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(54) **LATCH ARRANGEMENT**

(57) The present disclosure relates to a latch arrangement (1) for a door (100). The latch arrangement (1) comprises: a first latch element (2) adapted to be arranged to a first door element (100); a second latch element (3) adapted to be arranged to a second door element (110) and adapted, when arranged thereto, to be moveable relative the second door element (110) between a first position (P1) where it is able to disengage from the first latch element (2), and a second position (P2) where it retains the first latch element (2) in a locked position, wherein the second latch element (3) comprises a slot (32) for receiving an engaging portion (21) of the

first latch element (2), which slot (32) is adapted in size and shape to guide the engaging portion (21) into a retaining space (31) of the second latch element (3) as the second latch element (3) moves toward the second position (P2); the second latch element (3) is adapted to displace the first latch element (2) as the second latch element (3) moves from the first position (P1) to the second position (P2) so that the first door element and the second door element are pressed toward each other, and the second latch element (3) is adapted to move between the first position (P1) and the second position (P2) by means of a translational motion.

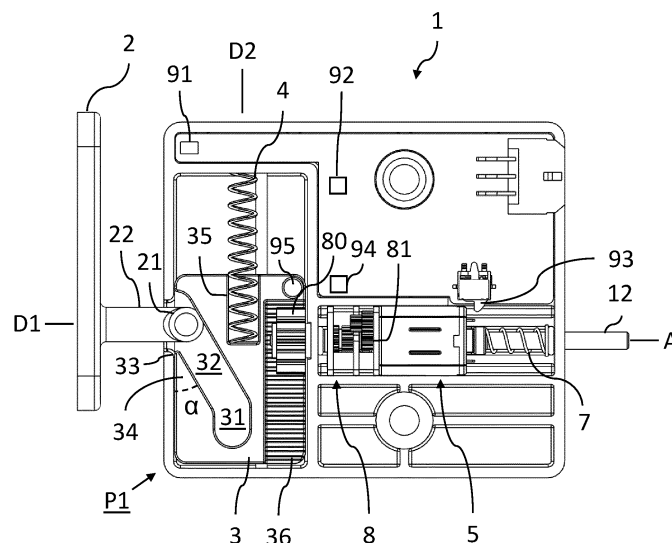


Fig. 4

Description

Technical Field

[0001] The present disclosure relates to a latch arrangement for a door and in particular a latch arrangement for use to compressively close hatches, doors, or the like.

Background

[0002] In some applications, it is desirable to compressively close a door to a door frame. This is typically done by means of a compression latch which during closing provides the desired compression effect. One type of a compression latch is the rotary pawl latch. A rotary pawl latch generally comprises a pawl adapted to rotatably engage with and retain a striker in the compression latch to compressively close the door to a door frame.

[0003] One example of a rotary pawl latch is disclosed in US 2011/0227351 A1 wherein the rotary pawl latch has the capability of providing a compression force between a first member and a second member. A control circuit of the latch is adapted to detect when a striker attached to one member, for example a door, has moved the pawl to a first latch position. A motor is then activated that drives the pawl to a second latched position to provide the desired compression force between the first door member and a second door member, for example a door frame.

[0004] One issue of common rotary pawl latch designs is that the torsion springs, which bias the one or more rotating members in the rotary pawl latch respectively, repeatedly expands and contracts with everyday use. Over time, they lose their flexibility, which eventually leads to failure. When this occurs, rotary pawl latches may jam in a locked position which prevents a door from being opened.

[0005] A further issue of common rotary pawl latch designs is their structural complexity which leads to higher material- and/or manufacturing costs.

[0006] Thus, there is a need for an improved latch arrangement which alleviates at least some of the issues mentioned above.

Summary

[0007] It is an object of the present invention to provide a solution that alleviates at least some of the mentioned drawbacks with present solutions. In particular, a first object of the invention is to provide a latch arrangement that is more durable than existing solutions. This object is solved by the invention of claim 1. A second object of the invention is to provide a latch arrangement which does not jam in case of a biasing member failure. This object is also solved by the invention of claim 1. A third object of the invention is to provide a latch arrangement which has a simpler design than rotary pawl latches. This object

is also solved by the invention of claim 1. Some particularly advantageous embodiments are specified in the dependent claims.

[0008] According to a first aspect, a latch arrangement for a door is provided. The latch arrangement comprises: a first latch element adapted to be arranged to a first door element; a second latch element adapted to be arranged to a second door element and adapted, when arranged thereto, to be moveable relative the second door element between a first position where it is able to disengage from the first latch element, and a second position where it retains the first latch element in a locked position. The latch arrangement is adapted so that the second latch element comprises a slot for receiving an engaging portion of the first latch element, which slot is adapted in size and shape to guide the engaging portion into a retaining space of the second latch element as the second latch element moves toward the second position; the second latch element is adapted to displace the first latch element as the second latch element moves from the first position to the second position so that the first door element and the second door element are pressed toward each other. The second latch element is adapted to move between the first position and the second position by means of a translational motion.

[0009] The invention thereby allows, when arranged accordingly to the respective first door element and the second door element, to compressively close the first door element with the second door element.

[0010] Moreover, since the second latch element is adapted to move between the first and second positions by means of a translational motion, the second latch element may more easily be biased toward the first position by means of a compression spring than a torsion spring. Since the invention allows for compression springs to be implemented rather than torsion springs, a more durable design is thus provided, thereby solving the first object of the invention.

[0011] Further, since the second latch element is adapted to move between the first position and the second position by means of a translational motion, the present latch arrangement may be arranged accordingly so that the second latch element is adapted to move from the second position to the first position by means of gravity, unless otherwise prevented from doing so by some prevention means. The prevention means may for instance be an openable catch member or an actuation member. Thus, in the event of a biasing member failure, even if that biasing member is a compression spring arranged to bias the second latch element to the first position, said failure would not prevent the latch arrangement from being opened. Thereby, the present invention does not jam in the event of a biasing member failure, thereby solving the second object of the invention.

[0012] In particular, the latch arrangement may be adapted to be arranged so that the second latch element has a higher gravitational potential in the second position than in the first position. The latch arrangement may be

adapted in shape and size to facilitate the second latch element to slide from the second position to the first position, for instance by means of one or more abutment or sliding surfaces facilitating a sliding motion of the second latch element. The latch arrangement may be adapted to be arranged so that the second latch element is vertically moveable between the first and second position. As an alternative, the latch arrangement may be adapted to be arranged so that the second latch element is moveable along a horizontal plane in which case the latch arrangement may comprise a biasing member arranged to bias the second latch element to the first position. Thereby, the latch arrangement may be biased toward an open state.

[0013] Moreover, since the second latch element is moveable between the first and second position by means of a translational motion, there is no need for any member to rotate as in the rotary pawl latch design. Thus, a simpler compression latch design is provided, thereby solving the third object of the invention.

[0014] The latch arrangement according to the first aspect may be a compression latch arrangement. By "compression latch arrangement", it may be meant a latch arrangement which when arranged accordingly to a door allows the door to compressively close.

[0015] The first door element may be a door, a locker door, a cabinet door, a compartment door, a hatch, or the like. The second door element may be a door frame, a locker frame, a cabinet frame, a compartment frame, or the like, to which the first door element is coupled so as to allow the first door element to move between an open position and a closed position. The first door element and the second door element may be adapted to couple by means of one or more hinge arrangements so that the first door element is pivotable to the second door element.

[0016] The first latch element may be adapted to be arranged to the first or second door element. The second latch element may be adapted to be arranged to the second or first door element respectively. The latch arrangement may comprise a housing provided with an opening for receiving the engaging portion of the first latch element. The second latch element may be adapted to move relative the housing between the first position and the second position.

[0017] The second latch position is adapted to be moveable between the first position and the second position. The first position corresponds to a position where the second latch element is able to disengage from the first latch element. Thus, the first position may alternatively be referenced as a disengaging position. Similarly, the first position corresponds to a position where the second latch element is able to release the first latch element. Thus, the first position may alternatively be referenced as a releasing position. The second position corresponds to a position where the second latch element is able to retain the first latch element. Thus, the second position may alternatively be referenced as a retaining position.

[0018] The first latch element is moveable relative the second latch element. It may be moveable between a locked position where the second latch element retains the first latch element in the locked position and a released position where the first latch element is not engaging with the second latch element. The locked position may alternatively be referenced as a second position. The released position may alternatively be referenced as a first position. Between the released position and the locked position, the first latch element may be placed in an intermediate engaging position. In the engaging position, the first latch element may engage with the second latch element while the second latch element is still in the first position.

[0019] Alternatively, the latch arrangement may be described to be moveable between an open state corresponding to a state wherein the first latch element and the second latch element are not engaging with one another, i.e. the first latch element is in the released position, and a closed state corresponding to a state wherein the first latch element is in the locked position and the second latch element is in the second position. The latch arrangement may further be described to be able to be placed in an engaging state between the open state and the closed state wherein the first latch element is in the engaging position and the second latch element is in the first position.

