parts of the actuator are accommodated in the housing. The housing can be formed as a separate housing. In one embodiment, the housing is formed integrated in one or more components of a lock cylinder. Thus, in one embodiment the housing is in the form of a hollow cylinder or hollow cylinder section. Along with the housing of one component or several components of the actuator, the housing can have further functions. Thus, in one embodiment, provision is made that the housing has a guide function, so that the slide is guided by means of the housing. The housing itself can be a single part. In one preferred embodiment, the housing is designed in multiple parts, in particular, in two parts.

[0021] Further, one embodiment provides that the slide has means, in particular at least one slide arm, a front end and/or a tip, for engaging with a portion of the locking mechanism, in particular with a coupling part of the locking mechanism. The locking mechanism has a coupling for blocking/release of the locking mechanism. The coupling comprises an actuator-side coupling part and a corresponding coupling part. Both coupling parts are configured for cooperation. At least one coupling part is configured to be movable for coupling of the two coupling parts and thus for blocking/release of the coupling. In one preferred embodiment, at least the actuator-side coupling part

is configured to be movable, in particular, movable in translation. The actuator-side coupling part is configured as a slide device or short slide. This slide functions as a coupling part and can be moved in translational direction towards and
5 away from the corresponding coupling part. For an optimized engagement with the corresponding coupling part, the slide has suitable means, to be precise, engagement means. The engagement means can be integrated in the slide or cooperate with the slide as a separate component, in particular being connected to the
10 slide. The engagement means are in the process preferably in the form of at least one slide arm, a front end of the slide or of the slide arm and/or a tip of the slide arm. Preferably at least one slide arm, further preferably at least two or more slide arms are provided. Hence, in one embodiment the slide comprises
15 a single component, the base body. In a multiple part design, the slide comprises the base body and the engagement means, to be more precise the slide arm or the slide arms. The slide arms can in the process tower over the base body partially or wholly. Thus, the slide arm can be in the form of a housing surrounding
20 the slide. In other embodiments the at least one slide arm can be configured as a component extending downward from the base body or a downward extending projection. The slide is configured to cooperate with the coil spring. To this end, the slide limits the coil spring on two sides, so that a preloading of the coil
25 spring is possible. According to the invention, the slide is configured in the manner of a bridge, which spans a space in which the spring is arranged. In any case, a movement of the spring, preferably in axial direction, is limited by the slide. The slide cooperates with the spring and transfers the resulting
30 movement from the cooperation to the actuator-side coupling part. Preferably the slide has at least one slide arm/blocking

bar and/or a tip centrally and/or laterally for engagement in the corresponding coupling part of the locking mechanism. The locking mechanism is for example a locking mechanism configured as a lock cylinder locking mechanism and/or a locking mechanism of a door lock. In one embodiment, the slide is in the form of a single part, hence with an integrated coupling part / blocking bar for a cooperation with a corresponding coupling part of the locking mechanism. In another embodiment, the slide is in the form of multiple parts. The slide comprises in one embodiment a base body, in which the spiral spring is accommodated limited on two sides and through which the shaft protrudes. According to the invention, the slide or the base body is configured as a bridge-like slide or base body. In the process, the base body has at least one through-opening, in particular two through-openings, for the shaft. According to the invention, the shaft penetrates the base body or the slide. In another embodiment, in addition to the base body, the slide has an actuator-side coupling part for cooperation with the locking mechanism, to be more precise, with a corresponding coupling part of the locking mechanism. The coupling part can be configured in the form of a single part with the slide or configured separately and connected to the base body. In one embodiment, a coupling part protruding in axial and/or radial direction over one of the lateral walls is arranged on the lateral wall of the base body. The coupling part can be configured as a side arm or as a plurality of side arms. The side arm is also referred to as a blocking bar or slide arm. In another embodiment, the coupling part or the slide arm/blocking bar is configured as a tip. Yet another embodiment provides a housing-type slide arm, which surrounds the base body at least partially. The coupling part, thus the slide arm or blocking bar cooperates with the slide and

in one embodiment, is used for an engagement in a corresponding coupling part of the locking mechanism. In the multiple part embodiment of the slide, the blocking bar is connected to the slide. To this end, suitable connection means are provided, for example material, positive and/or non-positive connection means. The coupling part is hence configured for engagement in a corresponding section of the locking mechanism.

[0022] The invention also includes the technical teaching that, in the case of a locking mechanism, in particular a locking mechanism for electromechanically unlocking and locking locks, comprising a coupling, provision is made that the coupling comprises an actuator described here, which establishes and/or releases an engagement with the coupling of the locking mechanism, in particular a coupling part of the locking mechanism. The locking mechanism can be realized in a door lock. In another embodiment, the locking mechanism is realized in a lock cylinder. The actuator is configured as an electromechanical actuator. Said electromechanical actuator preferably comprises an electromotor. When activating the electromotor, a shaft connected to the slide is driven via its drive shaft. A spiral or coil spring is located in the slide, which is seated on the shaft and cooperates with a driver arranged on the shaft. In the case of a rotating shaft the spring-driver combination translates the rotating movement of the shaft into a translational movement of the slide. Hence, the slide moves back and forth in axial direction with respect to the shaft. The actuator, to be more precise, the slide, is arranged adjacent to the corresponding engagement part for an engagement of the locking mechanism. By means of the retraction or extension of the slide and of the connected coupling part an

engagement of the locking mechanism is ensured or cancelled. To this end the locking mechanism has a coupling part configured for cooperation with the slide. Hence, the actuator and coupling part of the locking mechanism form a coupling.

5 **[0023]** In one embodiment, provision is accordingly made that the coupling of the locking mechanism has a corresponding coupling part, that is configured to cooperate with the slide or the actuator-side coupling part to release and/or block the locking mechanism. The respective coupling part can be configured to be
10 integrated or separate. One preferred embodiment provides that the coupling part is formed in a manner integrated in a locking cam, a ring and/or a locking lever of the locking mechanism. The locking cam is rotatable and/or pivotable around an axis of rotation. Depending on an engagement of the slide in the locking
15 cam or of the ring or of the corresponding coupling parts with one another, the locking mechanism blocks or is in a released or releasing position.

[0024] Yet another embodiment provides that the housing is in the form of a hollow cylinder, which is formed axially with respect
20 to an axis of rotation of the locking cam, and next to the latter, wherein the actuator is arranged in the housing or the hollow cylinder. In one embodiment, the hollow cylinder is formed integrated with the housing of the lock cylinder, thus the cylinder housing. In another embodiment another form of a
25 housing is provided.

[0025] One embodiment also provides that the slide, in particular at least one blocking bar of the slide, is at least partially extendable out of and/or retractable into the housing or hollow
cylinder at an end of the latter next to the locking cam, ring
30 or the locking lever, such that the slide or the at least one

blocking bar is able to be brought into engagement with the locking cam or coupling part.

