(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
4 January 2007 (04.01.2007)

PCT

(10) International Publication Number
WO 2007/000763 A1

(51) International Patent Classification:
E05B 65/10 (2006.01) *E05B 59/00* (2006.01)
E05B 63/20 (2006.01) *E05B 15/10* (2006.01)
E05C 9/04 (2006.01) *E05B 63/16* (2006.01)
E05C 9/00 (2006.01) *E05C 9/18* (2006.01)
E05B 63/00 (2006.01) *E05C 9/06* (2006.01)
E05B 17/20 (2006.01)

(21) International Application Number:
PCT/IL2006/000746

(22) International Filing Date: 27 June 2006 (27.06.2006)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/693,883 27 June 2005 (27.06.2005) US

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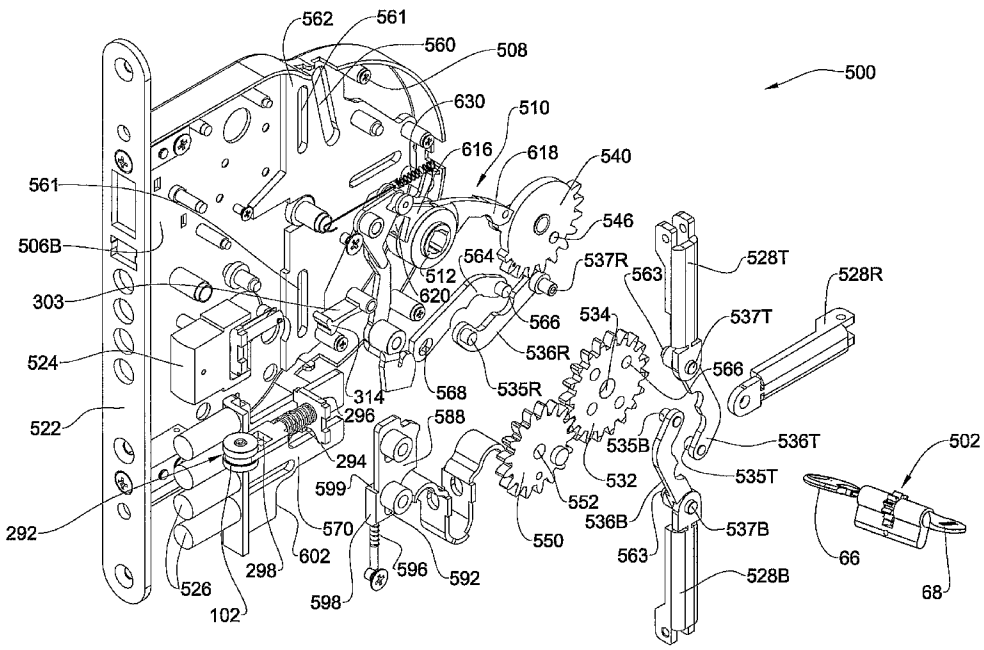
(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*

[Continued on next page]

(54) Title: MORTISE LOCK



(57) Abstract: A mortise lock comprising a housing, a locking mechanism, a locking latch and one or more bolts displaceable between a locked position and an unlocked position; the locking mechanism fitted with a lock cylinder, a handle assembly comprising an inside locking latch activator articulated with the locking latch and the bolts and an independent outside locking latch activator articulated only with the locking latch, a locking latch sensor for selectively arresting the locking latch, and a deadbolt mechanism for arresting the bolts at their extended, locked position.

WO 2007/000763 A1

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

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MORTISE LOCK

FIELD AND OF THE INVENTION

The present invention is concerned with a mortise lock and more particularly it is concerned with such a mortise lock fitted with multiple locking bolts, the lock being actuated in different operable positions.

BACKGROUND OF THE INVENTION

Mortise locks are well known in the art and are typically designed to fit into an opening formed at the locking stile (an edge of a door opposite the edge that is hinged to the door frame).

A mortise lock generally includes one or more latches (also referred to as bolts) displaceable between an extended position in which they project beyond the edge of the door into a corresponding opening in the door frame (and/or wall or sealing/floor, in some cases) so as to latch the door closed, and a retracted position in which opening of the door is facilitated.

Also known in the art are so called *"panic doors"* which are designed so as to quickly be opened, from the inside, at different emergency situations no matter if the door is locked or not, typically by simply actuating a door handle or bar. This requirement is to enable fast escape from an enclosure (building and the like) in case of emergency.

A large diversity of mortise locks are known in the art, designed to provide different operable situations of the locking mechanism. Examples of mortise locks are disclosed in US Patents Nos. 4,154,070 and 5,678,870 and in WO 99/61734 and WO 2004/059114.

SUMMARY OF THE INVENTION

According to the present invention there is provided a mortise lock comprising a mortise lock case housing, a locking mechanism, a locking latch and one or more bolts

displaceable between a locked position and an unlocked position; the locking mechanism fittable with a lock cylinder, a handle assembly comprising an inside locking latch activator (*'inside nut'*) articulated with the locking latch and the bolts and an independent outside locking latch activator (*'outside nut'*) articulated only with the locking latch; a locking latch sensor for selectively arresting the locking latch, and a deadbolt mechanism for locking the bolts at their extended, locked position.

As can be appreciated, the lock cylinder may be key-operated, electrically operated, or otherwise.

According to one embodiment of the invention, the lock is a multi-functional lock and is fitted with a panic selector for selectively engaging the inside handle with the bolts regardless of whether or not the bolts are locked by the lock cylinder, and a handle selector for selectively engaging the outside handle with locking latch.

According to another particular embodiment of the invention the handle assembly comprises a handle selector mechanism comprising in turn an inside locking latch activator operable by the inside handle, and a bolt activator selectively engageable with said inside locking latch activator by the panic selector, and a seperable outside locking latch activator selectively engageable with the outside handle by a handle selector knob.

The design may be such that the inside locking latch activator and the outside locking latch activator are coaxial or axially shifted, however, they are functionally separated from one another and also comprise, according to a particular aspect of the invention a security plate rotatably fitted there between to prevent tampering from the outside.

However, according to another embodiment of the invention, the mortise lock is fitted with an active panic mechanism for unlocking and unlocking the lock (and opening the door) from the inside, regardless the locking state of the lock. Namely, depressing the inside handle will result in immediate unlocking of the lock (locking latch and all bolts), regardless the locking state of the lock.

The following are some particular aspects and embodiments or modifications of the mortise lock according to the present invention, referring to either or both of the embodiments:

- the locking latch sensor is fitted for cooperation in conjunction with a lock jamb supporting a door fitted with the lock, for arresting the locking latch and retaining it at

its retracted position when the door is opened; however closing the door entails depressing the locking latch sensor, resulting in that the locking latch will return to its locked, projecting position;

- the locking latch sensor comprises a spring biased plunger for axially projecting from the front plate of the lock' and formed with a cam surface followed by a spring biased locking arm designed to engage with the locking latch and arrest it at its retracted position when said plunger projects from the front panel;
- the outside locking latch activator is selectively engageable with the outside handle via a coupling member fixed with the outside handle. Normally the outside handle is retained at its un-depressed position, owing to a biasing spring;
- applying to the first embodiment, the coupling member is biased to retain the outside handle at its closed position. When the outside locking latch activator is disengaged from the outside handle it is lockingly engaged with a casing of the handle selector mechanism;
- applying to the first embodiment, either one or both of the panic selector and the handle selector knob is fitted on a front plate of the lock or on an inside plate thereof;
- applying to the first embodiment, when the inside locking latch activator is disengaged from the bolt activator, it is lockingly engaged with a casing of the handle selector mechanism.
- applying to the first embodiment, the panic selector and the handle selector are displaceable between discrete positions;
- applying to the first embodiment, the inside handle is articulated with the locking latch by a bell crank, such that once the inside handle is depressed it will remain at its depressed position if the door is open, and the inside handle will return to its non depressed position upon closing the door;
- the bolts comprise one or more face bolts extendable from the front plate of the mortise lock case housing and being displaceable along a first axis (typically horizontal, though not restricted to such a configuration); and one or more secondary bolts projecting from the case housing and being restricted for displaceable about a second axis substantially perpendicular to said first axis (typically vertical). Often there is further provided a rear bolt displaceable about an axis parallel to said first axis, though at an opposite sense, so as to project through a hanging stile of the door; it is however

appreciated that the secondary bolts may be displaceable about axes not necessarily perpendicular to the first axis.

- the locking latch and optional one or more face bolts projecting from the front plate of the mortise lock case housing, symmetrically extend the front plate of the lock and/or at a locking stile of a door fitted with a lock according to the incvention;
- a static bolt may be provided, fixedly extending from the lock case housing through a hinge stile of a door for engagement with a corresponding aperture formed at a door jamb;
- the one or more face bolts are articulated to a locking plate displaceable between a respective locked and an unlocked position, retractable either by the lock cylinder or by the inside handle, said locking plate being restricted into axial displaceable in a plane along the first axis;
- according to one particular design applying to the first embodiment, the secondary bolts are each articulated to the locking plate by a link converting linear motion from said first axis into said second axis; by another particular design, the secondary bolts are articulated to the locking plate by a gear train, each bolt being fitted with a link for converting motion between said first axis and said second axis;
- according to another design the front bolts, the secondary bolts and the rear bolt are each articulated to a locking cog by a link converting rotary motion into linear displacement, whereby rotating the locking cog in one direction entails retraction of all bolts and rotating the locking cog in an opposite direction entails projection of the bolts;
- an additional bolt may be fitted for axial displacement in a plane substantially parallel to said first axis, though in an opposite sense;
- applying to the first embodiment, the deadbolt mechanism comprises a locking block fixed within the mortise lock case, a bridge member fixedly attached to the face bolts and being articulated to the locking plate with limited degree of freedom along the first axis, a locking piece articulated to the locking plate and having limited degree of freedom along the second axis; said locking piece being articulated to the bridge member by a motion converting mechanism such that axial displacement of the bridge member about said first axis entails corresponding axial displacement of the locking piece about said second axis, whereby when the face bolts are at their extended, locked position, the locking piece is lockingly engaged with the locking block, and where

retracting the face bolts entails disengagement of the locking piece from the locking block;

With respect to the first design of the deadbolt mechanism, the following may apply;

- the motion converting mechanism is in the form of an engagement member projecting from one of the bridge member and the locking piece, and an inclined slot formed in the other of said bridge member and the locking piece and slidingly receiving said engagement member;
- the locking block is formed with a gliding surface and an arresting shoulder, and the locking piece is formed with a sliding portion formed with a locking edge, wherein when at the locked position of the face bolts the locking edge is arrested by the arresting shoulder; and during displacement of the face bolts between a retracted, open position, and an extended, locked position, the sliding portion smoothly slides over said gliding surface;
- the locking piece is articulated to the locking plate by an engagement member projecting from one of the locking plate and the locking piece, and a slot extending along said second axis, formed in the other of said locking plate and the locking piece and slidingly receiving said engagement member;
- the bridge member is articulated to the locking plate by an engagement member projecting from one of the locking plate and the bridge member, and a slot extending along said first axis, formed in the other of said locking plate and the bridge member and slidingly receiving said engagement member;
- according to a second design of the deadbolt mechanism a locking piece is restricted for axial displacement about the second axis between an upward, biased position and a downward position; the locking plate is formed with an abutting shoulder for abutting against a corresponding shoulder of the locking piece such as to prevent displacement of the locking plate, namely to prevent retraction of the face bolts.
- according to a specific design the locking piece is displaced downward by a connecting lever pivotally coupled to the locking cog. Alternatively, the locking piece is displaced by a cam of a cylinder engaging gear wheel which in turn is engaged with the lock cylinder.
- the locking mechanism comprises, according to an other embodiment thereof, the cylinder engaging gear wheel engageable with the lock cylinder and in turn engaged

with a geared locking cog, to which the secondary and rear bolts are linked, each by a pivotable link.