[0020] The second latch element is adapted to displace the first latch element as the second latch element moves from the first position to the second position so that the first door element and the second door element, to which the first latch element and the second latch element are arranged during use, are pressed toward each other. When the first and second latch element engage with one another, the first and second latch element may be in direct contact with each other or in indirect contact with one or more intermediate elements placed between the first and second latch element. Said one or more intermediate elements may be e.g. anti-friction means facilitating the engaging portion of the first latch element to move in and follow said slot.

[0021] Moreover, the first latch element may be adapted to engage with the second latch element via a slot opening provided in a housing. The first latch element may be adapted to move into said slot opening along a first direction relative said housing into said engaging position. The second latch element may be adapted to displace the first latch element from the engaging position to the locked position. The second latch element may be adapted to displace the first latch element from the engaging position to the locked position along said first direction. The second latch element may be adapted to move relative the housing between the first and second position along a second direction. The second direction may be substantially perpendicular to the first direction.

[0022] By "substantially x", it may be meant $x \pm x'$ wherein $x' = x * tol$ wherein tol is a 1 - 2 %, 2 - 3 %, 3 - 4 %, 4 - 5 %, 5 - 6 %, 6 - 7 %, 7 - 8 %, 8 - 9 %, 9 - 10%. In

the case of substantially perpendicular, it may be meant e.g. 90 degrees $\pm$ (0.9 degrees up to 9 degrees).

[0023] According to one embodiment, the second latch element is adapted to displace the first latch element by means of an abutment surface provided within said slot, wherein said abutment surface is at least partially angled at an acute angle with respect to a slot opening side of the second latch element. By this, it may facilitate moving the first latch element into the locked position as the second latch element moves to the second position. The abutment surface may be a wall portion of said slot. The abutment surface may be located at an intermediate slot region between a slot opening and the retaining space. The abutment surface may be adapted to guide the first latch element into the locked position as the second latch element moves to the second position. The abutment surface may be a first abutment surface within said slot and a second abutment surface located on the opposing side of the slot may be adapted so as to guide the first latch element from the locked position into an engaging position as the second latch element moves to the first position.

[0024] According to one embodiment, said acute angle is within the interval of 20 - 50 degrees. The slot may be adapted so that the acute angle is within the interval of 20 - 25 degrees, 25 - 30 degrees, 30 - 35 degrees, 35 - 40 degrees, 40 - 45 degrees, or 45 - 50 degrees. By such an acute angle, the second latch element may facilitate the first latch element to move to the locked position. The first abutment surface may be angled at said acute angle with respect to a slot opening side of the second latch element. The second abutment surface may be angled at said acute angle with respect to a slot opening side of the second latch element. The first abutment surface and the second abutment surface may be placed a distance apart from another at a distance allowing the engaging portion of the first latch element may be moved therebetween between the slot opening and the retaining space. The first abutment surface and the second abutment surface may extend in a parallel manner.

[0025] By "slot opening side", it may be meant the side where the slot opening is positioned. The second latch element may be adapted in size and shape to provide a generally planar geometry about the slot opening. The second latch element may be adapted so that the slot opening side is oriented towards the first latch element as it is being received by the second latch element.

[0026] According to one embodiment, the abutment surface extends from a slot opening to the retaining space. The abutment surface may be a planar surface. The abutment surface may be a curved surface. The abutment surface may be partially a planar surface and partially a curved surface. The abutment surface may be said first abutment surface and the second abutment surface may have a shape at least partially similar to the first abutment surface.

[0027] According to one embodiment, the first latch element is adapted with an elongated portion to which the

engaging portion is arranged, and the second latch element is further adapted in shape and size for receiving the elongated portion in a gap between two slot boundary portions of the second latch element as the engaging portion is moved to the retaining space. The two slot boundary portions may define two parallel abutment surface portions together corresponding to said abutment surface. The engaging portion may extend along a perpendicular direction to said neck portion, thereby forming a t-shape. By this, the second latch element may receive the first latch element in a more controlled manner.

[0028] According to one embodiment, the first latch element is adapted to be received along a first direction and the second latch element is adapted to move between the first and second positions along a second direction substantially perpendicular to the first direction. The first direction may be perpendicular to the slot opening side of the second latch element. The latch arrangement may be adapted arranged so that the first direction is a horizontal direction. The latch arrangement may be adapted to be arranged so that the second direction is a vertical direction. The latch arrangement may be adapted to be arranged so that the second direction is a horizontal direction.

[0029] According to one embodiment, the engaging portion comprises a cylinder portion and the slot has a width substantially corresponding to the diameter of the cylinder portion. By the engaging portion comprising a cylinder portion, the first latch element may more easily move about in said slot. The cylinder portion may be rotatably arranged to the neck portion to rotate about a cylinder portion axis. By this, the engaging portion may more easily move about in said slot. The engaging portion may comprise two cylinder portions extending out from the neck portion. The two cylinder portions may be coaxially arranged about a common cylinder portion axis. The two cylinder portions may be rotatably arranged to the neck portion to rotate about the cylinder portion axis. By this, the engaging portion may more easily move about in said slot.

[0030] According to one embodiment, the latch arrangement further comprises an actuation member adapted to be moveable between a coupled state in which it is coupled with the second latch element to control the movement of the second latch element between the first and second position, and a decoupled state where it is decoupled from the second latch element. The actuation member may be a handle, a lever, a wheel or any other manually operated member.

[0031] The actuation member may be a motor. The motor may be a linear motor. In this case, the actuation member may be adapted to couple with the second latch element so that the movement of the second latch element between the first and second position is along the linear axis of the actuation motor. Alternatively, the actuation member may be rotatably coupled at respective ends, thereby allowing the second latch element to follow an at least partially curved trajectory.

[0032] Alternatively, the motor may be a rotary motor. In this case, the actuation member may be adapted to couple with the second latch element via a gear member.

[0033] The actuation member may be controlled by controlling means to cause said actuation of the second latch element to move between the first position and the second position.

[0034] The actuation member may be moveable between the coupled state and the decoupled state by means of a translational motion and/or a rotational movement. The actuation member may be axially moveable between the coupled state and the decoupled state. In the case of a linear motor, by axially moveable, it may be meant along the linear axis of the actuation member. In the case of a rotary motor, by axially moveable, it may be meant along the rotary axis of actuation member.

[0035] The actuation member may be adapted to couple with the second latch element by means of a coupling member. The coupling member may be a gear member adapted to engage with a gear member track arranged on the second latch element. The actuation member may be moveable so that the gear member is axially displaceable relative the gear member track so that it can be moved into and out of engagement with the gear member track. Alternatively, the gear member is adapted to remain engaged with the gear member track and the actuation member is adapted with a rod member adapted to be axially displaceable relative the gear member so that it can be moved into and out of engagement with the gear member. When engaging with the gear member, the gear member may be rotatable about the rod member axis.

[0036] By being able to decouple the actuation member from a coupled state with the second latch element to a decoupled state, the compression latch element may still be opened if there is a malfunction that prevents the actuation member from being able to actuate movement of the second latch element. Examples of malfunctions may include the actuation member breaking, one or more components coupling the actuation member to the second latch element breaking, or, if the actuation member is driven by a power supply, in the event of a power failure.

[0037] The actuation member may be moved between the decoupled state and the coupled state by means of an access member protruding out of a housing of the compression latch element. The access member may in one embodiment have an elongated shape which can be axially displaced. By displacing the access member, the actuation member may be moved between the decoupled state and the coupled state. The access member may have an elongated shape, such as a rod shape.

[0038] According to one embodiment, the latch arrangement further comprises a coupling gear member adapted to engage with a cog track of the second latch element, wherein the actuation member is adapted to disengage from the coupling gear member when moved to the decoupled state. Alternatively, the actuation member is adapted to move the coupling gear member out from an engaging state with the gear member track, either

by means of a translational motion, for instance axially displaced or translated away from the gear member track, or by means of a rotational motion.

[0039] According to one embodiment, the coupling gear member represents an output gear member of a gear train further comprising an input gear member rotationally coupled with a rotation means of the actuation member, wherein the gear train is adapted so that when the input gear member rotates an input circumferential distance, the coupling gear member rotates an output circumferential distance, wherein the ratio between the output circumferential distance and the input circumferential distance is in the interval of 1.5:1 to 10:1.

[0040] By circumferential distance, it may be meant the distance a circumferential point moves in a circumferential distance as the gear member rotates. Thus, in the example wherein the ratio is 10:1, it means that a circumferential point of the coupling gear member moves in a circumferential direction 10 times as much as a circumferential point of the input gear member when the input gear member rotates.

