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(54) **LOCKING ARRANGEMENT**

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Description

TECHNICAL AREA

[0001] The present invention relates to a door locking arrangement to be used with a closing structure such as a door, shutter, lid and the like arranged for preventing and allowing access to a compartment such as a container.

BACKGROUND OF INVENTION

[0002] Different locking systems are used in many applications for preventing unauthorized access to compartments. Such compartments may for example be safes, cargo containers, semi-trailers, swap-bodies, truck and van compartments, just to mention a few. A conventional locking system for containers comprise vertical rods extending on an outside of a loading door. The vertical rods are arranged with horizontal locking bolts that fit into fixtures on the frame of the loading door. The locking system is operated by handles attached to the vertical rods, enabling a rotation of the vertical rods between a locking position to a resting position. In order to prevent unauthorized access to the container, pad locks are used for locking the handles, preventing rotation of the vertical rods and thereby opening of the doors.

[0003] With the ever-increasing cargo shipment around the globe, often containing different types of goods targeted by thieves and thus goods that are tempting to steal, different solutions regarding trailers and trailer doors have been developed. The most basic are solutions where the handling of the trailer door handles are made more difficult, for instance by covering the area of the pad lock or to mount a sturdy lockable bar that grips around the vertical rods of a door pair. These might reduce the risk of break-in, but they are bulky, heavy and generally not user-friendly.

[0004] More recently, for a limited kind of cargo compartments and only where full access to power supply is available, intelligent systems have been launched having ID-functions. One such system comprises a locking system that is attached to a door, in particular doors of containers and in particular lorry and semi-trailer compartments. The locking system comprises a handle on the outside of the door. The handle controls a locking bolt placed on the inside of the door and extending towards and into a recess or passage in the floor or bottom of the trailer container. The handling of the handle is only permitted if a correct code is entered on a keypad. This type of locking system works quite well in most situations.

[0005] However, in many applications, considerable force is required to open doors of containers, due to effects from weather, such as water, ice, dirt and cold climate as well as effects due to use like refrigerated containers, washing liquids (acid or basic solutions). Other effects may come from (lack of) service and maintenance, logistic flows, expected life etc. Such conditions may make the locking and bolting arrangement of con-

tainers to function very poorly and/or even malfunction and jam, whereby there is a pronounced risk that for instance the handle or other vital components of the above mentioned locking system is broken, rendering it very difficult to open the container. Handles and other critical components can always be damaged on attempts to open as traditional stiff designed connected handle to the locking and blocking system, when locked as well as unlocked. The root cause of the problem is that the design is suffering from the stiff connection. When a very high required force needs to be applied to the handle in order to open, and when the lock/blocking system is locked, the operator can apply unlimited force to the handle until it brakes.

[0006] In WO 2007/125163 A1 a locking body is disclosed comprising a bolt and a follower that is functionally connectable with the bolt to control the position of the bolt and a driver.

[0007] In WO 2017/046445 A1 another locking body is disclosed, in which the parts that form the force transmission connection from the spindle shaft of the handle of the lock body to the bolt comprise a spring which transfer force and is used to eliminate the protrusion of the bolt caused by tolerance variations when opening the door.

[0008] In GB 2 199 612 A discloses a door lock arrangement comprising a housing with a latch bolt movable between a protruding and a retracted position. An operation axis is provided at which a follower is installed, and which is turnable by a lock operating device to its retracted position, wherein a spring acts to return the latch bolt to its protruding position.

[0009] In EP 0 306 028 A2 a door leaf with a bar lock, which has an upwardly and/or downwardly closing bolt and the locking bars. The locking bars are held in opening position by of a catch device, which triggers the transfer of the locking bars into the closing position only when the catch device senses the closing position of the door leaf or door-leaf wing.

BRIEF DESCRIPTION OF INVENTION

[0010] The aim of the present invention is to remedy the drawbacks of the state of the art solutions. This aim is obtained by a locking arrangement having the features of the independent patent claim. Preferable embodiments of the invention form the subject of the dependent patent claims. The invention enables a total control of the force that can be transferred via the handle to the lock and blocking system and prevent any harm to the vital components.

[0011] According to the invention, a locking arrangement for releasably locking a door of a compartment according to claim 1 is provided. The locking arrangement comprises a locking bolt movable between an extended locking position and a retracted release position, an actuator operably connected to an opening element, where the actuator is rotatable between an initial position and an activated position, and a transmission arranged

between the actuator and the locking bolt, the transmission being arranged to move the locking bolt between the extended position and the retracted position when the actuator is rotated.

[0012] Furthermore, the transmission comprises a lever arranged pivotable and in contact with the actuator, a pressure arm pivotally attached with one end to the lever and operably connected to said locking bolt, wherein rotation of the actuator causes the lever to pivot and the pressure arm to act on said locking bolt for moving the locking bolt from the extended position to the retracted position.

[0013] The actuator comprises an arm, a first roller bearing journaled at a free end of said arm, which first roller bearing is arranged in contact with and run along a surface of the lever. The use of roller bearings reduces the force requirements due to very low friction of the transmission.

[0014] Additionally, the pressure arm is arranged with an elongated groove, that the locking bolt being arranged with an attachment block attached to the locking bolt, the attachment block being arranged with a second roller bearing arranged to run in said groove. In accordance with the invention, the transmission further comprises a support surface provided with a track and wherein a second end of the pressure arm is arranged to be in contact with and run in the track. With this arrangement, the transmission enables a much-reduced force requirement for moving the locking bolt to the retracted position, which is a great advantage if the locking bolt is somehow jammed or difficult to move. This could for example be due to ice building up inside the compartment, which frequently occurs in refrigerated compartment for transporting frozen goods. It may also be due to misaligned doors wherein the locking bolt may be pressed hard against a surface of the recess that receives the locking bolt. Thus, the risk of breaking components of the locking arrangement due to the need of applying large forces in order to open the door is greatly reduced. In a preferred embodiment, the second end may be arranged with a third roller bearing running in the track. Also, the locking bolt may be arranged with a compression spring arranged to bias the locking bolt in the extended position.

[0015] The locking arrangement may further comprise bearing blocks arranged to support said locking bolt. In this regard, the bearing blocks may comprise slide bearings through which the locking bolt is slidably supported, and wherein the slide bearings are arranged in the bearing blocks with a play in transversal directions. With this solution, the locking bolt may enter a receiving recess even if for example the doors and thus the locking arrangement are somewhat misaligned in relation to the fixed structure of the compartment.

[0016] These and other aspects of and advantages with the present application will become apparent from the following detailed description and from the accompanying drawings.

[0017] Furthermore, a blocking device to be used with

a locking system of a closing structure for a compartment is disclosed but not forming part of the claimed invention.

[0018] The blocking device comprises an engagement member arranged movable between a non-engaging position out of contact with a locking system and an engaging position enabling operation of the locking system. The blocking device further comprises a blocking arrangement operably connected to the engagement member wherein the blocking arrangement blocks movement of the engagement member in the non-engaging position. Further, an activator is operably connected to said blocking arrangement wherein operation of said activator enables an unblocking of said engagement member by said blocking arrangement. With this arrangement, the blocking device effectively blocks the engagement member so that the locking system cannot be manipulated until the activator is operated and unblocks the engagement member.

[0019] The engagement member may comprise an axle arranged movable in a longitudinal direction between the non-engaging position and the engaging position. Further, a first blocking element may be arranged on the axle and a second blocking element may be arranged to the blocking arrangement, arranged and designed to engage with the first blocking element. Further, a drive mechanism may be arranged to the second blocking arrangement, wherein operation of the activator causes the drive mechanism to disengage the second blocking element with the first blocking element. In this regard, the first and the second blocking elements may be designed for form-locking of the axle when in the non-engaging position. As a type of form-locking, the first blocking element may comprise a groove extending generally transversal to the longitudinal direction of the axle and the second blocking element may comprise a plate-shaped section provided with a passage having a generally keyhole shape, wherein a narrower part of the passage fits into the groove of the axle in the engaging position and that the axle is positioned in a wider part of the passage when in the non-engaging position. A very secure locking of the axle is thus obtained by this form-locking design.

[0020] The blocking arrangement may comprise a blocking sledge provided with the second blocking element, that the blocking sledge may be arranged slidable between the engaging position and the non-engaging position, with a linkage between the blocking sledge and the activator and force elements acting on said blocking sledge for biasing it in the engaging position.

[0021] As a further security measure, the blocking arrangement may further comprise a blocker operatively arranged and designed to releasably lock the blocking arrangement in the engaging position. The blocker may be connected to the blocking sledge and being arranged slidable in directions generally transversal to the sliding direction of the blocking sledge, between a blocking position and a release position. Thus, the blocking sledge is securely blocked and prevented from manipulation.

[0022] The blocking arrangement may further comprise a blocking plate operably arranged in contact with the linkage and the blocking sledge and being slidable generally in the same direction as the blocking sledge and wherein the blocking plate is arranged to move the blocker between the blocking position and the release position when moved. The blocker may comprise a pin, which pin may cooperate with a groove of the blocking plate, which groove has a direction inclined in relation to the sliding direction of the blocking plate and the blocking sledge. In this regard, the linkage may be connected to the blocking sledge and the blocking plate such that a first movement, when the blocking arrangement is in the engaging position, causes the blocker to be moved out of the blocking position and a subsequent second movement causes the blocking sledge to be moved out of engagement with the axle. The axle may be accessible from outside the blocking device and is provided with an operating element, and wherein a force element is arranged to the axle for biasing it into the non-engaging position. The activator may comprise a code unit requiring unique code for the activation. Thus, the blocking device may not be operated unless a unique code is provided by an authorised user. For example, the code unit may be at least one key lock. As an alternative, or in addition, the code unit may be a code lock. As a further alternative the code unit may comprise an electric actuator and communication module for wireless communication.

BRIEF DESCRIPTION OF DRAWINGS

[0023] In the following detailed description of the invention, reference will be made to the accompanying drawings, of which

Figs. 1-2 show perspective views of an example of a blocking device not forming part of the invention,

Figs. 2a and 2b show detailed views of the blocking device of Figs. 1 and 2,

Figs. 3-8 show detailed views of components comprised in the blocking device of Fig. 1,

Figs. 9-12 show operational positions of components comprised in the blocking device of Fig. 1,

Figs. 13 and 14 show detailed views of operational position of the blocking device of Fig. 1

Figs. 15 and 16 show perspective views of a door provided with a blocking device and with a locking arrangement in accordance with the invention,

Fig. 17 show the blocking device and the locking arrangement with the door removed,

Figs. 18 to 21 show a first of a locking mechanism comprised in the locking arrangement of Fig. 16,

Figs. 22 and 23 show operational positions of the locking mechanism of Fig. 16, and

Figs. 24 to 28 show a second variant of a locking mechanism with a return mechanism,

Figs. 29 to 37 show the second variant of a locking mechanism with a second variant of a return mechanism,

Figs. 38 to 41 show the second variant of a locking mechanism with a third variant of a return mechanism,

Figs. 42 to 43 show a travel increasing mechanism, and

Figs. 44 to 46 show a manipulation locking mechanism.

DETAILED DESCRIPTION OF THE INVENTION

[0024] A blocking device 10 shown in the drawings comprises a housing, Figs. 1 and 2. In the embodiment shown the housing comprises a back or door plate 12 designed to be attached to a suitable surface such as the outer surface of a door, which door may be a cargo door for a transport container for instance. It is however to be understood that the blocking device may be used in numerous other applications for preventing access through a door. The back plate 12 is provided with a passage 13, Fig. 2a. The back plate 12 is arranged with inwardly directed protrusions 15 positioned on opposite sides of the passage 13, the function of which will be explained below. The housing further comprises a front part or cover 14. The housing of the blocking device 10 contains an activator 16, Figs. 1 and 3, that in the embodiment shown is in the form of a code lock of the type generally available on the market. As an example, a mechanical code lock is pictured, but any traditional mechanical or electronic lock can be used. The code lock 16 is bolted to a base plate 18, which in turn is bolted to a door or the like, preferably with bolts from the inside of the door going through the back plate 12. The code lock 16 is provided with a handle 20 and a keypad 22, wherein the interior of the code lock is arranged with a mechanism that blocks movement of the handle 20 until a correct sequence of keys are entered with the keypad 22. The front cover 14 of the housing is in that regard arranged with openings for the handle and the keypad but is covering and protecting the rest of the code lock as seen in Fig. 1. The code lock 16 is further arranged with an actuating pin 24, Figs. 5 and 8, extending through a passage of the base plate 18, which actuating pin 24 is operably connected to the handle 20 of the code lock.

[0025] The device further comprises an engagement member in the form of a through-going axle 26, Figs. 5 to 7, extending through an opening in the front cover 14. The axle 26 is preferably provided with a handle 28, the function of which will be explained below. The axle 26 extends through a first end wall 30 of a generally tubular protective hub 32, Figs. 5 to 7. The axle 26 is journaled in a bushing 34 or slide bearing. The bushing 34 is positioned in a seat 36 of a second end wall 38 at the opposite side of the hub 32. The hub 32 in turn is attached to the base plate 18 by a bracket 39 that fits into a recess 40 on the back side of the base plate 18, Fig. 4. Bolts (not shown) are threaded into threaded holes 42 in the hub 32 and clamp the hub 32 and the bracket 39 to the base plate 18. In this regard, the base plate 18 is arranged with a passage 44, Figs. 5 and 6, through which the axle 26 extends.

[0026] The axle 26 is provided with an annular ledge 46 that when the blocking device 10 is assembled is positioned inside the hub 32 and is pushed against an inner surface of the first end wall 30 by a compression spring 48 having one end acting on the annular ledge 46. The other end of the compression spring 48 is in contact with the bushing 34. The arrangement enables a movement of the handle 28 and the axle 26 towards the door against the force of the compression spring 48, as will be described below. In that regard, the end of the axle 26 is provided with a seat 50 at its inner end, Fig. 7, which seat 50 is designed to fit together and act with a shaft 52, Fig. 2b, which shaft 52 is an actuating part of a locking arrangement for locking the door or the like to which the blocking device 10 is attached. Further, the axle 26 is provided with an annular groove 54, forming a first blocking element. The end of the axle 26 is also arranged with planar surfaces 55 of removed material.

[0027] The blocking device 10 is further arranged with a blocking arrangement 57. The blocking arrangement 57 comprises a generally circular torque plate 56, Fig. 8, being a part of a drive mechanism that is arranged to be rotationally seated in a circular recess 58, Fig. 6, on the back side of the base plate 18. The torque plate 56 is retained in the recess 58 by a bracket 60 attached to the base plate 18, Fig. 4. The circular recess 58 is arranged with a central passage 62 through which the actuating pin 24 of the code lock 16 extends. The inner end of the actuating pin 24 is arranged with a key 64 at its inner end, generally rectangular in the embodiment shown, which key fits 64 into a seat 66 with corresponding shape in the torque plate 56, enabling rotation of the torque plate 56 when the handle 20 of the code lock 16 is operated.

[0028] A generally elongated torque arm 68, also being a part of a drive mechanism, is pivotally journaled to the torque plate 56 via a first shaft 70 at one end thereof, Fig. 8. The other end of the torque arm 68 is arranged with a second shaft 72. The second shaft 72 is arranged to fit into an elongated groove 74 arranged at a first end of a blocking sledge 76. The blocking sledge 76 is designed with a generally rectangular plate-shaped section 78 and

is placed in a recess 80 of the base plate 18, Fig. 6. The plate-shaped section 78 is positioned to cover the passage 44 of the base plate 18 through which the axle 26 extends. In that regard, the plate-shaped section 78 is arranged with a keyhole shaped passage 82, Figs. 7 and 8, forming a part of a second blocking element with the blocking sledge 76. The narrower part of the keyhole passage 82 has a width generally corresponding to the diameter of the annular groove 54 of the axle 26, while the wider part of the keyhole passage 82 has a width larger than the general diameter of the axle 26.

[0029] The blocking sledge 76 is further arranged with a first seat 84 extending in the longitudinal direction of the blocking sledge 76, Fig. 7. A generally plate-shape blocking plate 86 is designed to fit into the first seat 84 and to be movable in the longitudinal direction of the blocking sledge 76. The blocking plate 86 is arranged with a passage 88 in which the second shaft 72 of the torque arm 68 fits, Fig. 8. The blocking plate 86 is further arranged with an elongated groove 90 being inclined at an angle in relation to the longitudinal direction of the blocking sledge 76. A second seat 92 is provided in the blocking sledge 76, extending transversal to the longitudinal direction of the blocking sledge 76. A generally rectangular elongated blocker 94 is designed to fit into the second seat 92 and to be moved in the transversal direction. The blocker 94 is arranged with a pin 96 that fits into the elongated inclined groove 90 of the blocking plate 86. The blocker 94 is further arranged to interact with a stop ledge 85 provided in the base plate 18, Figs. 4 and 6, as will be described.

[0030] The blocking sledge 76 is moreover arranged with two stop ledges 98 at an upper area thereof, which stop ledges 98 extend transversal to the longitudinal direction on opposite sides of the blocking sledge 76. The stop ledges 98 are designed to interact with stop surfaces 87 provided in the base plate 18, Fig. 6. The stop ledges 98 are further provided with through-going guide passages 89 extending in the longitudinal direction of the blocking sledge 76. Guide pins 91 are provided in the guide passages 89, which guide pins 91 are attached to side walls of the recess 80 of the base plate 18, Fig. 4. Compression springs 93 are arranged surrounding the guide pins 91, wherein a first end of the compression springs 93 is in contact with the stop ledges 98 of the blocking sledge 76 and a second end of the compression springs is in contact with a side wall of the recess 80 of the base plate 18 such that the blocking sledge 76 is biased in the direction of the axle 26.

[0031] The base plate 18 is further preferably arranged with a drainage 95, Fig. 4, in order to prevent moisture or water that might enter the blocking device 10 from freezing if the surrounding temperature falls below zero degrees centigrade, which could endanger the function of the blocking device 10. The drainage 95 is arranged as a groove extending from the recess 80 for the blocking sledge 76 to an opening 97 at the lower end of the blocking device 10. The groove 95 may preferably have

such a shape and extension that it is very difficult to enter an object into the opening 97 of the drainage for manipulating the blocking arrangement 57.

[0032] The blocking device 10 is intended to function as follows. The blocking device 10 is bolted to door or the like part arranged and intended to close an opening of a compartment, see for example Fig. 15. The door is in this regard arranged with a locking system arranged for locking the door in the closed position by engaging with fixed structures surrounding the door. The locking system may in this regard comprise a number of different components like locking bolts that are movable between a locking position and a release position. The locking system may comprise one or several locking bolts that in the latter case may extend in different directions, such as for example espagnolette-type locking bolts. It is however to be understood that the present invention is not in any way limited to the type of locking system.

[0033] The blocking device 10 is bolted to a door or the like such that the passage 13 of the back plate 12 is placed in relation to an actuation shaft or axle 52 of the locking system is aligned with the longitudinal direction of the axle 26 of the blocking device 10, Fig 2b. In the initial inactivated position, the axle 26 is in its retracted position by the compression spring 48 that pushes it the outward direction. In this position of the axle 26, the annular groove 54 is in the same plane as the plate-shaped section 78 of the blocking sledge 76. Further, the blocking sledge 76 is in its forwardmost position whereby the narrow section of the keyhole 82 has been pushed into the annular groove 54 of the axle 26 by the compression springs 93 as seen in Figs. 4 and 10. Further, the blocking plate 86 is in its forwardmost position whereby the pin 96 of the blocker 94 is in the rearmost position in the inclined groove 90 of the blocking plate 86.

[0034] This has caused the blocker 94 to be moved in the transversal direction whereby it abuts the stop ledge 97 of the blocking sledge recess 80, Figs. 4 and 9. Thus, in the initial inactivated position of the blocking device 10, the axle 26 is blocked in the axial position by the blocking sledge 76, and the blocking sledge 76 is in turn blocked from movement by the blocker 94. In this position, the front end of the axle 26 is not in contact with any component of the locking system of the door as seen in Fig. 2a, and any manipulation of the handle 28 will only result in rotation of the axle 26. Further, the handle 20 of the code lock 16 is blocked by its locking mechanism and cannot be turned. However, even if substantial force was to be applied to the handle 20 of the code lock 16 in order to turn its actuating pin 24, the torque plate 56 cannot be turned due to the linkage by the torque arm 68 with the blocked blocking sledge 76. Such an attempt would probably only lead to that the actuating 24 pin of the code lock 16 is broken off due to its relatively small dimensions.

[0035] In order to activate the blocking arrangement 57, a user has to enter the correct pin code on the keypad 22. This will unlock the locking mechanism of the code lock 16. It is then possible to turn the handle 20 of the code

lock 16. This will in turn cause the torque plate 56 to rotate due to the connection with the actuating pin 24. Turning of the torque plate 56 will cause the torque arm 68 to be pulled in the rearward direction. Due to the second shaft 72 of the torque arm 68 being connected to the blocking plate 86, the blocking plate 86 will also move in the rearward direction. This in turn will cause the pin 96 of the blocker 94 to move in the inclined groove 90 of the blocking plate 86, causing the blocker 94 to be moved in the transversal direction and out of engagement with the stop ledge 85 of the base plate 18 as seen in Fig. 10. During this part of the movement the blocking sledge 76 will not move due to that the second shaft 72 of the torque arm 68 is moving in the elongated groove 74 of the blocking sledge 76.

[0036] Continued turning of the torque plate 56 will now cause the blocking sledge 76 to move rearwardly, Fig. 12, against the force of the compression springs 93 because the second shaft 72 of the torque arm 68 has reached the rear end of the elongated groove 74 of the blocking sledge 76. The narrow section of the keyhole 82 of the blocking sledge 76 is now moved out of engagement with the annular groove 54 of the axle 26 until the axle 26 is positioned in the wider section of the keyhole 82, whereby the blocking arrangement 57 has released the axle 26, Figs. 11 and 12. The axle 26 is now free to be pushed towards the door and extend out of the passage 13 of the blocking device 10 by operating its handle 28 against the force of the compression spring 48, wherein the front end of the axle 26 engages a corresponding component of a locking system for the door. In this extended engaged position, turning of the handle 28 will actuate the locking system and thereby open the door. The axle 26 is also orientated such in relation to the back plate 12 that when the axle 26 passes through the passage 13, the planar surfaces 55 pass the protrusions 15 of the passage 13, Fig. 13.