[0026] In one embodiment, provision is made that the locking mechanism is in the form of a lock cylinder, in particular of an
5 electromechanical lock cylinder. The locking mechanism can be used and/or configured in different locks. In one preferred embodiment the locking mechanism is realized as a lock cylinder.

[0027] Further, the invention includes the technical teaching that in the case of an electromechanical door lock, which
10 comprises an electrically and/or electromechanically actuatable locking mechanism that is blockable and/or releasable via a coupling, provision is made that the coupling has an actuator described here and/or that a locking mechanism described here is provided.

15 [0028] In one embodiment, provision is made that the slide of the actuator is arranged next to a complementary coupling part of the locking mechanism and is able to be brought into engagement therewith via actuation of the actuator.

[0029] In addition, the invention includes the technical teaching
20 that a use of an actuator described here or of a locking mechanism having an actuator described here, of a locking mechanism described here, is provided in a lock cylinder or an electromechanical door lock described here.

[0030] Finally, the invention includes the technical teaching
25 that in the case of a method for producing a locking mechanism and/or a lock cylinder or an electromechanical door lock, in particular a locking mechanism and/or an electromechanical door lock described here, provision is made that an actuator described here is provided and/or installed.

[0031] In one embodiment, preferably in all embodiments, provision is made that the locking mechanism has a coupling electronic system. Via this electronic system the locking mechanism can be coupled correspondingly. The electronic system
5 is preferably accommodated in the housing.

[0032] Further measures improving the invention are specified in the subsidiary claims or arise from the subsequent description of at least one exemplary embodiment of the invention, which is schematically represented in the figures. In the figures
10 identical or similar components are labeled with identical or similar reference numerals.

[0033] The figures show the following:

Fig. 1 shows schematically in a perspective exploded view an embodiment not according to the invention of a locking
15 mechanism designed as a lock cylinder with an actuator,

Fig. 2 shows schematically in a perspective view a section of the embodiment with an actuator according to fig. 1 in an extended position,

Fig. 3 shows schematically in a perspective view of a section
20 of the embodiment with an actuator according to fig. 1 in a retracted position,

Fig. 4 shows schematically in a perspective exploded view an embodiment according to the invention of a locking mechanism with an actuator,

25 Fig. 5 shows schematically in a perspective view a section of the embodiment with an actuator according to fig. 4 in an extended position and

Fig. 6 shows schematically in a perspective view a section of the embodiment with an actuator according to fig. 4 in a retracted position.

[0034] Figures 1 to 6 show two different embodiments of a locking mechanism 100 for an electromechanical door lock with an actuator 150 in different views and levels of detail.

[0035] Fig. 1 shows schematically in a perspective exploded view an embodiment not according to the invention of a locking mechanism 100 designed as a lock cylinder 200 with an actuator 150. Fig. 2 shows schematically in a perspective view a section of the embodiment with the actuator 150 according to fig. 1 in an extended position. Fig. 3 shows schematically in a perspective view a section of the embodiment with the actuator 150 according to fig. 1 in a retracted position. Figures 1 to 3 thus show a first embodiment of the locking mechanism 100 designed as a lock cylinder 200 with an actuator 150.

[0036] Fig. 4 shows schematically in a perspective exploded view an embodiment according to the invention of the locking mechanism 100 with an actuator 150. Fig. 5 shows schematically in a perspective view a section of the embodiment with an actuator 150 according to fig. 4 in an extended position. Fig. 6 shows schematically in a perspective view a section of the embodiment with an actuator 150 according to fig. 4 in a retracted position. Figures 4 to 6 thus show a second embodiment of the locking mechanism 100 with an actuator 150.

[0037] The locking mechanism 100 in accordance with the exemplary embodiment not according to the invention exemplary embodiment is configured as a lock cylinder 200 and comprises a cylinder housing 10. In a recess of the cylinder housing 10 a locking cam or a locking lever 9 is pivotably arranged around an axis of

rotation. Further, a first slide bearing 11 is provided in the lock cylinder 200. Said slide bearing is configured as a bushing, which is formed from a suitable material which differs from the material for the cylinder housing 10. The actuator 150
5 adjoins the first slide bearing 11 in an overlapping manner. To be more precise, the slide bearing 11 is seated on the housing 70, in which the actuator 150 is arranged. The actuator 150 comprises a motor 6. The motor 6 has a drive shaft 6a, which has a gearing in the form of a pinion 1. In meshing engagement with
10 the pinion 1 a gearing 2b of a shaft 2a is provided. The gearing 2b is likewise configured as a gear. The shaft 2a has a driver 2c. The driver 2c is arranged approximately centrally on the shaft 2a and extends radially downward therefrom. The driver 2c is configured for an engagement in an intermediate space 5a of
15 two adjacent turns 5b of a coil spring 5. The coil spring 5 is seated coaxially on the shaft 2a. The shaft 2a, gearing 2b and driver 2c are referred to as a worm 2. The coil spring 5 and worm 2 cooperate with a slide 3. In the process, the slide 3 has a lateral boundary, which is formed by corresponding lateral
20 walls 3a, which define an interior 3b of the slide 3. In the process, the shaft 2a runs through two opposite lateral walls 3a in axial direction such that the driver 2c and the coil spring 5 located on the shaft 2a are arranged in the interior 3b. The shaft 2a leads past corresponding guides, configured here as
25 indentations 3c or receptacles, the slide 3 is respectively mounted or accommodated there. The coil spring 5 has on its respective ends a radially protruding spring end 5c. The spring ends 5c are not fixed in the slide 3. Instead, the coil spring 3 can be at least partially turned or rotated around the axis
30 and/or displaced in axial direction. The spring ends 5c can limit a rotating movement of the coil spring 5 by application on

the lateral walls 3a. On each side an arm in the form of a blocking bar 4 or also slide arm is provided laterally on the slide 3. Said arm protrudes forward over a front lateral wall 3a' of the slide 3 in the direction of the locking lever 9.

5 Correspondingly, the blocking bars 4 are provided for an engagement in the adjacently arranged locking lever 9, which to this hand has corresponding engagement options. The motor 6, pinion 1, worm 2, slide 3, blocking bar 4 and coil spring 5 are arranged in a housing 70. In the process, the housing 70 is

10 cylindrical with two semi-cylindrical housing halves 7 and 8. These have corresponding protrusions on their respective inner wall for the accommodation of at least some of the aforementioned components. A second slide bearing 12 is provided axially opposite to the first bearing 11 at least partially

15 overlapping to the housing 70. A doorknob or rotary knob 50 is provided for the actuation of the lock cylinder 100. Said knob axially limits the lock cylinder 200 on one (as shown) or both ends (not shown).