- the arrangement is such that the links of the secondary bolts are pivotally secured to the locking cog along a first coupling axis extending through a center of the cog; and the connecting lever and rear bolt are pivotally secured to the locking cog about a second coupling axis transversing said first coupling axis at the center of said locking cog, at a right angle.
- the links of the secondary bolts and the connecting lever and rear bolt are pivoted to the locking cog such that at the locked position each pair extends beyond the over-center position, respectively, such that axial force applied on any on any of the bolts, in a retraction direction, results in geometric locking of the locking cog, namely arresting it at the locked position where the bolts project, so as to prevent forced retraction of the bolts.
- the cylinder engaging gear wheel is engaged with the locking cog which in turn is engaged with a third gear articulated with the inside locking latch activator, such that manipulation of the inside locking latch activator (that is possible only by the inside handle) entails corresponding rotation of the third gear, which in turn rotates the locking cog and the cylinder engaging gear, and the thereby rotating, resulting in simultaneous retraction of the locking latch and all the bolts (face bolts, secondary bolts and the rear bolt).
- the cylinder engaging gear wheel is coupled with the locking latch sensor by a pivotable arm, such that rotation of the cylinder engaging gear wheel by the cylinder lock at an extent after the bolts have been retracted (e.g. at about 30°), entails retraction of the locking latch;
- the locking latch has a rectangular cross-section, whereby it is unlikely to be manipulated from the outside e.g. by a card, screwdriver and the like.
- the one or more secondary bolts are fitted for either/and projecting through a top and/or bottom rail of a door and for activating one or more auxiliary locking assemblies at lock stile of the door;
- applying to the first embodiment, the inside handle is permanently engaged with the locking latch and the outside handle is permanently disengaged from the one or more bolts; and wherein when the panic selector is activated the inside handle engages

with the bolts and when the handle selector is activated the outside handle is engaged with the locking latch;

- applying to the first embodiment, the locking plate is articulated by a crank lever to the bolt activator, whereby depressing the inside handle, when the panic selector is activated to engage the inside handle with bolts, result in axial displacement of the locking plate about said first axis; however according to the second embodiment axial displacement of the locking plate about said first axis will take place at any event;
- applying to the first embodiment, the locking plate is fitted with a locking gear engaged to an actuating gear of the lock cylinder, and further there is provided a crank link coupling said locking gear with the locking plate, whereby rotating the lock cylinder entails axial displacement of the locking plate about said first axis;
- rotating the lock cylinder beyond 360° entails retraction of the locking latch by a pivot lever articulated at one end with the locking latch and at an opposed end it is formed with a follower arm for engagement with a cam projection formed on the locking gear;
- the crank link is pivotally articulated to the locking plate, with a degree of freedom along the first axis, such that the face bolts do not retract beyond the front plate even when the lock cylinder is rotated more then 360°;
- the locking plate is restricted for axial displacement about said first axis by one or more axial follower pins received with corresponding grooves formed correspondingly in the lock case and the locking plate;
- the locking plate is displaceable between discrete positions corresponding with respective locked and unlocked positions of the lock;
- restricting displacement of either the secondary and rear bolts in a particular axial direction may be facilitated by tracks integrally formed or attached to at least one face covers of the mortise lock case housing;
- the invention calls for a mortise lock comprising a casing accommodating a handle assembly, a locking latch articulated to the handle assembly and to a locking latch sensor, one or more bolts manipulable by a locking plate and being displaceable between an open position and a locked position, and a deadbolt mechanism for locking face bolts extending from said locking plate at their extended, locked position, and wherein when the lock is at a fully locked position, namely the locking latch an all bolts are at their projecting position, manipulation of the inside handle results in immediate

and synchronized unlocking of the lock, namely simultaneous retraction of the locking latch and all the associated bolts. However, an attempt to open the lock at this position using the outside handle entails only retraction of the locking latch. When the lock is at the so called slammed position, namely only the locking latch lockingly projects, whilst all the bolts are retracted, manipulation of either the inside handle or the outside handle equally results in retraction of the locking latch into its open position.

The invention is also concerned with a door fitted with a mortise lock according to the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

For better understanding the invention and to see how it may be carried out in practice, several embodiments will now be illustrated, by way of non-limiting examples only, with reference to the accompanying drawings, in which:

Fig. 1 is a partial view of a door front fitted with a mortise lock according to the present invention;

Fig. 2 is an isometric, partially exploded view of a portion of the door with the lock seen in Fig. 1;

Figs. 3A and **3B** are isometric views of an inside and an outside shield plate and handle, respectively of the lock seen in Figs. 1 and 2;

Figs. 4 is an isometric view of the lock according to the present invention, fitted with auxiliary locking assemblies;

Fig. 5 is an exploded isomeric view of a mortise lock according to an embodiment of the present invention, with a cover plate removed for visualization;

Fig. 6 is an exploded isomeric view of the mortise lock of Fig. 5, showing the cover plate, a cam support plate, and some other components;

Fig. 7 is a planer view of the lock, with the cover plate removed, at a fully locked position;

Fig. 8 is a planer view of the lock, with the cover plate removed, at a first step of unlocking the lock using the inside handle;

Fig. 9 is a planer view of the lock, with the cover plate removed, at an unlocked position of the bolts, using the cylinder lock, the locking latch still at its projecting position;

Fig. 10 is a planer view of the lock, with the cover plate removed, at a fully unlocked position using the inside handle and with the locking latch sensor at its projecting position;

Fig. 11 is a planer view of the lock, with the cover plate removed, at a fully unlocked position using the cylinder lock, and with the locking latch sensor at its projecting position;

Fig. 12 is an isometric view of the lock in the position of Fig. 11.

Fig. 13 is a front view of the mortise lock according to another embodiment of the present invention, fitted with a panic selector and a handle selector, the locking latch and bolts at their extended, locked position;

Fig. 14 is an inside view of the mortise lock of Fig. 13, though being an isometric view and with the lock cover removed;

Fig. 15A is an isometric view of a locking mechanism in accordance with an embodiment of the present invention;

Fig. 15B is an exploded isometric view of the locking mechanism taken along line C-C in Fig. 15A;

Fig. 15C is a planar partial section of the locking mechanism seen in Fig. 15A;

Figs. 16A is a planar view of principal components of the locking mechanism with the panic selector at its deactivated position;

Fig. 16B is a planar view of principal components of the locking mechanism with the panic selector at its activated position;

Fig. 17A is a planar view of principal component of the locking mechanism with the selector coupler at its disengaged position;

Fig. 17B is a planar view of principal component of the locking mechanism with the selector coupler at its engaged position;

Figs. 18A and **18B** are an enlargement of the portion marked X in Fig. 1, illustrating the panic selector in its activated and deactivated position, respectively;

Fig. 19 is a planar view of the lock of Fig. 14, illustrating retracting of the locking latch using the inside handle, with the bolts, *a priori* retracted;

Fig. 20 is an isometric view illustrating retraction of the locking latch to its unlocked position, and with the door still shut preventing projection of a locking latch sensor;

Figs. 21A and **21B** are planer views of the lock showing the latch retraction mechanism in an extended and a retracted position;

Figs. 22A and **22B** are enlargements of portion marked XVA and XVB, in Figs. 21A and 21B, respectively;

Fig. 23 is a rear isometric view of the locking latch retracting mechanism;

Figs. 24A through **24D** are rear views of consecutive positions of a deadbolt mechanism associated with the face bolts during gradual extraction of the bolts; and

Figs. 25A through **Fig. 25C** illustrate an isometric enlargement of the deadbolt mechanism during consecutive steps of extension of the bolts;

DETAILED DESCRIPTION OF THE INVENTION

Attention is first directed to Figs. 1 to 3 of the drawings illustrating a door **20** fitted with a mortise lock in accordance with the present invention generally designated **22**, through an opening **24** formed at a locking style **26** of the door **20**. The mortise lock assembly comprises an outside handle assembly **30**, an inside handle assembly **32** and a cylinder lock **34**. The arrangement is such, that at the assembled position, the lock is received such that a front plate thereof **38** extends substantially flush with the locking style **26** of the door, as seen in Fig. 1, with the inside plate and outside plate being interconnected to one another via so called blind bolts **40** extending from the outside plate **30** and being lockingly secured to bolts **42** fitted on the inside plate **32**, whereby disengagement thereof may be facilitated only from the inside.

As can be seen in Fig. 3A, the inside plate **32** rotatably secures an inside handle **46** secured to the inside plate **32** by a nut **48** with an inside door handle square spindle **50** projecting therefrom. According to a different embodiment, the inside plate **32** further accommodates a handle selector **54**, to which reference will be made in more detail hereinafter with particular reference to Figs. 13 and onwards.

In Fig. 3B there is illustrated the outside door plate **30** rotatably accommodating the outside handle **58** rotatably secured thereto by nut **60** and where a square spindle **62** inwardly projects.

At the assembled position (e.g. Fig. 1) both square spindles **50** and **62** coaxially engage a locking mechanism of the lock, though operable independently, as will be explained hereinafter in detail.

The cylinder lock **34** noticed in Figs. 1 and 2 is fitted with a removable outside key **66** and a fixed inside knob **68**. The inside knob **68** may be replaceable by a removable key, as known, *per se*, however, this is not preferable since in the case of a removable key the panic mechanism works only when the key is received within the cylinder lock. The option of a removable key will require that the user to first insert the key into the lock and only then open the door, thus loosing valuable time during emergencies.

In the illustration of Fig. 4, the mortise lock **22** is illustrated separate from the door wherein it is noticeable that its front plate **38** slidingly accommodates a locking latch **74**, a plurality of face bolts **76**, and two secondary bolts, namely a top bolt **80T** and a bottom bolt **80B**, each articulated via an extension rod **82T** and **82B**, respectively, to an auxiliary lock **84T** and **84B**, respectively. Auxiliary locks **84T** and **84B** are designed for locking engagement at the locking style of the door thereby provided with a locking latch **88T** and **88B** and optionally for projecting through a top and bottom rail of the door (not shown). Lock **22** further comprises a rearward extending static bolt **94** extending from the lock case and projecting through an opening formed at a hinge style of the door (not shown) for engagement with a corresponding aperture formed at a door jam (not shown) upon closing of the door.

It is also noticed in Fig. 1 that the locking latch **74** and the face bolts **76** extend substantially symmetrically within the front face of the door whereby it may be easily fitted within a *"left side door"* or a *"right- side door"*.

Turning now to Figures 5 to 12 there is illustrated a mortise lock according to one embodiment of the present invention, directed to an application without a panic selector and without a handle selector mechanism.

The lock in accordance with the second embodiment is generally designated **500** and is fitted for securely receiving therein a cylinder lock **502** (**34** in Figs. 1 and 2) through suitable openings **504A** and **504B** formed in the inside plate **506A** and the outside plate **506B** respectively, as shown in Fig. 5. The outside plate **506B** is formed with side walls thus constituting a casing for the locking, whilst the inside face **506A** serves as a cover securely attachable to the outside case **506B** by means of bolts **508**, as seen in Fig. 6.

The lock in accordance with the illustrated embodiment comprises a locking mechanism generally designated **510** which in the particular embodiment has a square receptacle **512** for receiving a corresponding square spindle **50** of an inside door handle **46**

(Fig. 3A) and a spindle **62** of an outside door handle **58** (Fig. 3B) respectively, wherein the receptacles are separated from one another as will be become apparent hereinafter.

Furthermore, and typical with a mortise lock of this kind, the cylinder lock **502** represented in Fig. 10 by cog wheel **520**, is fitted with a removable outside key (not shown) and a fixed inside knob. However, the inside knob may be replaceable by a removable key, as discussed hereinabove.

Furthermore, the mortise lock is formed with a front plate **522** slidingly accommodating locking latch **524** displaceable between a retracted position (Figs. 10 to 12) and a projecting position (Figs. 7 to 9). A plurality of face bolts **526** (4 in the present example) are also slidingly displaceable through the front plate **522** between a retracted position (Figs. 10 to 12) and a projecting position (Figs. 7 and 8).

The mortise lock **500** further comprises three secondary bolts namely a top bolt **528T**, a bottom bolt **528B** and a rear bolt designated at **528R**. It is noticed that the locking latch **524** and the face bolts **526** are displaceable upon parallel axes being substantially horizontal and similarly the rear secondary bolt **528R** is displaceable upon an axis parallel to said horizontal axis. According to a different embodiment (not shown) the rear bolt fixedly projects through the rear of the door. However, the secondary bolts **528T** and **528B** are displaceable upon a coaxially extending axis being substantially perpendicular to said first axis. The bolts **528T**, **528R** and **528B** are restricted for axial displacement by means of grooves **561** formed in the plate **562** slidingly receiving pins **563**.

As discussed hereinabove, the secondary bolts **528T, 528B** and **528R** are fitted for articulation via extension rods **82T, 82B** and **94** (shown Fig. 4) to corresponding auxiliary locks (not shown) respectively, for locking engagement at the locking style of a door and a hinged style of a door, respectively. Alternatively, the secondary bolts merely activate locking rods projecting into the sashes.

As apparent from Fig. 5, the locking latch **524** and the face bolts **526** extend substantially symmetrically about the longitudinal axis of the front plate **522** whereby the lock is easily fitted within a *"left side door"* or a *"right side door"*.

A geared locking cog **532** is pivotally secured to the casing at **534** wherein each of the secondary bolts is articulated thereto by means of a pivot arm **536T, 536R** and **536B,** respectively, said pivot arms being pivotally secured at a proximal end thereof to the locking cog **532** (by pins **535T, 535B** and **535R**) and at a distal end thereof to the respective secondary bolt **528** (by pins **537T, 537B** and **537R**) The arrangement is such

that pivot arms **536T** and **536B** are pivoted to the locking cog **532** about a line 531extending through the center **534** of the locking cog **532.** It is also noticed that whilst the pivot arms **536T** and **536B** extend above the locking cog **532,** the pivot arm **536R** extends below the locking cog **532** with a distal end (at **535R**) of the pivot arm **536R** pivoted to the locking cog **532** at a point generating a line with center pin **534** adapted to transverse the axis **531** at a substantially perpendicular relation.

The geared locking cog **532** is engaged by a semi geared secondary cog **540** whereby rotation of one cog entails corresponding angular displacement of the other cog wheel, the purpose of which will become apparent thereafter.