[0041] By this, a relatively small rotation of the rotating means of the actuation member results in a relatively large change in position of the second latch element. The gear train may comprise two or more gear members. The two or more gear members may be of varying sizes and mutually arranged to provide the specified ratio. The diameter of the coupling gear member may be larger than the diameter of the input gear member, for instance 2 to 5 times that of the diameter of the input gear member. By "x times that", it may be meant that x multiplied by the specified parameter. For instance, "1 times that" means equal to. The coupling gear member may be a gear with a plurality of cog teeth. The input gear member may be a gear with a plurality of cog teeth. Said two or more gear members may each be gears with a respective set of cog teeth.

[0042] According to one embodiment, the actuation member is adapted to move along an axis between the coupled state and the decoupled state.

[0043] According to one embodiment, the actuation member is adapted to couple with the coupling gear member by means of a rod member axially displaceable relative the coupling gear member. The rod member may comprise a portion having a non-circular cross section which is adapted to axially engage with the coupling gear member. By the portion having the non-circular cross section, the rod member may in an engaging position be rotationally fixed with the coupling gear member. The rod member may be axially coupled with or axially extend out of a gear member of the gear train.

[0044] According to one embodiment, the latch arrangement further comprises a biasing member adapted to bias the second latch element to move in a direction toward the first position. By this, the second latch element may move towards the first position to be ready to receive the first latch element when being moved to an engaging position. Further, if the latch arrangement comprises an

actuation member as herein disclosed, when the actuation member moves from a coupled state to a decoupled state, the second latch element will consequently move to the first position. The actuation member may be adapted to be maintained in a state corresponding to the second latch element being in the second position.

[0045] According to one embodiment, said biasing member is a first biasing member and said latch arrangement further comprises a second biasing member arranged to bias the actuation member to its coupled state. By this, the actuation member may automatically return to the coupled state after being moved therefrom.

[0046] According to one embodiment, the latch arrangement further comprises a first sensor adapted to detect a presence of the first latch element, wherein the latch arrangement is further adapted so that when a presence of the first latch element is detected, the actuation member is controlled to actuate movement of the second latch element to move to the second position to lock the first latch element in place.

[0047] According to one embodiment, the latch arrangement may further comprise a second sensor adapted to detect when the second latch element is in the second position.

[0048] According to one embodiment, the latch arrangement may further comprise a third sensor adapted to detect when the actuation member is in the decoupled state.

[0049] According to one embodiment, the latch arrangement may further comprise a fourth sensor adapted to detect when the second latch element is in the first position.

[0050] By the first sensor, the compression latch element may automatically respond and move the engaging portion into a locked position. When the first latch element is in an engaging position, the first sensor may detect the first latch element's position. The first sensor may then emit a signal that may be interpreted as indicating that the first latch element is in the engaging position. A controlling means may be adapted to receive said signal and correspondingly control the latch arrangement so that the engaging portion is moved into a locked position.

[0051] By the second sensor, feedback may be received on when the second latch element is in the second position, at which point the actuation member will stop moving the second latch element in the direction from the first position to the second position.

[0052] The latch arrangement may comprise a fourth sensor adapted to detect when the second latch element is in the first position. By this, feedback may be received on when the second latch element is in the first position, at which point the actuation member will stop moving the second latch element in the direction from the second position to the first position.

[0053] By the third sensor, feedback may be received on when the actuation member is in the decoupled state.

[0054] The first, second, third, and/or fourth sensor may be a sensor adapted to detect a presence by means

of magnetism. The latch arrangement may comprise one or more magnets arranged accordingly to the first latch element or the second latch element or the actuation member.

5 **[0055]** The first, second, third, and/or fourth sensor may be mechanical switches which when pressed emits an electrical signal indicating the mechanical switch is being pressed, i.e. indicating a presence of the first latch element, the second latch element or the actuation member in their respective positions.

10 **[0056]** According to a second aspect of the invention, a latch arrangement is provided. The latch arrangement comprises: a first latch element adapted to be arranged to a first door element; a second latch element adapted to be arranged to a second door element and adapted, when arranged thereto, to be moveable relative the second door element between a first position where it is able to disengage from the first latch element, and a second position where it retains the first latch element in a locked position. The latch arrangement is adapted so that the second latch element comprises a slot for receiving an engaging portion of the first latch element, which slot is adapted in size and shape to guide the engaging portion into a retaining space of the second latch element as the second latch element moves toward the second position; the second latch element is adapted to move between the first position and the second position by means of a translational motion.

25 **[0057]** The latch arrangement may further comprise an actuation member adapted to be moveable between a coupled state in which it is coupled with the second latch element to control the movement of the second latch element between the first and second position, and a decoupled state where it is decoupled from the second latch element.

30 **[0058]** By this, the latch arrangement may be opened in the event of a failure preventing the actuation member from moving the second latch element between the first position and the second position.

35 **[0059]** The latch arrangement according to the second aspect may comprise any combination of features of the above specified embodiments of the latch arrangement according to the first aspect. The latch arrangement may omit the feature wherein the second latch element is adapted to displace the first latch element as the second latch element moves from the first position to the second position so that the first door element and the second door element are pressed toward each other. As an alternative, the slot for receiving the engaging portion may be substantially L-shaped, i.e. when the first latch element is placed in an engaging position, the engaging portion may be positioned at the corner of the L-shaped slot. When moving the second latch element between the first and second position, the engaging portion thereby moves linearly which results in no net pressing effect during use between the first door element and the second door element.

[0060] The second latch element may be adapted to

displace the first latch element as the second latch element moves from the first position to the second position so that the first door element and the second door element are pressed toward each other. By this, the latch arrangement may be a compression latch arrangement.

[0061] The latch arrangement may be partly made by a durable material such as a metallic material or a suitable plastic material. One or more components may have protective or anti-friction coating.

[0062] The invention is defined by the appended independent claims, with embodiments being set forth in the appended dependent claims, in the following description and in the drawings.

Brief Description of the Drawings

[0063] The invention will in the following be described in more detail with reference to the enclosed drawings, wherein:

Fig. 1 shows a perspective view of the latch arrangement according to one embodiment of the invention;
Fig. 2 shows a first side view of the latch arrangement according to one embodiment of the invention;

Fig. 3 shows a second side view of the latch arrangement according to one embodiment of the invention;
Fig. 4 shows a side view of the latch arrangement in an open state according to one embodiment of the invention wherein a side panel of the housing is omitted from the view;

Fig. 5 shows a side view of the latch arrangement in a closed state according to one embodiment of the invention wherein a side panel of the housing is omitted from the view;

Fig. 6 shows a side view of the latch arrangement in an open state according to one embodiment of the invention wherein a side panel of the housing is omitted from the view and the actuation member is in a decoupled state;

Fig. 7 shows a perspective view of some of the elements of the latch arrangement according to one embodiment of the invention;

Figs. 8-10 show further perspective views of some of the elements of the latch arrangement according to one embodiment of the invention;

Fig. 11 shows a schematic view of the latch arrangement according to one embodiment of the invention when arranged to a door.

Description of Embodiments

[0064] The present invention will be described more fully hereinafter with reference to the accompanying drawings, in which preferred 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 so that this disclosure

will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. In the drawings, like numbers refer to like elements.

[0065] Fig. 1 shows a perspective view of a latch arrangement 1 according to one embodiment of the invention. The latch arrangement 1 is arranged in a housing 10. The housing 10 generally comprises three sets of parallel side surfaces; however, the housing 10 may be adapted in other appropriate shapes depending on the door arrangement and available space for the latch arrangement 1. The housing 10 is provided with arranging means 13 for allowing it to be arranged to a door element. The housing 10 also provides a connection port 11 by which power may be supplied for one or more electronic components of the latch arrangement 1 (if comprising any such components).

[0066] The latch arrangement 1 comprises a first latch element 2. The first latch element 2 is adapted to be arranged to a first door element 100. As can be seen in e.g. Figs. 1-2, the first latch element 2 comprises a plate portion. When arranged to a first door element 100, the plate portion is fixedly attached to said door element 100. The plate portion comprises a set of mounting holes allowing it to be fixedly attached to said door element 100. The first door element 100 may be a door.

[0067] In one embodiment, as exemplified in e.g. Fig. 1, the first latch element 2 comprises an elongated portion extending out of a plate portion. The elongated portion is adapted in shape and size to define an engaging portion. The latch arrangement is adapted to receive the engaging portion via an opening 101 of the housing, which engaging portion engages internally with one or more elements of the latch arrangement.

[0068] The latch arrangement 1 further comprises a second latch element 3, see e.g. Figs. 4-6. The second latch element 3 is adapted to be arranged to a second door element 110 and adapted, when arranged thereto, to be moveable relative the second door element 110 between a first position P1 where it is able to disengage from the first latch element 2, and a second position P2 where it retains the first latch element 2 in a locked position. The second latch element 3, shown in e.g. Fig. 4, is arranged in the housing 10 and adapted to move relative the housing in a predetermined manner. The second latch element 3 is generally shaped as a block element and is further adapted in size and shape to be able to receive at least a portion of the first latch element in a locked position.