[0037] When the handle 28 and thus the axle 26 then are turned, the protrusions 15 will enter into the groove 54 of the axle 26 and thereby hold the axle in the engaged axial position against the force of the compression spring 48, Fig. 14. This is important since both hands of a user may have to be used for opening the doors to the compartment. Especially doors that are used for fridge compartments require considerable force to pull open, both due to the thick and sturdy insulation seals surrounding the doors but also that these doors may be jammed by ice for example.

[0038] When the door is to be locked, the handle 28 and thus the axle 26 are again turned. Turning of the handle 28 in the opposite direction will cause the locking system to lock the door. After that, release of the handle 28 will cause it and the axle 26 to be moved back to their initial retracted position by the compression spring 48, whereby the planar surfaces 55 of the axle 26 pass the protrusions 15 of the passage 13. The handle 20 of the code lock 16 is also turned to its initial position, which turning will cause the torque plate 56 to rotate and thereby push the torque

arm 68 in the forward direction. The compression springs 93 acting on the blocking sledge 76 will in turn cause the blocking sledge 76 to be moved in the forward direction whereby the narrower section of the keyhole 82 will enter and engage with the annular groove 54 of the axle 26, again locking it from axial movement. At the same time the blocking plate 86 will be moved such that the pin 96 of the blocker 94 is moved in the inclined groove 90, causing the blocker 94 to be moved transversally into blocking engagement with the stop ledge 85 of the base plate 18.

[0039] Even though the embodiment shown utilizes a code lock, it is to be understood that other types of locks may be used for locking the blocking arrangement from being operated, such as for instance a key lock. In this respect, it is also possible to have a two-part authentication for unlocking the blocking arrangement. For instance, both a code lock and a key lock may be arranged in the blocking device, wherein, for example, a driver has a key for the key lock but does not have the code for the code lock. Instead the code may be known only to an entrusted person at distribution site or the like, in order to minimize the risk that the blocking device may be manipulated and/or operated at an unauthorised place by for instance the driver. It is also possible to include electronically operated locking components in the blocking device that are capable of wireless communication with authorised communication devices and only when a correct code or signal is transmitted from the communication device to the blocking device, then the blocking arrangement may be operated.

[0040] In this regard, the torque plate 56 may be rotated by electrically driven actuators such as a stepper motor or a linear actuator. To this end, a suitable power source is arranged to provide the actuators with power to operate them. In order to activate the actuators, suitable communication devices may be utilised that preferably are provided with authorisation elements so that only dedicated communication devices may operate the actuators.

[0041] Further, the first and the second blocking elements may have alternative designs that provide form-locking functions. For instance, the axle 26 may be provided with a transversal hole or passage and the blocking sledge 76 may be provided with a pin or shaft extending in the sliding direction wherein the pin in the blocking position is positioned inside the passage and wherein the pin is moved out of the passage in the release position.

[0042] The present invention provides a locking arrangement 100, Fig. 16, for a door or the like element arranged for opening and closing passages to a compartment such as cargo containers, truck containers etc. containing cargo that is shipped between destinations. Of particular interest is fridge containers having doors that require considerable force to pull open, both due to the thick and sturdy insulation seals surrounding the doors but also that these doors may be jammed by ice for example.

[0043] Figures 15 and 16 show a door provided with a blocking device 10 according to above arranged on the outside and a locking arrangement 100 on the inside of the door. As seen in Fig. 17, the locking arrangement 100 is recessed in the door in order to have a smooth planar surface. This is important in particular with trailer doors that are swung 270 degrees when opened and are more or less planar with the sides of the trailer. When the trailer is backed up to a loading dock, it is important that no parts protrude from the doors, which otherwise could lead to breaking of parts if the space of the loading dock between parked vehicles is limited and/or narrow and the vehicles contact each other.

[0044] The locking arrangement 100 comprises a housing 102, Fig. 17, to be inserted into a recess of a door and with flanges 104 to bolt the housing 102 to the door sides surrounding the recess. The locking arrangement is further provided with a cover plate 106 having an opening 108 for manual handling of the locking arrangement 100 from inside the compartment, Fig. 16. The locking arrangement 100 further comprises a base plate 110. To the base plate 110 a locking mechanism 112 is arranged, Figs. 18 and 19. The locking mechanism comprises a locking bolt 114 arranged slidable in the housing and protruding with an end section 116 out of the lower edge of the door. The end section of the locking bolt 114 is designed to engage with a recess, seat, ledge or the like fixed structure arranged on a fixed structure of the compartment, such as a door frame or the floor of the compartment. In the embodiment shown the end of the locking bolt is arranged with an inclined surface 118, enabling a movement from an extended position to a retracted position when the locking bolt during a closing action hits the fixed structure with its inclined surface. It is however to be understood that the locking bolt may have a more planar or convex end surface. The end section 116 is also arranged with a generally tubular element 120 surrounding the locking bolt 114, which element is arranged to prevent attempts to saw or cut off the locking bolt in order to get access to the interior of the compartment. To that end, the element 120 may be provided with plates of very hard carbide material around its circumference that is very difficult to cut through. Further, the element 120 may be rotationally journaled on the locking bolt, causing it to rotate if for example an angle grinder is used, making it even harder to cut off the locking bolt.

[0045] The locking bolt 114 is provided with an elongated shaft or spindle 122 which is guided by two bearing blocks 124 attached to the base plate 110. The upper end of the shaft 122 is arranged with a pulling knob 123 which is accessible via the opening 108. Each bearing block 124 is arranged with a generally cylindrical passage 126, Figs. 20 - 21. Each bearing block 124 comprises a generally tubular slide bearing 128 through which the elongated shaft 122 of the locking bolt passes and is journaled. The slide bearing 128 is placed in a generally tubular bearing housing 130 and the unit is retained in the bearing block 124 by an end plate 132 with a central

passage 134 for the shaft at one end and a circlip 136 in a groove 138 in the cylindrical passage 126 of the bearing block 124 at the opposite end. The diameter of the cylindrical passage 126 of the bearing block 124 and the diameter of the bearing housing 130 are chosen such that there is a gap or play 140 between the bearing block 124 and the bearing housing 130, enabling movement in the transversal direction of the locking bolt. This is an advantage if the door for some reason is not completely aligned in relation to the frame and therefore the locking bolt is not completely aligned with the locking recess, which could provide difficulties during a locking action. With the "floating" design of the locking bolt being movable transversally, any misalignment would be handled.

[0046] The locking mechanism 112 further comprises a transmission that incorporates an attachment block 142 that comprises a central passage through which the shaft 122 of the locking bolt passes. The attachment block 142 is provided with a locking element such as a lock screw (not shown) with which the attachment block 142 may be attached to the shaft 122 at a suitable point along its length. A compression spring 144 is provided between an upper end of the attachment block 142 and the end plate 132 of the upper bearing block 124, where the compression spring 144 surrounds the shaft 122. The attachment block 142 is further arranged with a second roller bearing 146 journaled on a shaft of the attachment block 142. The second roller bearing 146 is arranged to fit into an elongated groove 148 of an elongated pressure arm 150 of the transmission. At one end of the pressure arm 150 a third roller bearing 152 is rotationally journaled. The third roller bearing 152 is arranged to be in contact with a track 154 provided in a ledge 156, in turn attached to the back plate. The track 154 is designed with two end ledges 158 between which the third roller bearing 152 may move as will be described.

[0047] The opposite end of the pressure arm 150 is pivotally attached to a generally elongated lever 160 of the transmission at a point along its extension. The lever 160 is in turn pivotally attached to the base plate 110 at an upper end of the lever 160. The locking mechanism is further arranged with an actuator 162 rotatably attached to the base plate 110 in a through-going passage. The actuator 162 comprises a generally cylindrical hub 164 extending into the passage. To the hub 164 an arm 166 is attached, which arm 166 is arranged with a key positioned in the centre of the hub 164, which key is arranged to interact with a generally rectangular shaft 168, Fig. 17, which shaft 168 in turn is arranged to interact with the axle 26 of the blocking device 8. The outer free end of the arm 166 is arranged with a first roller bearing 170 which is arranged to be in contact with an outer side surface of the lever 160 as seen in Fig. 18.

[0048] The locking arrangement 100 is intended to function as follows. When the handle of the blocking device is operated as described above and turned clockwise as seen from outside the door, the arm 166 is also turned. Since the first roller bearing 170 is in contact with

the lever 160, the turning of the arm 166 will cause the lever 160 to pivot towards the locking bolt 114, Fig. 22. In turn, since the pressure arm 150 is pivotally attached to the lever 160, it will also be moved and its third roller bearing 152 will follow the track 154, pivoting the pressure arm 150 upwards. Since the pressure arm 150 is in contact with the attachment block 142 via the second roller bearing 146 following the elongated groove of the pressure arm 150, the attachment block 142 and thus the locking bolt 114 to which it is attached will also move upwards against the force of the compression spring, Figs. 22 and 23, whereby the end of the locking bolt will be moved out of engagement with the locking recess. The door may now be opened. A holding element may be provided for holding the locking bolt in the retracted position.

[0049] When the handle of the blocking device 10 is moved back to its initial position, the arm 166 is also moved back to its initial position and so are the rest of the components of the locking mechanism 112. The locking bolt 114 is also returned to its extended position by the force of the compression spring 144 acting on the attachment block 142.

[0050] Figures 24 - 28 show a variant of the locking arrangement 100. The same components have the same reference numerals as the previous variant. This variant is provided with a return mechanism for the locking bolt. It comprises an elongated return shaft 180 arranged slidable in a direction generally transversal to the direction of movement of the locking bolt 114. The return shaft 180 is journaled in a bushing 182 that is attached to a side edge of a door to which the locking device is attached and preferably to the side edge that is provided with hinges. A compression spring 184 is arranged in the bushing 182 for biasing the return shaft 180 in the extended position, Fig. 27. In the initial position with the door closed, the return shaft is retracted inside the bushing and thus the side edge of the door as seen in Fig. 24. The inner end of the return shaft 180 is pivotally attached to one arm of a pusher 186. The pusher 186 is provided with a fourth roller bearing 188. The roller fourth bearing 188 is arranged to roll along an upper guide 190 and a lower guide 192 attached to the base plate and arranged parallel to each other. The upper guide 190 is provided with a stop ledge 194 for preventing movement of the pusher in the transversal direction. The pusher is arranged with a pusher plate 196 that is pivotally attached to the pusher. The free end of the pusher plate 196 is arranged with a fifth roller bearing 198.

[0051] The pusher plate is further arranged with a pin 200 that is intended to cooperate with a groove 202, Fig. 25, on the inside of the stop ledge 194. The lower guide 192 is provided with an inclined surface 204, the function of which will be described below. An elongated locking arm 206 is further provided that is pivotally attached to the base plate via a pillar 207 at a point nearly in the middle of the extension of the locking arm 206. In this regard, the locking arm 206 may be pivotally attached with a low

friction bearing. At a lower end of the locking arm, a first pin 208 is attached and arranged to be in contact with the end of the pusher plate 196 and the fifth roller bearing 198. An upper end of the locking arm 206 is provided with a second pin 210, which is arranged to be in contact with the lever 160 as will be described. The second pin 210 may in this regard be provided with a roller bearing for low friction.

[0052] Further developments of the variant is that the shaft 122 of the locking bolt 114 is arranged with a locking ring 214, Fig. 24, whereby the attachment block 142 acts against the locking ring during retraction of the locking bolt. This also enables a manual retraction of the locking bolt by a person inside the compartment, by merely gripping the knob 123 and lifting the locking bolt. Further, a groove 216 is arranged in the base plate and the attachment block 142 is arranged with a further roller bearing on the opposite side of the second roller bearing 146, running in the groove 216, which provides an increased guide for the attachment block 142 during its movement, preventing any twisting of the attachment block 142 around the shaft 122 since it now doesn't have to be fixedly attached to the shaft 122.

[0053] The variant is intended to function as follows. In the initial locked position, the locking bolt 114 is extended and the transmission is positioned as described above. The return shaft 180 is in a retracted position by the contact with the end of the return shaft against a fixed structure, such as a door frame. The pusher plate 196 is resting on the inclined surface 204 of the lower guide 192 and the locking arm 206 is biased by a torsion spring (not shown) arranged between the locking arm 206 and the pillar.

[0054] When the handle of the blocking device is operated to open the door, the components of the locking arrangement are moved in the same manner as above. Further, the lever 160 will during the movement come in contact with the second pin 210 of the locking arm 206 and pivot it so that the lower end of the locking arm 206 is moved towards the pusher. This is enabled in that the pusher plate 196 is inclined downwards, resting on the inclined surface 204 of the lower guide 192 as seen in Fig. 24. As seen in Fig. 28, when the locking bolt is in the retracted position, it cannot be pulled out due to that the lever 160 has somewhat passed the vertical position and will together with the rest of the transmission block the locking bolt 114.

[0055] When now the door is opened, the return shaft 180 will be moved to the extended position as seen in Fig. 28 by the force of the compression spring 184. The movement of the return shaft 180 will further cause the pusher plate 196 to be moved from the inclined position to a horizontal position, sliding along the guides 190, 192, whereby the pin 200 of the pusher plate 196 will enter the groove 202 of the stop ledge 194.

[0056] During subsequent closing of the door, the return shaft 180 will come in contact with the fixed structure and will be pushed into the retracted position. This will in

turn cause the pusher plate 196 to move towards and come in contact with the first pin 208 of the locking arm, Fig. 25. The pusher plate 196 is guided by its pin 200 through an extension of the groove 202, 202', as seen in Fig. 25. The pusher plate is further secured in this position by a spring-loaded ball 212 placed in the lower guide 192, seen in Fig. 24. Further movement will cause the locking arm 206 to pivot, whereby its second pin 210 will act on the lever 160 and pivot it towards its initial position. Once the lever 160 has passed its vertical position, the transmission is no longer locked and the force of the compression spring 146 will urge the locking bolt back to its extended, locking, position and all the components will return to their initial positions. The locking arm 206 will also return to its initial position by the torque spring and leave the contact with the fifth roller bearing 198 of the pusher plate 196. The pin 200 of the pusher plate 196 has now left the groove 202' and the pusher plate 196 is returned to its inclined position against the inclined surface 204.

[0057] Figures 29 - 37 show another variant of the return mechanism 100. The same components have the same reference numerals as the previous variant. This variant is provided with another variant of a return mechanism for the locking bolt. It comprises an elongated return shaft 300 arranged slidable in a direction generally parallel to the direction of movement of the locking bolt 114. The return shaft is arranged with an inclined end surface 302 intended to come in contact with a fixed structure of the compartment when the door is closed. The return shaft is arranged with an overload mechanism comprising an end bolt 304 having the inclined end surface 302, Fig. 30. The end bolt 304 is arranged with a threaded hole in which a threaded section of a piston 306 is connected. The upper end of the piston 306 is placed in a cylinder 308. A spring 310 is arranged surrounding the piston and is pretensioned between a rear end surface of the end bolt 304 and a front surface of the cylinder 308. The cylinder-piston arrangement is placed in a sleeve 312, which sleeve 312 is arranged with an upper contact part 314 to be in contact with an upper part 300' of the return shaft. The return shaft 100 may extend into the locking arrangement, but may also be divided so that there is a gap between the lower part and the upper part of the return shaft 300. An advantage with the gap is that the travel of the return shaft 300 may be adjusted to the specific door arrangement and the distance between the lower edge of the door and the fixed structure surrounding the door, such as a door frame or the floor of the compartment.

[0058] The upper part 300' of the return shaft is slidably journaled in a bearing block 316. The bearing block 316 may be attached to an assembly block 318 which in turn is attached to the base plate 110. Further, a nut 320 may be threaded onto the upper part of the return shaft 300 and a compression spring 322 is arranged between the nut 320 and a downward surface of the bearing block 316 for urging the upper part 300' of the return shaft 300 in the

downward direction. The nut 320 enables adjustment of the tension and thus the force of the compression spring 322. The upper end of the return shaft is attached to a pusher 324. The upper part of the pusher 324 is arranged with a through-hole 326, which is cooperating with a pin 328, extending generally transversal to the direction of the return shaft 300 and thus the sliding direction of the pusher 324. The pin 328 is arranged in an elongated hole 330 in an assembly block 332 and is provided with an enlargement 334 fitting in a recess 336 surrounding the elongated hole 330 on the backside of the assembly block 332, Fig. 34, enabling a sliding action of the pin 328.

[0059] Further, the pin 328 extends through a hole in a follower 338 so that the follower 338 and the pusher 324 are slidably connected. However, the arrangement provides a certain turning of the follower 338 as will be described. On the backside of the follower 338, a first roller bearing 340 is attached. The first roller bearing 340 is arranged to fit into a recess 342 in the assembly block 332 arranged above the elongated hole 330. The side surfaces of the recess 342 are such that the left side, as seen in Fig. 34 extends in a generally straight line with the elongated hole 330. The side surface transforms into a curved top surface wider than the elongated hole so that the right wall extends back with an inclination in relation to the direction of the elongated hole 330. The function of this design will be explained below. The follower 338 with the first roller bearing 340 is further biased towards the left side surface of the recess 342 by a leaf spring 344 pressing on the right side surface of the follower 338 as seen in Fig. 32.

[0060] Further, a generally T-shaped pulling arm 346 is pivotally attached to the assembly block 332 via a shaft 348 at the left upper part as seen in Fig. 33. The right upper part of the pulling arm 346 is pivotally connected to the follower 338 via a pin 350 fitting in a recess 352 of the follower 338. The lower end of the pulling arm 346 is in turn pivotally connected to one end of an elongated tension rod 354 via a shaft 355. The other end of the tension rod 354 is pivotally attached to one end of an elongated actuator arm 356 via a shaft 358. The actuator arm 356 is further pivotally journaled on a shaft 360 attached to the base plate 110 about midway along the extension of the actuator arm 356. A compression spring 362 is attached with one end to the actuator arm 356 at a location between the pivot point of the actuator arm 356 and the attachment point of the pulling arm 354. The other end of the compression spring 362 is attached to a point on the base plate 110. An inwardly extending pin 364 is attached to the other end of the actuator arm 356, on which pin a roller bearing 366 is journaled. The roller bearing is arranged to be in contact with the lever 160 as will be explained below.

[0061] The arrangement is intended to function as follows. When in an initial position as seen in Fig. 29, for instance when the door is open, the locking bolt 122 is retracted. This is done in that a handle or the like is turned on the outside whereby the hub 164 with its arm 166 has

been turned to a vertical downward position. The fourth roller bearing 366 of the actuator arm 356 then acts on the lever 160, which will pivot towards the locking bolt 122. In turn, since the pressure arm 150 is pivotally attached to the lever 160, it will also be moved and its third roller bearing 152 will follow the track 154, pivoting the pressure arm 150 upwards. Since the pressure arm 150 is in contact with the attachment block 142 via the second roller bearing 146 following the elongated groove of the pressure arm 150, the attachment block 142 and thus the locking bolt 114 to which it is attached will also move upwards against the force of the compression spring 144, whereby the end of the locking bolt 114 will be moved to the retracted position. The arrangement is held in this position because the lever 160 has passed the vertical orientation and is somewhat tilted towards the locking bolt.

[0062] The return shaft 300 is in its extended position by the compression spring 322 and the return mechanism is unaffected.

[0063] When the door is closed the inclined end surface 302 of the return shaft 300 will strike against a fixed structure surrounding the door such as a door frame or the floor of the compartment. The inclination of the end surface 302 will cause the return shaft 300 to move upwards against the force of the compression spring 322. If the door and the door frame for some reason are misaligned so that the return shaft may be pushed too far upwards, risking damage to the mechanism, the overload mechanism will come in action, whereby the end bolt 304 will move upwards in the sleeve 312, thereby compressing the spring of the cylinder-piston arrangement, thereby taking up any excessive movement of the return shaft 300.

[0064] Further movement upwards of the return shaft 300 will cause the pusher 324 to move upwards and due to the connection with the follower 338, the latter will also move upwards. The first roller bearing 340 of the follower 338 will run in the recess 342 of the assembly block 394 and due to the shape of the recess 342, the recess will tilt the follower 338 to the right against the force of the leaf spring 344. The tilting of the follower 338 will cause the T-shaped pulling arm 346 to pivot so that the lower part of the pulling arm 346 is moved to the right, see Fig. 36-37. Due to the linkage with the actuator arm 356 via the tension rod 354, the upper part of the actuator arm 356 will pivot to the left, in turn pushing the lever 160 to the left by the contact with the bearing 366.

[0065] Once the lever 160 has passed its vertical position, the transmission is no longer locked and the force of the compression spring 146 will urge the locking bolt 114 to its extended, locking, position and all the components of the transmission will return to their initial positions as shown in Fig. 36. However, the return shaft 300 will still be in its biased position, and thus the other components of the return mechanism are not moved, until the locking assembly is operated by turning a handle on the outside such that the locking bolt is again retracted as described

above and the door is opened. This will cause the return shaft 300 to be moved out of contact with the surface on which it has been resting on, whereby the return shaft 300 is moved downward by the compression spring 322. This in turn will cause the follower 338 to return to its initial position by the leaf spring 344 and the rest of the components of the return mechanism are moved to their initial positions as described above.

[0066] If for some reason the return mechanism is not capable of activating the locking process as described above, the locking may be performed manually by operating the opening device manually. For this purpose a return arm 368 is pivotally attached to the arm 166 of the actuator 162, Fig. 35. The return arm 368 is further arranged with an elongated groove 370, in which a bolt 372 is placed. The bolt 372 is attached to a lower area of the lever 160. The turning of the actuator 162 will cause the hub 164 and the arm 166 to rotate and due to the connection between the arm 166 and the lever 160 with the return arm 368, the lever 160 will be turned when the bolt 372 has reached the end of the elongated groove 370 of the return arm 368, until the lever 160 passes its vertical position and the locking mechanism will move the locking bolt 114 to its locking position as described above.