Pivotally articulated to the secondary cog **540** there is provided a pivot link **544** pivotally articulated at **546** to the secondary cog **540** and comprising a cam roller **548** slidingly displaceable within a cam groove **560** (Figs. 5, 6, 9 and 10) either formed directly in the rear cover plate **506B** or, as in the present example, formed in a cam plate **562** (This applies to the other directing grooves as well, e.g. grooves **561** etc.).

The geared locking cog **532** is also engaged to a locking gear **550** pivotally secured to the casing at **552** the arrangement being such that at an assembled position of the lock, in the presence of a cylinder lock, the locking gear **550** is engaged with a corresponding activating gear **520** of the cylinder lock **502** (Figs. 9 to 11), whereby rotation of the cylinder lock entails a chain rotation of gears **550, 532** and **540,** respectively, as will become apparent hereinafter.

Reverting now to the geared locking cog **532,** it is apparent that a further pivot arm **564** is pivotally linked at **566** to the cog wheel **532** and at **568** to a locking plate **570** bearing the four face bolts **526.**

The locking plate **570** is capable of displacing only about an axis parallel to said first axis (substantially horizontal) owing to a plurality of pins **552, 572** and **574** fixed to the casing and received within corresponding grooves **576** and **578.** The arrangement is such that rotation of the locking gear **550** in the direction of arrow **580** entails projection of the face bolts **526** and rotation of the locking gear **550** in a direction opposite to that of arrow **580** entails retraction of the face bolts **526.**

The mortise lock **500** is fitted with a dead bolt mechanism generally designated **586.** With reference also to Figs. 24 and 25, the dead bolt mechanism **586** comprises a locking piece **588** restricted for axial displacement about a second axis (substantially vertical) owing to two positioning pins **590** extending from the casing and

slidingly received within a pair of grooves **592** formed in the locking piece. The locking piece **588** is normally biased in an upward direction owing to a coiled compression spring **596** and the locking piece **588** is thus displaceable between an upward, biased position as seen in Figs. 7, 8, 25A and 25C and a downward, depressed position, as in Fig. 9, 10, 11 and 25A. Locking piece **588** is formed with a shoulder **599** (best seen in Fig. 25) for abutting arresting a bottom shoulder **602** of locking plate **570**.

The arrangement is such that only when the locking piece **588** is in its downward position, the locking plate **570** is free to displace rearwards. This arrangement ensures that the face bolts **526** cannot be forced into an unlocking position. The locking piece **588** is displaced into its downward position, against the biasing effect of the coiled spring **596** by means of a dead-bolt pin **324** (Figs. 21 and 22) positioned on the locking gear **550,** which at the unlocking position bears against the slope **597** locking piece **588** and depresses it downwardly against the biasing effect of spring **596**. However, upon unlocking, namely rotating the locking gear **550** in the direction of arrow **580**, the dead-bolt pin **324** disengages from the locking piece **588**, facilitating its upward displacement to thereby arrest the locking plate **570** as discussed hereinabove.

The handle assembly **612** comprises a locking latch activating arm **616** and a bolt activating arm **618**, laterally projecting in opposite directions and integrated with the pivotally secured square receptacle **512**. Coaxially extending behind there is provided a rear locking latch activator arm **620** which in turn is articulated with a square receptacle (not seen) for receiving a square spindle of the outside handle (not shown).

The arrangement is such that the bolt activating arm **618** bearingly engages against pivot link **544** through pin **545,** which, as previously explained, is articulated to gear **540.** When the inside handle **46** (not shown) is depressed, arm **618** causes a downward displacement of the link **544,** resulting in counter-clockwise rotation of the gear **540.** This, in turn, results in simultaneous rotation of locking gears **550** and **532,** entailing retraction of the bolts **528B**, **528T** and **528R**, facilitating opening of the door. During locking of the door, the arrangement of the top bolt **528T** is such that axial displacement of the top bolt **528T** in an outward direction (into a locked position) entails displacement of the bolt activating arm **618** in a counter clockwise direction for a purpose to become apparent hereinafter.

The handle assembly **612** is biased into a counter clockwise direction so as to retain a handle (not shown) at an essentially horizontal position, as known *per se*. This

however takes place by two separate biasing members namely a coiled spring **630** associated with the rear locking latch activating arm **620** and a coiled spring **634** associated with the locking latch **524** and normally biasing it to project from the front plate **522.** In turn, projection of the locking latch **524** entails pivotal displacement of a bell type crank **638** pivotally secured at **640** to the rear plate of the casing and fitted with an arm portion **644** bearing against a pin **646** of the locking latch **524,** and formed at its opposite end with a roller pin **648** bearing against the locking latch activator arm **616.**

It is also appreciated that intermediate the front and rear handle activating members there is fitted a drill-proof steel separation plate **235** (Fig. 15B) thereby separating between the inside handle mechanism and the outside handle mechanism whereby vandalism and tempering from the outside do not affect the inside handle mechanism.

With Further reference also being made to Fig. 20, it is noticed that the lock comprises a locking latch sensor mechanism generally designated **292** whereby, as long as the door remains closed within the frame, depressing the inside handle **46** and releasing it, will entail displacement of the inside handle to its original position. In this position, the locking latch sensor mechanism **292** (Fig. 11) remains retracted with its follower wheels **102** bearing against a locking jam (not shown). However, depressing the inside handle **46** and opening the door, entails displacement of the locking latch sensor **292,** owing to a biasing spring **294** bearing at a rear end thereof against a support plate **226.** Locking latch sensor **292** comprises a recess **298** (Fig. 20) accommodating a projection **301** of a locking arm **303** which is pivotable about axis **306** and may be spring biased by coiled spring **308** in a downward direction, namely to bear against the arm of the locking latch sensor **292** in a manner facilitating smooth retraction and projection of the locking latch **524.** The locking arm **303** is usually freely rotatable about the pivot point **305,** achieving the downward movement of the locking arm **303** simply by gravity, thus eliminating the need for a biasing spring. However, upon opening the door whilst the inside handle **46** is depressed (position of Fig. 10) the locking latch sensor **292** is urged to project from the face plate **522,** resulting in pivotal displacement of arm **303** upwardly, in the direction of arrow **312** (Fig. 11) whereby a shoulder **314** of arm **303** arrests a corresponding shoulder **316** of the locking latch **524** retaining the locking latch **524** at its retracted position and further retaining the inside handle at its depressed position thereby providing a visual indication that the door is unlatched (Fig. 10).

For better understanding how the lock in accordance with the present embodiment operates, attention is directed to Fig. 7 illustrated the mortise lock at a closed and locked position. In this position the locking latch **524** and the front bolts **526** project from the front plate **522** into locking engagement with corresponding openings of a locking sash (not shown) and similarly, the secondary bolts namely **528T**, **528R** and **528B** are at their extended positions in locking engagement with a respective ceiling/wall/floor, respectively.

As can be seen in this drawing, the locking cog **532** is rotated all the way in a counterclockwise direction namely in direction of arrow **700** in Fig. 7 (this is facilitated by rotation of the cylinder lock as discussed hereinabove, which results in rotation of locking gear **550** in direction of arrow **580).** In this position it is noticed that the line **531** extending between the pins **535T** and **535B** of the pivot centers of the pivot arms **536T** and **536B** respectively (and passing through the center **534** of the cog wheel **532)** has exceeded the vertical line extending substantially between the secondary bolts **528T** and **528B** into a so-called over-locked position whereby axial force applied to the bolts **528T** and **528B** will not facilitate rotation of the cog **532** namely will not result in unlocking of the mortise lock.

As can further be noticed in Fig. 7, a similar arrangement exists between the pivot point **535R** and **566** whereby at the locked position an attempt to apply vandalism force on the rear bolt **528R** will not result in rotation of the cog wheel **532** into an open position.

Unlocking the mortise lock **500** takes place only upon a rotation of the cylinder lock (not shown) as in the position shown in Fig. **8.** Upon partial rotation of the cylinder lock, the locking gear **550** rotates (about 30° in a direction opposite that of arrow **580**) resulting in corresponding angular displacement of the locking cog **532** in the unlocking direction represented by arrow **706** in Fig. 8. As a result, the line extending between the pivot points **535T** and **535B** of arms **536T** and **536B** now passes the vertical lines extending between the bolts **528T** and **528B** such that further unlocking of the lock is facilitated, but only owing to rotation of the cylinder lock. Nevertheless, in this situation, the locking latch **524,** the front bolts **526** and the secondary bolts **528T**, **528R** and **528B** are still at their projecting, namely locking position.

Fig. 9 is a consecutive step of unlocking the mortise lock **500** in accordance with the present embodiment of the invention, wherein the locking gear **550** is rotated practically all the way through unlocking direction opposite that of arrow **580,** resulting in corresponding rotation of wheel **532,** though at an opposite direction. Such rotation results in retraction of the face bolts **526** and of the secondary bolts **528T**, **528R** and **528B**. It is apparent that the bolts retain at their retracted position upon releasing the key of the cylinder lock. It is further apparent that the locking latch still projects and is still in its locked position.

Once the face bolts **526** and the secondary bolts **528T**, **528R** and **528B** have been retracted (using the cylinder lock as explained hereinabove), retraction of the locking latch **524** may take place upon either further rotation of the cylinder lock by about another 30° or, as seen in Fig. 11, by depressing the outside handle (not shown) whereby the external locking latch activator arm **623** pivots to rotate the bell crank **638,** resulting in retraction of the locking latch **524,** as explained.

The locking latch can also be retracted using the inside handle (Fig. 10) wherein the locking latch activating arm **616** engages roller **710** of the bell crank **638** causing it to pivot in direction of arrow **712** resulting in turn in retraction of the locking latch **524.**

It is appreciated, however, that the lock **500** in accordance with this embodiment has a built-in panic position, namely, also when the lock is completely locked, i.e. as in the position of Fig. 7 (namely, locking latch **524,** face bolts **526** and secondary bolts **528T**, **528R** and **528B**, are all at their projecting, locking position), the lock may be fully unlocked and opened simply by a one-stroke activation (depression) the inside handle (not shown) so as to retract all bolts and latches and facilitate instant opening of the lock. This takes place simultaneously by retracting the face bolts **526** and the secondary bolts **528T**, **528R** and **528B** side by side with retraction of the locking latch **524.**

Simultaneously, as explained above, the locking latch activating arm **616** engages roller **710** of the bell crank **638** causing it to pivot in direction of arrow **712** resulting in turn in retraction of the locking latch **524.**

As mentioned hereinabove, these steps take place simultaneously whereby the mortise lock **500** is rapidly unlocked from the inside, in case of emergency. This procedure however, can not be performed using the outside handle, since the bolt activating arm **618** is permanently and securely disconnected from the outside handle.

The locking latch sensor mechanism generally designated at **292** operates to ensure that when the door is shut (i.e. displaced into its closed position) the locking latch **524** snaps into its projecting locking position.

A second embodiment is depicted in Figs. 13 to 25 in which Fig. 13 is a planar view of the lock in its fully locked position. This embodiment differs from the previous embodiment in that it further comprises a panic selector **138** and a handle selector coupler **98** as seen in Fig. 14 and in particular with reference being made to Figs. 15 to 18.

Turning now to Fig. **13**, the mortise lock **22** is illustrated from its inside, at its locked position, namely with locking latch **74** and face bolts **76** projecting through the face plate **38** and with the top and bottom bolts **80T** and **80B** at their extended, locked position. Further noticed in this figure, is a square receptacle **95** geometrically receiving the inside square spindle **50** (not shown), a handle selector coupler **98** fitted for engagement with handle selector actuator **54** (Figs. 1 and 3A). Further noticed in Fig. 13, the inside plate **105** of the lock **22** is formed with several grooves, namely grooves **106** being substantially parallel to axial displacement of the face bolts **76** and extending along a first axis of the lock which slidingly receives sliding pins **108,** to be discussed hereinafter, however, for the sake of ensuring displacement of the face bolts **76** and an associated locking plate (not shown in this figure) along said first axis only. It is further noticed that the rear static bolt **94** is secured to the case **107** of the lock and is also secured to the inside plate **105** (and the outside plate too, though not seen in this figure).

In Fig. 14, the inside cover plate has been removed, visualizing the outside plate **120** secured to the case **107** and the front panel **38**. It is here noticed that locking latch **74** has a substantially rectangular cross section thus making it difficult, if not impossible, to manipulate by prying the latch **74** open with a credit card, etc. This applies also to locking latch **524** of the previous embodiment.

The lock **22** comprises a locking mechanism generally designated **128** comprising in turn a handle assembly **132** fitted with a handle selector **98** and a panic selector **138** as discussed hereinafter and further, with a handle selector mechanism generally designated **140** also discussed hereinafter

Handle assembly **132** seen in Fig. 15A comprises a handle selector mechanism **140** which as can best be seen in Fig. 15B comprises a square receptacle **152** for fit engagement with the corresponding inside square spindle **50** (see Fig. 3A) for angular

engagement therebetween. A locking latch activating arm **156** laterally projects as will be discussed hereinafter. Coaxially mounted on the inside locking latch activator **150** there is a bolt activator formed with a bolt activating arm **160** and being selectively engageable with the inside locking latch activator **150** by the panic selector **138** as will be explained hereinafter.