[0069] As illustrated in e.g. Figs. 4 and 5, the second latch element 3 is adapted to be moveable between a first position P1 and a second position P2. When the second latch element 3 is in the first position P1, as shown in Fig. 4, the second latch element 3 is placed to be able to disengage from and receive at least a portion of the first latch element 2. When the second latch element 3 is in the second position P2, as shown in Fig. 5, the second latch element is placed so that the first latch element 2 is in a locked position.

[0070] The first latch element 2 is adapted to move between a released position (where it is not engaging with the second latch element or housing) and the locked position along a first direction D1. The second latch element 3 is adapted to move between the first position P1 and the second position P2 by means of a translational motion along a second direction D2. The latch arrangement 1 is adapted so that the first direction D1 and the second direction D2 are substantially perpendicular to each other. Between the released position and the locked position, the first latch element 2 may be positioned in an intermediate engaging position wherein the first latch element 2 is engaging with the second latch element 3 when it is placed in the first position P1. This position setup is depicted in Fig. 4.

[0071] The second latch element 3 comprises a slot 32 for receiving an engaging portion 21 of the first latch element 2. Said slot 32 is adapted in size and shape to guide the engaging portion 21 into a retaining space 31 of the second latch element 3 as the second latch element 3 moves toward the second position P2 (see Fig. 5). The slot 32 extends from a slot opening to said retaining space 31. The location of the retaining space 31 is laterally offset relative a region of the slot opening. Thereby, when the second latch element 3 moves from the first position P1 to the second position P2, the first latch element 2 consequently translates relative the housing 10 in an inward direction. This results in, during use, that the first door element 100 and the second door element 110 press toward each other, thereby resulting in a compressive effect. The degree of this compressive effect may be adjusted by adjusting the position of the first latch element 2 to the first door element 100 and/or the adjusting the position of the housing 10 relative the second door element 110 and/or adjusting the size and shape of the first latch element 2 and/or adjusting the size and shape of the second latch element 3 and/or the housing 10.

[0072] The second latch element 3 is adapted to displace the first latch element 2 by means of an abutment surface provided within said slot 32. The abutment surface 32 is angled at an acute angle α with respect to a slot opening side of the second latch element 3. The abutment surface within said slot 32 extends from the slot opening located at the slot opening side of the second latch element 3 and the retaining space 31. The retaining space 31 comprises a surface which is substantially parallel with the slot opening side of the second latch element 3. The slot 32 has a width which substantially corresponds to the diameter of a cylinder portion of the engaging portion of the first latch element 2. Thereby, the slot 32 may be regarded as defining two abutment surfaces located on opposite side walls of the slot 32 wherein each abutment surface guides the engaging portion 21 into and out of the retaining space 31 as the second latch element moves between the first position P1 and the second position P2.

[0073] Moreover, as shown in Fig. 7, the second latch element 3 is adapted in shape and size to define two slot

boundary portions 34 between which a gap 36 is formed. The purpose of the gap 36 is to provide a space into which the elongated portion 22 may be received when the engaging portion is moved into the retaining space 31. The abutment surface is thus divided in two separate abutment surface portions located along a side of slot bounding side of the slot boundary portions 34.

[0074] The latch arrangement 1 may also comprise an actuation member 5. The actuation member 5 is adapted to be moveable between a coupled state in which it is coupled with the second latch element 3 to control the movement of the second latch element 3 between the first and second position P1, P2, and a decoupled state where it is decoupled from the second latch element 3. The actuation member 5 may be axially moveable between said states as shown in Figs. 4, 5 and 6 respectively. This axial movement may be controlled by means of an access member 12 which is adapted to protrude out of the housing 10. Thereby, by moving the access member 12 relative the housing 10, the actuation member 5 may be moved between the coupled and decoupled state. As an example, the access member 12 may be shaped as a rod. Moreover, the actuation member 5 may be biased toward the coupled state by means of a biasing member 7. The biasing member 7 may be a compression spring. The actuation member 5 is further adapted to move between the coupled state and the decoupled state along an axis A.

[0075] The latch arrangement 1 may further comprise a coupling gear member 80 adapted to engage with a cog track 36 fixedly arranged to the second latch element 3. The cog track 36 may be a separate element fixedly arranged to the second latch element 3. The cog track 36 may be an integral shape of the second latch element 3. The actuation member 5 may couple with said coupling gear member 80 and transfer a rotational motion generated by a rotation means of the actuation member 5 via said coupling gear member 80 and gear track 36 to the second latch element 3. The actuation member 5 may be adapted to couple with said coupling gear member 80 by means of a rod member or rod portion adapted to be axially displaceable relative an axis of the coupling gear member 80.

[0076] The latch arrangement 1 may further comprise a gear train 8 wherein the coupling gear member 80 represents an output gear member of said gear train 8 which further comprises an input gear member 81 rotationally coupled with a rotation means of the actuation member 5. The gear train 8 is adapted so that when the input gear member 81 rotates an input circumferential distance, the coupling gear member 80 rotates an output circumferential distance, wherein the ratio between the output circumferential distance and the input circumferential distance is in the interval of 1.5:1 to 10:1.

[0077] The second latch element 3 is further biased toward the first position P1 by means of a first biasing means 4. The first biasing means 4 may be a compression spring. The second latch element 3 may be adapted

with a biasing member recess for receiving a portion of the biasing member. This may prevent the biasing member from being dislocated. The biasing member 4 may be adapted to extend between a bottom of the recess along said second direction D2 towards an internal housing surface.

[0078] The latch arrangement 1 may further comprise a first sensor 91 adapted to detect a presence of the first latch element 2, wherein the latch arrangement 1 is further adapted so that when a presence of the first latch element 2 is detected, the actuation member 5 is controlled to actuate movement of the second latch element 3 to move to the second position P2 to lock the first latch element 2 in place. The first sensor 91 may be a magnetic sensor.

[0079] The latch arrangement 1 may further comprise a second sensor 92 adapted to detect when the second latch element 3 is in the second position P2. The second sensor 92 is a magnetic sensor adapted to detect the presence of a magnet 95 arranged to the second latch element 3.

[0080] The latch arrangement 1 may further comprise a third sensor 93 adapted to detect when the actuation member 5 is in the decoupled state. The third sensor 93 is a mechanical switch adapted to be pressed by the actuation member 5 as it moves into a decoupled state.

[0081] The latch arrangement 1 may further comprise a fourth sensor 94 adapted to detect when the second latch element 3 is in the first position P1. The fourth sensor 94 may be a magnetic sensor adapted to detect the presence of a magnet 95 arranged to the second latch element 3.

[0082] A single magnet 95 may be used by the second sensor 92 and the fourth sensor 94 for identifying whether the second latch element 3 is located in the respective second or first position or in between.

[0083] Figs. 8-10 show various perspective views of the gear train 8 and the actuation member 5. The gear train 8 may comprise an output gear member which corresponds to the coupling gear member 80. The gear train 8 comprises an input gear member 81 rotationally coupled with the rotating means of the actuation member 5. The gear train 8 may further comprise one or more intermediate gear members 82, 83, 84, 85, 86 which form said gear train 8 for transferring a motion from the actuation member 5 to the second latch element 3.

[0084] Further, the access element 12 may be axially offset relative the actuation member 5. A body 120 may extend from the access element 12 to couple with the actuation member 5. The body may extend along a side of the actuation member 5 and may optionally extend to the gear train 8. The third sensor 93 may be adapted to interact with said body 120.

[0085] The actuation member 5 may be a rotary motor as shown in Figs. 4 - 10. The latch arrangement 1 may comprise controlling means and power supply means for controlling the actuation member 5 based on input from any of the first, second, third, fourth sensors 91, 92, 93,

94.

[0086] Fig. 11 illustrates a schematic view of the latch arrangement 1 when arranged to a door arrangement comprising a door 100 and a door frame 110. The door arrangement may be a door arrangement for a locker, a cabinet, a compartment, a vault or the like. The door arrangement may be a hatch arrangement.

[0087] In the drawings and specification, there have been disclosed preferred embodiments and examples of the invention and, although specific terms are employed, they are used in a generic and descriptive sense only and not for the purpose of limitation, the scope of the invention being set forth in the following claims.

Claims

1. A latch arrangement (1) for a door (100), comprising:

- a first latch element (2) adapted to be arranged to a first door element (100);
- a second latch element (3) adapted to be arranged to a second door element (110) and adapted, when arranged thereto, to be moveable relative the second door element (110) between a first position (P1) where it is able to disengage from the first latch element (2), and a second position (P2) where it retains the first latch element (2) in a locked position,

wherein the second latch element (3) comprises a slot (32) for receiving an engaging portion (21) of the first latch element (2), which slot (32) is adapted in size and shape to guide the engaging portion (21) into a retaining space (31) of the second latch element (3) as the second latch element (3) moves toward the second position (P2); the second latch element (3) is adapted to displace the first latch element (2) as the second latch element (3) moves from the first position (P1) to the second position (P2) so that the first door element and the second door element are pressed toward each other, and the second latch element (3) is adapted to move between the first position (P1) and the second position (P2) by means of a translational motion.