[0067] Figs. 38 - 41 show a further variant of a return mechanism for the locking bolt. The same components as for the previous variants have the same reference numbers. It also comprises a return shaft 300. The upper part 300' of the return shaft is attached to a generally plate-shaped pusher 400, Figs 40 and 41. The pusher 400 is guided by an elongated groove 402 in the assembly block 332. Further, a generally T-shaped pulling arm 404 is pivotally attached to the assembly block 332 via a shaft 348 at the left upper part. At the right upper part, a pin 408 is pivotally attached, extending generally in the extension of the pulling arm 404. The pin 408 extends through a hole 410 in a generally plate-shaped follower 412, wherein the follower is arranged generally perpendicular to the extension. The hole 410 is somewhat larger than the diameter of the pin 408. An upper part of the pin fits into a hole 414 in a downward end surface of the assembly block 332. The follower 412 is attached to the assembly plate 398 via pins 416 extending into elongated grooves 418 in the assembly plate 398 and in a holding plate 420 attached to the ledge 156, allowing a movement of the follower 412 in the direction of the extension and also a slight turning around the pins 416 as will be described. A compression spring 422 is arranged surrounding the pin between a seat around the hole 414 in the downward end surface of the assembly block 332 and a side surface of the follower 412. The rest of the mechanism of the variant is the same as described above and will not be described in detail.

[0068] The function of the variant is as follows. When the lower end of the return shaft 300 comes in contact with a fixed structure surrounding the door, it will move upwards, whereby the pusher 400 will move upwards in the groove of the assembly block 332. The upper end of the

pusher 400 will in turn come in contact with a downward directed surface of the follower 412, where the contact point is offset in relation to the hole 410 of the follower 412 in which the pin 408 extends. When the follower 412 now is moved by the pusher 400, the offset will cause the follower 412 to turn somewhat. Since the hole 410 of the follower 412 is somewhat larger than the pin 408 the turning of the follower 412 will cause a locking effect between the pin 408 and the hole 410, whereby the pin 408 will move upwards together with the follower 412 against the force of the spring 422 with the pins 416 sliding in the grooves 418. Since the pin 408 is pivotally attached to the right side of the T-shaped pulling arm 404, the pulling arm 404 will pivot around the shaft 348 and in turn act on the tension rod 354, Fig. 39, releasing the locking bolt as described above.

[0069] When the door is opened, the return shaft 300 with the pusher 400 will move downward by the force of the return shaft spring 322 and the follower 412 will be moved back to its initial position in contact with the upper end surface of the pulling arm 404 by the spring 422 surrounding the pin. The rest of the release mechanism will now assume the initial position.

[0070] In order to increase the distance that the locking bolt can travel, the pressure arm 150 may be arranged with a mechanism since the pivoting movement of the pressure arm dictates the movement of the locking bolt as described above. The mechanism comprises a lifting arm 430 to the free end of the pressure arm 150, Figs. 42 and 43. The lifting arm 430 is provided with an elongated groove 432 through which a bolt 434 is arranged, connected to the attachment block 142. Further a section of the pressure arm 150 above the groove 148 has been removed.

[0071] When the door is opened by turning an actuator from the outside, the mechanism described above will pivot the pressure arm 150 upwards, wherein the bearing of the attachment block will move in the groove of the pressure arm as described above while the bolt 434 of the attachment block moves in the groove 432 of the lifting arm 430. Near the end of the lifting stroke, the bolt 434 has reached the lower end of the groove 432 of the lifting arm 430 and further movement of the pressure arm will provide a further raising of the locking bolt as seen in Fig. 43.

[0072] In order to prevent manipulation of the locking bolt manually, especially trying to move it from a locking position, a blocking arrangement may be used, Figs. 44 and 45. A cylindrical bushing 440 is fixedly attached to a plate 442 that in turn is attached to a downward surface of a door or the like openable component. The locking bolt 114 is provided with a cylindrical sheath 444 that is movable along the locking bolt, wherein the lower part of the locking bolt 114 may extend out of a lower end of the sheath 444. The inner surface of the sheath 444 is arranged with protrusions 446 at its lower end, providing a distance between the locking bolt and the sheath, and has an end wall 448 at its upper end with a central hole

450 through which the shaft 122 of the locking bolt extends. The sheath 444 has a diameter that is just smaller than the inner diameter of the bushing 440, whereby the bushing 440 acts as a slide bearing for the sheath 444. A circular locking plate 452 is arranged inside the sheath 444 between its end wall 448 and an upper surface of the locking bolt. The locking plate 452 is arranged with a central hole 454 through which the shaft 122 extends, wherein the diameter of the hole 454 is somewhat larger than the diameter of the shaft 122. The locking plate 452 is further arranged with a protrusion 456 that extends into a slot 458 in the sheath 444 wherein the outer end surface of the protrusion 456 generally coincides with the outer surface of the sheath 444. Further, an inwardly directed protrusion 460 is arranged on the inner wall of the sheath 444 below the locking plate 452 and opposite the slot 458 as seen in cross-section. The length of the slot 458 and the inwardly protrusion 460 limits the movement of the locking plate 452.

[0073] When the locking bolt is in its extended and thus locked position and someone tries to manually raise the locking bolt upwards, the sheath 444 is the only part accessible and if the sheath 444 is pushed upwards, the inwardly directed protrusion 460 will push on the locking plate 452. Since the contact point between the protrusion 460 and the locking plate 452 is offset to the central shaft 122 of the locking bolt, the locking plate 452 will tilt, whereby the edges of its central hole 454 will engage with the shaft 122 and lock the locking plate 452 to the shaft 122. Further, the tilting of the locking plate 452 will cause its protrusion 456 in the slot 458 of the sheath 444 to protrude outside the surface of the sheath 444 and will engage with the inner surface of the fixedly attached bushing 440 due to the rather tight tolerances therebetween. This will then also cause a locking action, effectively preventing any upwards movement of the locking bolt, and the more force that is used on trying to lift the sheath the stronger the locking action both between the locking plate and the shaft and between the locking plate and the bushing.

[0074] Should the locking bolt be lifted in the normal way as described earlier, the shaft will pull the locking bolt upwards. The diameter of the locking bolt is such that it will pass the inwardly directed protrusion 460 and be move in contact with the locking plate. Since the upper end surface of the locking bolt is parallel with the locking plate 452, the latter will not tilt and the whole assembly can be moved to the unlocking position through the bushing.

[0075] It is to be understood that the embodiment described above and shown in the drawings is to be regarded only as a non-limiting example of the invention and that it may be modified in many ways within the scope of invention as defined by the appended patent claims.

Claims

1. Locking arrangement for releasably locking a door of a compartment, the locking arrangement comprising:

- a locking bolt (114) movable between an extended locking position and a retracted release position;

- an actuator (162) operably connected to an opening element, the actuator being rotatable between an initial position and an activated position;

- a transmission (146, 150, 154, 160, 166) arranged between the actuator (162) and the locking bolt (114), the transmission being arranged to move said locking bolt (114) between the extended position and the retracted position when the actuator is rotated, wherein said transmission comprises

- a lever (160) arranged pivotable and in contact with the actuator;

- a pressure arm (150) pivotally attached with one end to the lever and operably connected to said locking bolt;

- wherein rotation of the actuator causes the lever to pivot and the pressure arm to act on said locking bolt for moving said locking bolt from the extended position to the retracted position, wherein said actuator (162) comprises an arm (166), a first roller bearing (170) journaled at a free end of said arm (166), which first roller bearing (170) is arranged in contact with and run along a surface of said lever (160), said pressure arm (150) being arranged with an elongated groove (148), the locking bolt (114) being arranged with an attachment block attached to said locking bolt, said attachment block being arranged with a second roller bearing (146) arranged to run in said groove, said transmission further comprising

- a support surface (156) provided with a track (154) and wherein a second end of said pressure arm is arranged to be in contact with and run in said track.

2. Locking arrangement according to claim 1, wherein said second end is arranged with a third roller bearing (152) running in said track (154).

3. Locking arrangement according to claim 1 or 2, wherein said locking bolt is arranged with a compression spring (144) arranged to bias said locking bolt (114) in the extended position.

4. Locking arrangement according to any of the preceding claims, further comprising bearing blocks

(124) arranged to support said locking bolt (114).

5. Locking arrangement according to claim 4, wherein said bearing blocks comprises slide bearings (128) through which the locking bolt is slidably supported, and wherein said slide bearings are arranged in said bearing blocks with a play in transversal directions. 5
6. Locking arrangement according to any of the preceding claims, wherein the locking arrangement further comprises: 10
 - a return mechanism (100) operatively acting on said transmission (146, 150, 154, 160, 166) when said locking bolt (114) is in its retracted position, which return mechanism (100) is provided with an element that during closing of a door is moved in contact with a fixed structure surrounding the door. 15
7. Locking arrangement according to claim 6, wherein said return mechanism (110) comprises 20
 - a slidable return shaft (180) extending out of the door when the door is in an open position, with an inner end in contact with said lever (160) such that a movement of said return shaft (180) to the retracted position will cause the lever (160) to pivot back to its initial position 25

Patentansprüche

1. Verriegelungsanordnung zum freigebbaren Verriegeln einer Tür eines Fachs, wobei die Verriegelungsanordnung Folgendes umfasst: 35
 - einen Verriegelungsbolzen (114), der zwischen einer ausgefahrenen Verriegelungsposition und einer eingefahrenen Freigabeposition beweglich ist; 40
 - einen Aktuator (162), der mit einem Öffnungselement wirkverbunden ist, wobei der Aktuator zwischen einer Anfangsposition und einer aktivierten Position drehbar ist; 45
 - ein Getriebe (146, 150, 154, 160, 166), das zwischen dem Aktuator (162) und dem Verriegelungsbolzen (114) angeordnet ist, wobei das Getriebe derart angeordnet ist, dass es den Verriegelungsbolzen (114) zwischen der ausgefahrenen Position und der eingefahrenen Position bewegt, wenn der Aktuator gedreht wird, wobei das Getriebe Folgendes umfasst 50
 - einen Hebel (160), der schwenkbar und in Kontakt mit dem Aktuator angeordnet ist; 55
 - einen Druckarm (150), der mit einem Ende schwenkbar an dem Hebel befestigt und mit dem Verriegelungsbolzen wirkverbunden ist;

- wobei eine Drehung des Aktuators bewirkt, dass der Hebel schwenkt und der Druckarm auf den Verriegelungsbolzen wirkt, um den Verriegelungsbolzen von der ausgefahrenen Position in die eingefahrene Position zu bewegen, wobei der Aktuator (162) einen Arm (166) umfasst, wobei ein erstes Rollenlager (170) an einem freien Ende des Arms (166) gelagert ist, wobei das erste Rollenlager (170) in Kontakt mit dem Hebel (160) angeordnet ist und entlang einer Oberfläche desselben verläuft, wobei der Druckarm (150) mit einer länglichen Nut (148) angeordnet ist, wobei der Verriegelungsbolzen (114) mit einem Befestigungsblock angeordnet ist, der an dem Verriegelungsbolzen befestigt ist, wobei der Befestigungsblock mit einem zweiten Rollenlager (146) angeordnet ist, das derart angeordnet ist, dass es in der Nut verläuft, wobei das Getriebe ferner Folgendes umfasst

- eine Stützfläche (156), die mit einer Schiene (154) versehen ist, und wobei ein zweites Ende des Druckarms derart angeordnet ist, dass es in Kontakt mit der Schiene ist und in dieser verläuft.

2. Verriegelungsanordnung nach Anspruch 1, wobei das zweite Ende mit einem dritten Rollenlager (152) angeordnet ist, das in der Schiene (154) verläuft.
3. Verriegelungsanordnung nach Anspruch 1 oder 2, wobei der Verriegelungsbolzen mit einer Druckfeder (144) angeordnet ist, die derart angeordnet ist, dass sie den Verriegelungsbolzen (114) in der ausgefahrenen Position vorspannt.
4. Verriegelungsanordnung nach einem der vorhergehenden Ansprüche, ferner umfassend Lagerblöcke (124), die derart angeordnet sind, dass sie den Verriegelungsbolzen (114) stützen.
5. Verriegelungsanordnung nach Anspruch 4, wobei die Lagerblöcke Gleitlager (128) umfassen, durch die der Verriegelungsbolzen verschiebbar gestützt ist, und wobei die Gleitlager in den Lagerblöcken mit einem Spiel in transversalen Richtungen angeordnet sind.
6. Verriegelungsanordnung nach einem der vorhergehenden Ansprüche, wobei die Verriegelungsanordnung ferner Folgendes umfasst:
 - einen Rückstellmechanismus (100), der auf das Getriebe (146, 150, 154, 160, 166) einwirkt, wenn sich der Verriegelungsbolzen (114) in seiner eingefahrenen Position befindet, wobei der

Rückstellmechanismus (100) mit einem Element versehen ist, das während eines Schließens einer Tür in Kontakt mit einer die Tür umgebenden feststehenden Struktur bewegt wird.

7. Verriegelungsanordnung nach Anspruch 6, wobei der Rückstellmechanismus (110) Folgendes umfasst

- eine verschiebbare Rückstellwelle (180), die sich aus der Tür heraus erstreckt, wenn sich die Tür in einer geöffneten Position befindet, wobei sich ein inneres Ende derart in Kontakt mit dem Hebel (160) befindet, dass eine Bewegung der Rückstellwelle (180) in die eingefahrene Position bewirkt, dass der Hebel (160) zurück in seine Anfangsposition schwenkt.

Revendications

1. Agencement de verrouillage destiné à verrouiller de manière libérable une porte d'un compartiment, l'agencement de verrouillage comprenant :

- un boulon de verrouillage (114) mobile entre une position de verrouillage étendue et une position de déverrouillage rétractée ;
 - un actionneur (162) fonctionnellement relié à un élément d'ouverture, l'actionneur pouvant tourner entre une position initiale et une position activée ;
 - une transmission (146, 150, 154, 160, 166) disposée entre l'actionneur (162) et le boulon de verrouillage (114), la transmission étant conçue pour déplacer ledit boulon de verrouillage (114) entre la position étendue et la position rétractée lorsque l'actionneur est tourné, ladite transmission comprenant
 - un levier (160) disposé de manière pivotante et en contact avec l'actionneur ;
 - un bras de pression (150) fixé de manière pivotante au niveau d'une extrémité au levier et relié fonctionnellement audit boulon de verrouillage ;
 - la rotation de l'actionneur amenant le levier à pivoter et le bras de pression à agir sur ledit boulon de verrouillage pour faire passer ledit boulon de verrouillage de la position étendue à la position rétractée,
 ledit actionneur (162) comprenant un bras (166), un premier roulement à rouleaux (170) tourilloné au niveau d'une extrémité libre dudit bras (166), lequel premier roulement à rouleaux (170) étant disposé en contact avec une surface dudit levier (160) et se déplaçant le long de celle-ci,
 ledit bras de pression (150) étant pourvu d'une

rainure allongée (148), le boulon de verrouillage (114) étant pourvu d'un bloc de fixation fixé audit boulon de verrouillage, ledit bloc de fixation étant pourvu d'un deuxième roulement à rouleaux (146) conçu pour se déplacer dans ladite rainure,
 ladite transmission comprenant en outre

- une surface de support (156) pourvue d'un rail (154) et une seconde extrémité dudit bras de pression étant conçue pour être en contact avec ledit rail et s'y déplacer.

2. Agencement de verrouillage selon la revendication 1, ladite seconde extrémité étant pourvue d'un troisième roulement à rouleaux (152) se déplaçant dans ledit rail (154) .

3. Agencement de verrouillage selon la revendication 1 ou 2, ledit boulon de verrouillage étant pourvu d'un ressort de compression (144) conçu pour solliciter ledit boulon de verrouillage (114) dans la position étendue.

4. Agencement de verrouillage selon l'une quelconque des revendications précédentes, comprenant en outre des blocs d'appui (124) conçus pour soutenir ledit boulon de verrouillage (114).

5. Agencement de verrouillage selon la revendication 4, lesdits blocs d'appui comprenant des appuis coulissants (128) à travers lesquels le boulon de verrouillage est supporté de manière coulissante, et lesdits appuis coulissants étant disposés dans lesdits blocs d'appui avec du jeu dans les directions transversales.

6. Agencement de verrouillage selon l'une quelconque des revendications précédentes, l'agencement de verrouillage comprenant en outre :

- un mécanisme de rappel (100) agissant fonctionnellement sur ladite transmission (146, 150, 154, 160, 166) lorsque ledit boulon de verrouillage (114) est dans sa position rétractée, lequel mécanisme de rappel (100) étant pourvu d'un élément qui, lors de la fermeture d'une porte, est mis en contact avec une structure fixe entourant la porte.

7. Agencement de verrouillage selon la revendication 6, ledit mécanisme de rappel (110) comprenant

- un arbre de rappel coulissant (180) s'étendant hors de la porte lorsque la porte est en position ouverte, une extrémité intérieure étant en contact avec ledit levier (160) de sorte qu'un mouvement dudit arbre de rappel (180) vers la

position rétractée amène le levier (160) à pivoter pour revenir à sa position initiale.

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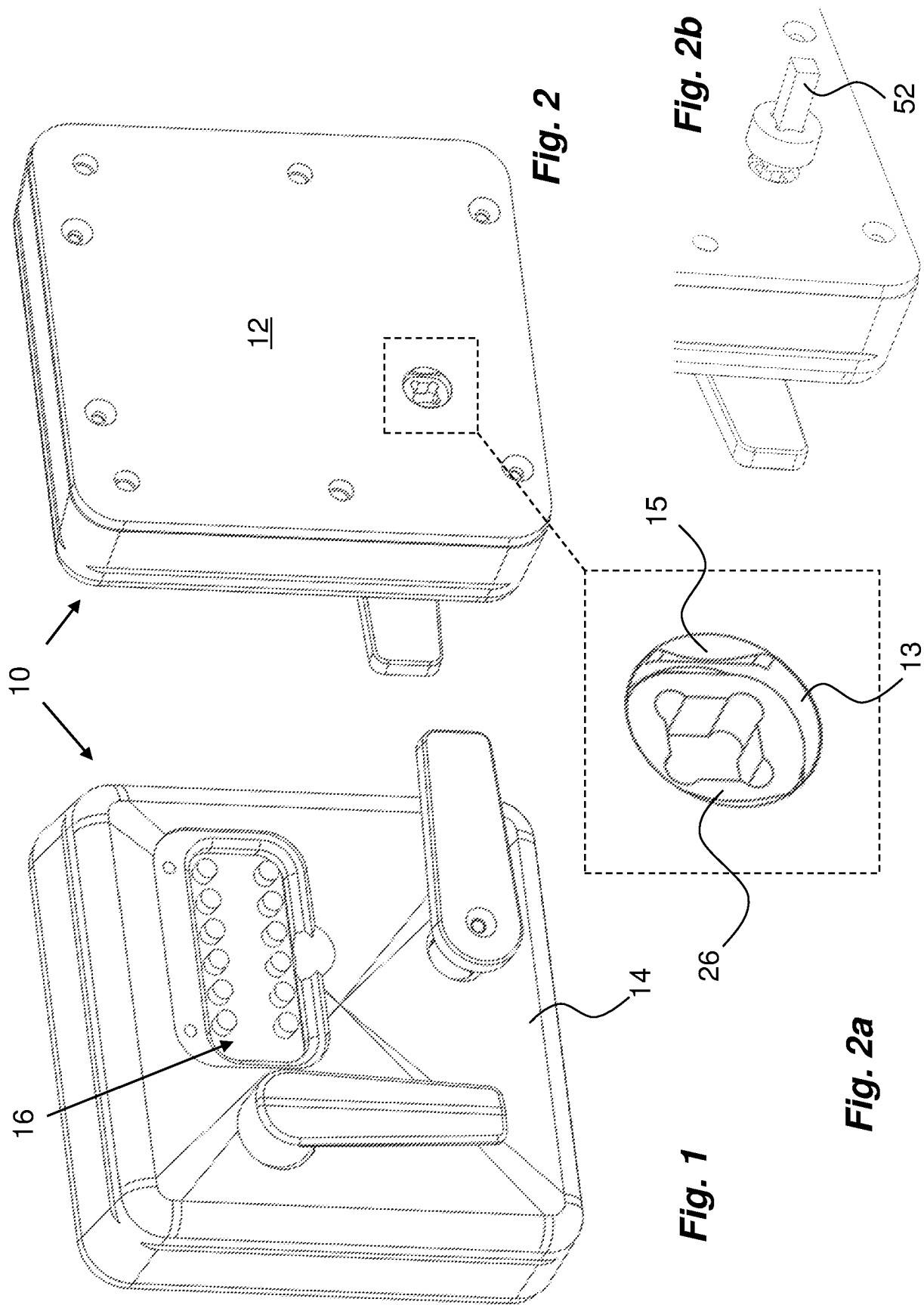
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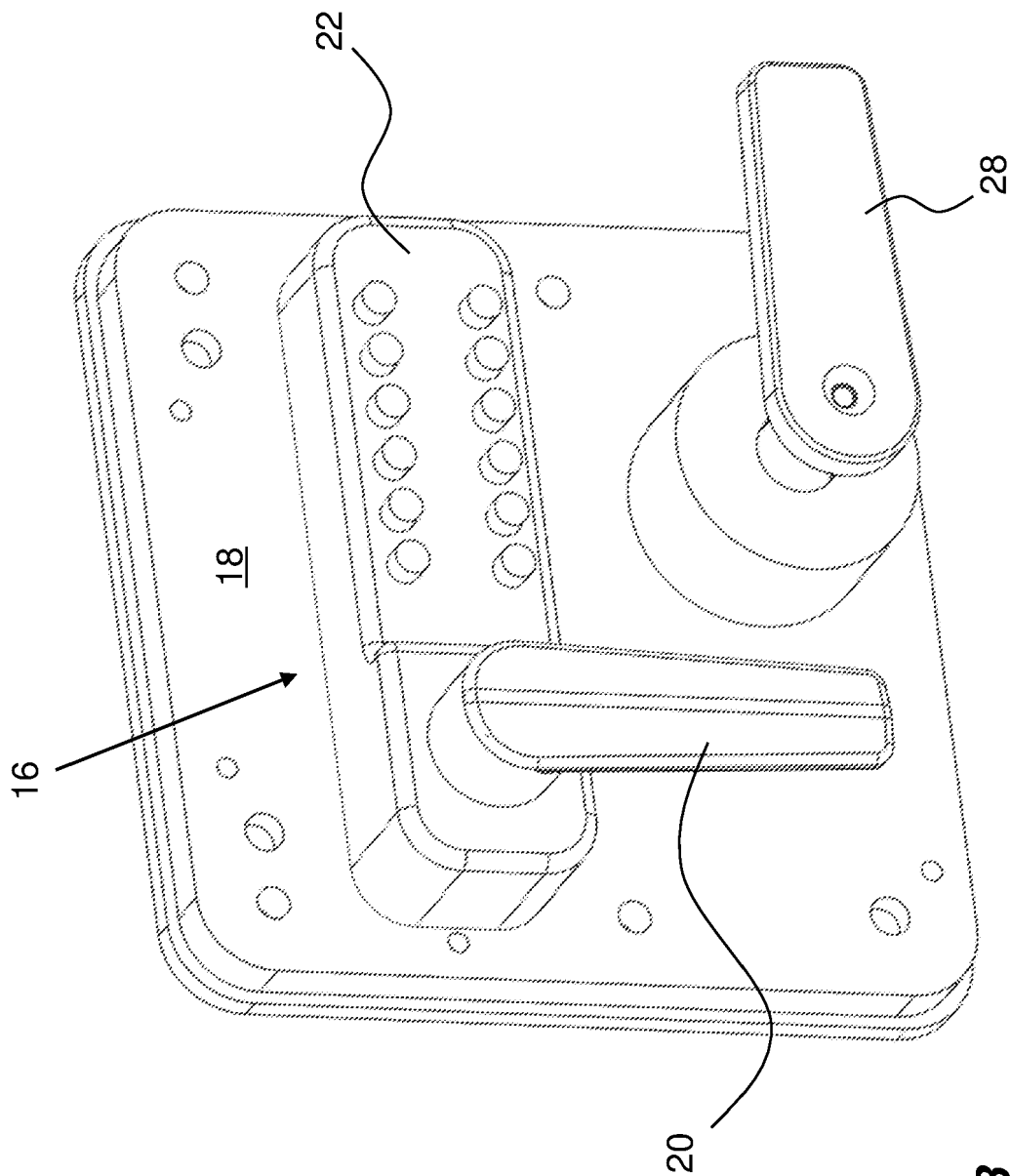