The handle selector mechanism **140** also comprises an outside locking latch activator **174** formed with a locking latch activator arm **177** and being selectively engaged with an outside handle coupler **180,** fitted with a square receptacle **182** for receiving square spindle **62** of the outside handle **58** (Fig. 2) and selectively engageable therewith by means of handle selector knob **99** (Fig. 19) coupled in turn with actuator **98** as will be explained in more detail hereinafter.

As already mentioned, the inside square spindle **50** is rotatably engaged with the square receptacle **152** of the inside locking latch activator **150** and at the normal course of operation, e.g. when the panic selector **138** is at its disengaged position referred to as an *"off"* position (Fig. **18**A) is disengaged from the bolt activator **158** whereby depressing the inside handle **46** (Figs. 1 and 2) entails angular displacement of the inside locking latch activator arm **156** in the direction of arrow **190** (Fig. 15C). However, upon engaging the panic selector **138** into the panic position (referred to as *"on"* position as in Fig. 18B) the bolt activator **158** rotatably engages with the inside locking latch activator **150** whereby depressing the inside handle will entail corresponding angular displacement also of the bolt activator arm **160** as represented by arrow **194** (Fig. 15C).

With reference to Figs. 16A and 16B, engagement between the inside locking latch activator **150** and bolt activator **158** takes place by an L-like shaped plunger **202** normally downwardly biased by means of a coiled spring **204.** A banana shaped member **1012** is hinged to the housing **210** by a pin **1014** positioned in indent **1016.** As can further be seen, best in Figs. 16A and 16B, the banana shaped member **1012** is normally biased by spring **1020** and ball **1022** such that the L-shaped tip **1018** of the member **1012** protrudes from the latch activator **156.**

Upon rotation of the panic selector **138** into its panic position (namely "on" position as in Fig. 18B) the L-like plunger **202** axially displaces upwardly, pressing on the side of the banana shaped member **1012** against the biasing spring **1020** and ball **1022.** This results in the L-shaped tip **1018** entering the slot **1050,** whereby the inside

locking latch activator **150** becomes rotatably engaged with the bolt activator **158** such that depressing the inside handle **46** (not shown) entails corresponding angular displacement of the inside locking latch activator arm **156** and the already engaged arm **160** of the bolt activator **158** in the direction of arrows **190** and **194**, respectively. A ball **1024** is downwardly biased by spring **1026** and is adapted to fit into either one of recess **161** in order to keep the selector **138** from spontaneous switching from one position to the other.

It is further noticed that on one hand at the non-panic position the bolt activator **158** is rotatably disengaged from the inside locking latch activator **150,** and on the other hand, it is rotatably fixed with respect to the handle selector mechanism housing **210** i.e., the bolt activator **158** and its arm **160** are angularly fixed for a purpose to become apparent hereinafter.

The panic position is desired to permit a person at an inside of the door to unlock the locking latch **74** as well as face bolts **76** and top and bottom bolts **80T** and **80B** respectively, upon an emergency, by a single depression of the inside handle **46**, this being regardless of the situation of the lock cylinder **34**.

Whilst the panic selector **138** is illustrated in the figures on the face plate **38**, it may be positioned also on an inside face of the door, though not common practice in the art.

Turning now also to Figs. 17A and 17B, there is illustrated a similar mechanism for the outside handle coupler **180.** The coupler **180** is formed with the square receptacle **182** for fixedly engaging with outside square spindle **62** of outside handle **58** (not shown) which at the normal course of operation is biased by a spring **232** (Figs. 15A-15C) to retain the outside handle at its undepressed position. In the normal position of the door, the outside handle is freely depressible, though disengaged from any operable mechanism thereby no actual result will occur upon depressing the handle. It is further noticed that the inside spindle receptacle **152** (Figs. 15A to 15C) is separated from the outside spindle receptacle **182** by means of a drill-proof steel separation plate **235** (Fig. 15B) thereby there is no mutual effect between the inside handle mechanism and the outside handle mechanism and whereby even in the event of vandalism and removing of the outside handle, tempering with of the inside mechanism is not possible owing to said plate **235**.

A banana shaped member **1032** is hinged to the housing **210** by a pin **1034** positioned in indent **1036**. As can further be seen, best in Figs. 17A and 17B, the banana shaped member **1032** is normally biased by spring **1040** and ball **1042** such that the L-shaped tip of the member **1038** protrudes from the coupler **180.** A plunger **1048** bears against a surface **101** of the selector **98**.

Upon rotation of the selector **98** the plunger **1048** axially displaces upwardly, in the direction of arrow **1070** pressing on the side of the banana shaped member **1032** against the biasing effect of spring **1040** and ball **1042**. This results in the L-shaped tip **1038** entering the slot **1036**, whereby the arm **177** becomes rotatably engaged with the handle coupler **180** such that depressing the outside handle **58** (not shown) entails corresponding angular displacement of inside locking arm **177** and the already engaged arm **180** of the bolt activator **182** in the direction of arrows **190** and **194,** respectively (Fig. 15C). The ball **1044** is laterally biased by spring **1046** and is adapted to fit into either one of recess (not shown) in order to keep the selector **98** from spontaneous switching from one position to the other.

Referring now to Figs. 21 to 23, further reference is made to the locking latch mechanism of the lock **22**. The locking gear **550** is fitted with a knob **346,** adapted to press against a lower end **331** of a latch lever, freely pivotable about a pivot point **332**. When the locking gear **550** is turned using cylinder key the knob **346** pushes the lower end **331** in direction of arrow **1080**, resulting in displacement of the hook **338** in direction opposite arrow **1080**. This movement of the hook works against the effect of the biasing spring **634** to facilitate retraction of the locking latch **524**.

However, as mentioned hereinbefore, the outside handle mechanism and the inside handle mechanism are at all times disengaged, namely depressing the outside handle when the handle selector is engaged will result in retracting the locking latch by the separable/independent outside locking latch activator arm **177**, however, without engagement with the inside locking latch activator **150** and correspondingly without engagement with the bolt activator **158**.

In the annexed table, there are illustrated different positions of the panic selector and hand selector and their effect on operating the lock in accordance with the invention by the inside handle, the outside handle and the key.

In the table, the terms 'ON' and 'OFF' are used to denote the engaged/activated and disengaged/deactivated positions of the panic selector and the handle selector, respectively.

Furthermore, the term 'bolts' denotes the face bolts of the lock and any other auxiliary bolts, i.e. top and bottom bolts, as described hereinabove.

Panic selector		On	On	Off	Off
Handle selector		On	Off	On	Off
Inside handle	locking latch	✓	✓	✓	✓
	Bolts	✓	✓	-	-
Outside handle	locking latch	✓	-	✓	-
	Bolts	-	-	-	-
key	locking latch	✓	✓	✓	✓
	Bolts	✓	✓	✓	✓

Whilst some embodiments have been described and illustrated with reference to some drawings, the artisan will appreciate that many variations are possible which do not depart from the general scope of the invention, *mutatis, mutandis*.

CLAIMS:

1. A mortise lock comprising a mortise lock case housing, a locking mechanism, a locking latch and one or more bolts displaceable between a locked position and an unlocked position; the locking mechanism fittable with a lock cylinder, a handle assembly comprising an inside locking latch activator articulated with the locking latch and the bolts and an independent outside locking latch activator articulated only with the locking latch; a locking latch sensor for selectively arresting the locking latch, and a deadbolt mechanism for locking the bolts at their extended, locked position.

2. A mortise lock according to claim 1, wherein the lock is a multi-functional lock fitted with a panic selector for selectively engaging the inside handle with the bolts regardless of whether or not the bolts are locked by the lock cylinder, and a handle selector for selectively engaging the outside handle with locking latch.

3. A mortise lock according to claim 2, wherein the handle assembly comprises a handle selector mechanism comprising in turn an inside locking latch activator operable by the inside handle, and a bolt activator selectively engageable with said inside locking latch activator by the panic selector, and a seperable outside locking latch activator selectively engageable with the outside handle by a handle selector knob.

4. A mortise lock according to claim 1, wherein the inside locking latch activator and the outside locking latch activator are coaxial and are separated from one another by a security plate.

5. A mortise lock according to claim 2, wherein the outside locking latch activator is selectively engageable with the outside handle via a coupling member fixed with the outside handle.

6. A mortise lock according to claim 5, wherein the coupling member is biased to retain the outside handle at its closed position.

7. A mortise lock according to claim 3, wherein when the outside locking latch activator is disengaged from the outside handle it is lockingly engaged with a casing of the handle selector mechanism.

8. A mortise lock according to claim 3, wherein when the inside locking latch activator is disengaged from the bolt activator, it is lockingly engaged with a casing of the handle selector mechanism.

9. A mortise lock according to claim 2, wherein the panic selector and the handle selector are displaceable between discrete positions.

10. A mortise lock according to claim 1, wherein the locking latch sensor operates in conjunction with a lock jamb supporting a door fitted with the lock, for engaging the locking latch and retaining it at its retracted position in case the door is open; however upon closing the door the locking latch will return to its locked, projecting position.

11. A mortise lock according to claim 10, wherein the inside handle activator is articulated with the locking latch by a bell crank, such that once the inside handle is depressed it will remain at its depressed position if the door is open, and the inside handle will return to its non depressed position upon closing the door.

12. A mortise lock according to claim 1, wherein the locking latch sensor comprises a spring biased plunger projecting from the front plate of the lock and formed with a cam surface followed by a spring biased locking arm designed to engage with the locking latch and arrest it at its retracted position when said plunger projects from the front panel.

13. A mortise lock according to claim 1, wherein the bolts comprise one or more face bolts projecting from the front plate of the mortise lock case housing and being displaceable along a first axis; and one or more secondary bolts projecting from the case housing and being restricted for displaceable about a second axis substantially perpendicular to said first axis.

14. A mortise lock according to claim 13, wherein the face bolts are articulated to a locking plate displaceable between a respective locked and an unlocked position, either by a key-operated lock cylinder or by the inside handle, said locking plate being restricted into axial displaceable in a plane along the first axis, and where the secondary bolts are each articulated to the locking plate by a link converting linear motion from said first axis into said second axis.

15. A mortise lock according to claim 1, wherein the locking latch has a rectangular cross-section.

16. A mortise lock according to claim 2, wherein the inside handle is permanently engaged with the locking latch and the outside handle is permanently disengaged from the one or more bolts; and wherein when the panic selector is activated the inside handle engages with the bolts and when the handle selector is activated the outside handle is engaged with the locking latch.

17. A mortise lock according to claim 1, where the locking latch and optional one or more face bolts projecting from the front plate of the mortise lock case housing, symmetrically extend at a locking stile of a door for fitting within left sided or right sided doors.

18. A mortise lock according to claim 1, further comprising a static bolt fixedly extending from the lock case housing through a hinge stile of a door for engagement with a corresponding aperture formed at a door jamb.

19. A mortise lock according to claim 3, wherein a locking plate is articulated by a crank lever to the bolt activator, whereby depressing the inside handle, when the panic selector is activated to engage the inside handle with bolts, result in axial displacement of the locking plate about said first axis.

20. A mortise lock according to claim 14, wherein the locking plate is fitted with a locking gear engaged to an actuating gear of the key-operated lock cylinder, and further there is provided a crank link coupling said locking gear with the locking plate, whereby rotating the lock cylinder entails axial displacement of the locking plate about said first axis.

21. A mortise lock according to claim 1, wherein rotating the lock cylinder beyond 360° entails retraction of the locking latch by a pivot lever articulated at one end with the locking latch and at an opposed end it is formed with a follower arm for engagement with a cam projection formed on the locking gear.

22. A mortise lock according to claim 20, wherein the crank link is pivotally articulated to the locking plate, with a degree of freedom along the first axis, such that the face bolts do not retract beyond the front plate even when the lock cylinder is rotated more then 360°.

23. A mortise lock according to claim 14, wherein the locking plate is restricted for axial displacement about said first axis by one or more axial grooves formed in the lock case, and corresponding follower projections formed on the locking plate.

24. A mortise lock according to claim 14, wherein the deadbolt mechanism comprises a locking piece restricted for axial displacement about the second axis between an upward, biased position and a downward position; the locking plate is formed with an abutting shoulder for abutting against a corresponding shoulder of the locking piece such as to prevent displacement of the locking plate, namely to prevent retraction of the face bolts.

25. A mortise lock according to claim 24, wherein the locking piece is displaced downward by a connecting lever pivotally coupled to a locking cog.

26. A mortise lock according to claim 25, wherein the locking piece is displaced by a cam of a cylinder engaging gear wheel which in turn is engaged with the lock cylinder.

27. A mortise lock comprising a mortise lock casing accommodating a handle assembly comprising a panic selector and a handle selector for selectively engaging an inside handle and an outside handle and controlling their function, a locking latch articulated to the handle assembly and to a locking latch sensor, one or more bolts manipulable by a locking plate and being displaceable between an open position and a locked position, and a deadbolt mechanism for locking face bolts extending from said locking plate at their extended, locked position.