2. Latch arrangement (1) according to claim 1, wherein the second latch element (2) is adapted to displace the first latch element (2) by means of an abutment surface provided within said slot (32), wherein said abutment surface (32) is at least partially angled at an acute angle with respect to a slot opening side of the second latch element (3).

3. Latch arrangement (1) according to claim 2, wherein said acute angle (a) is within the interval of 20 - 50 degrees.
4. Latch arrangement (1) according to claim 2 or 3, wherein the abutment surface extends from a slot opening to the retaining space (31).
5. Latch arrangement (1) according to any of claims 1-4, wherein the first latch element (2) is adapted with an elongated portion (22) to which the engaging portion (31) is arranged, and the second latch element (3) is further adapted in shape and size for receiving the elongated portion (22) in a gap between two slot boundary portions (34) of the second latch element (3) as the engaging portion (21) is moved to the retaining space (31).
6. Latch arrangement (1) according to any of the preceding claims, wherein the first latch element (2) is adapted to be received along a first direction (D1) and the second latch element (3) is adapted to move between the first and second positions (P1, P2) along a second direction (D2) substantially perpendicular to the first direction (D1).
7. Latch arrangement (1) according to any of the preceding claims, wherein the engaging portion (21) comprises a cylinder portion and the slot (32) has a width substantially corresponding to the diameter of the cylinder portion.
8. Latch arrangement (1) according to any of the preceding claims, further comprising an actuation member (5) adapted to be moveable between a coupled state in which it is coupled with the second latch element (3) to control the movement of the second latch element (3) between the first and second position (P1, P2), and a decoupled state where it is decoupled from the second latch element (3).
9. Latch arrangement (1) according to claim 8, further comprising a coupling gear member (80) adapted to engage with a cog track (36) of the second latch element (3), wherein the actuation member (5) is adapted to disengage from the coupling gear member (80) when moved to the decoupled state.
10. Latch arrangement (1) according to claim 9, wherein the coupling gear member (80) represents an output gear member of a gear train (8) further comprising an input gear member (81) rotationally coupled with a rotation means of the actuation member (5), wherein the gear train (8) is adapted so that when the input gear member (81) rotates an input circumferential distance, the coupling gear member (80) rotates an output circumferential distance, wherein the ratio between the output circumferential distance and the input circumferential distance is in the interval of 1.5:1 to 10:1.
11. Latch arrangement (1) according to any one of claims 8-10, wherein the actuation member (5) is adapted to move along an axis (A) between the coupled state and the decoupled state.
12. Latch arrangement (1) according to any one of claims 9-11, wherein the actuation member (5) is adapted to couple with the coupling gear member (80) by means of a rod member (82) axially displaceable relative the coupling gear member (80).
13. Latch arrangement (1) according to any one of claims 1-12, further comprising a biasing member (4) adapted to bias the second latch element (3) to move in a direction toward the first position (P1).
14. Latch arrangement (1) according to claim 13 when dependent on any one of claims 8-12, wherein said biasing member (4) is a first biasing member (4) and said latch arrangement (1) further comprises a second biasing member (7) arranged to bias the actuation member (5) to its coupled state.
15. Latch arrangement (1) according to any of the preceding claims, further comprising:
 - a first sensor (91) adapted to detect a presence of the first latch element (2), wherein the latch arrangement (1) is further adapted so that when a presence of the first latch element (2) is detected, the actuation member (5) is controlled to actuate movement of the second latch element (3) to move to the second position (P2) to lock the first latch element (2) in place, and/or
 - a second sensor (92) adapted to detect when the second latch element (3) is in the second position (P2), and/or
 - a third sensor (93) adapted to detect when the actuation member is in the decoupled state, and/or
 - a fourth sensor (94) adapted to detect when the second latch element (3) is in the first position (P1).