Fig. 3

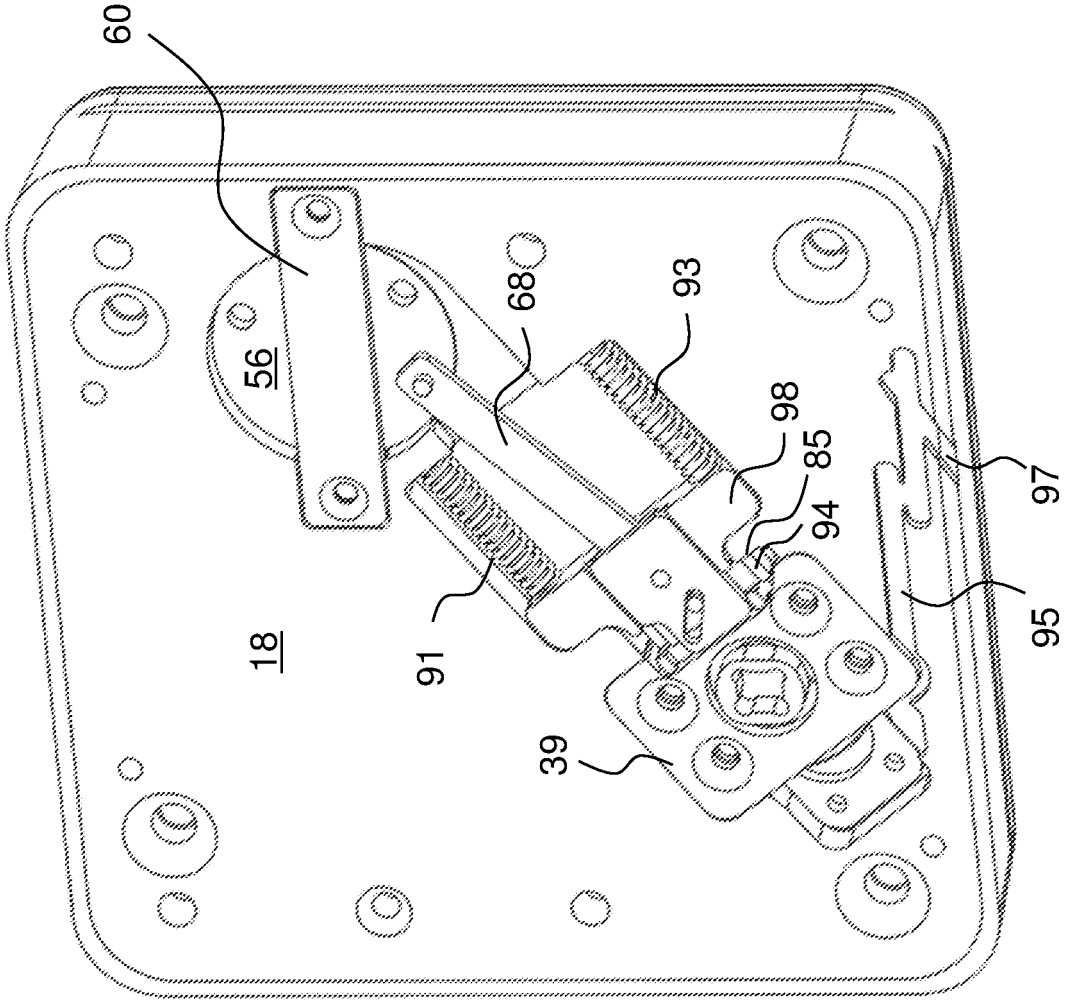


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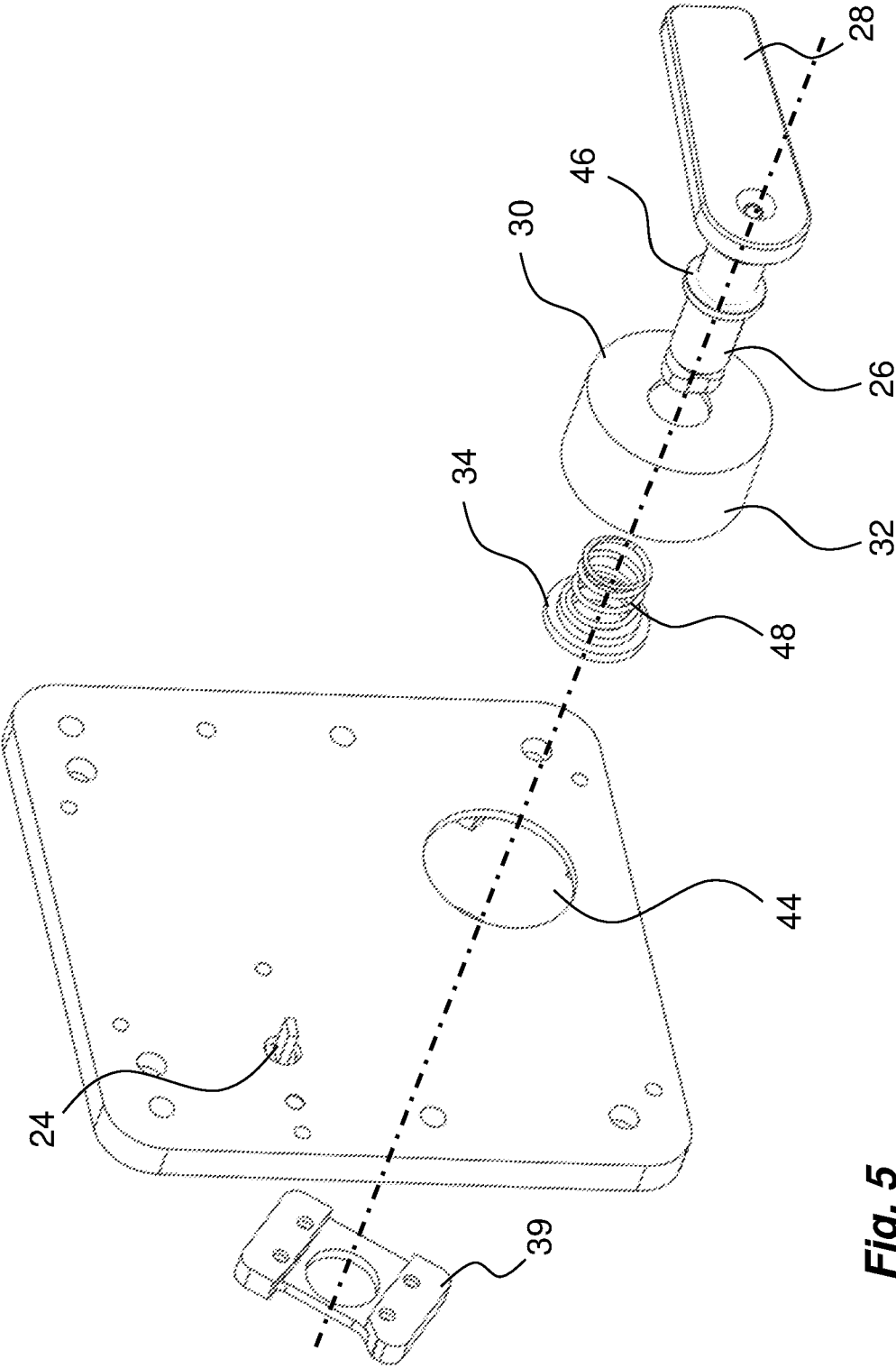


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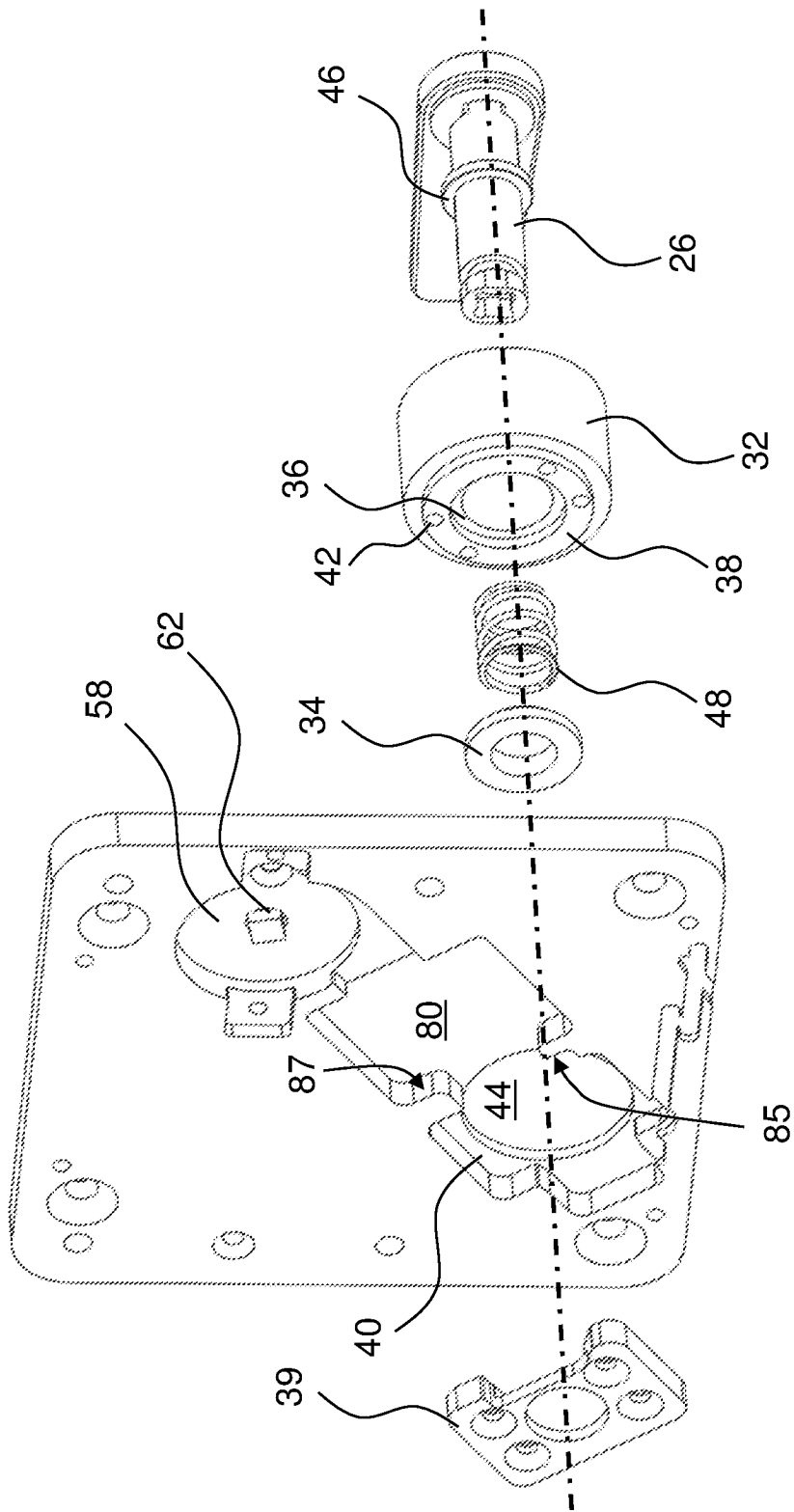


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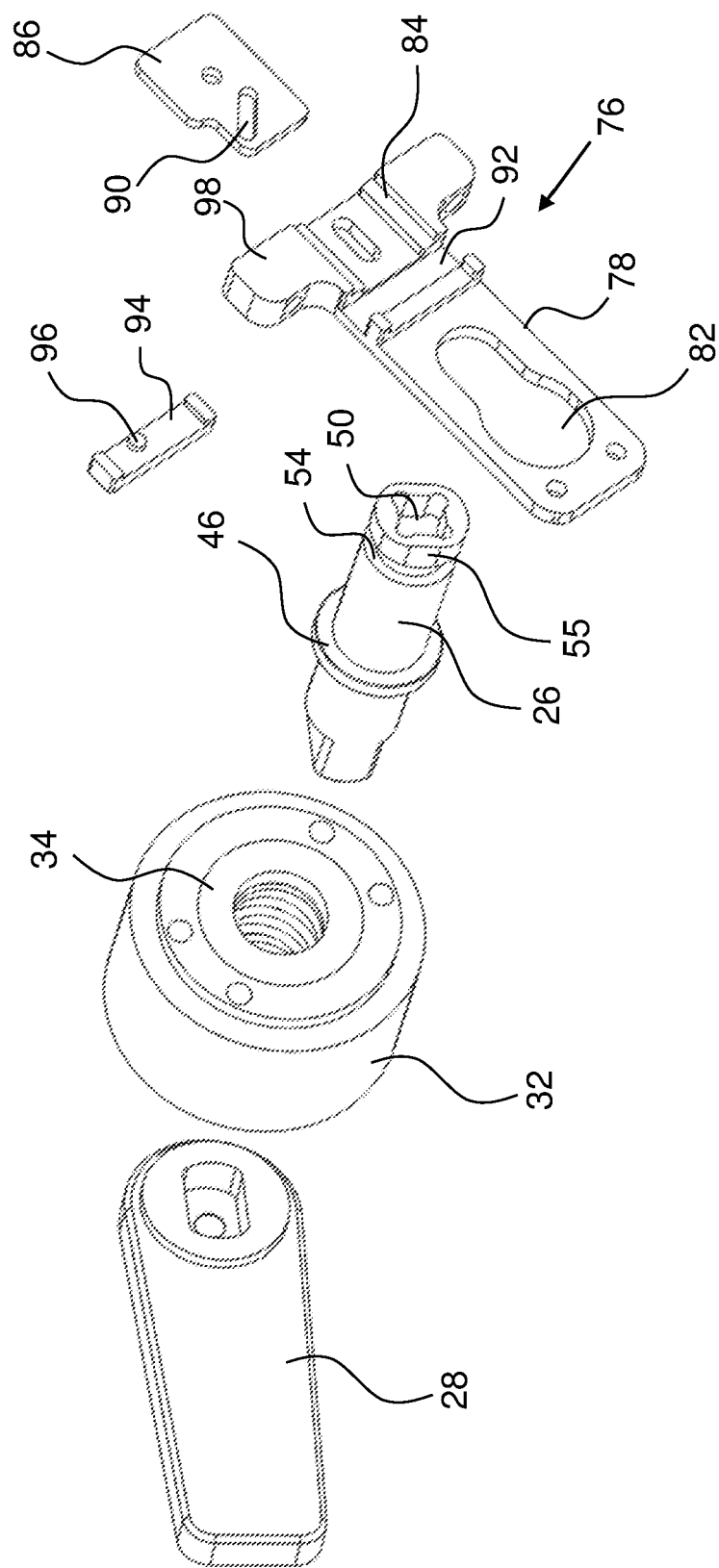


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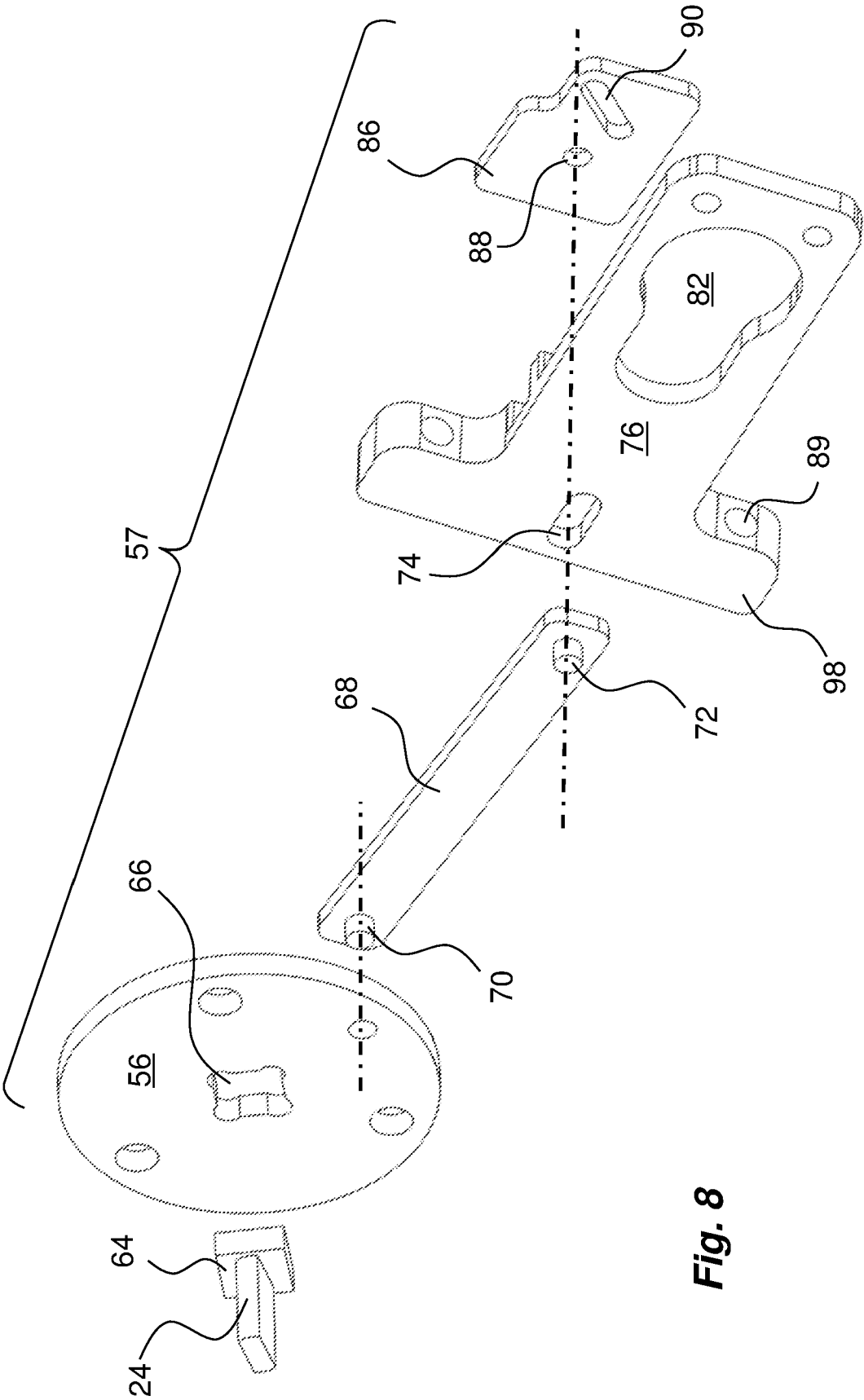


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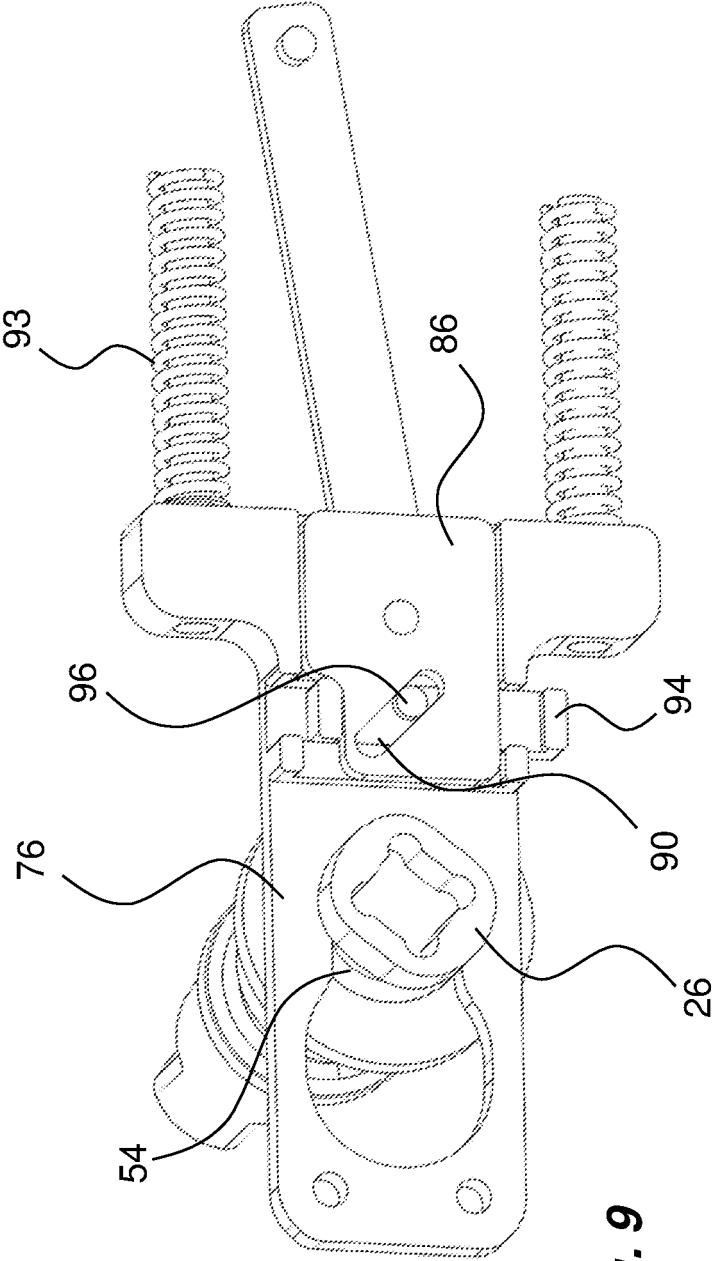