[0038] The actuator 150 is provided for the actuation of a door

20 lock (not shown here). The motor 6 is configured as an electromotor. Said motor drives the shaft 2a, either directly or via an interposed gear mechanism. Here, the gear mechanism comprises the pinion 1 and the gearing 2b configured as a gear. The coil spring 5 is arranged on, in or at the shaft 2a. The

25 shaft 2a engages with its driver 2c in at least one intermediate space 5a between two adjacent turns 5b of the coil spring 5, as a result of which a rotation of the shaft 2a axially displaces the coil spring 5. The coil spring 5 engages on the slide 3, so that an axial displacement of the coil spring 5 preloads the

30 slide 3 at least in the direction corresponding to a

displacement. In the process, the coil spring 5 is arranged opposite a stator of the motor 6 at least partially axially displaceably on, in or at the shaft 2a. The spring ends 5c are not fixed stationarily, but rather arranged freely. The driver 5 2c is configured as an external thread 2d extending at least partially circumferentially around the shaft 2a at and/or on the shaft 2a. The profile of the external thread 2d can be any form, for example involute, rectangular, triangular or the like. In particular, the external thread 2d configured for suitable 10 engagement in the intermediate space of the coil spring 5. The motor 6, to be more precise, the electromotor 6, has the drive shaft 6a next to a stator. The shaft 2a is driven via the drive shaft 6a. The shaft 2a is preferably arranged offset, either transversely or as here, arranged parallel offset to the drive 15 shaft 6a. As a result, a compact arrangement can be realized. In order to drive the shaft 2a, a deflection of the torque is required. Preferably, this occurs via a Deflection mechanism and/or transmission. Via a gear mechanism interposed between shaft 2a and drive shaft 6a or motor 6 the torque is 20 correspondingly deflected and/or transmitted or translated. The drive shaft 6a has a gearing here in the form of the pinion 1. The shaft 2a has the gearing, here in the form of a gear meshing with the pinion 1. Hence, the pinion 1 and gear form the gear mechanism. The housing 70 is provided for a compact and easy to 25 install design of the actuator 150, in which at least the slide 3 is accommodated so as to be guided in translation. The slide 3 has at least one slide arm/blocking bar 4 laterally for an engagement with the locking lever 9. The slide arm 4 is connected to the base body via a projection on the base body of 30 the slide. In particular, the front end 4a of the blocking bar 4 is configured for engagement with a corresponding part of the

locking mechanism 100, to be more precise, of the lock cylinder 200.

[0039] The lock cylinder 200 is configured as an electromechanical lock cylinder 200. Said electromechanical lock cylinder is part of a locking mechanism 100 that is blockable and/or releasable via a coupling. The coupling comprises the actuator 150, which establishes and/or releases an engagement of the locking mechanism 100. The locking mechanism 100 has a coupling part, which is configured for cooperation with the slide 3 for releasing and/or blocking the locking mechanism 100. The coupling part is integrated in the locking cam 9 of the locking mechanism 100 here. Further, a hollow cylinder is provided, which is formed axially with respect to an axis of rotation of the locking cam 9 and next to the latter, wherein the actuator 150 is arranged in the hollow cylinder. Thus, the hollow cylinder functions as a housing 70. The slide 3 is at least partially extendable out of and/or retractable into and end of the hollow cylinder at an end of the latter next to the locking cam 9, such that the slide 3, to be more precise, the corresponding coupling part - here the blocking bar 4 - is able to be brought into engagement with the locking cam 9 or the corresponding coupling part.

[0040] The locking mechanism 100 is provided for use in an electromechanical lock cylinder 200 or in an electromechanical door lock. The electromechanical door lock comprises the electrically and/or electromechanically actuatable locking mechanism 100, which is blockable and/or releasable via the coupling. The coupling has the actuator 150. The slide 3 of the actuator 150, to be more precise, the blocking bar 4 and to be more precise still, the front end 4a of the blocking bar, is

arranged next to the coupling part of the locking mechanism 100 and is able to be brought into engagement with it via actuating the actuator 150. Hence, the actuator 150 and/or the locking mechanism 100 configured as a lock cylinder 200 can be used with
5 the actuator 150 in the locking mechanism 200 or electromechanical lock.

[0041] Because the actuator 150 can be accommodated in the hollow cylindrical housing 70, lock cylinders 200 or electromechanical door locks can be easily equipped or produced with the actuator
10 150 according to the invention.

[0042] The function of the actuator 150 or of the locking mechanism 100 can be clearly seen in figures 2 and 3 and 5 and 6. In the respective embodiments the actuator 150 is in each case presented in a retracted position and in an extended
15 position. Figures 2 and 5 show the extended position. Figures 3 and 6 show the retracted position.

[0043] In Fig. 2 the actuator 150 is in an extended position. That means that the front ends 4a of the blocking bar 4 protrude over a front end 70a of the housing 70, so that these front ends
20 4a can engage into the coupling part, to be more precise, the coupling part integrated in the locking lever 9. As a result, a coupling of the blocking bar 4 and locking lever 9 is brought about, so that on activation of the doorknob 50 the locking lever 9 is rotated. In the case of an installation in a door it
25 can thus be opened or blocked. A spinning is prevented by the engagement. The retraction of the front end 4a of the blocking bar 4 is brought about by the fact that, by rotation of the shaft 2a the driver 2c moves the entire spiral- or coil spring 5 in the direction of the front end of the housing 70, so that the
30 spring 5 is arranged tensioned between a front lateral wall 3a'

of the slide 3 and the driver 2c on the shaft 2a. Because the engagement of the driver 2c into the free space or intermediate space 5a of two turns 5b and rotation of the driver 2c via the shaft 2a, the rotational movement of the shaft 2a is translated
5 into a translational movement of the coil spring 5. The coil spring 5 moves in the direction of the front lateral wall 3a' along the shaft 2a and in the process is compressed or tensioned. The tension causes the entire slide 3 together with the blocking bar 4 to move in the direction of the front end
10 70a. The slide 3 is thus displaceably moveable to the translationally stationary arranged shaft 2a, so that the slide 3 moves relative to the shaft 2a, in particular being able to be displaced.

[0044] Fig. 3 shows the actuator 150 in a retracted position. Here too, the coil spring 5 is presented in a tensioned state. However, the coil spring 5 is tensioned between a rear lateral wall 3a" of the slide 3 opposite the front lateral wall 3a' wall 3a" and the driver 2c. By means of a corresponding rotational movement the coil spring 5 has been moved and tensioned in the
20 opposite direction vis-a-vis fig. 2. Through the tension, the slide 3 is moved into the retracted position. Thus, the blocking bars 4 also move back in the direction of the housing interior. Correspondingly, the front ends 4a of the blocking bar 4 no longer protrude above the front end 70a of the housing 70. A
25 coupling of the actuator 150 with the locking lever 9 is in this connection reversed.

[0045] Fig. 4 shows an embodiment of a locking mechanism 100 according to the invention.