28. A mortise lock according to claim 14, wherein the deadbolt mechanism comprises a locking block fixed within the mortise lock case, a bridge member fixedly attached to the face bolts and being articulated to the locking plate with limited degree of freedom along the first axis, a locking piece articulated to the locking plate and having limited degree of freedom along the second axis; said locking piece being articulated to the bridge member by a motion converting mechanism such that axial displacement of the bridge member about said first axis entails corresponding axial displacement of the locking piece about said second axis, whereby when the face bolts are at their extended, locked position, the locking piece is lockingly engaged with the locking block, and where retracting the face bolts entails disengagement of the locking piece from the locking block.

29. A mortise lock according to claim 28, wherein the motion converting mechanism is in the form of an engagement member projecting from one of the bridge member and the locking piece, and an inclined slot formed in the other of said bridge member and the locking piece and slidingly receiving said engagement member.

30. A mortise lock according to claim 28, wherein the locking block is formed with a gliding surface and an arresting shoulder, and the locking piece is formed with a sliding portion formed with a locking edge, wherein when at the locked position of the face bolts the locking edge is arrested by the arresting shoulder; and during displacement of the face bolts between a retracted, open position, and an extended, locked position, the sliding portion smoothly slides over said gliding surface.

31. A mortise lock according to claim 28, wherein the locking piece is articulated to the locking plate by an engagement member projecting from one of the locking plate and the locking piece, and a slot extending along said second axis, formed in the other of said locking plate and the locking piece and slidingly receiving said engagement member.

32. A mortise lock according to claim 28, wherein the bridge member is articulated to the locking plate by an engagement member projecting from one of the locking plate and the bridge member, and a slot extending along said first axis, formed in the other of said locking plate and the bridge member and slidingly receiving said engagement member.