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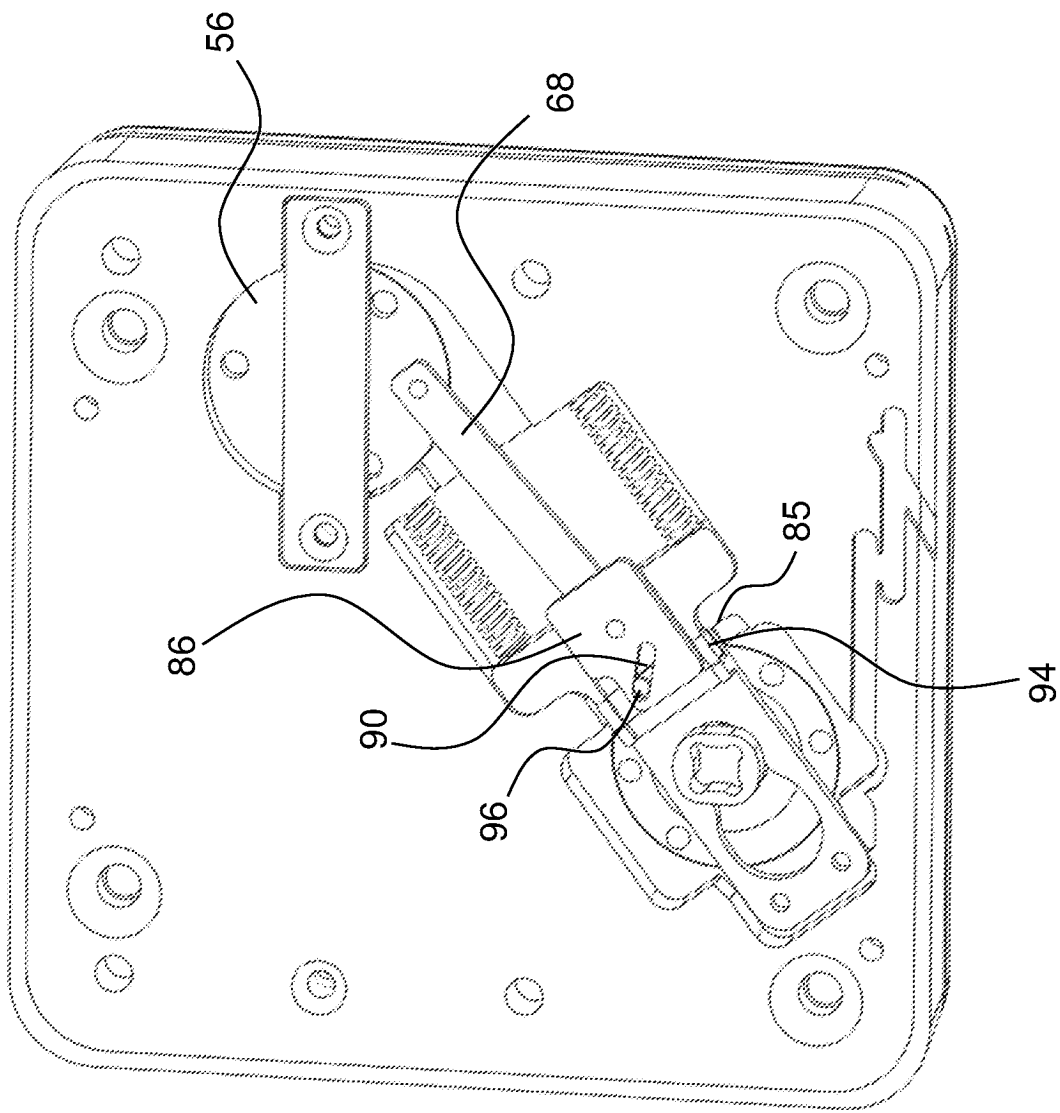


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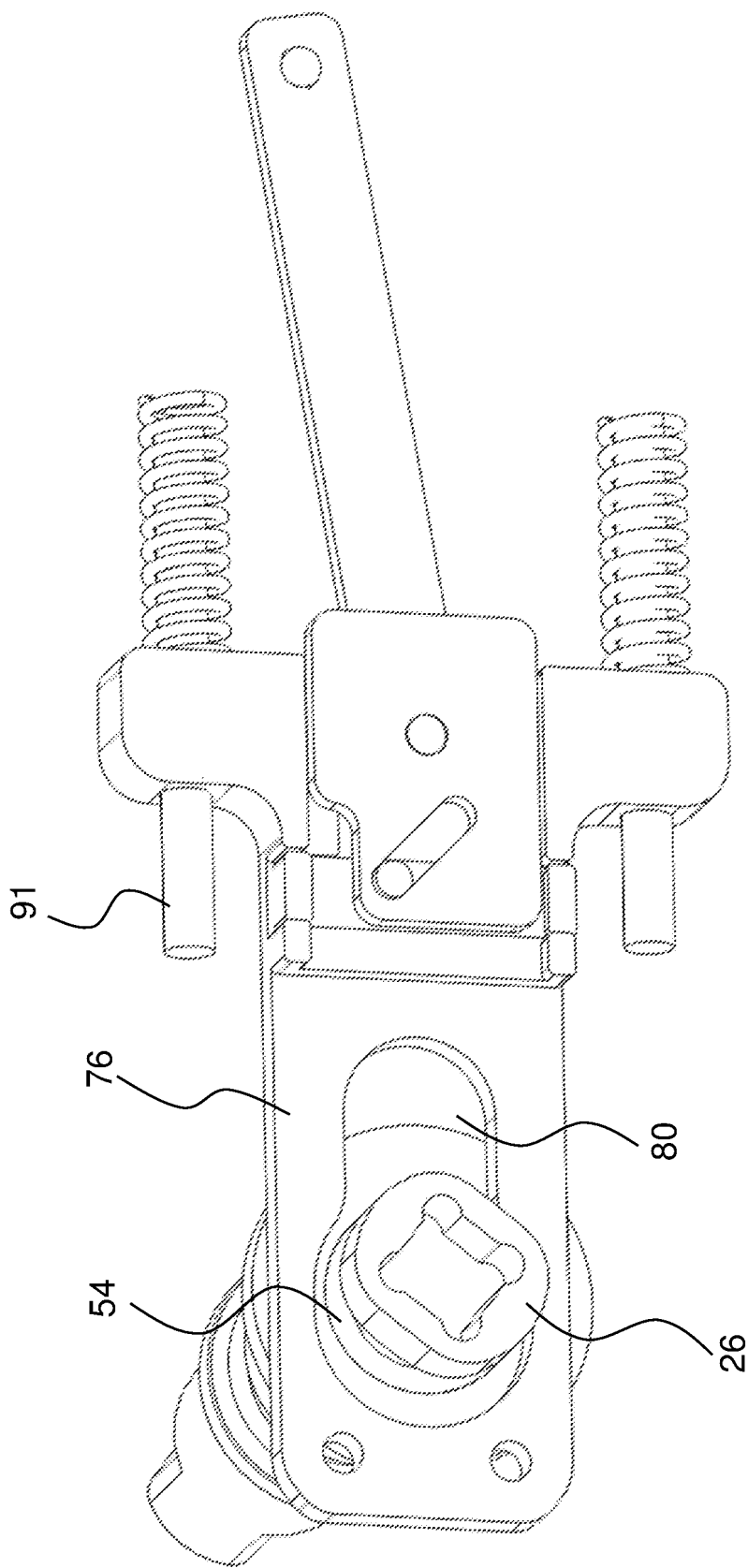


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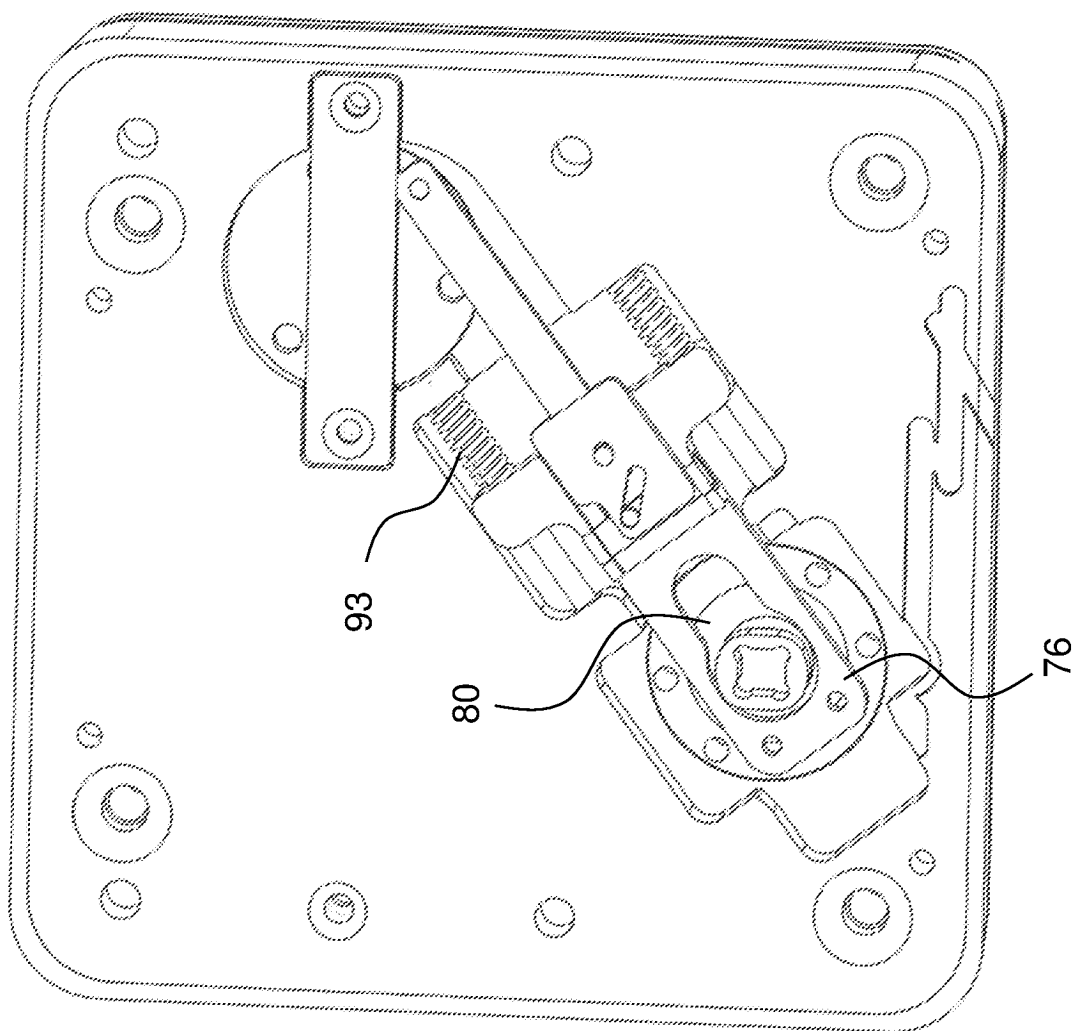


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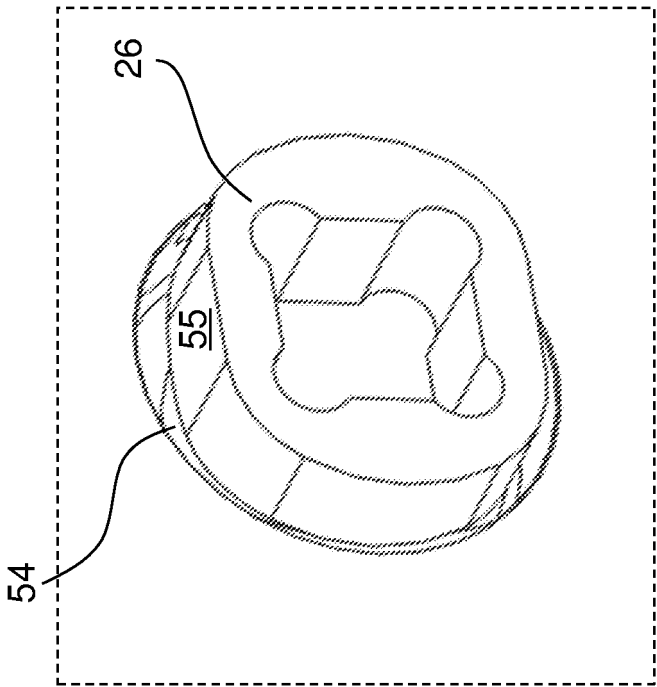


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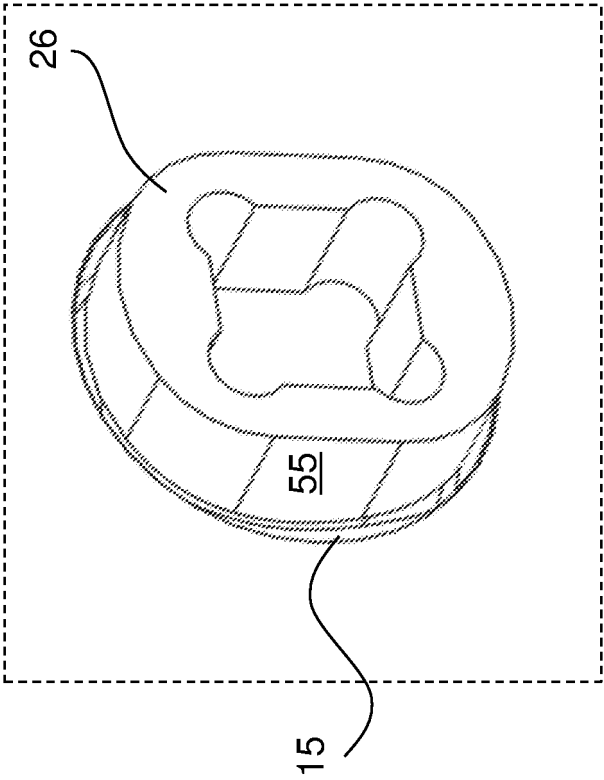


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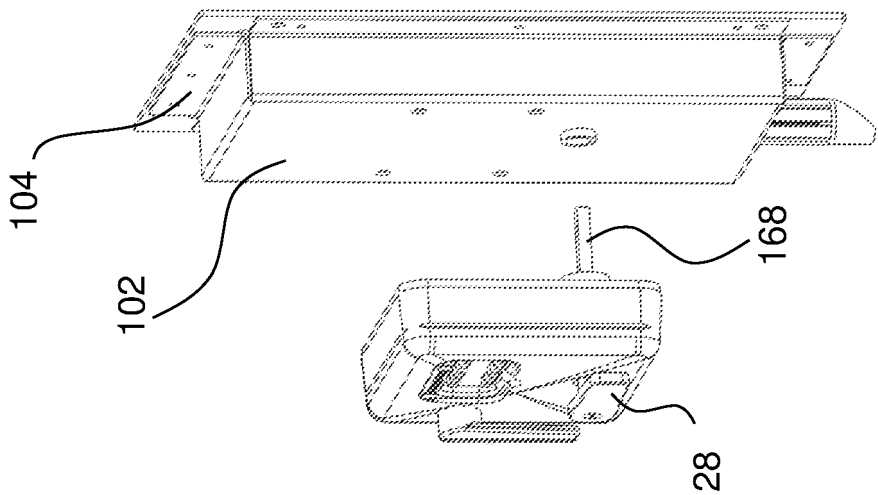


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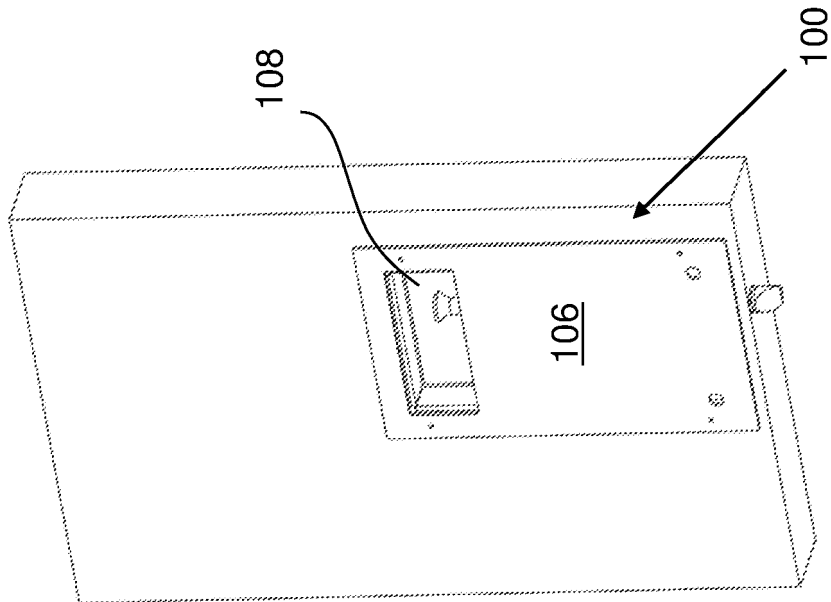