[0046] In the presented exemplary embodiment of a locking
30 mechanism 100, an embodiment of an actuator 150 according to the

invention is provided. The locking mechanism 100 comprises a coupling, which has two coupling parts, an actuator-side coupling part and a complementary coupling part. The actuator-side coupling part is configured as a blocking bar 4 or slide arm 4. The arm 4 or blocking bar 4 is connected to the bridge-like slide 3 here. In the process, the arm 4 is not seated eccentrically laterally on lateral walls 3a of the slide 3, but rather is in the form of a housing. In the housing. The bridge-like slide 3 is provided. The coupling part, here the slide arm 4, has a tip 4e integrated approximately centrally on a front side, which is configured for engagement in the corresponding coupling part. The coupling part in this embodiment is configured as a separate, housing-like slide arm 4, which is connected to the bridge-like slide. The housing-like slide arm 4 has an interior, in which the bridge-like slide 3 is arranged or is in the assembled state. The interior is limited by corresponding walls. On a front wall, i.e. next to a complementary coupling part, the tip 4e is configured integrated in the housing-like slide arm 4. According to the invention, the slide 3 is configured as a bridge-like slide 3 with two lateral walls that are spanned in a bridge-like manner by a bridge portion. This is used for cooperation with the blocking bar 4 in its free space. In the process, the bridge-like slide 3 has walls 3a. The front lateral wall 3a' and the rear lateral wall 3a" each have a receptacle 3c in the form of a slotted through-opening. The shaft 2a projects through this in the assembled state. The through-openings are dimensioned such that the shaft 2a projects through them with clearance, preferably without contact. Correspondingly, the inside diameter of the receptacles 3c is greater than the outside diameter of the shaft 2a. Through this design disruptions in operation are avoided. The spring 5

and the driver 2c are arranged between the two lateral walls 3a', 3a" in the assembled state. In the case of a rotational movement of the shaft 2a, the slide 3 along with the blocking bar 4 are preloaded and correspondingly moved on the basis of the cooperation with the coil spring 5.

[0047] The actuator 150 presented in figures 4 to 6 further comprises the motor 6, to be more precise, the electromotor 6. The motor 6 has the drive shaft 6a, which has a gearing in the form of the pinion 1. The pinion 1 is configured here with a magnet, to be more precise, a permanent magnet 1a. A rotating movement of the drive shaft 2a can be recorded via a sensor (not shown here) via the magnet 1a. A gearing 2b of the shaft 2a is provided meshing with the pinion 1 in engagement. The gearing 2b is likewise configured as a gear. The shaft 2a has the driver 2c. The driver 2c is arranged approximately centrally on the shaft 2a and extends radially downward therefrom. The driver 2c is configured for engagement in the intermediate space 5a of two adjacent turns 5b of the coil spring 5. The coil spring 5 is seated coaxially on the shaft 2a. The shaft 2a, gearing 2b and driver 2c are referred to as a worm 2. The coil spring 5 and worm 2 cooperate with the slide 3. In the process, the slide 3 has a lateral boundary, which is formed by corresponding lateral walls 3a, which define the interior 3b of the slide 3. In the process, the shaft 2a runs into two opposite lateral walls 3a in axial direction such that the driver 2c and the coil spring 5 located on the shaft 2a are arranged in the interior 3b. The slide 3 has corresponding receptacles 3c, which are configured here as slotted through-openings. The shaft 2a projects through these rotationally in the assembled state. The coil spring 5 has a radially protruding spring end 5c on each of its ends. The

spring ends 5c are not rotationally fixed in the slide 3. Instead, the coil spring 3 can be at least partially rotated and/or axially displaced around the axis or shaft 2a. The spring ends 5c can limit a rotating movement of the coil spring 3 by application on the lateral walls 3c. The coil spring 5 is limited here in axial direction by the lateral walls 3a', 3a" of the bridge-like slide 3, so that the coil spring 5 is spanned in a bridge-like manner. The shaft 2a is correspondingly rotatably arranged to the bridge-like or bridge-shaped slide 3. The bridge-like design supports the tensioning of the coil spring 5 in the corresponding position. The blocking bar 4 is arranged around the slide 3, said blocking bar whose front end 4a is configured integrated in the form of a tapering tip 4e. The function corresponds approximately to the blocking bar 4 or its front end 4a in accordance with the embodiment according to fig. 1 to 3. The tip 4e projects in axial direction in the direction of the complementary coupling part 15. The complementary coupling part 15 here is configured integrated in a ring 16 of the locking mechanism 100. The actuator 150 has the housing 70, in which the aforementioned components are accommodated, similar to the exemplary embodiment according to fig. 1 to 3. The housing 70 is likewise configured in multiple parts here, wherein the housing 70 comprises the two - non-cylindrical here - housing halves 7, 8. Further, the coupling electronic system 17 for the actuator 150 is also provided in the housing. Such a coupling electronic system 17 can also be provided in the exemplary embodiment according to fig. 1 to 3 but is not explicitly represented there.

[0048] The actuator 150 is provided for the actuation of a locking mechanism 100, here of a locking mechanism 100 for an

electromechanical door lock (not shown here). The motor 6 is configured as an electromotor. Said electromotor drives the shaft 2a, either directly or via an interposed gear mechanism. The coil spring 5 is arranged on, in or at the shaft 2a. The shaft 2a engages with this driver 2c in at least one intermediate space 5a between two adjacent turns 5b of the coil spring 5, as a result of which a rotation of the shaft 2a axially displaces the coil spring 5. The coil spring 5 engages on the slide 3, so that an axial displacement of the coil spring 5 preloads the slide 3 at least in the direction corresponding to a displacement. The driver 2c is configured as an external thread 2d extending at least partially circumferentially around the shaft 2a and/or on the shaft 2a. The profile of the external thread 2d can be any form, for example involute, rectangular, triangular or the like. In particular, the external thread 2d is configured for suitable engagement in the intermediate space of the coil spring 5. The motor 6, to be more precise, the electromotor 6, has the drive shaft 6a next to a stator. The shaft 2a is driven via the drive shaft 6a. The shaft 2a is preferably offset, either transversely or as here, arranged parallel offset to the drive shaft 6a. As a result, a compact arrangement can be realized. A deflection of the torque is required to drive the shaft 2a. This takes place preferably via a deflection mechanism and/or transmission. The torque is correspondingly deflected and/or transmitted or translated via a gear mechanism interposed between the shaft 2a and drive shaft 6a or motor 6. The drive shaft 6a has a gearing here in the form of the pinion 1. The shaft 2a has the gearing, here in the form of a gear meshing with the pinion 1. Hence, the pinion 1 and gear form the gear mechanism. The housing 70 is provided for a compact and easy to install design of the actuator 150, in which

at least the slide 3, to be more precise, the blocking bar 4, is accommodated so as to be guided in translation. The slide 3 has a tip 4e for an engagement with the ring 16 or the coupling part 15. The blocking bar 4 is in general configured for engagement with a corresponding locking mechanism 100.