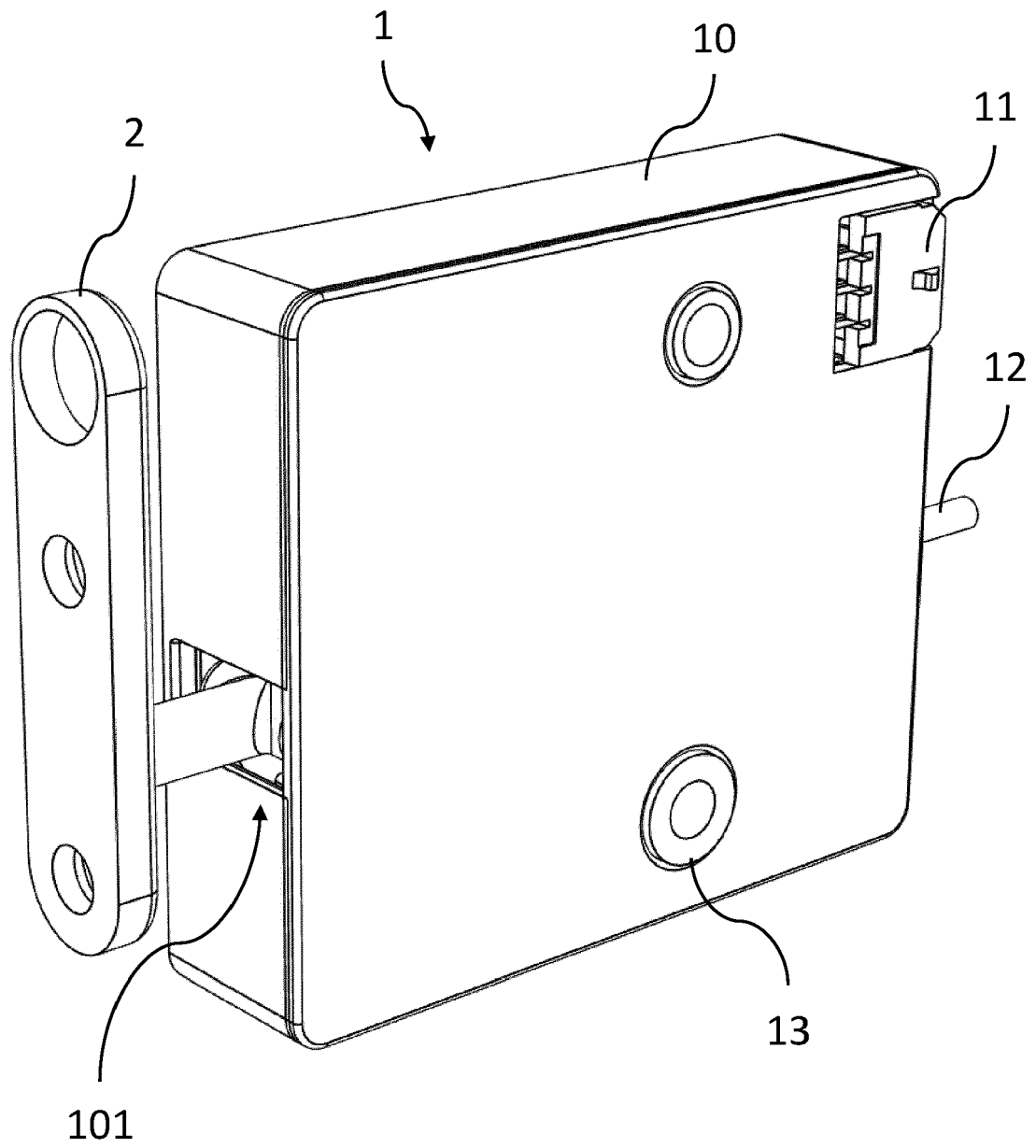


Fig. 1

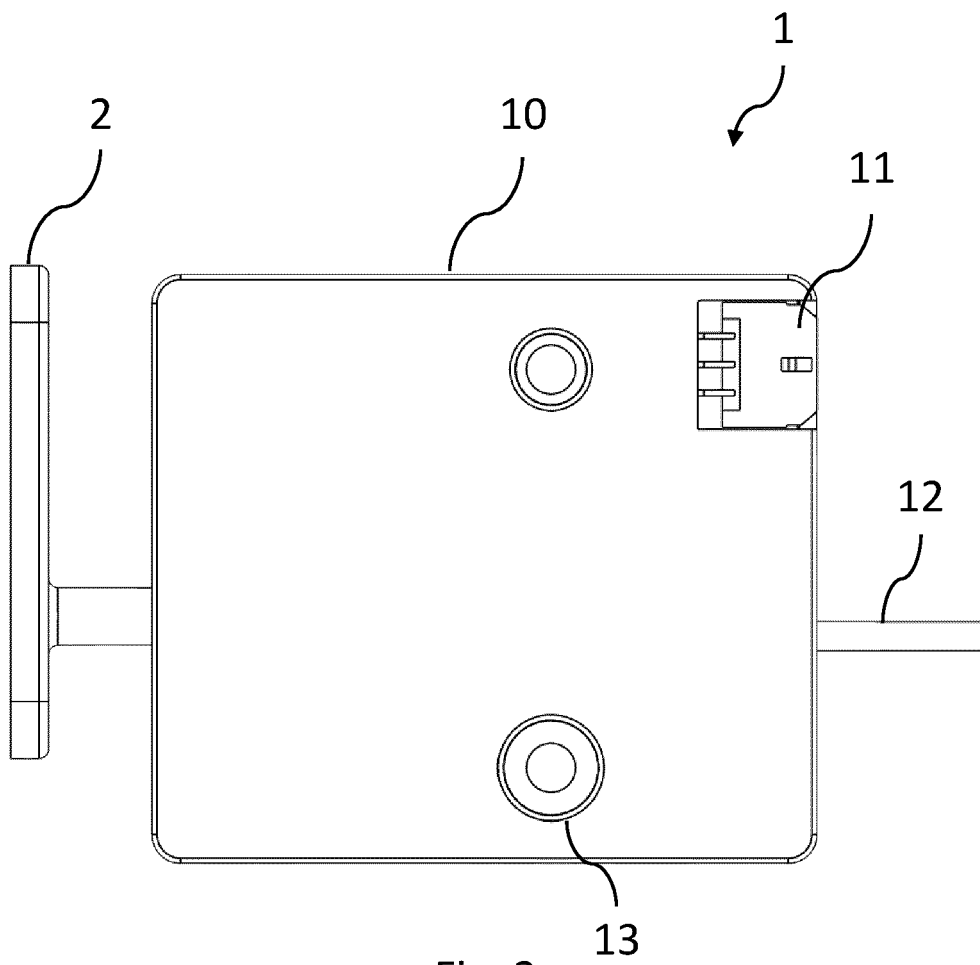


Fig. 2

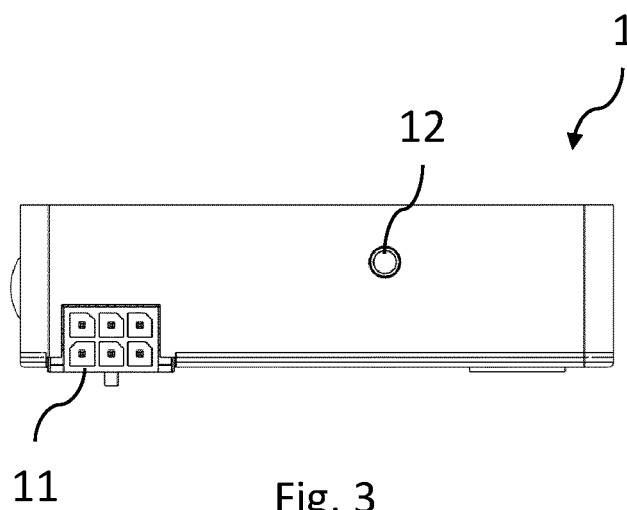


Fig. 3

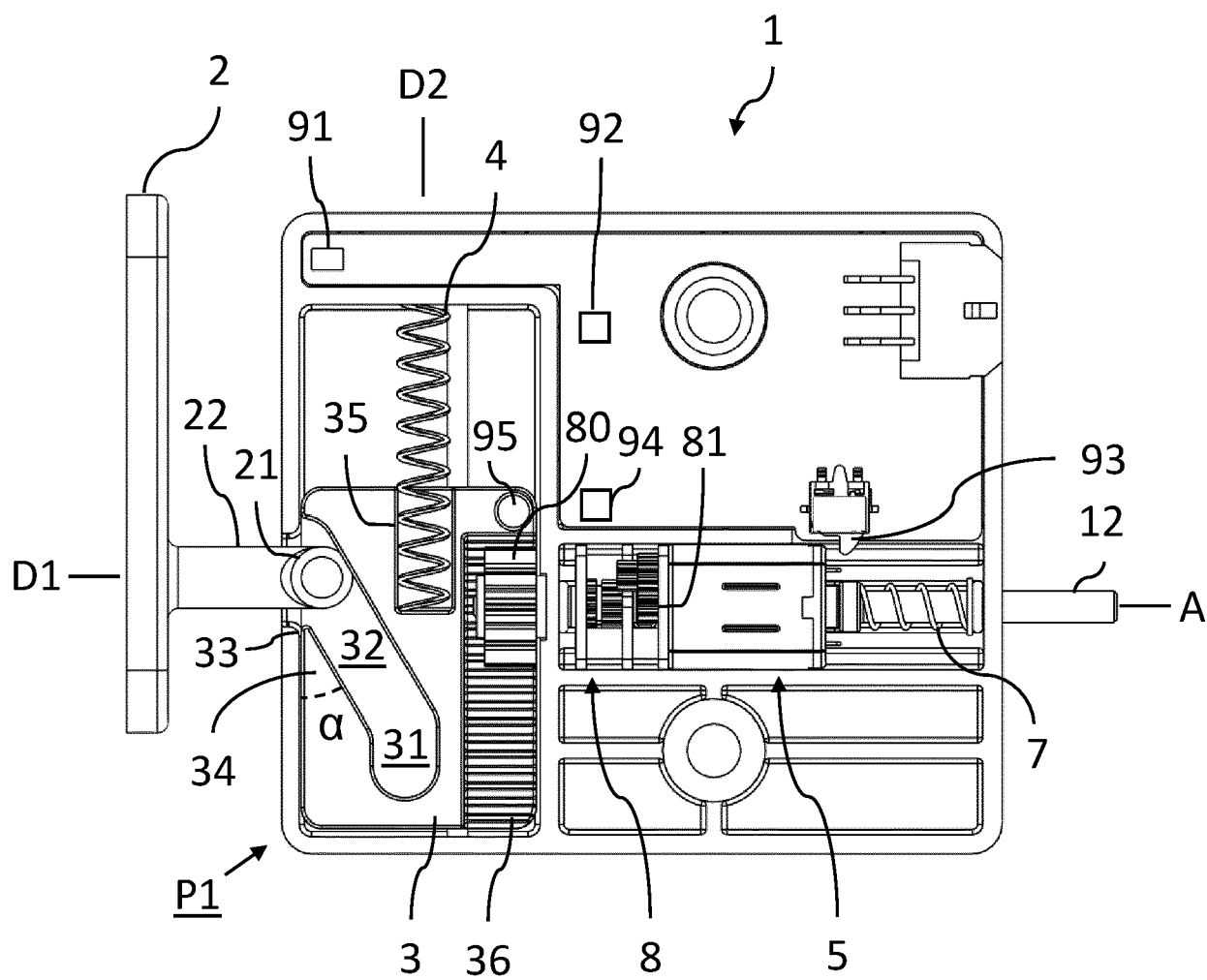


Fig. 4

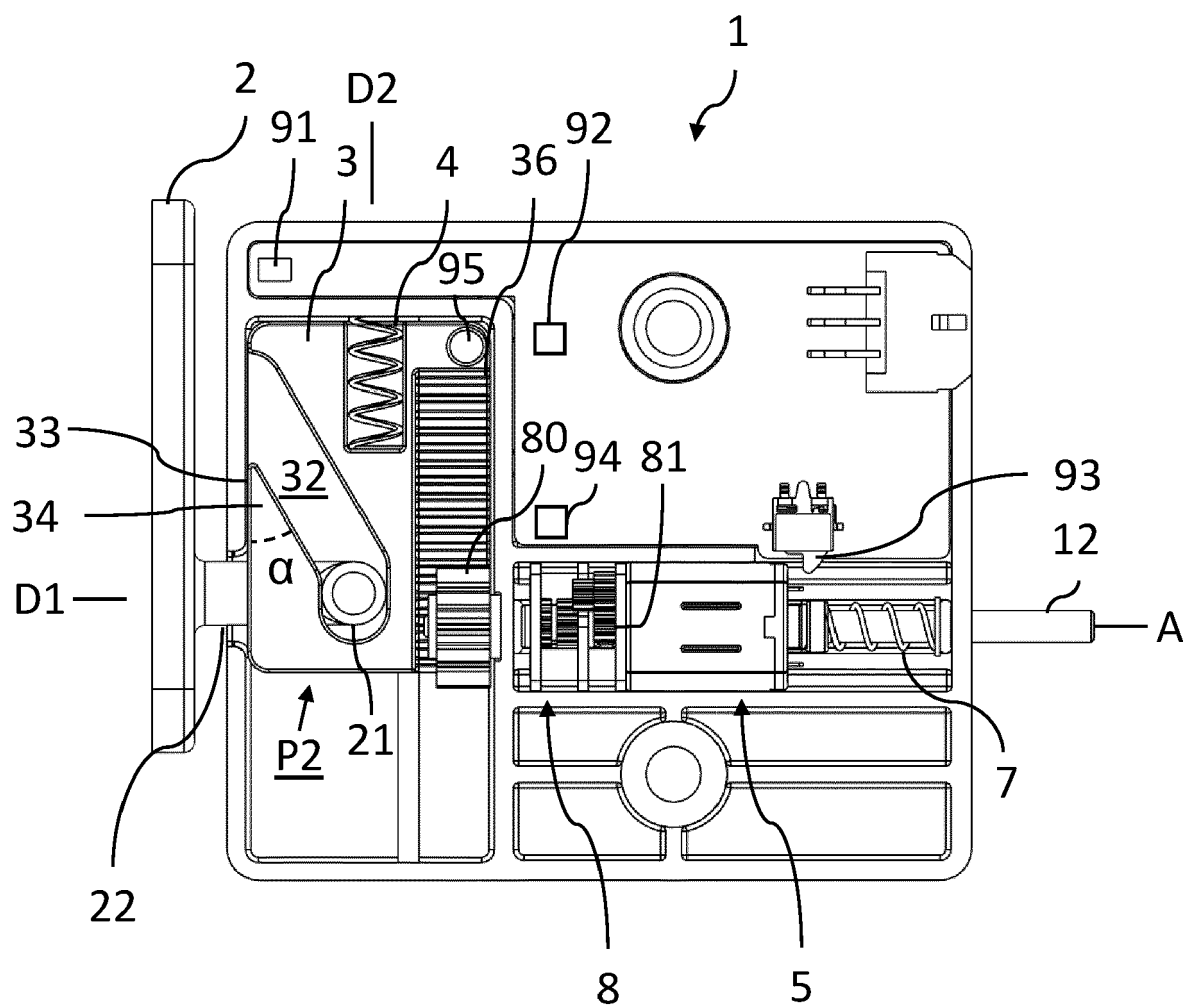


Fig. 5