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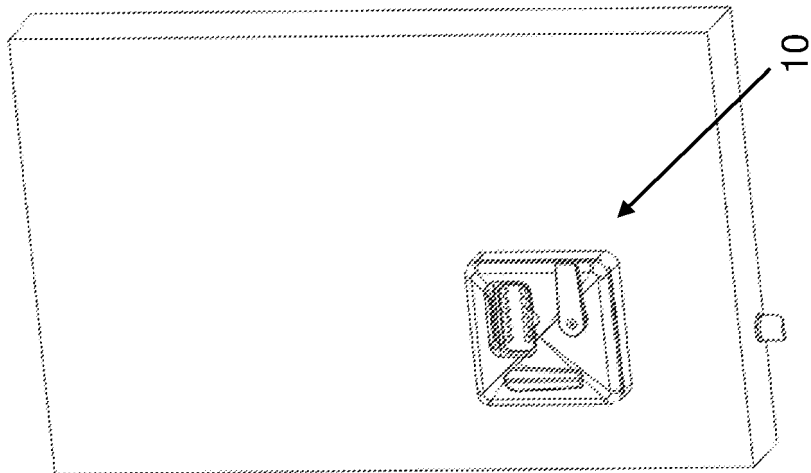
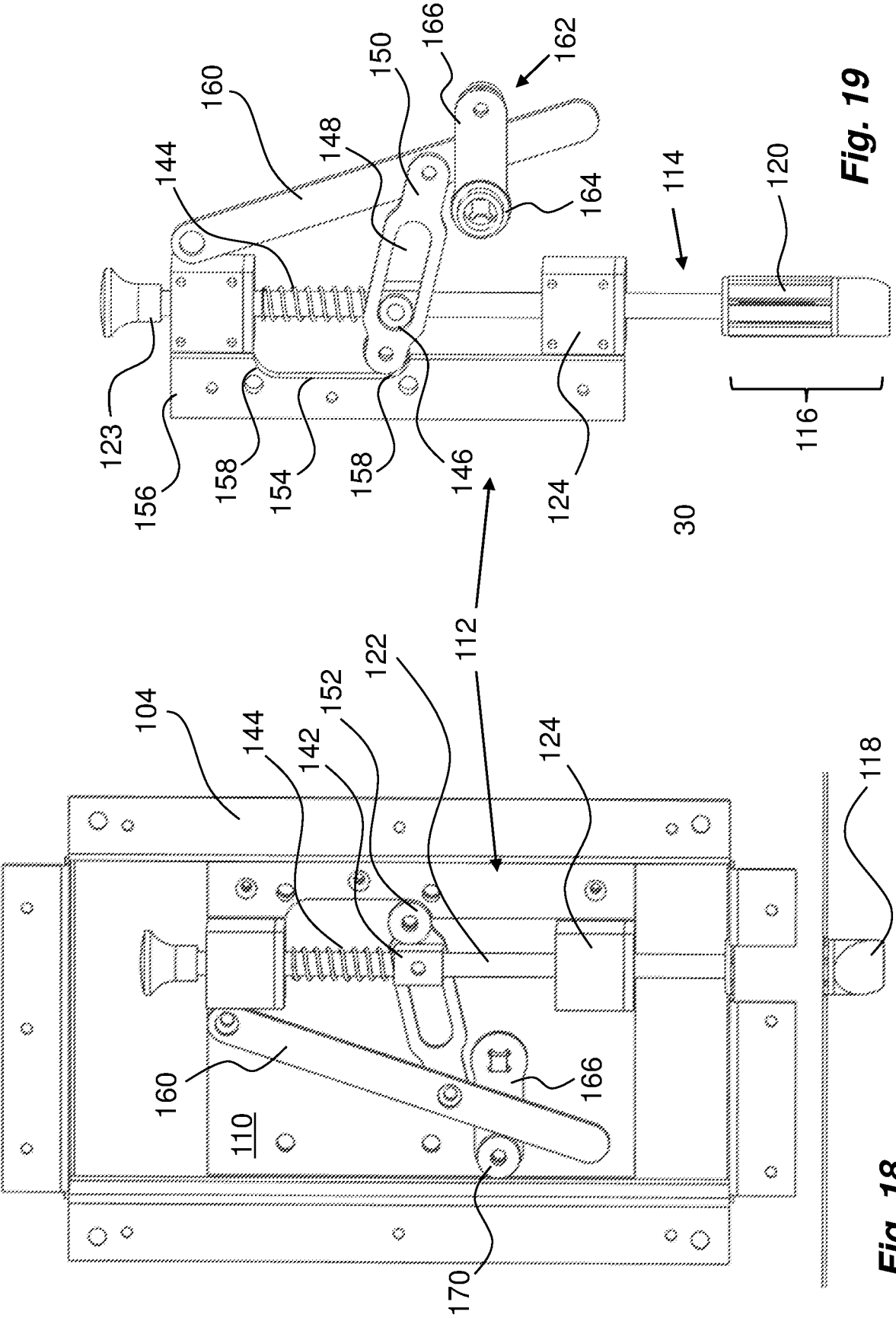
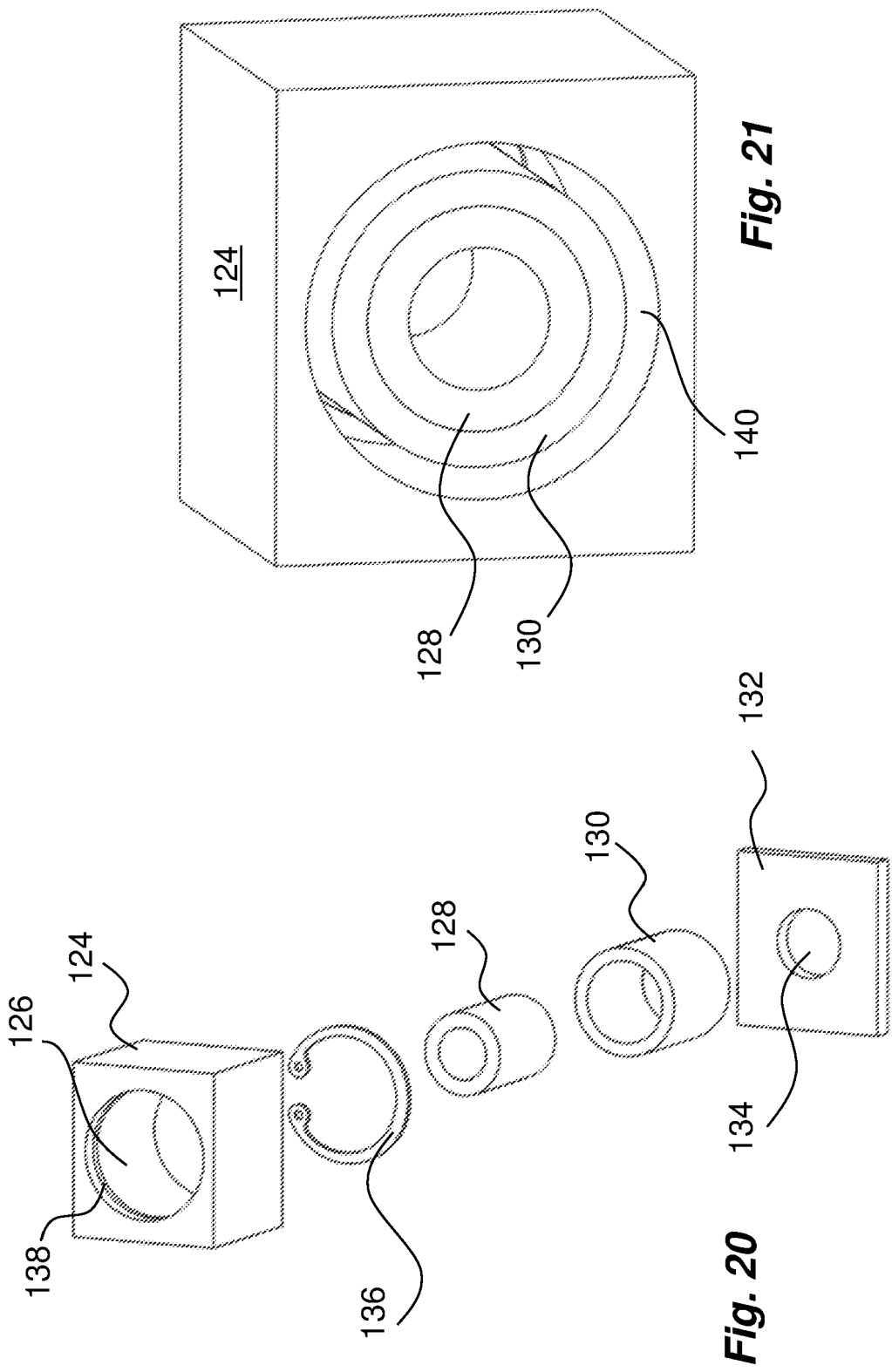


Fig. 15





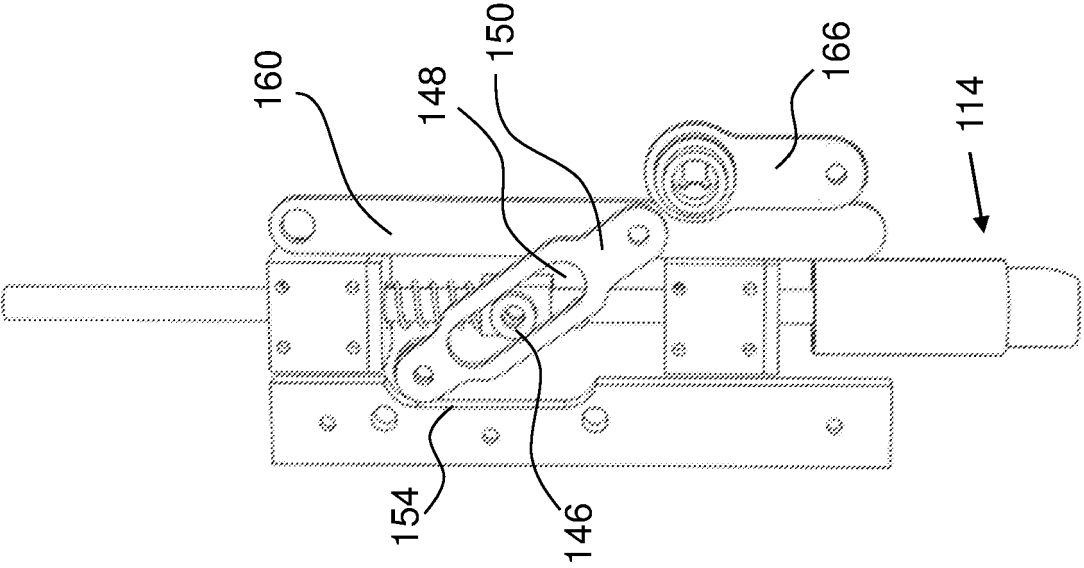


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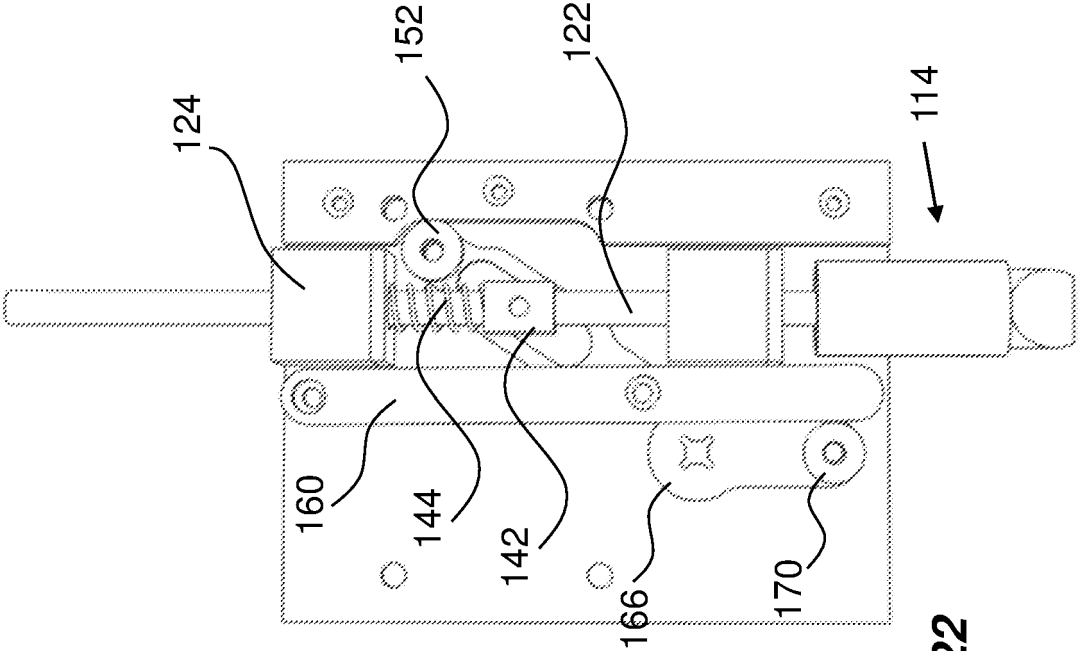


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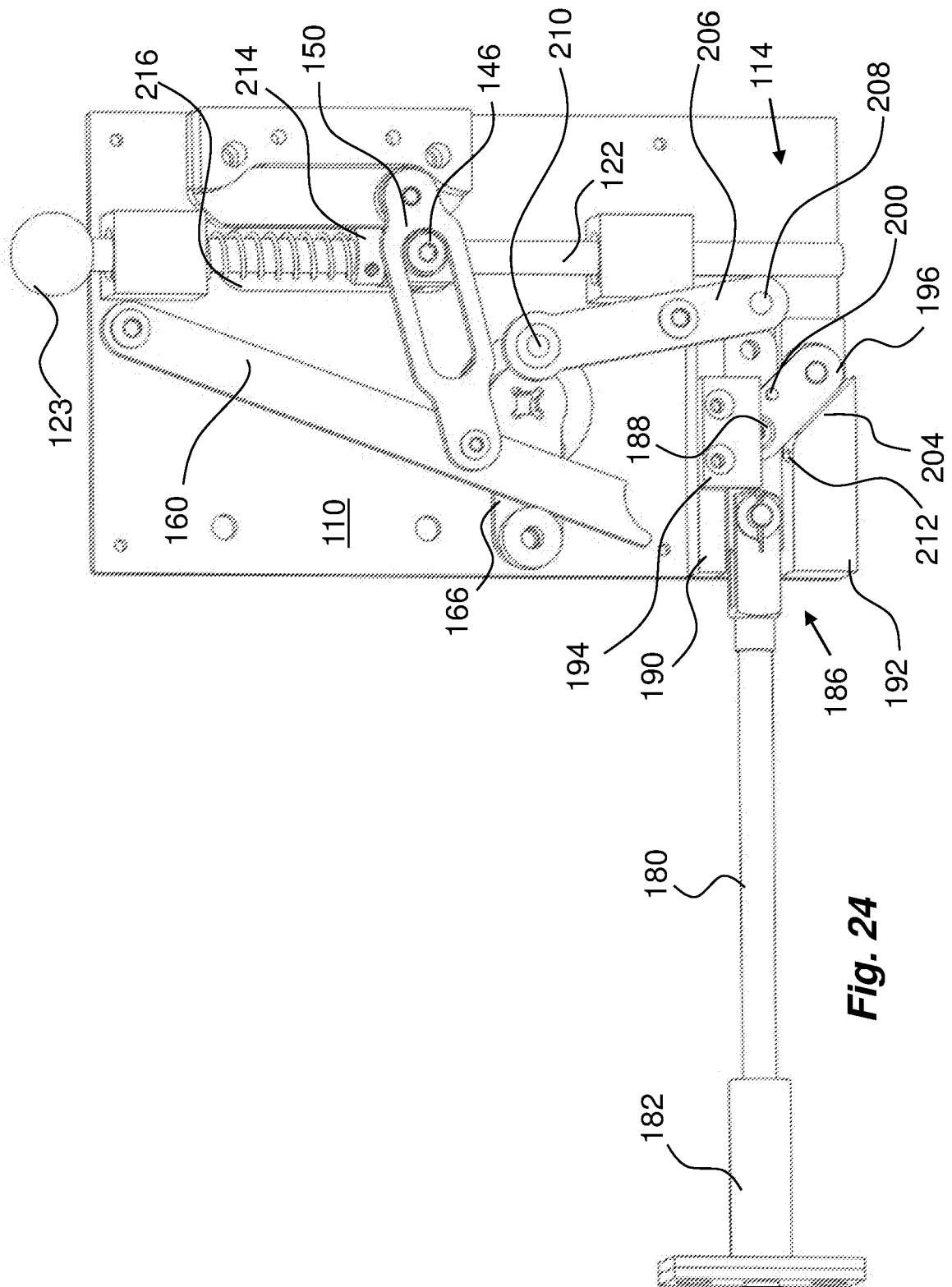


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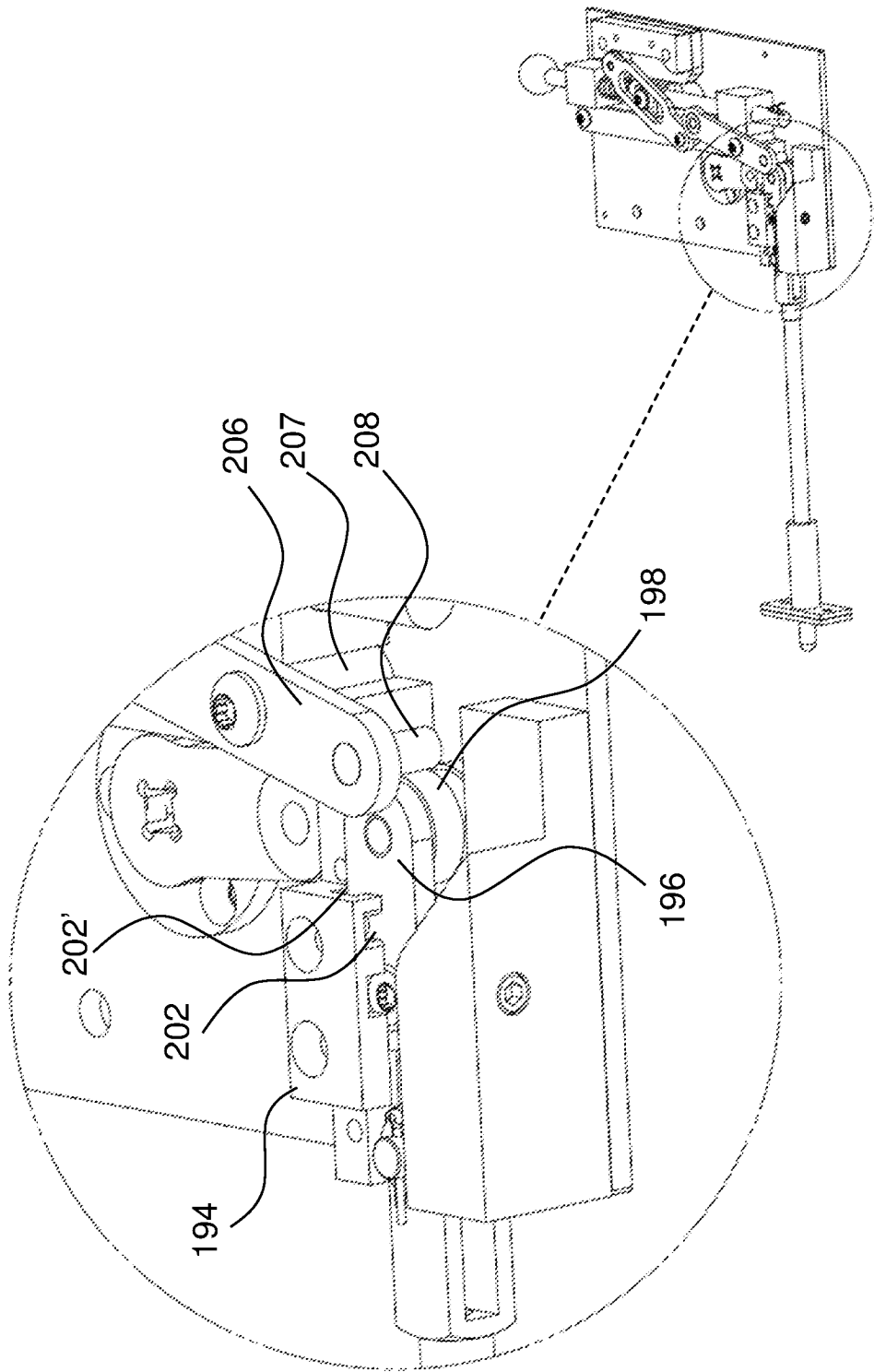


Fig. 26

Fig. 25

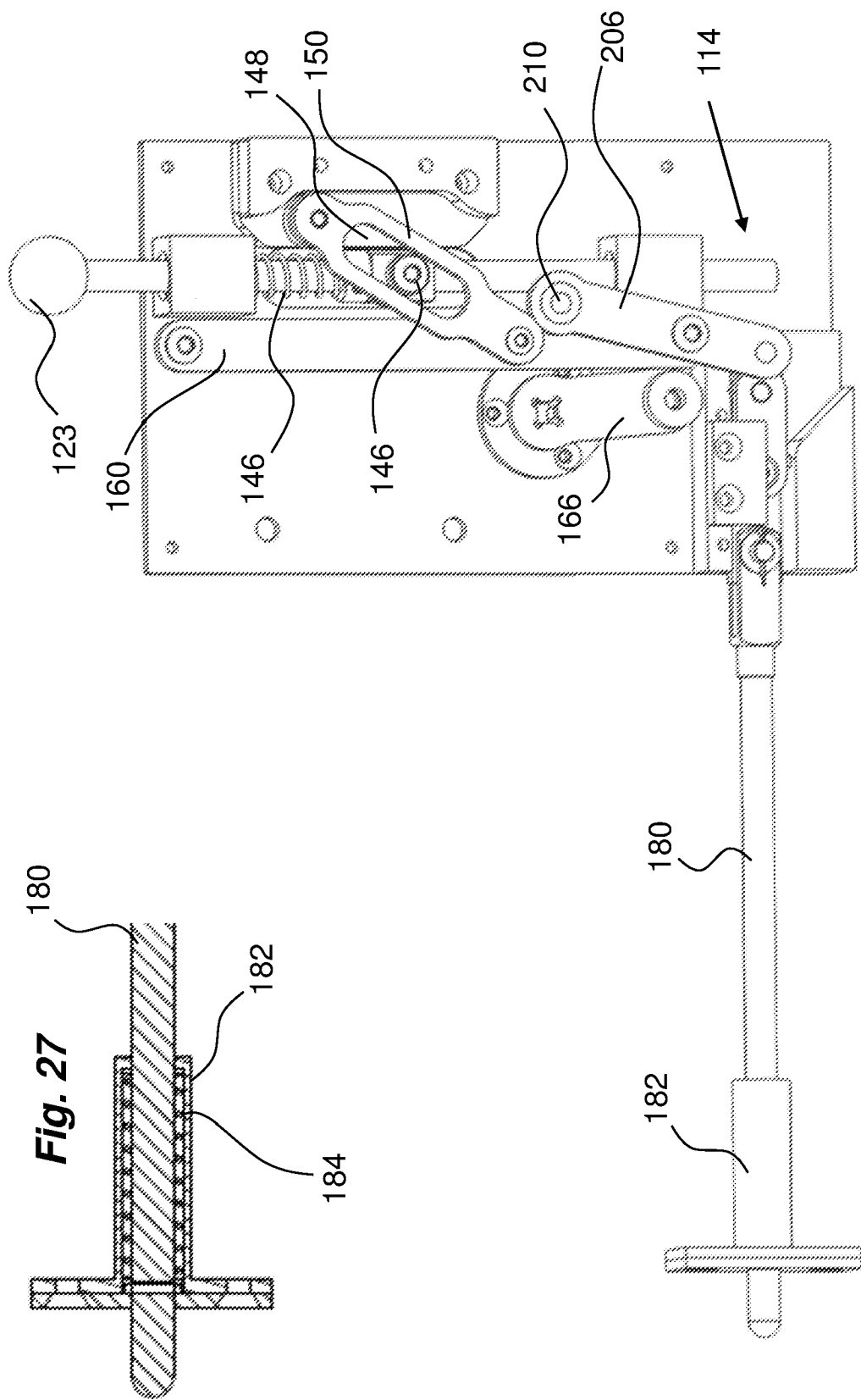
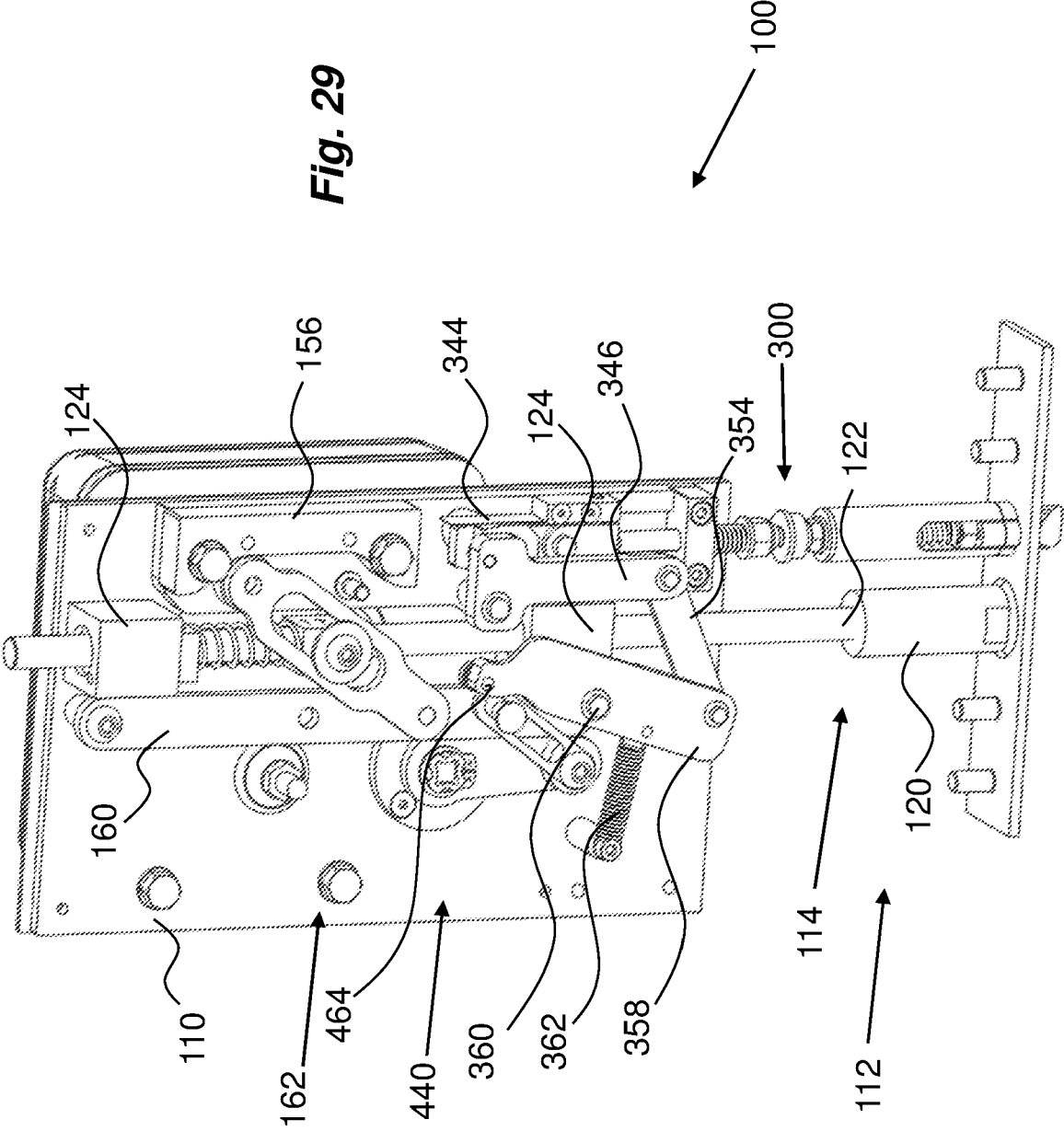
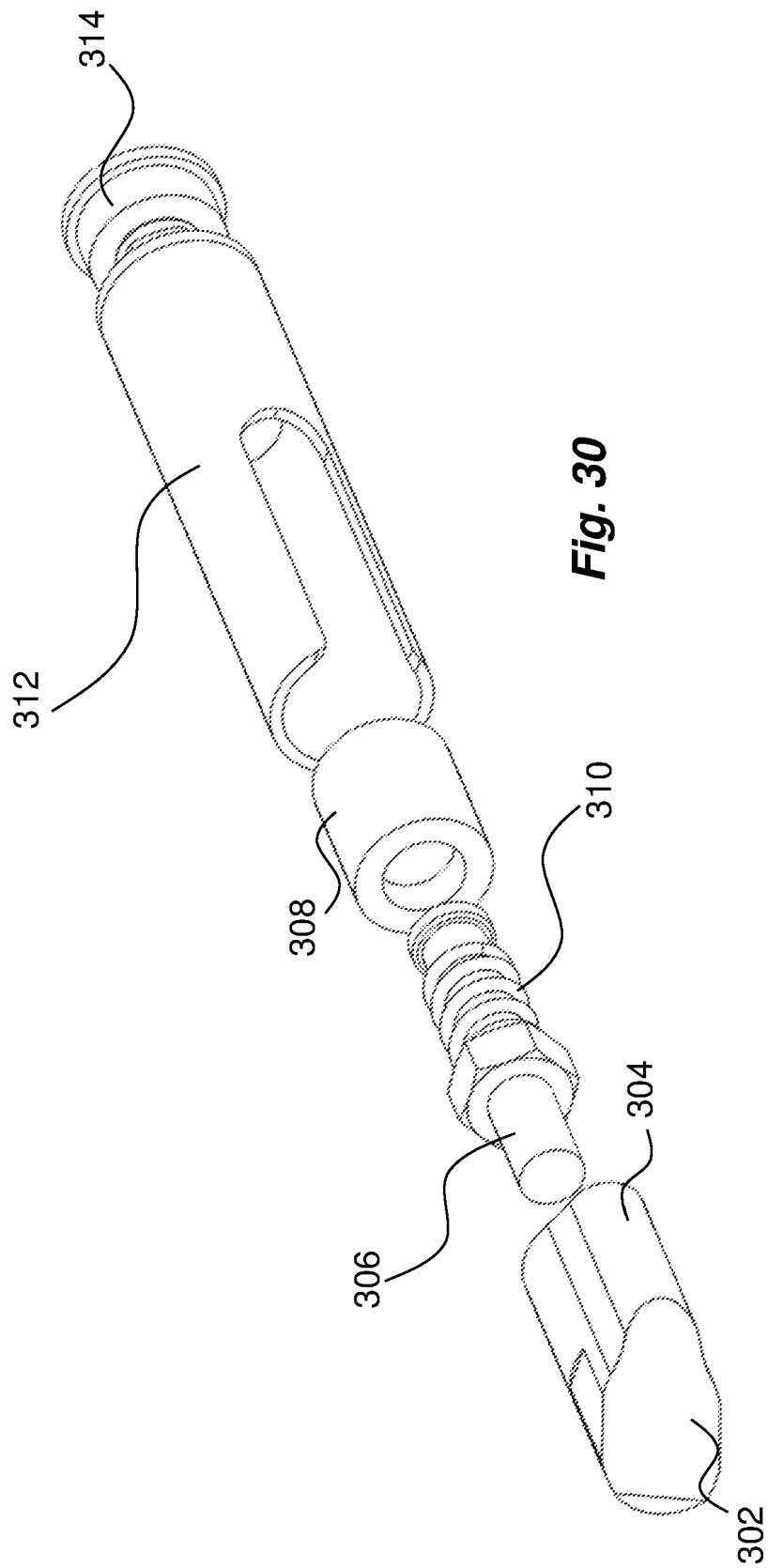