[0049] In Fig. 5 the actuator 150 is shown in an extended position. Similar to fig. 2, the actuator 150 is located in an extended position. That means a front end 4a of the blocking bar 4 or here, of the tip 4e, projects over a front end 70a of the housing 70, so that this front end 4a can engage in the coupling part 15, to be more precise, in the coupling part 15 integrated in the ring 16. As a result, a coupling of the blocking bar 4 and ring 16 is brought about. In the case of an installation in a door, it can thus be opened or blocked. A spinning is prevented or made possible by the engagement. The retraction of the front end 4a of the blocking bar 4 or of the tip 4e is brought about by the fact that, by rotation of the shaft 2a, the driver 2c moves the entire spiral- or coil spring 5 in the direction of the front end 70a of the housing 70, so that the spring 5 is arranged tensioned between a front lateral wall 3a' of the slide 3 and the driver 2c on the shaft 2a. Because of the engagement of the driver 2c in the free space or intermediate space 5a of two turns 5b and rotation of the driver 2c via the shaft 2a, the rotational movement of the shaft 2a is translated into a translational movement of the coil spring 5. The coil spring 5 moves in the direction of the front lateral wall 3a along the shaft 2a and in the process is compressed or tensioned. The tensioning causes the entire slide 3 along with the tip 4e to move in the direction of the front end 70a. The shaft 2a is mounted in the housing 70. The slide 3 is thus at

least displaceable vis-a-vis the shaft 2a. The function is similar to the first exemplary embodiment.

[0050] Fig. 6 shows the actuator 150 in a retracted position. Here too, the coil spring 5 is in a tensioned state. Similar to
 5 fig. 3, the coil spring 5 is tensioned between the rear lateral wall 3a" of the slide 3 and the driver 2c. By means of a corresponding rotational movement, the coil spring 5 has moved in the opposite direction in comparison with fig. 5 and, in the process, has been tensioned. By means of the tensioning, the
 10 slide 3 is moved to the retracted position. Hence, the tip 4e also moves back in the direction of the housing interior. Correspondingly, the tip 4e of the slide 3 no longer projects over the front end 70a of the housing 70. In this connection, a coupling with the Ring 16 is reversed.

15

List of References

[0051]

- 1 pinion
- 1a permanent magnet
- 20 2 worm
- 2a shaft
- 2b gearing
- 2c driver
- 2d external thread
- 25 3 slide
- 3a lateral wall (slide)
- 3a' front lateral wall
- 3a" rear lateral wall
- 3b interior (slide)

- 3c indentation (receptacle)
- 4 blocking bar (slide arm)
- 4a front end (blocking bar)
- 4e tip
- 5 5 coil spring
- 5a intermediate space
- 5b turn
- 5c spring end
- 6 (electro-)motor
- 10 6a drive shaft
- 7 housing half
- 8 housing half
- 9 locking lever, locking cam
- 10 cylinder housing
- 15 11 (first) slide bearing
- 12 (second) slide bearing
- 15 (complementary) coupling part
- 16 ring
- 17 coupling electronic system
- 20 50 doorknob, rotary knob
- 70 housing
- 70a front end (housing)
- 100 locking mechanism
- 150 actuator
- 25 200 lock cylinder

Patentkrav

1. Aktuator (150) for en elektromekanisk dørlås, som omfatter en motor (6), der
5 driver en aksel (2a), i og/eller på hvilken mindst én spiralfjeder (5) er arrangeret,
hvori akslen (2a) har mindst et drivelement (2c), der griber ind i et
mellemliggende område (5a) mellem to tilstødende vindinger (5b) af
spiralfjederen (5), med det resultat, at en rotation af skaftet (2a) flytter
spiralfjederen (5) aksialt, spiralfjederen (5) fungerer på en skyder (3), så en
10 aksial forskydning af spiralfjederen (5) forudbelaster skyderen (3) i mindst den
retning, der svarer til en forskydning, hvori motoren (6) har en drivaksel (6a), og
akslen (2a) er arrangeret på en ikke-koaksial måde med, specielt parallelt med,
og/eller ikke i serie og/eller ikke på en justeret måde med drivakslen (6a), hvori
motoren (6) driver akslen (2a) via en indsat gearmekanisme (1, 2b), hvori de to
15 ender af spiralfjederen (5) er fastgjort på en frit, aksialt forskydelig, dvs. ikke
stationær, måde, hvori skyderen (3) har en sokkel (3c) i form af en hullet
gennemgående åbning, gennem hvilken akslen (2a) stikker i den helt
monterede tilstand, **kendetegnet ved, at** drivelementet (2c) er i form af mindst
ét eksternt gevind, der strækker sig mindst delvist periferisk omkring akslen
20 (2a), på akslen (2a), skyderen (3) er i form af en bro lignende skyder (3) med to
laterale vægge, der strækker sig på en bro lignende måde via en brodel.

2. Aktuator (150) i henhold til krav 1, **kendetegnet ved, at** det eksterne gevind
strækker sig periferisk omkring akslen gennem mere end eller lig med 360°.

25

3. Aktuator (150) i henhold til et af de forudgående krav 1 og 2, **kendetegnet
ved, at** der er tilvejebragt et hus (70), hvori mindst skyderen (3) er tilvejebragt,
så den styres i translation.

30 4. Aktuator (150) i henhold til ét af de foregående krav 1 til 3, **kendetegnet ved,
at** skyderen (3) har midler, specielt mindst én skyderarm (4), en forende (4a)

og/eller en spids (4e), til at gå i indgreb med en del af låsemekanismen (100), specielt med en koblingsdel af låsemekanismen (100).

- 5 **5.** Låsemekanisme (100), specielt en låsemekanisme (100) til elektromekanisk oplåsning og låsning af låse, som omfatter en kobling, **kendetegnet ved, at** koblingen omfatter en aktuator (150) i henhold til ét af de foregående krav 1 til 4, som etablerer og/eller frigør et indgreb med koblingen i låsemekanismen (100), specielt en koblingsdel af låsemekanismen (100).
- 10 **6.** Låsemekanisme (100) i henhold til krav 5, **kendetegnet ved, at** koblingen i låsemekanismen (100) har en koblingsdel (15), der er konfigureret til at virke sammen med skyderen (3) for at frigøre og/eller blokere låsemekanismen (100).
- 15 **7.** Låsemekanisme (100) i henhold til ethvert af de forudgående krav 5 og 6, **kendetegnet ved, at** koblingsdelen (15) er formet på en måde, så den er integreret i en låseskive (9)/låsering (16) på låsemekanismen (100).
- 20 **8.** Låsemekanisme (100) i henhold til krav 7, **kendetegnet ved, at** huset (70) er i form af en hul cylinder, der er formet aksialt i forhold til en rotationsakse af låseskiven (9) og ved siden af den sidstnævnte, hvori aktuatoren (150) er arrangeret i huset (70) eller den hule cylinder.
- 25 **9.** Låsemekanisme (100) i henhold til ét af de forudgående krav 7 og 8, **kendetegnet ved, at** skyderen (3), specielt i mindst én blokeringsbjælke (4) på skyderen (3), kan mindst delvist strækkes ud af og/eller trækkes ind i huset (70) eller den hule cylinder i en ende af sidstnævnte ved siden af låseskiven (9), så skyderen (3), eller mindst én blokeringsbjælke (4), kan føres i indgreb med låseskiven (9) eller koblingsdelen (15).
- 30 **10.** Låsemekanisme (100) i henhold til ét af de foregående krav 5 til 9, **kendetegnet ved, at** låsemekanismen (100) er i form af en låsecylinder (200), specielt af en elektromagnetisk låsecylinder (200).