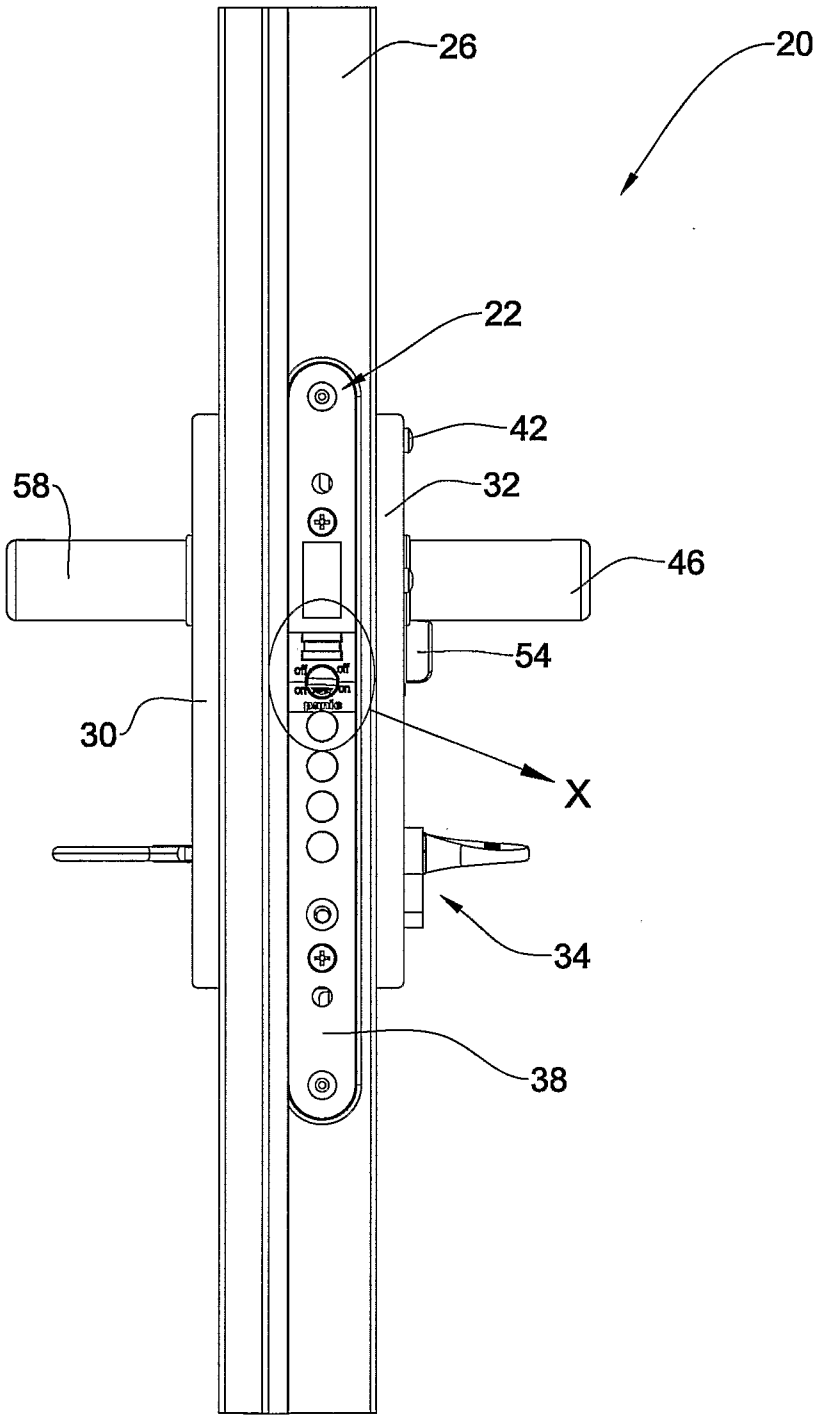

Fig. 1

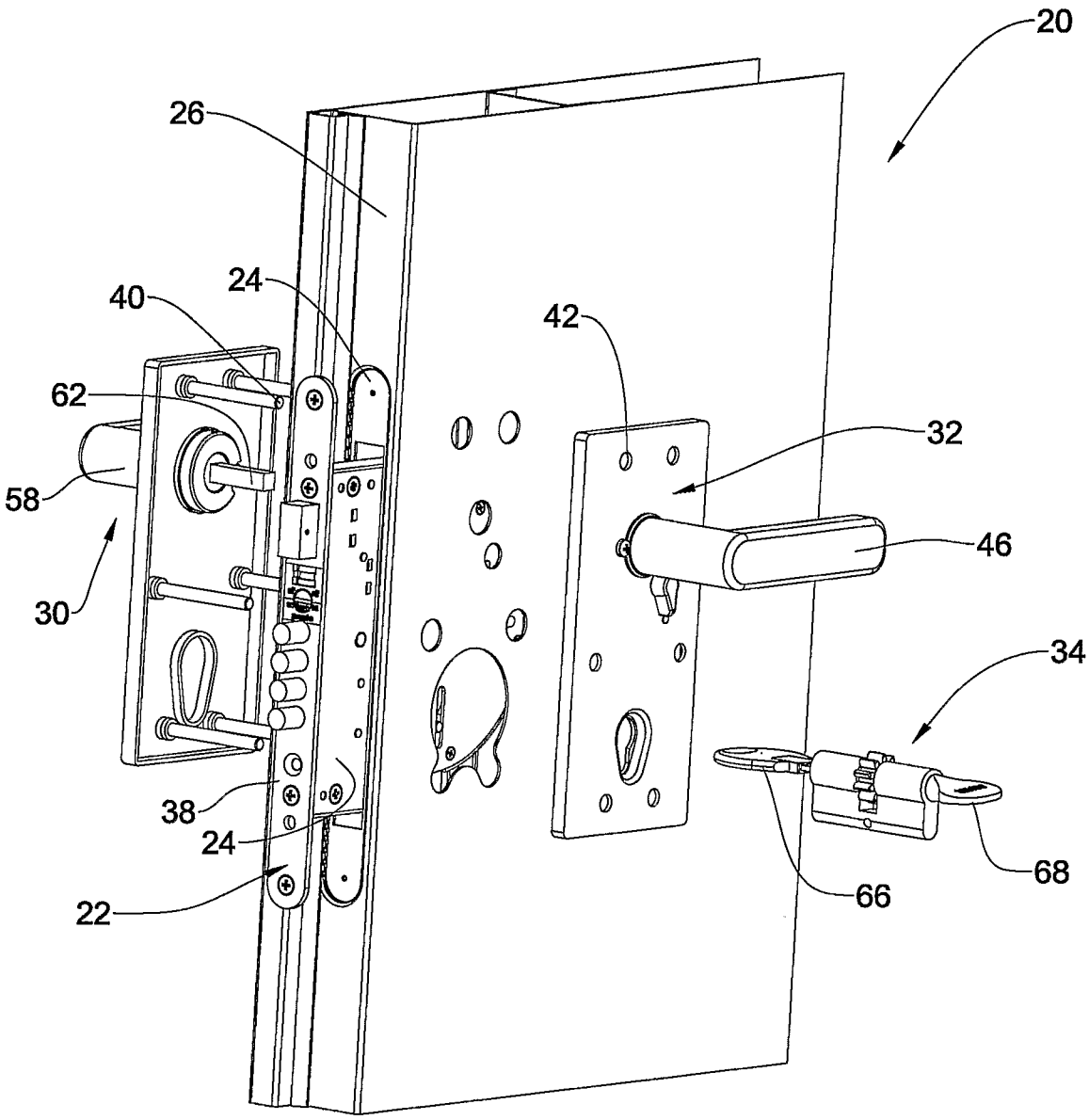

Fig. 2

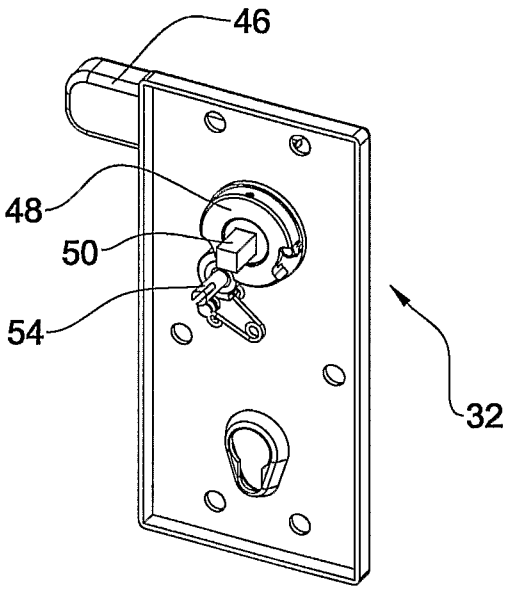

Fig. 3A

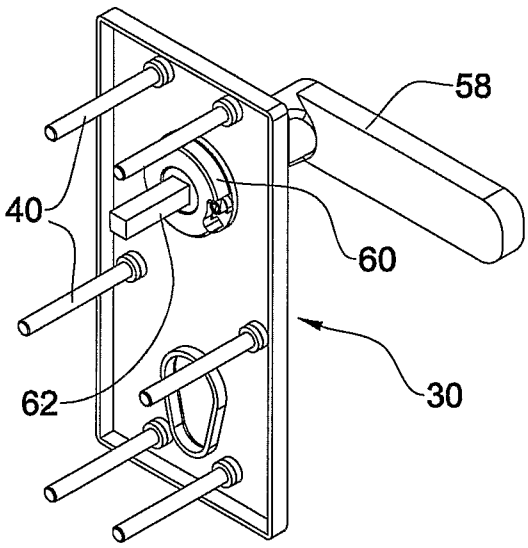

Fig. 3B

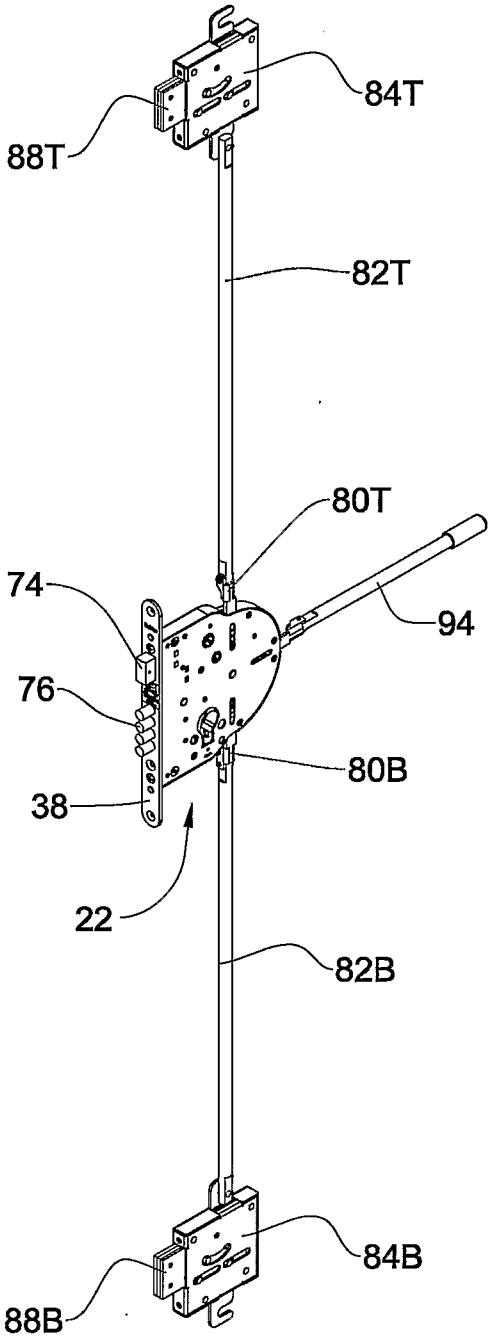

Fig. 4

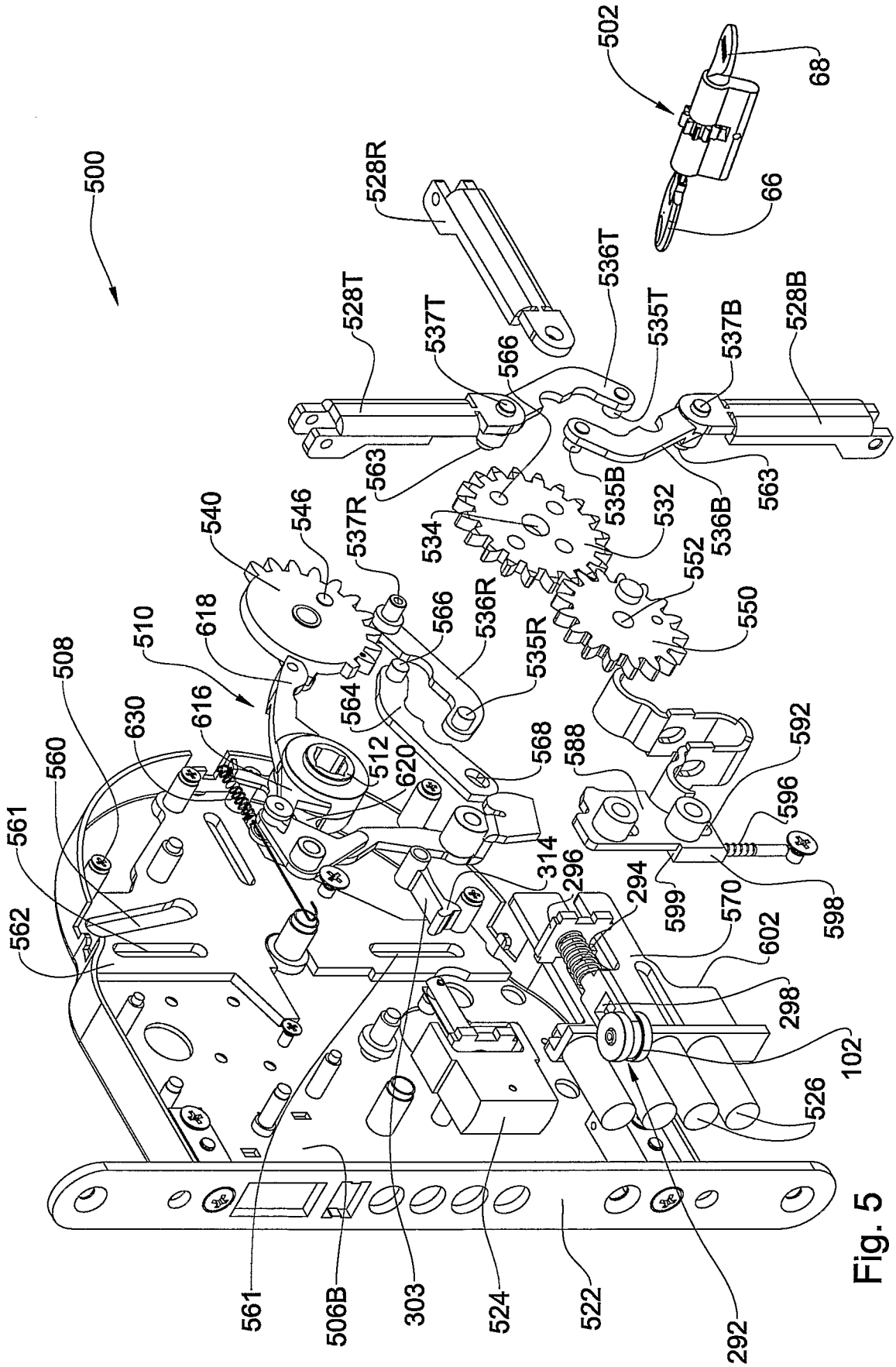
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Fig. 5

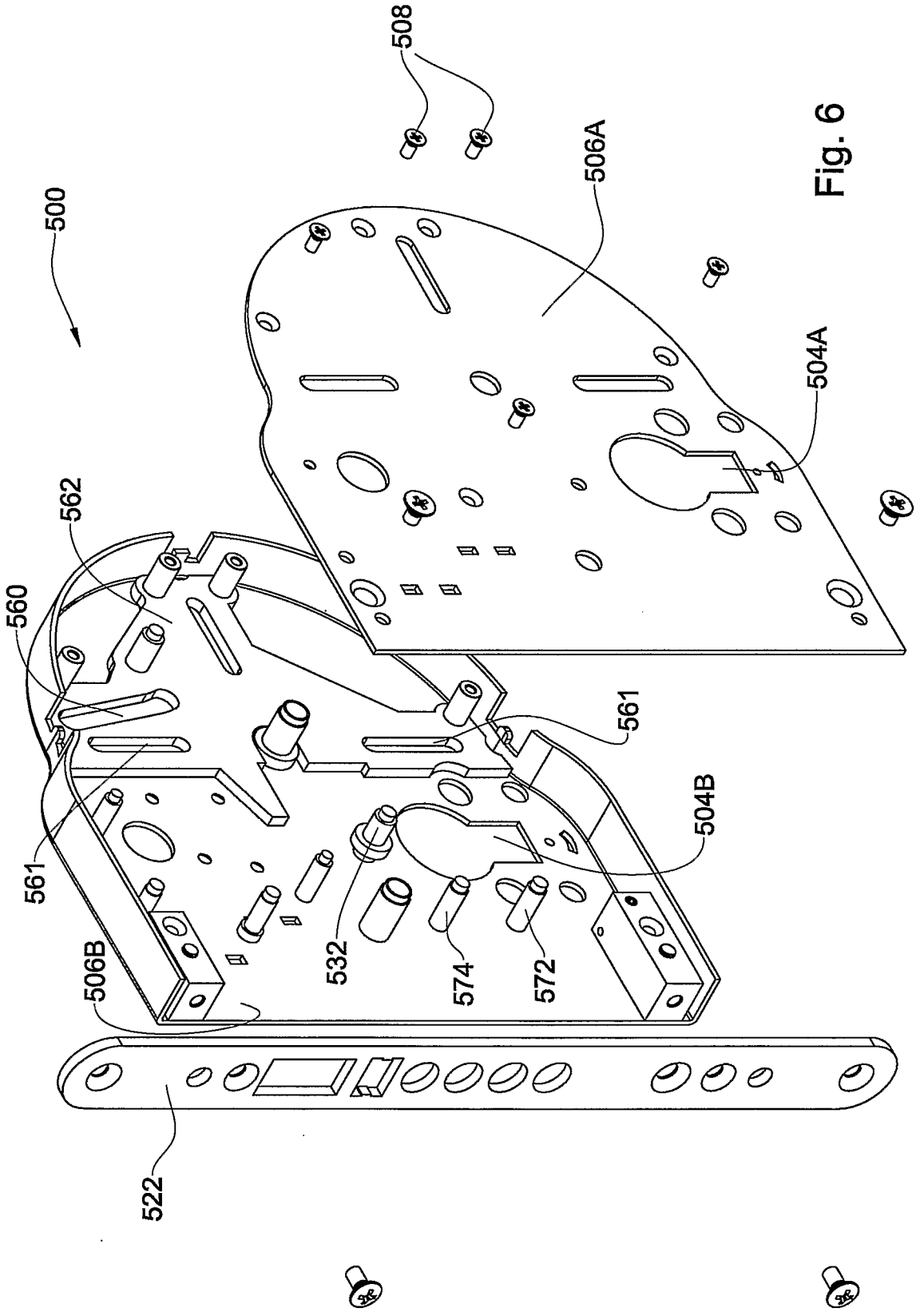
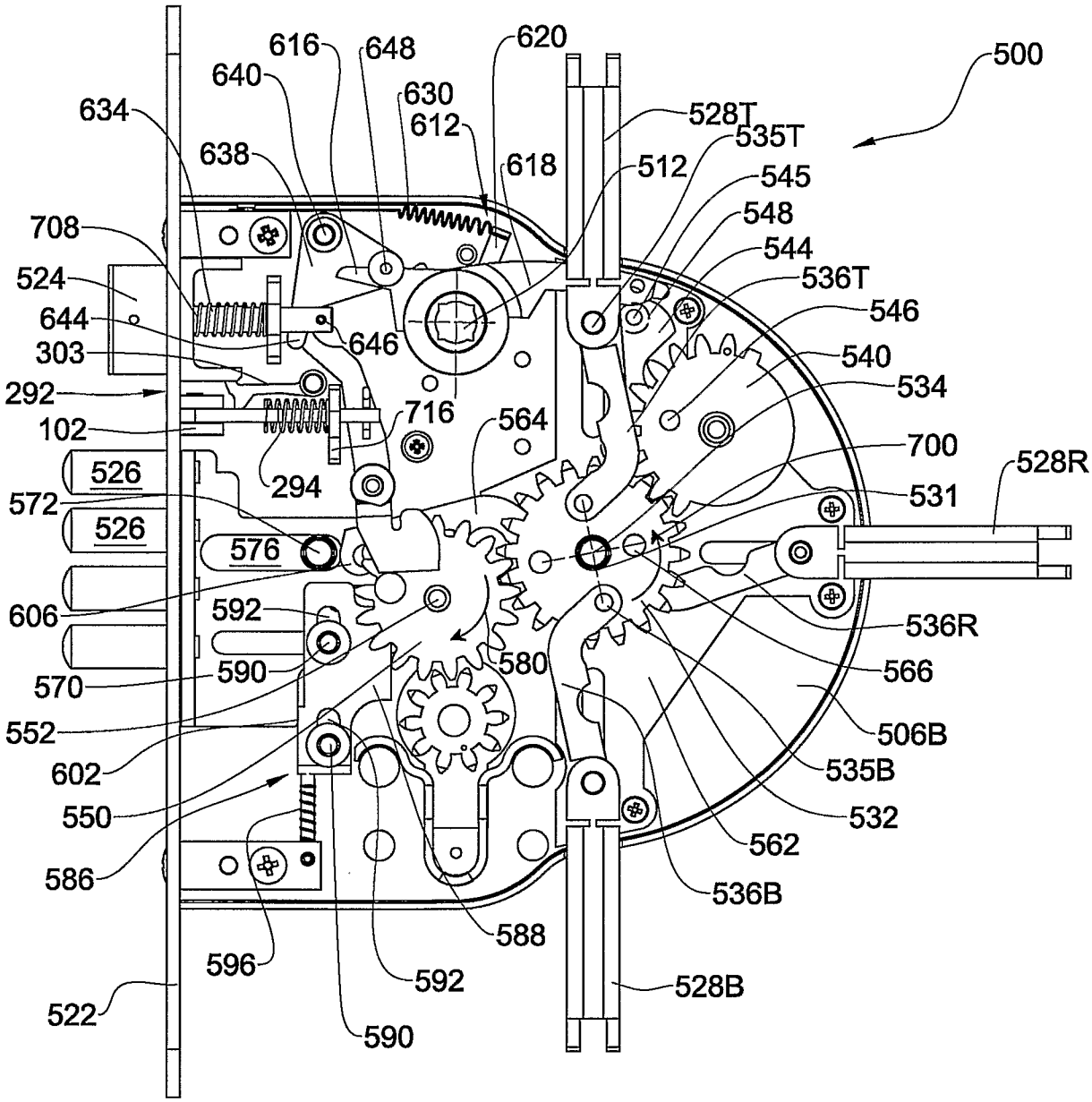