Fig. 28

Fig. 27





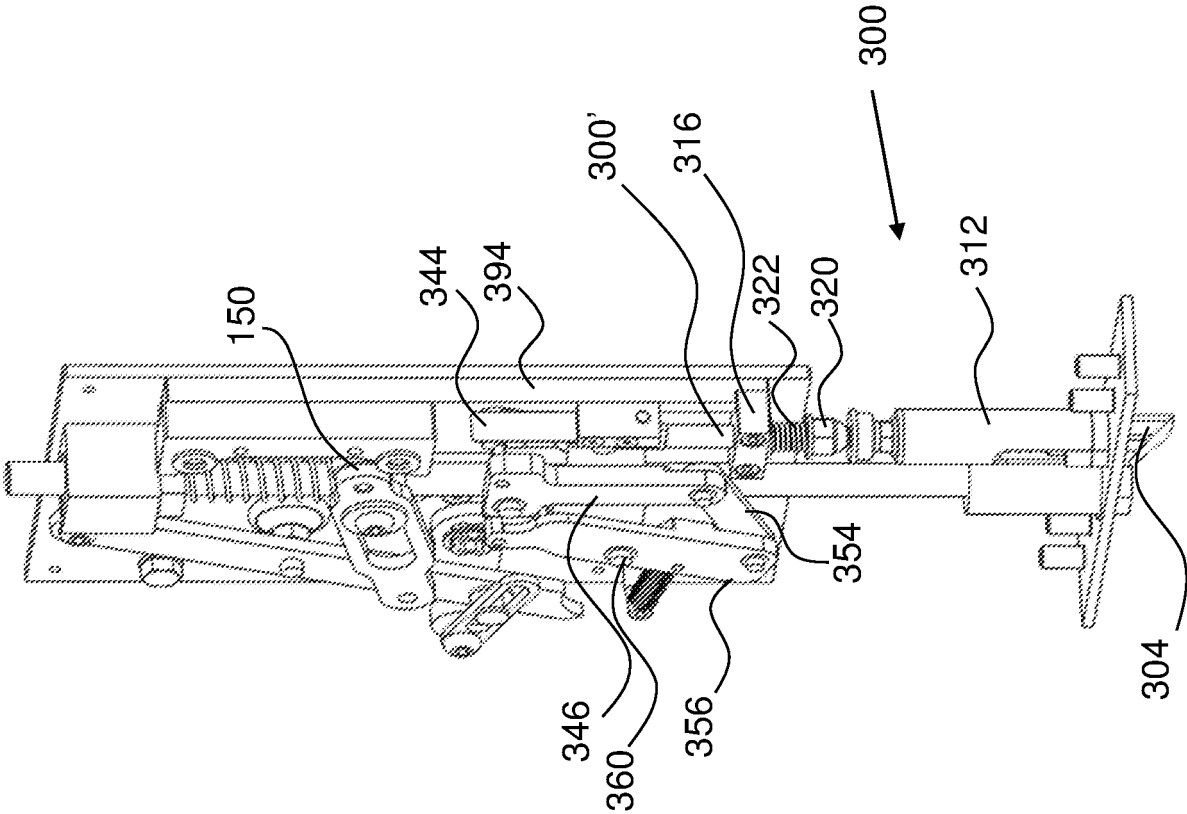


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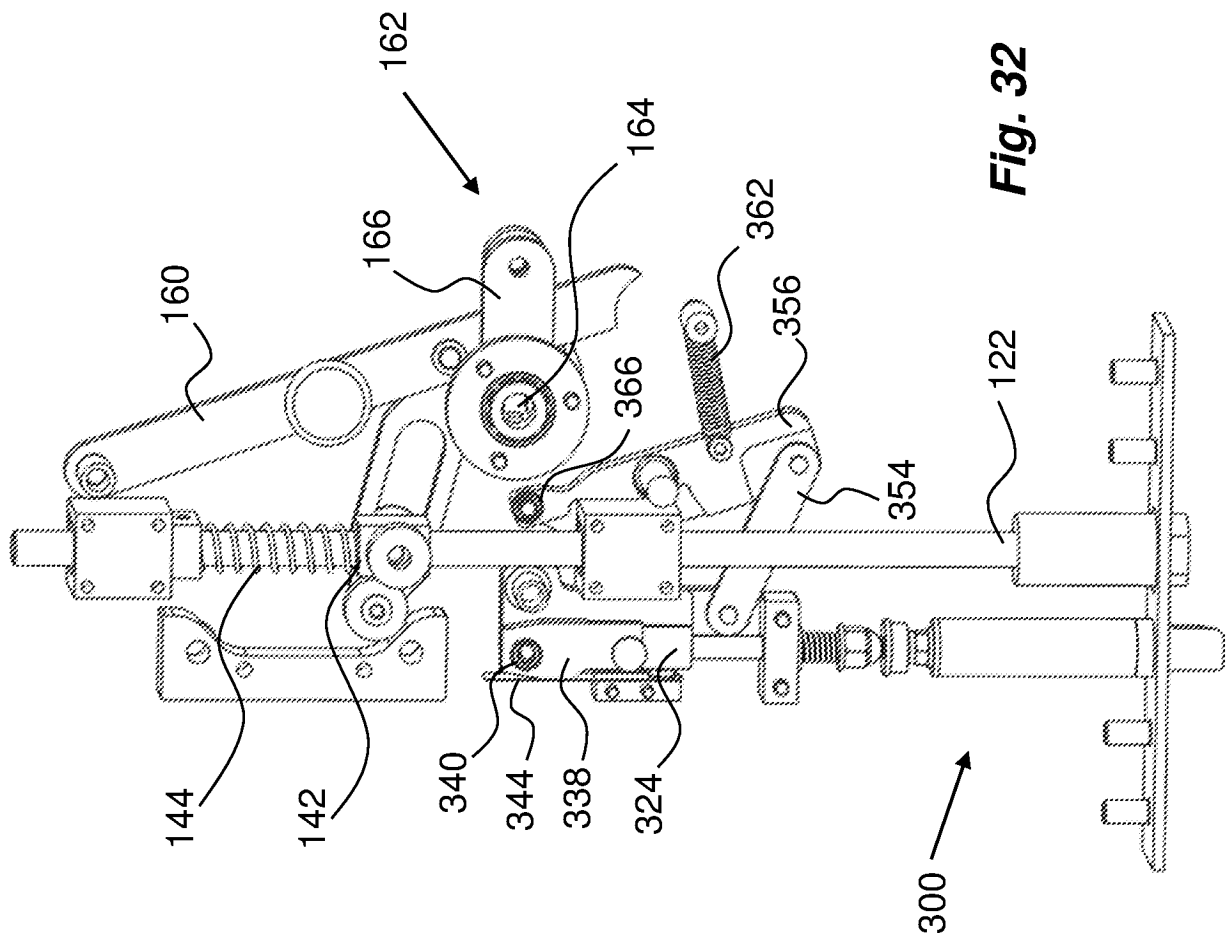


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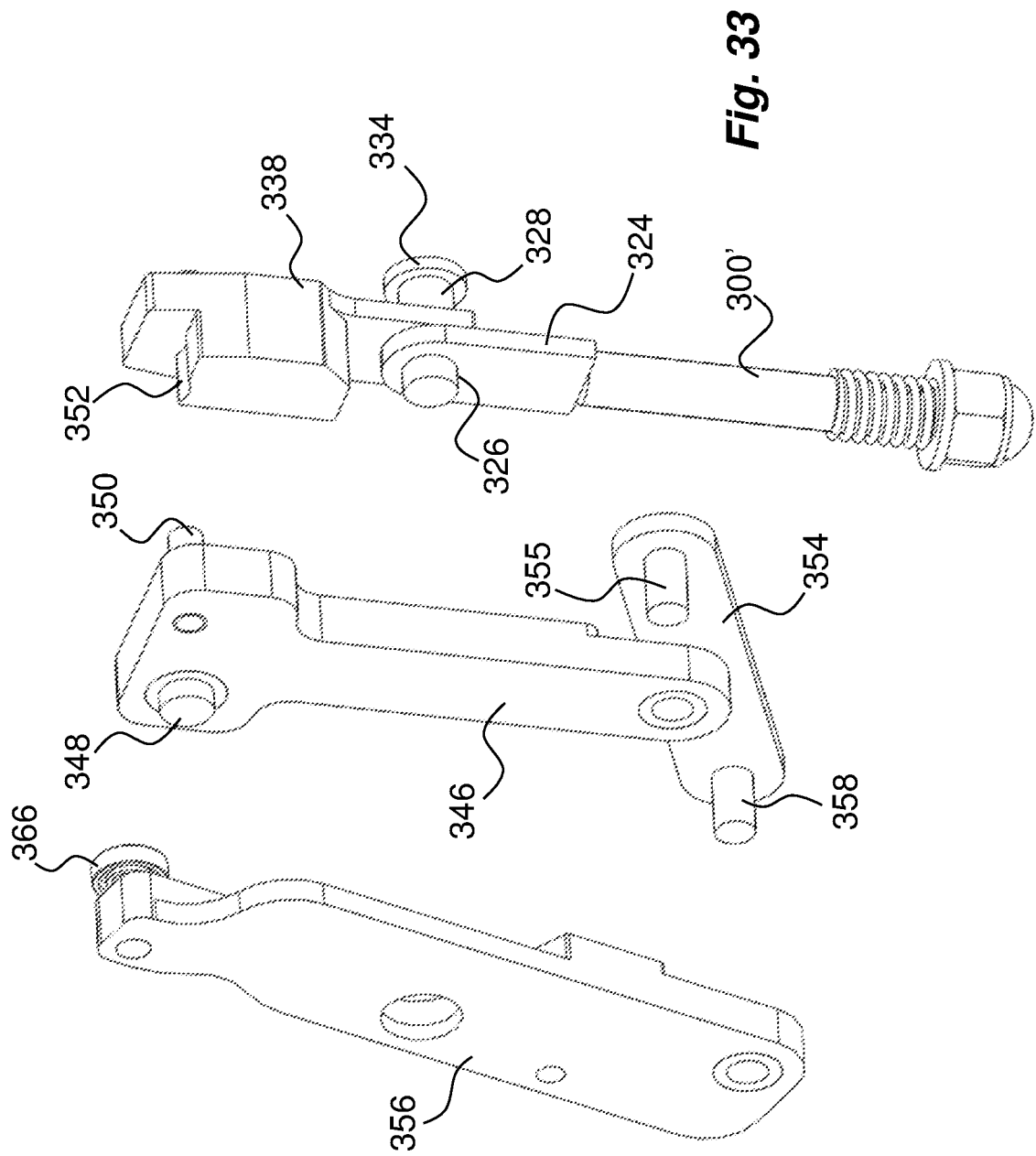