11. Elektromekanisk dørlås, der omfatter en elektrisk og/eller elektromekanisk aktuerbar låsemekanisme (100), der kan blokeres og/eller frigøres via en kobling, **kendetegnet ved, at** koblingen har en aktuator (150) i henhold til ét af de forudgående krav 1 til 4, og/eller der er tilvejebragt en låsemekanisme (100) i henhold til ét af de foregående krav 5 til 10.
12. Elektromekanisk dørlås i henhold til krav 11, **kendetegnet ved, at** skyderen (3), specielt mindst én blokeringsbjælke (4), på aktuatoren (150) er arrangeret ved siden af en koblingsdel (15) på låsemekanismen (100) og kan føres i indgreb dermed via aktivering af aktuatoren (150).
13. Brug af en aktuator (150) i henhold til ét af kravene 1 til 4 eller af en låsemekanisme (100), der har en aktuator (150), i henhold til et af de forudgående krav 1 til 4, specielt af en låsemekanisme (100) i henhold til ét af kravene 5 til 10, i en låsecylinder (200) eller en elektromekanisk dørlås i henhold til ét af kravene 11 og 12.
14. Fremgangsmåde til fremstilling af en låsemekanisme (100) og/eller en elektromekanisk dørlås, specielt en låsemekanisme (100) og/eller en elektromekanisk dørlås i henhold til henholdsvis ét af de forudgående krav 5 til 10 eller 11 og 12, **kendetegnet ved, at** en aktuator (150) i henhold til ét af de forudgående krav 1 til 4 er tilvejebragt og/eller installeret.