Fig. 6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536R
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506B
535B
532
562
536B
528B
588
592
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522
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586
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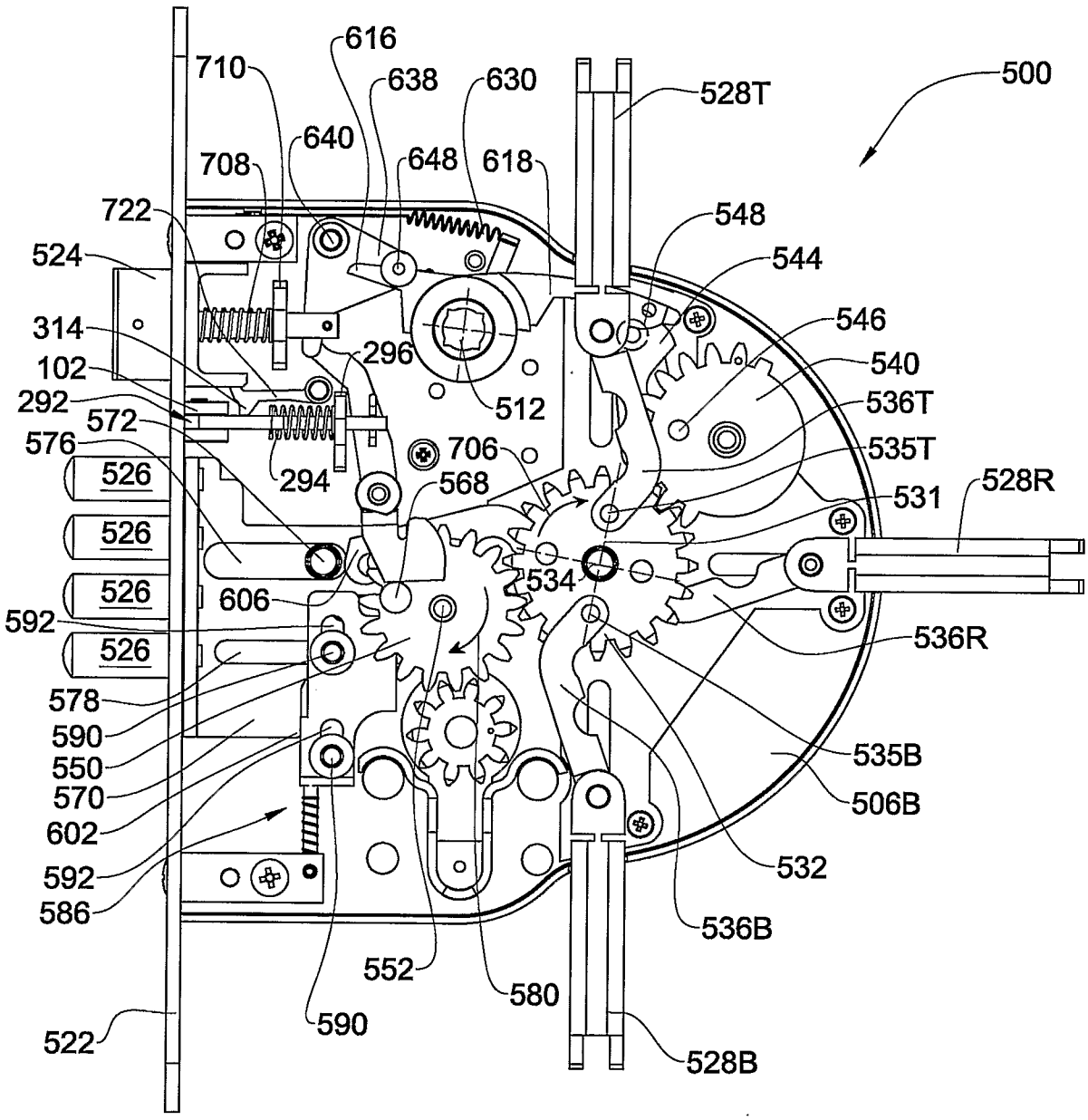
Fig. 7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606
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536R
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Fig. 8

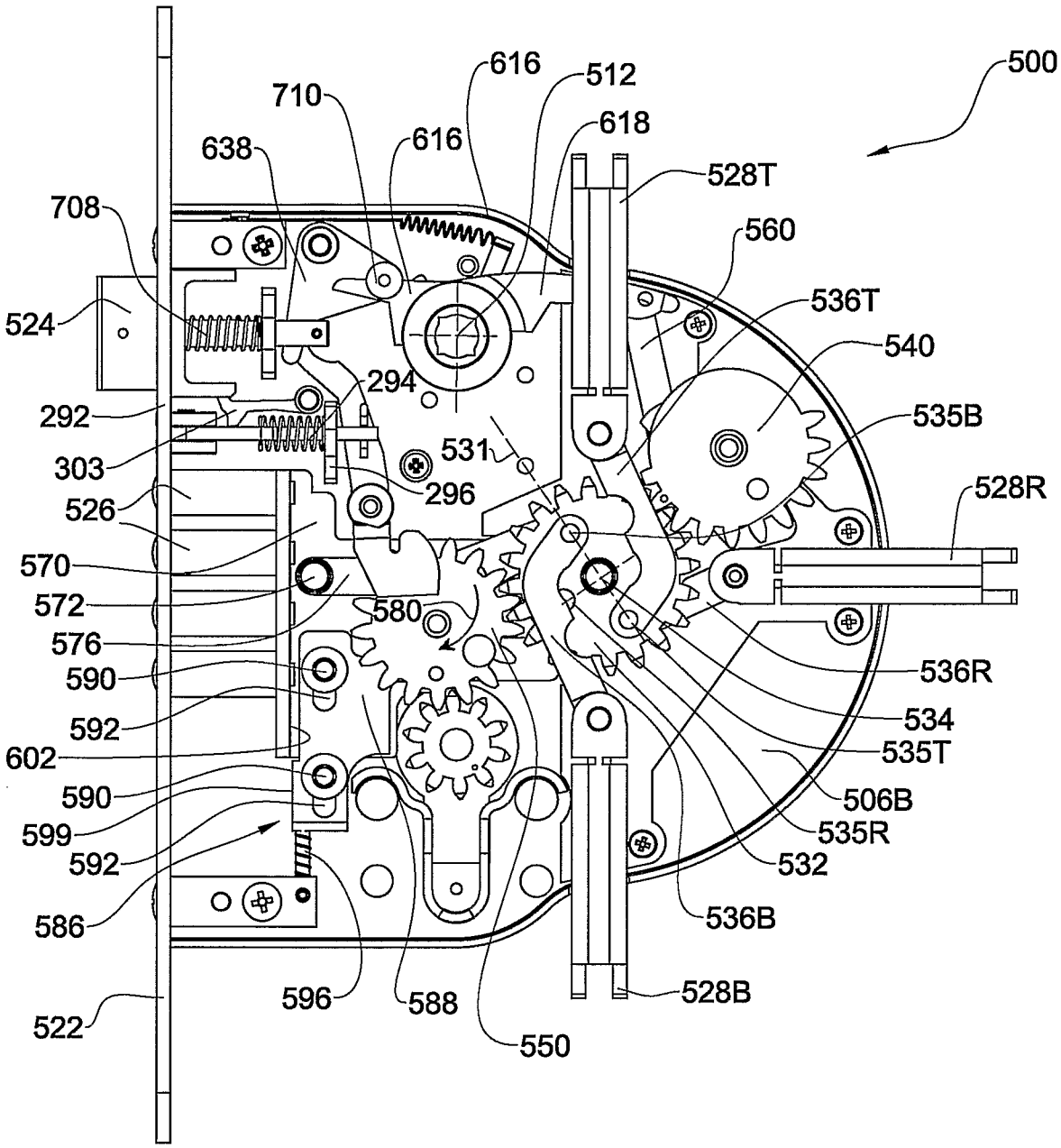
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Fig. 9

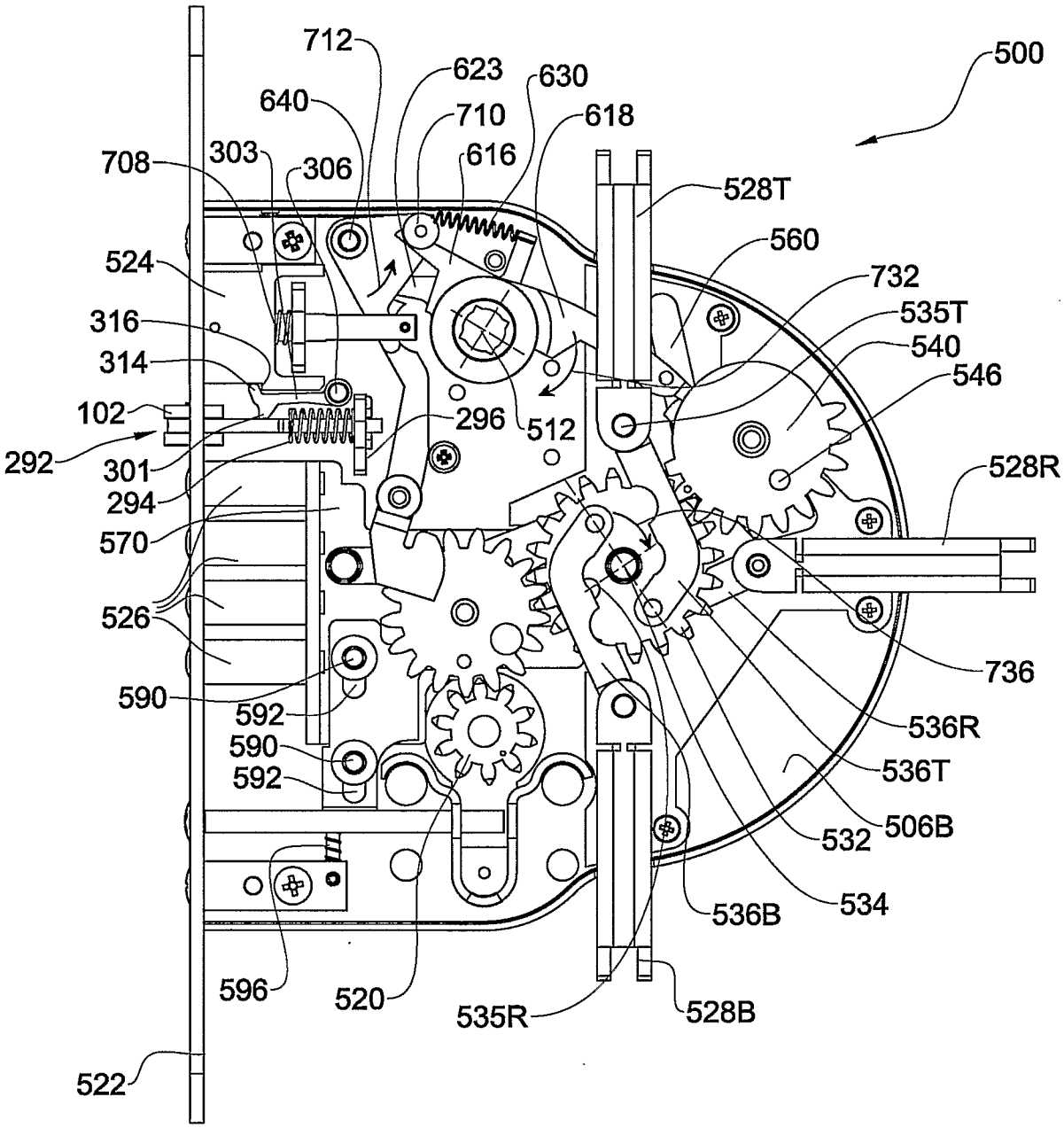
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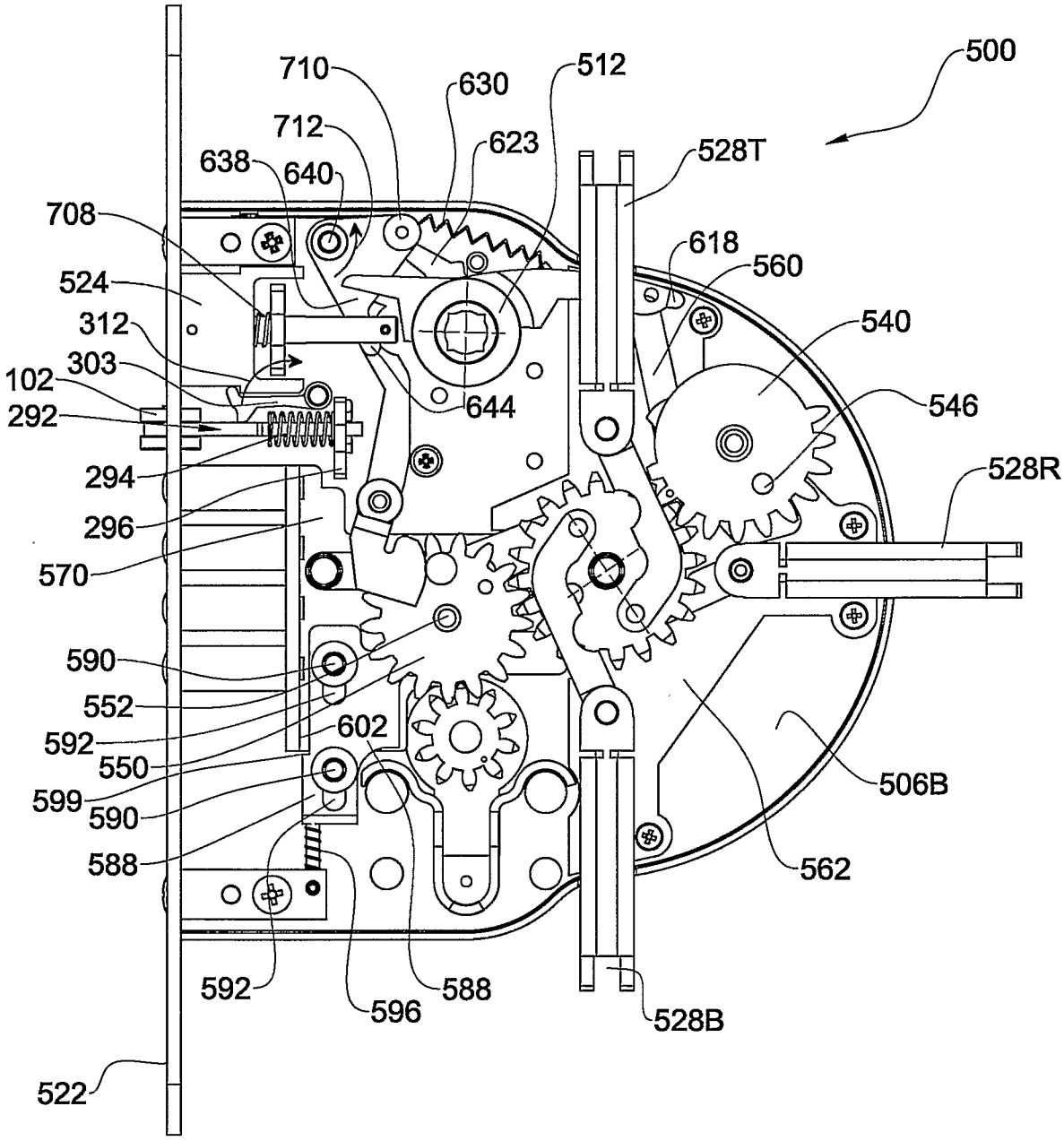
Fig. 10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528B
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FIG. 11