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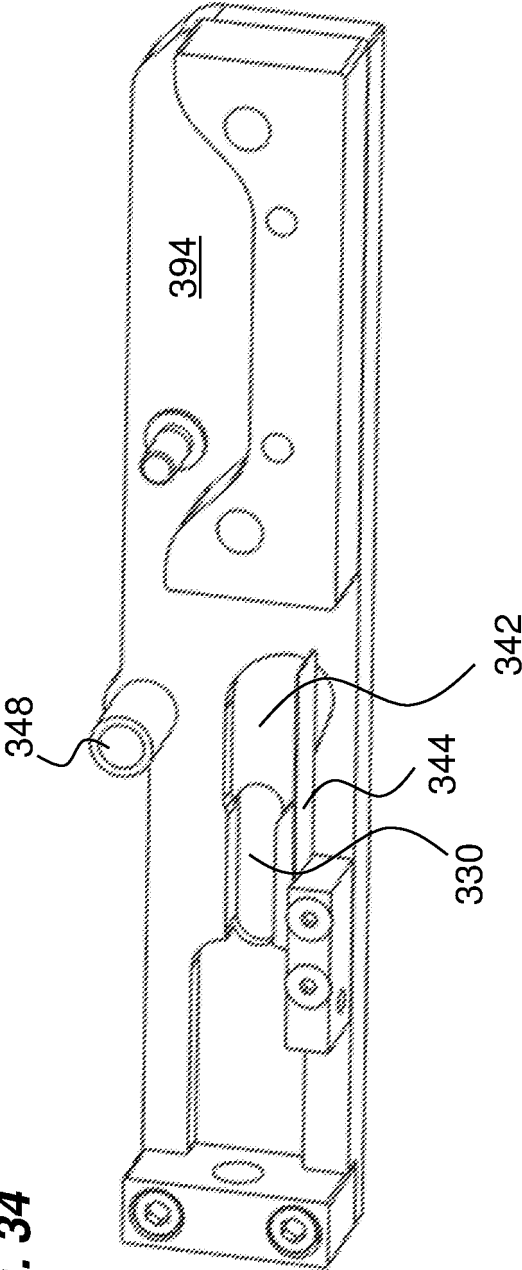
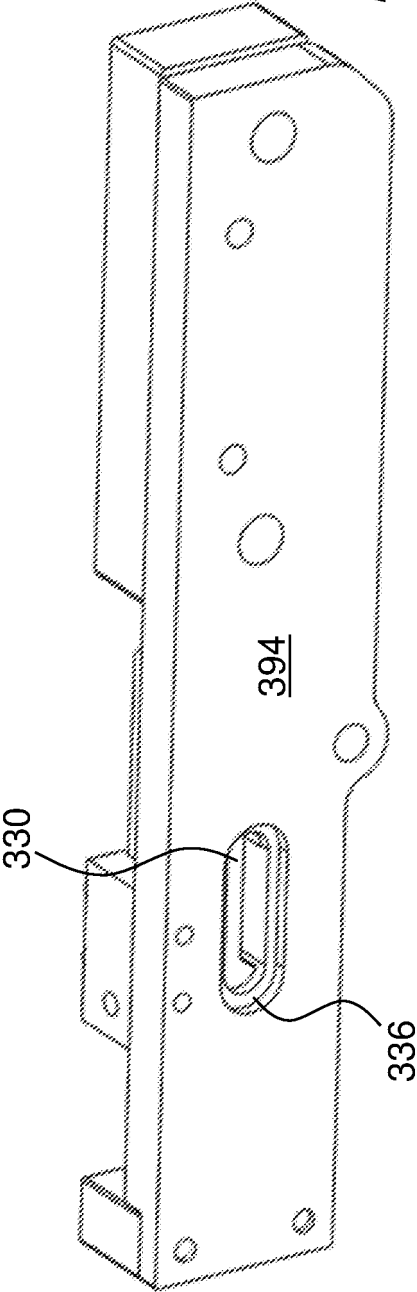
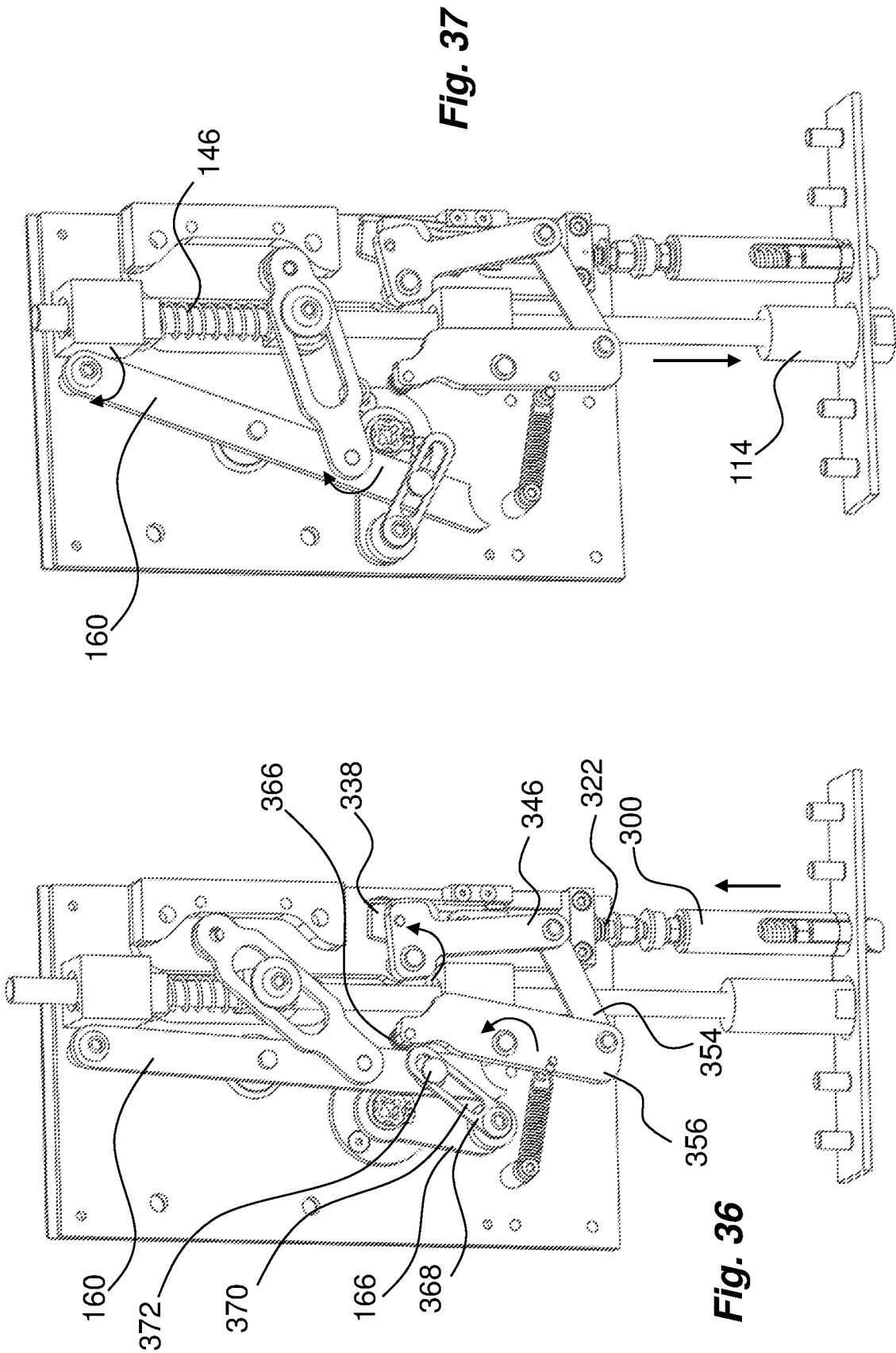
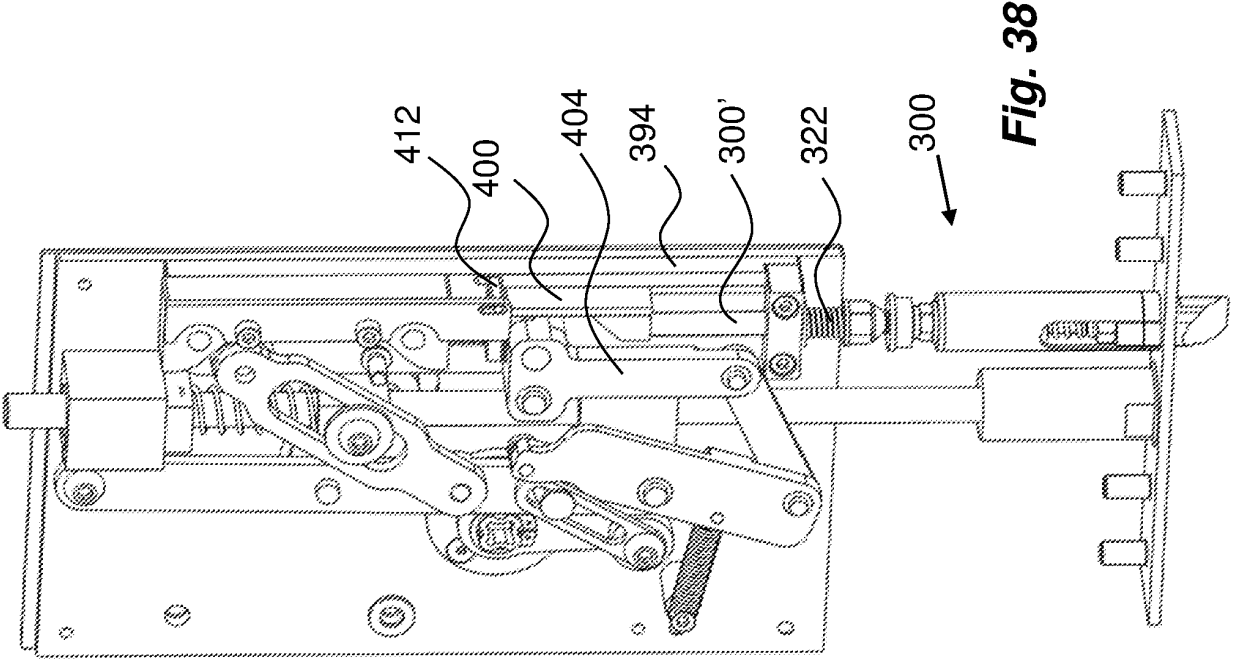
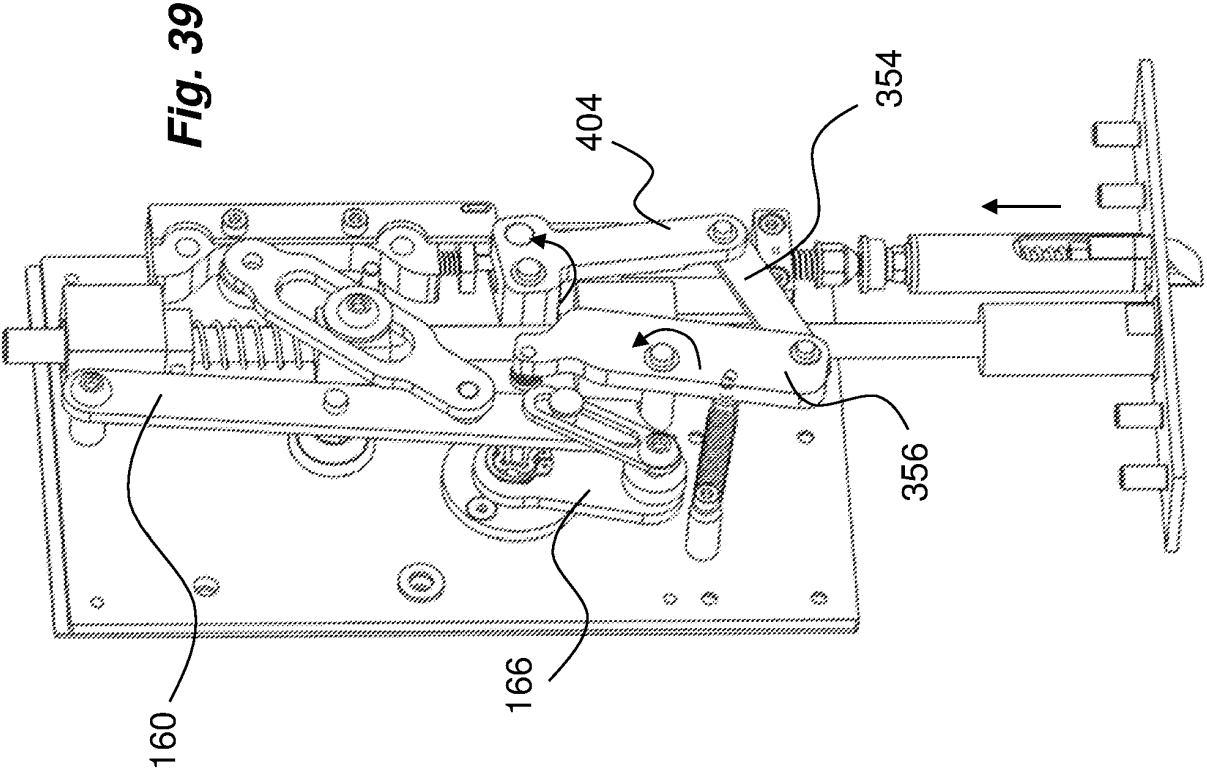


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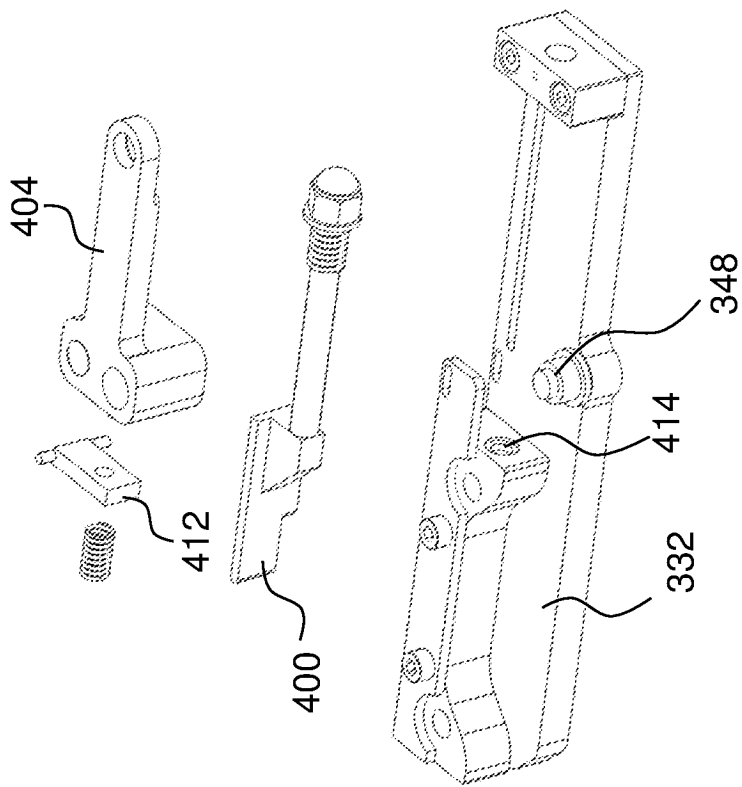


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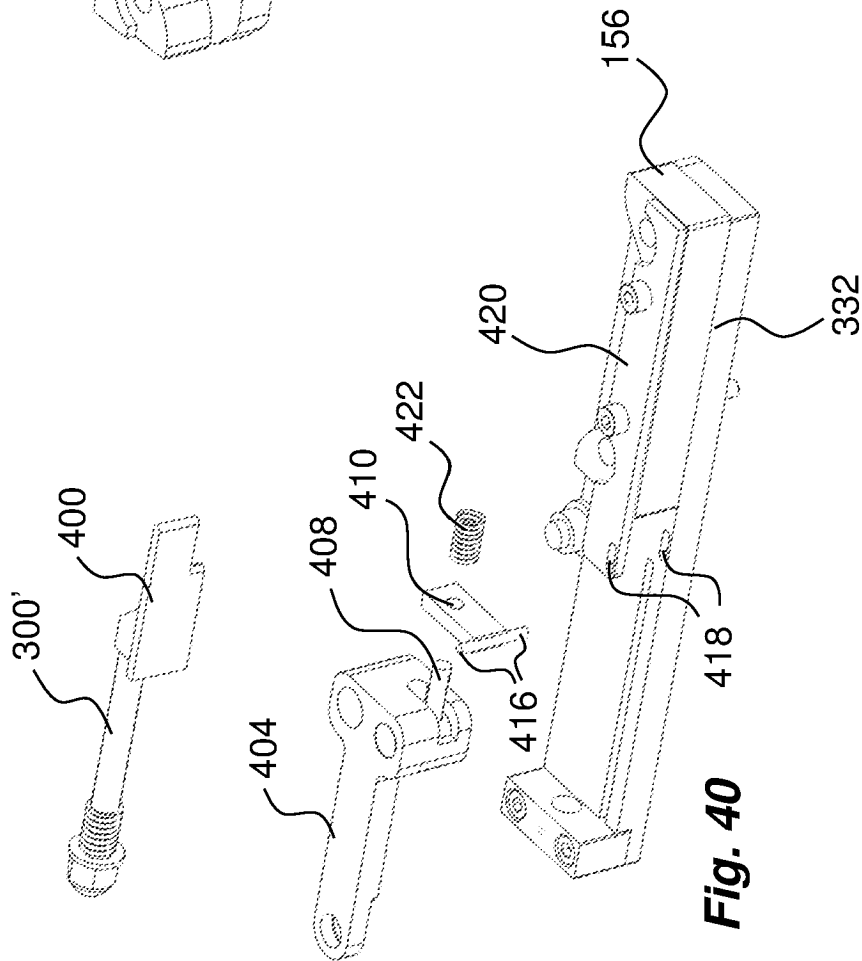


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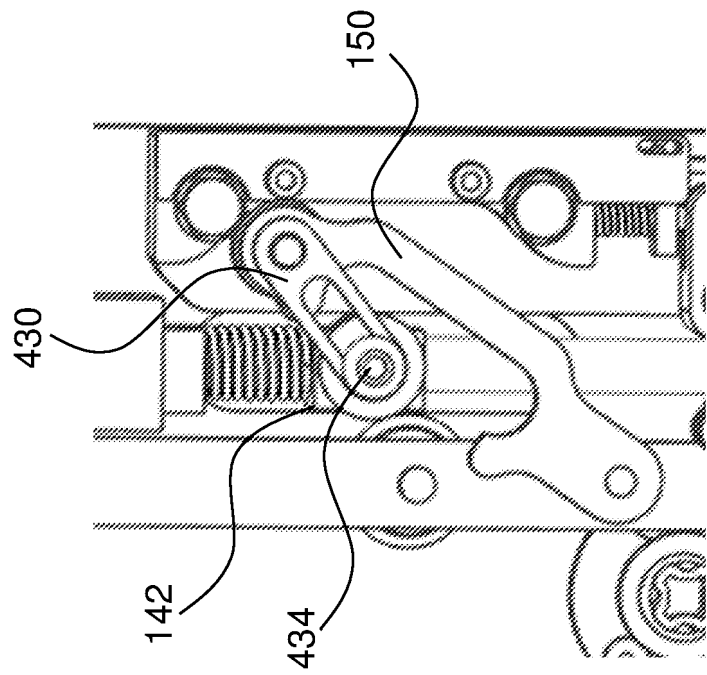


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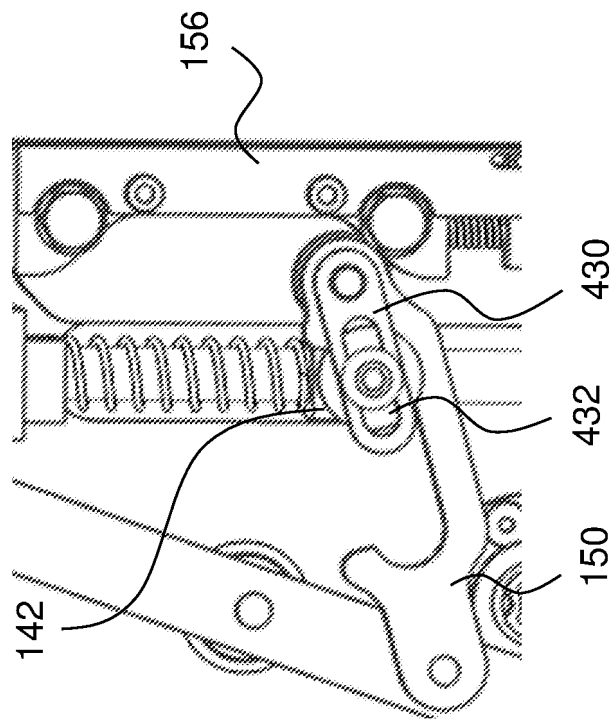


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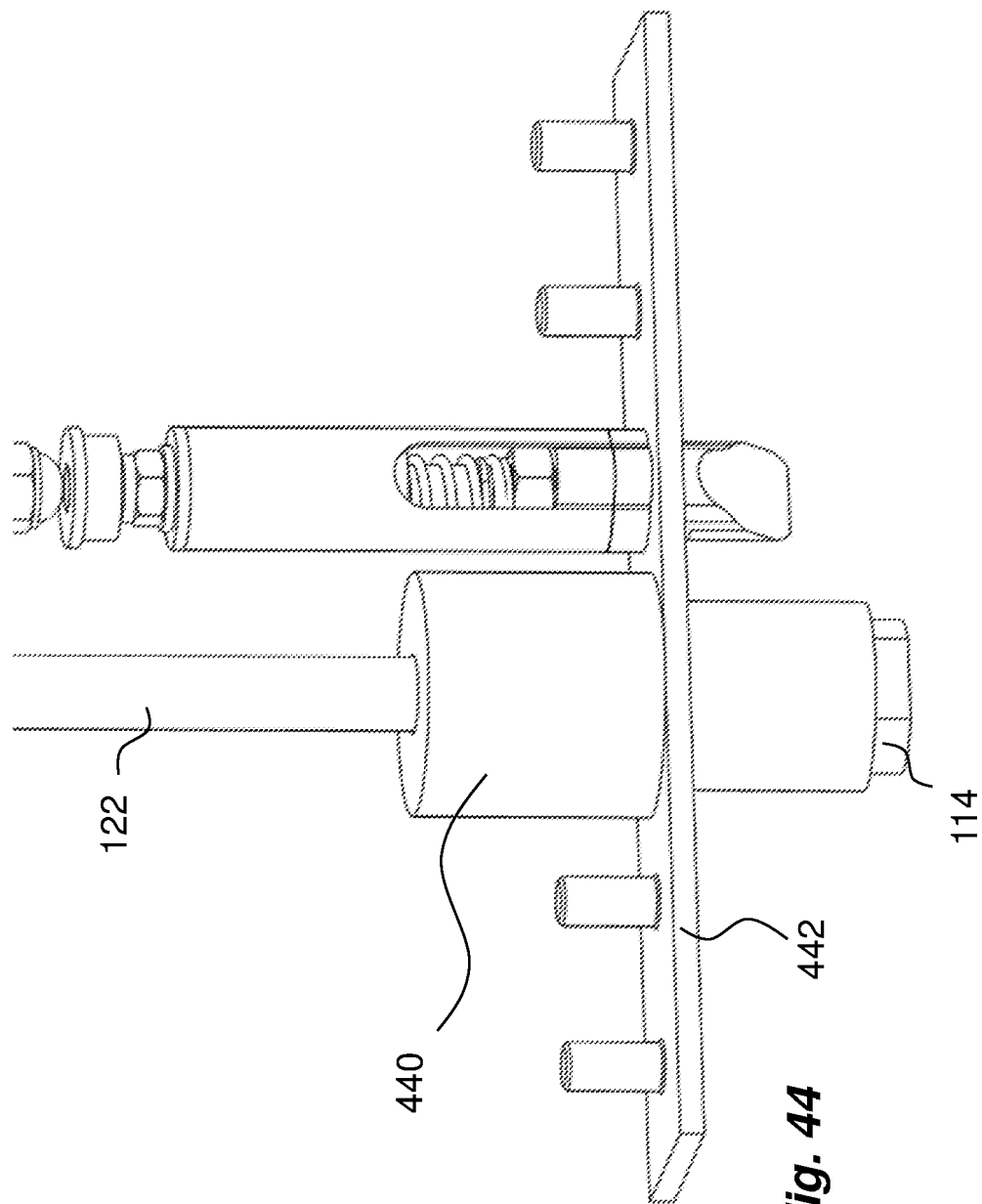
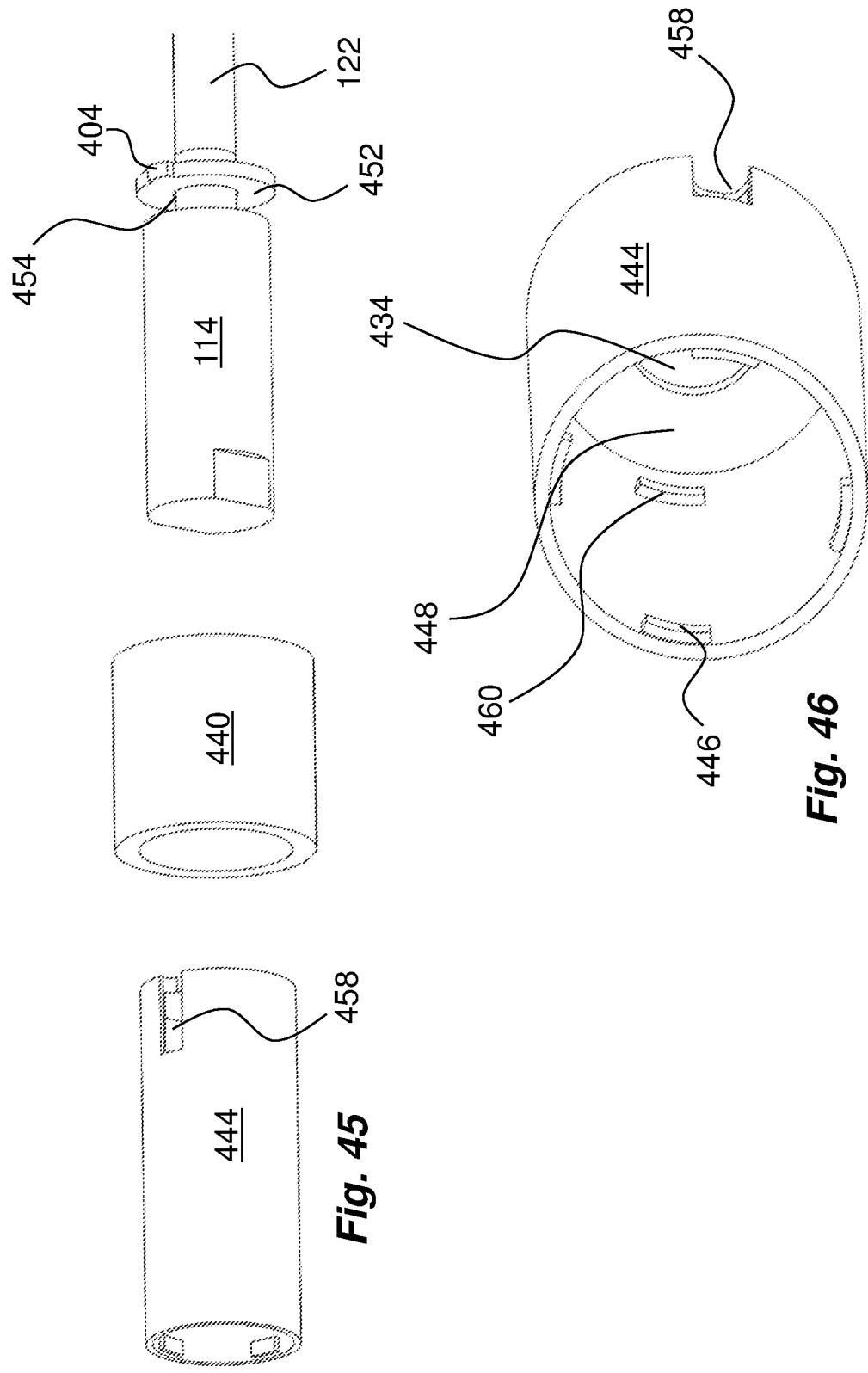


Fig. 44



REFERENCES CITED IN THE DESCRIPTION

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