Fig. 1

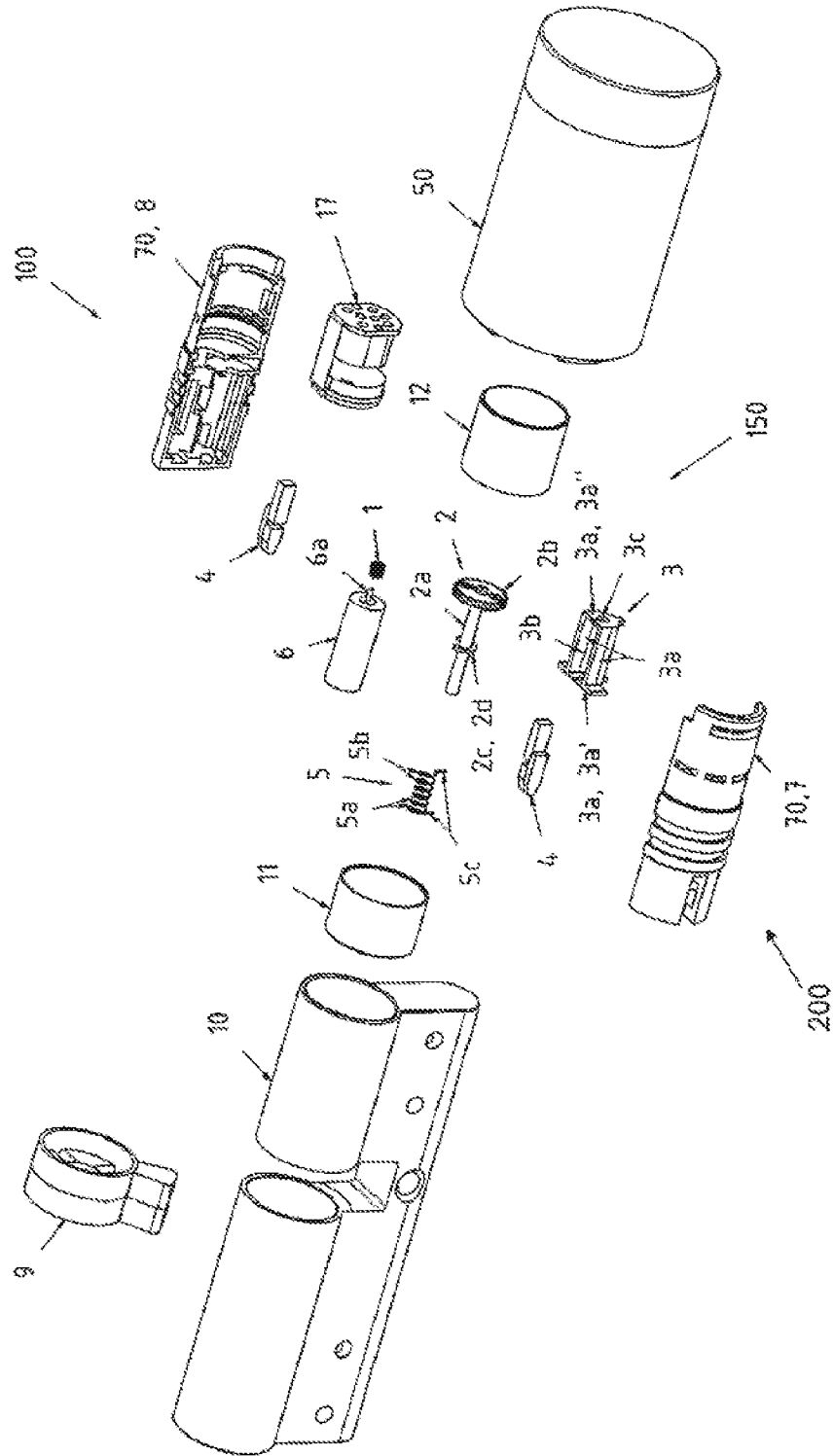


Fig. 2

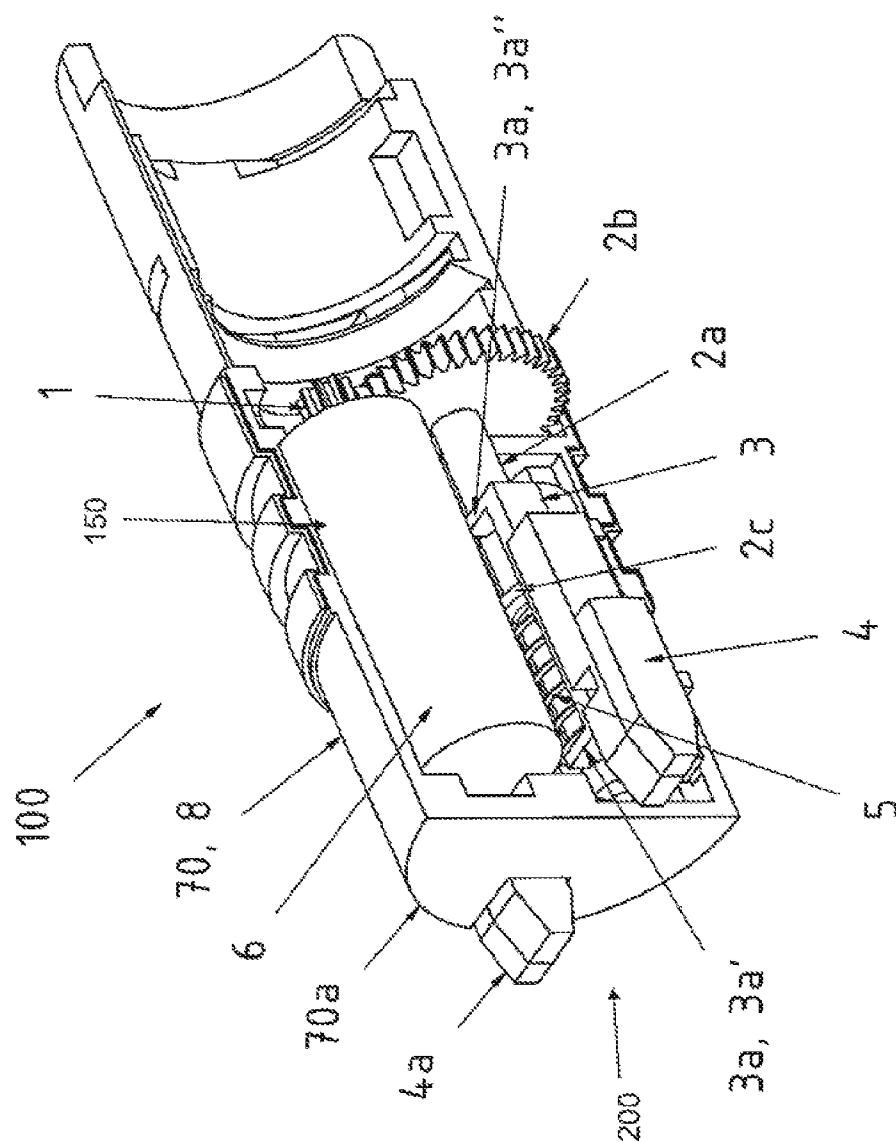


Fig 3

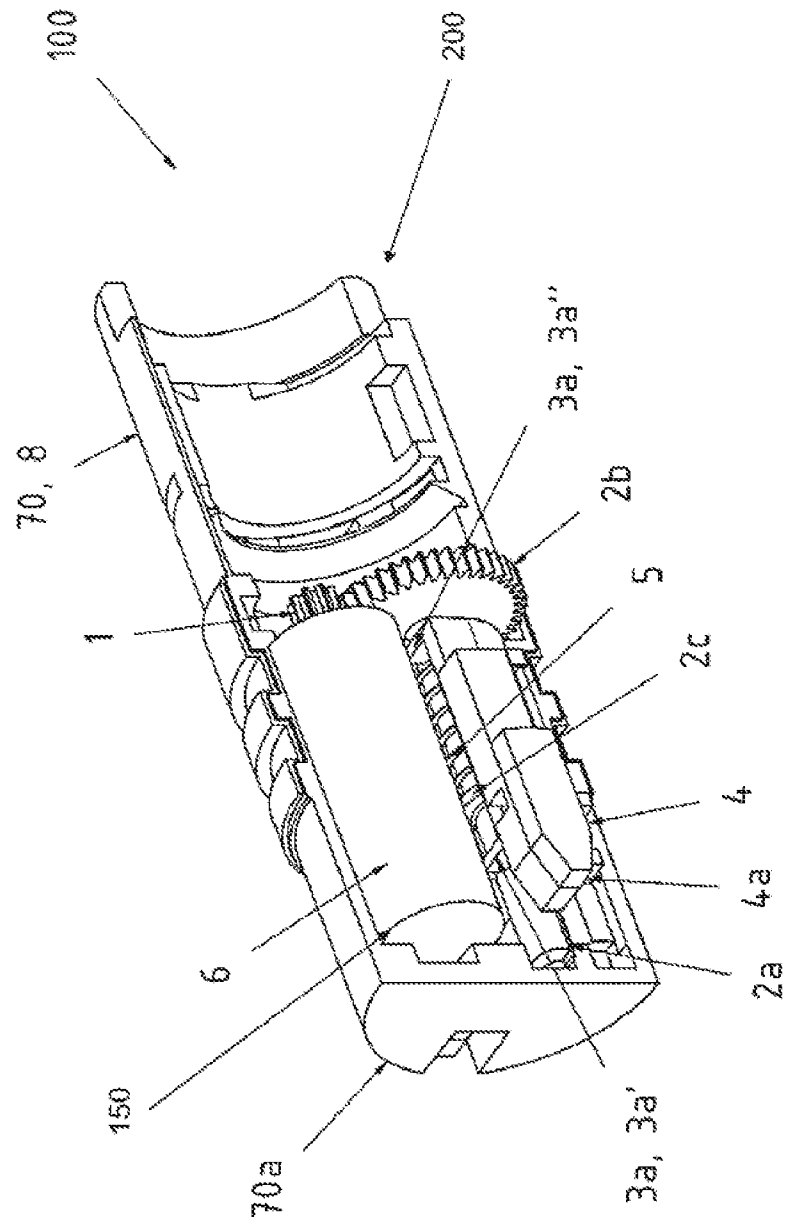