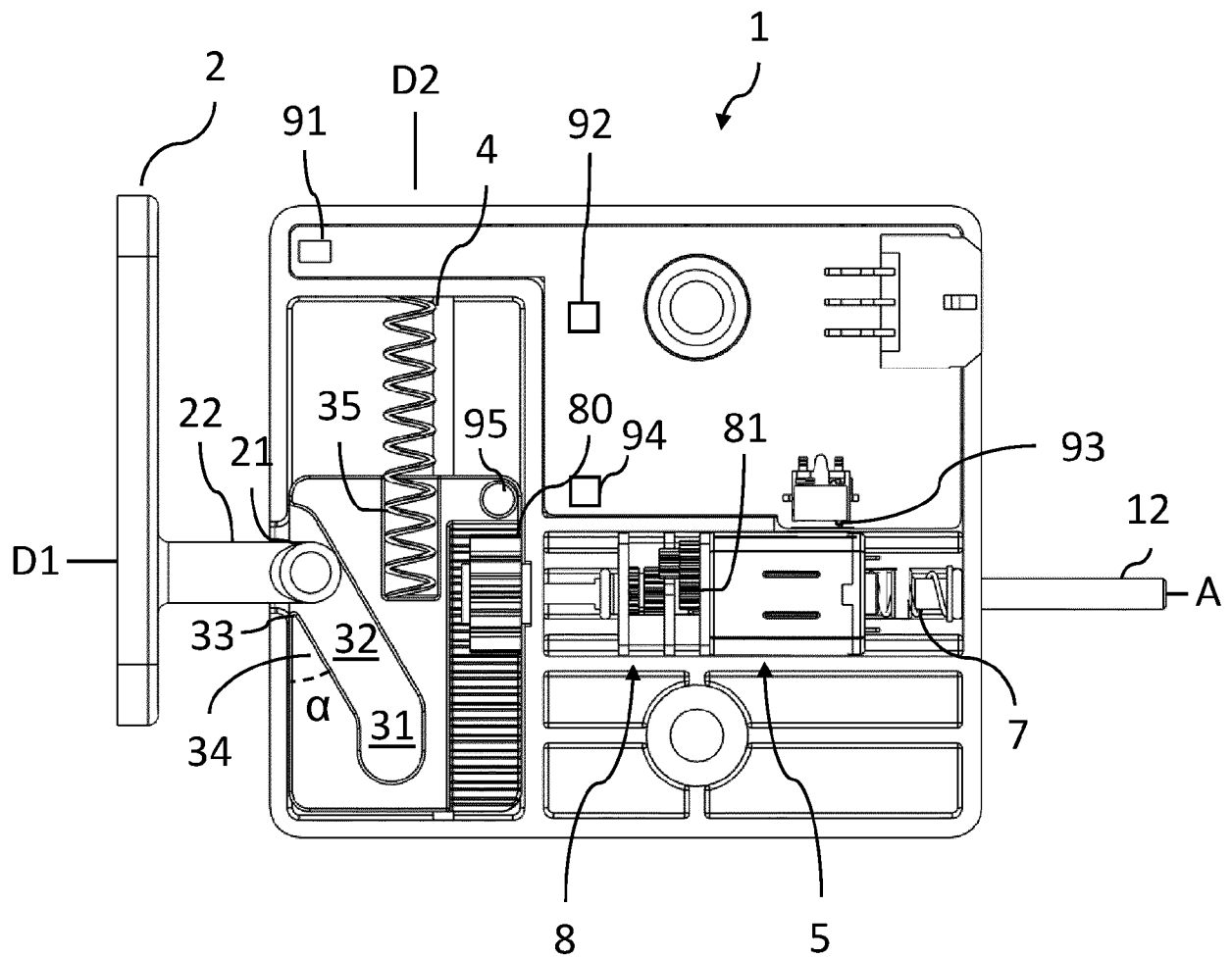


Fig. 6

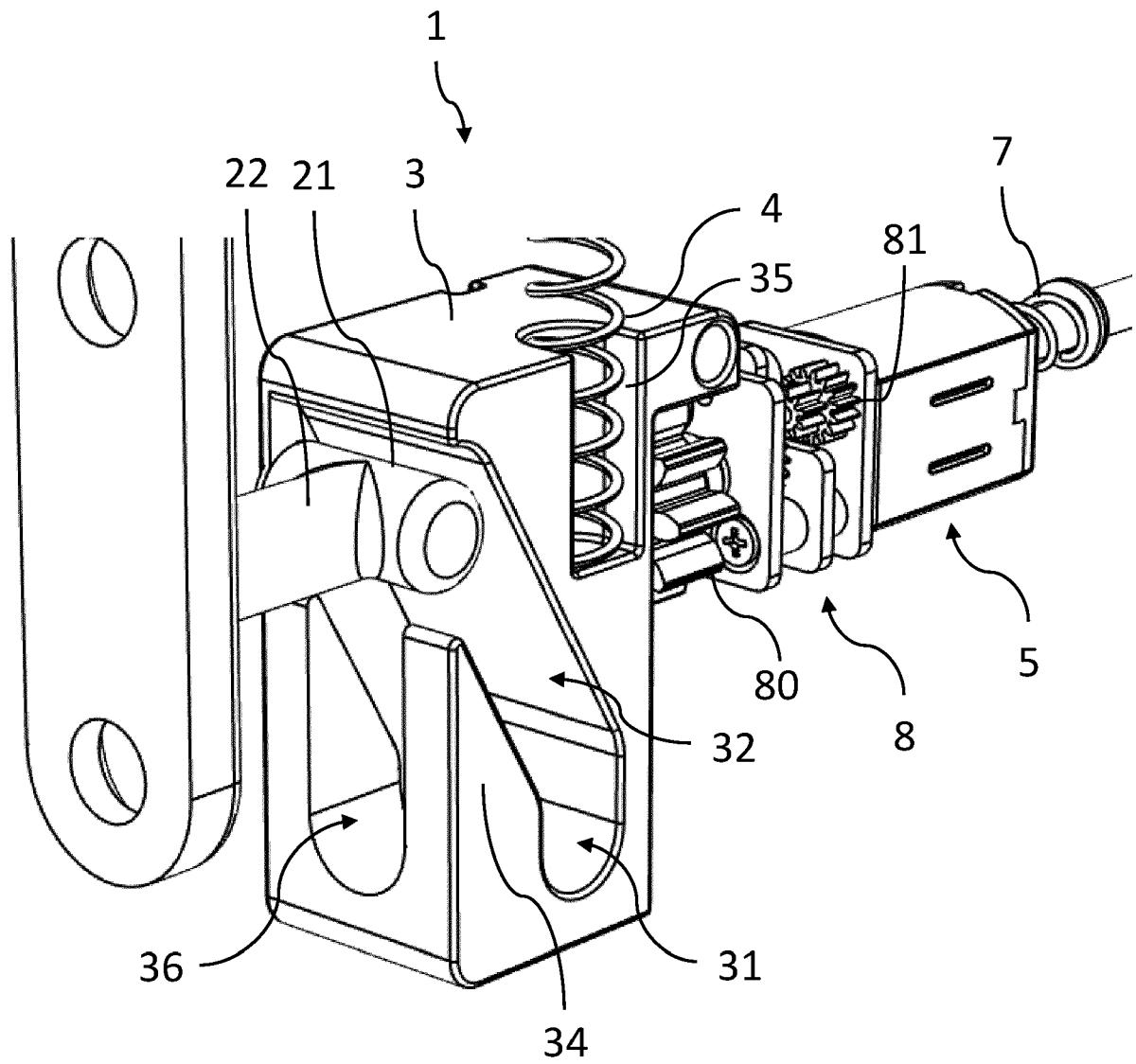
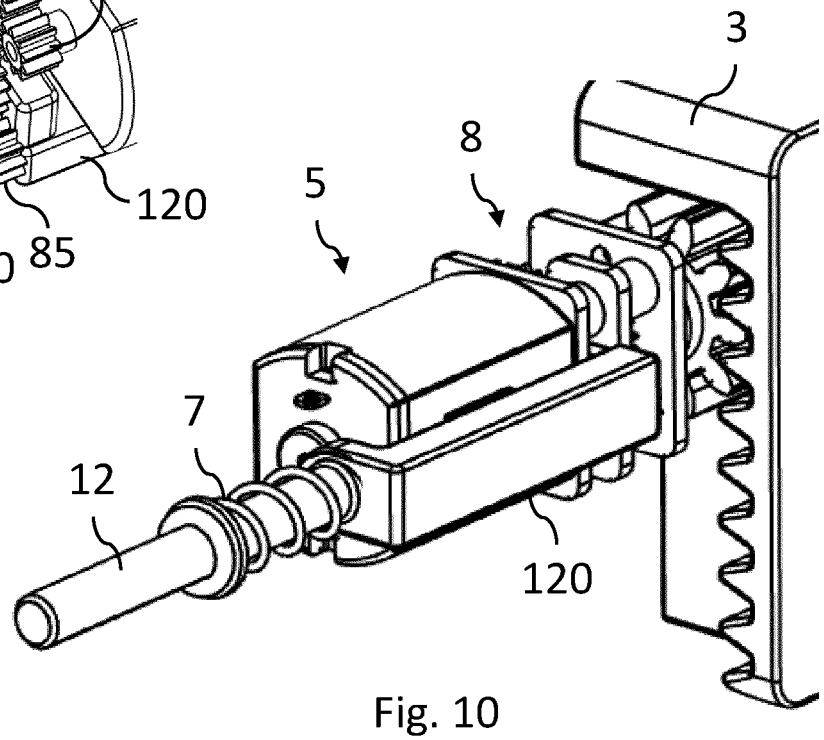
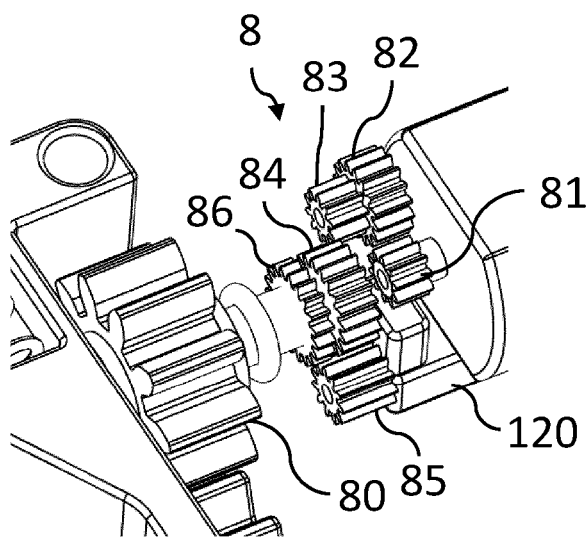
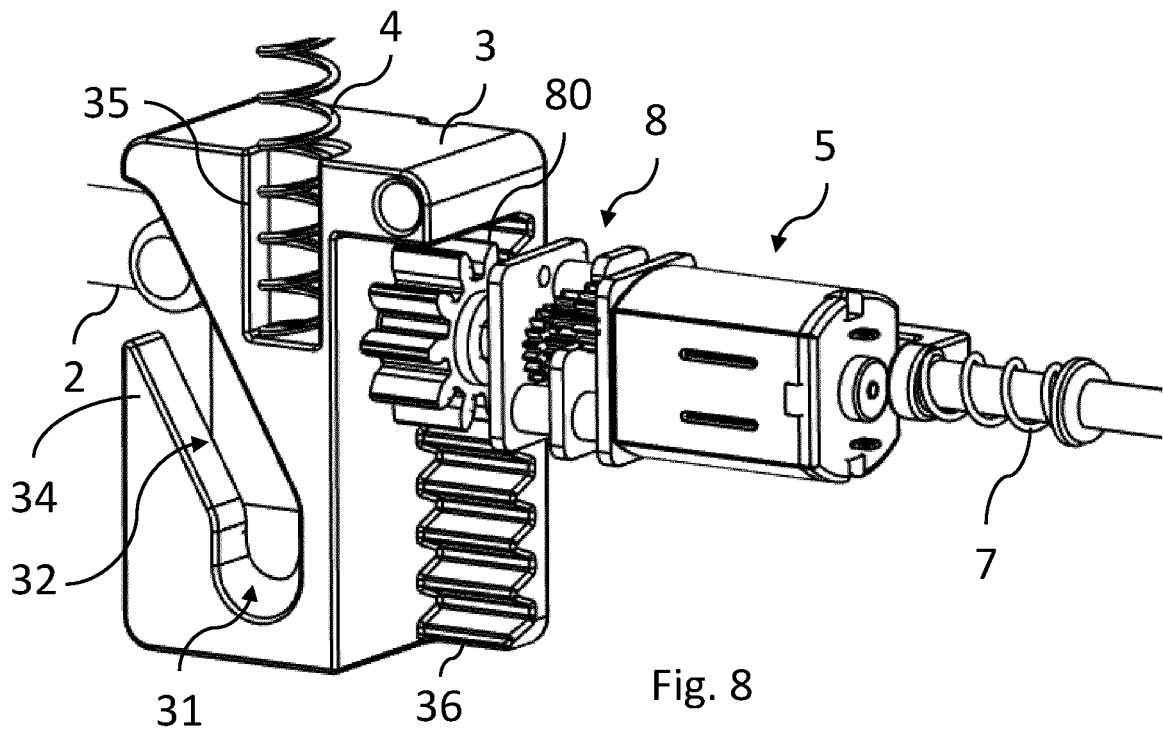


Fig. 7



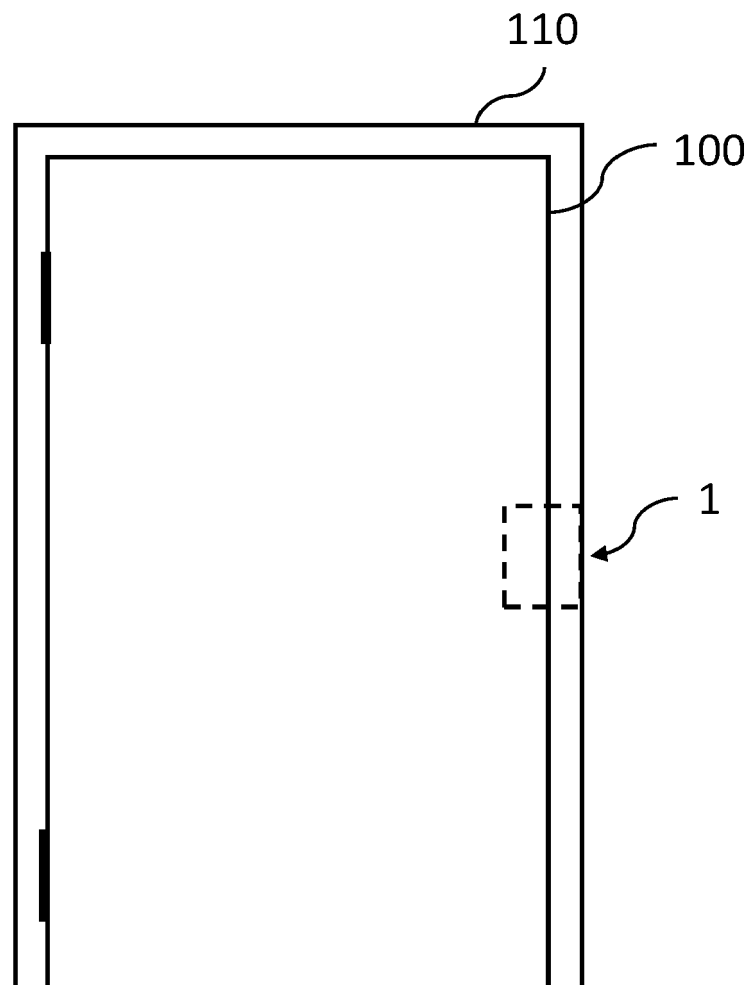


Fig. 11



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Application Number

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Place of search		Date of completion of the search	Examiner
The Hague		1 June 2022	Westin, Kenneth
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