Fig. 4

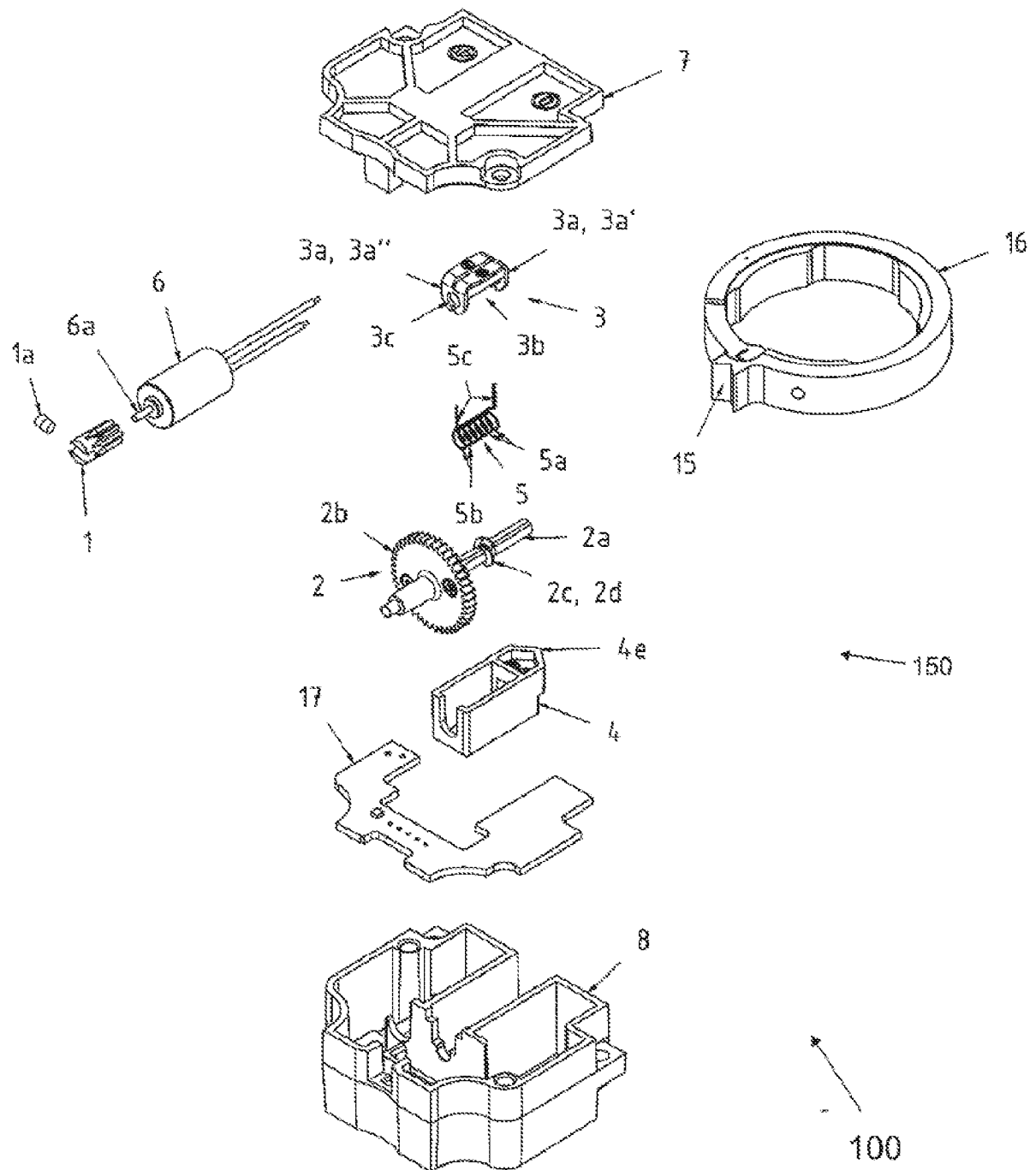


Fig. 5

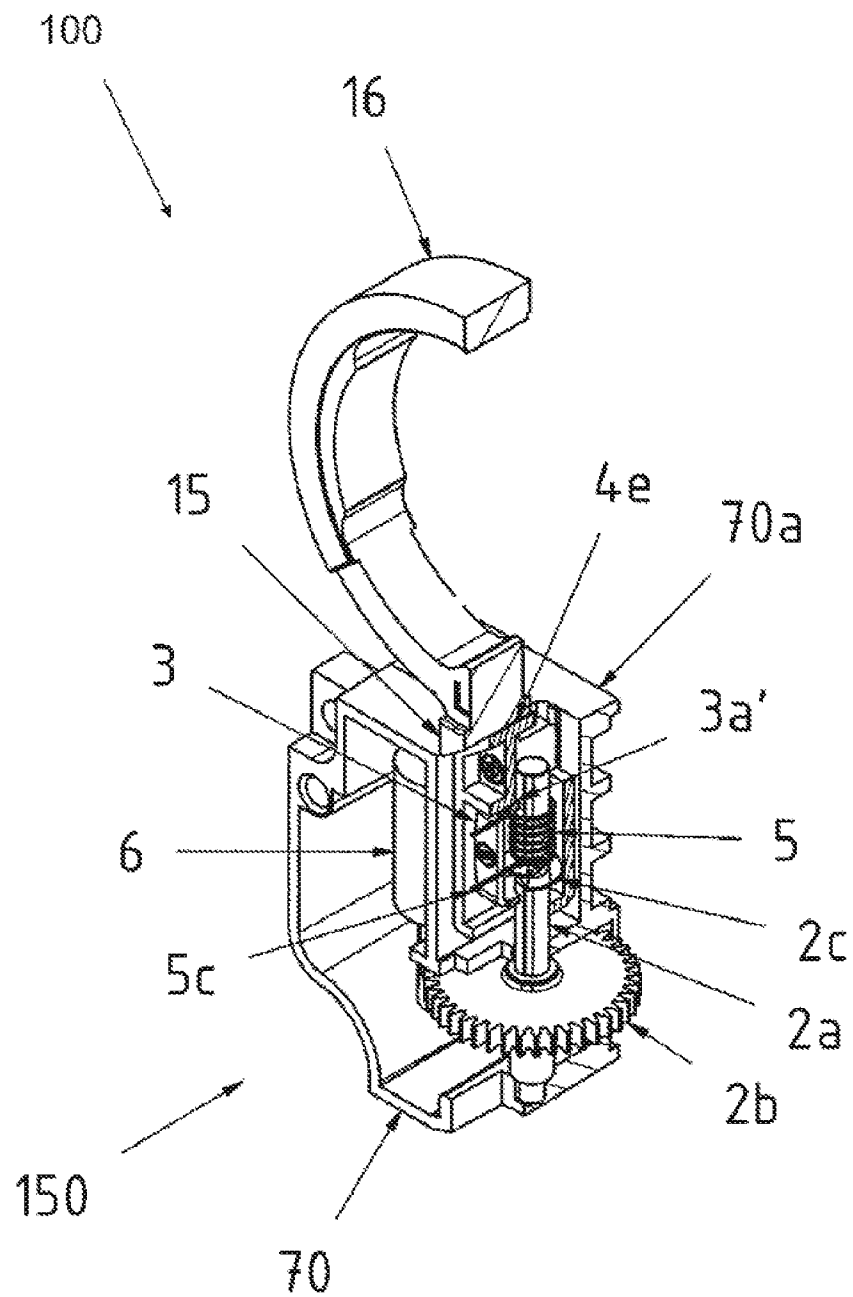


Fig. 6