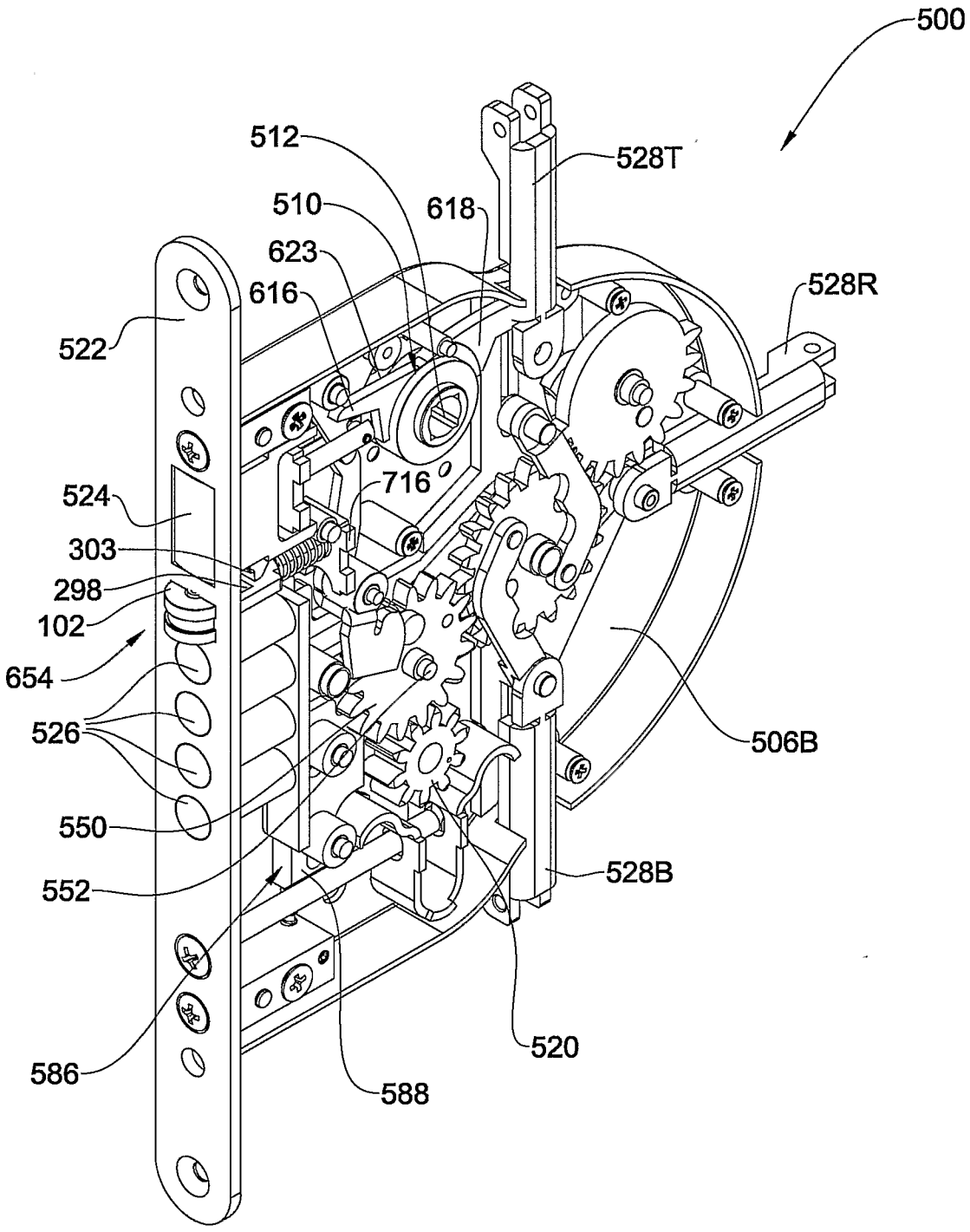
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Fig. 12

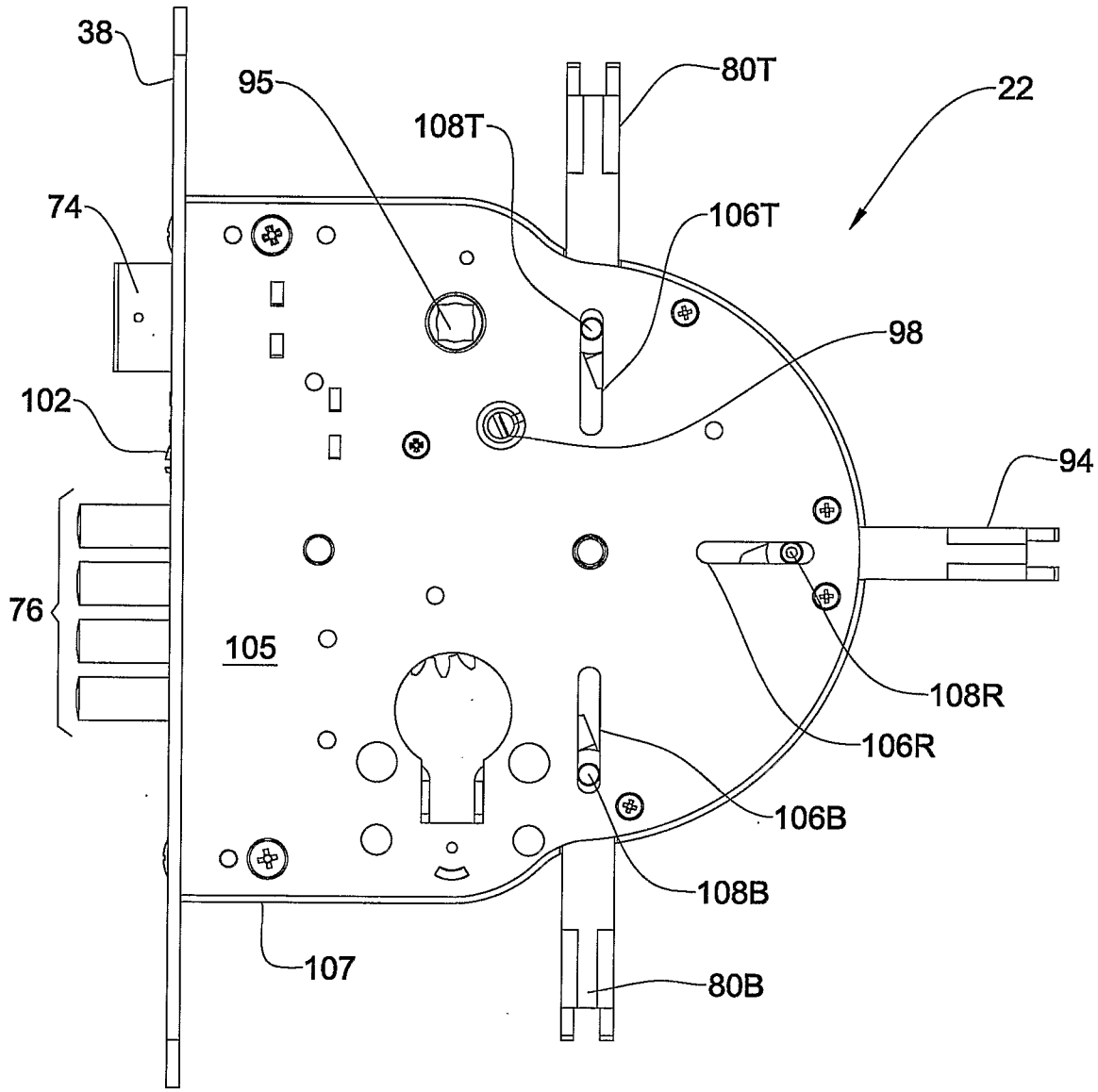
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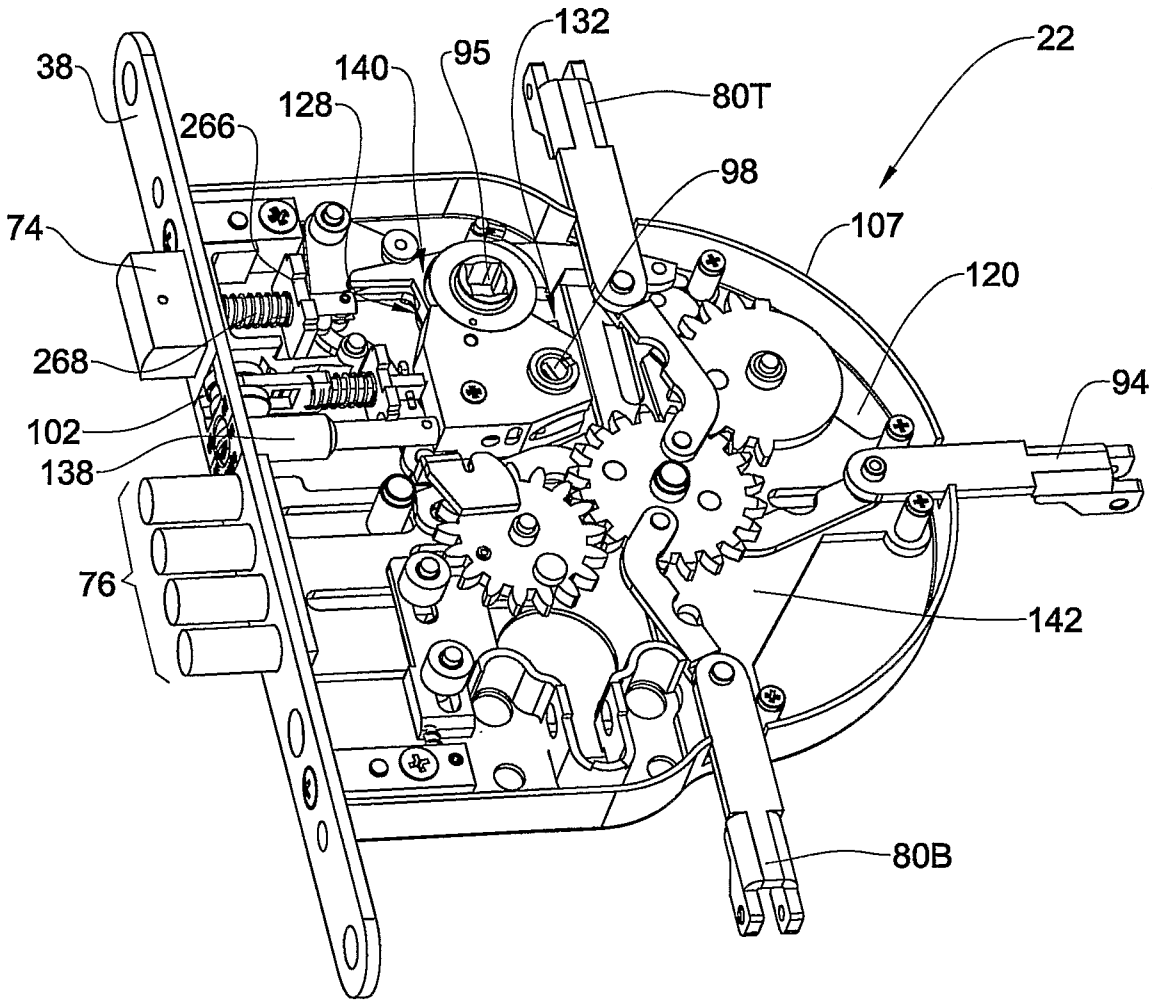
FIG. 13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80B

Fig. 14

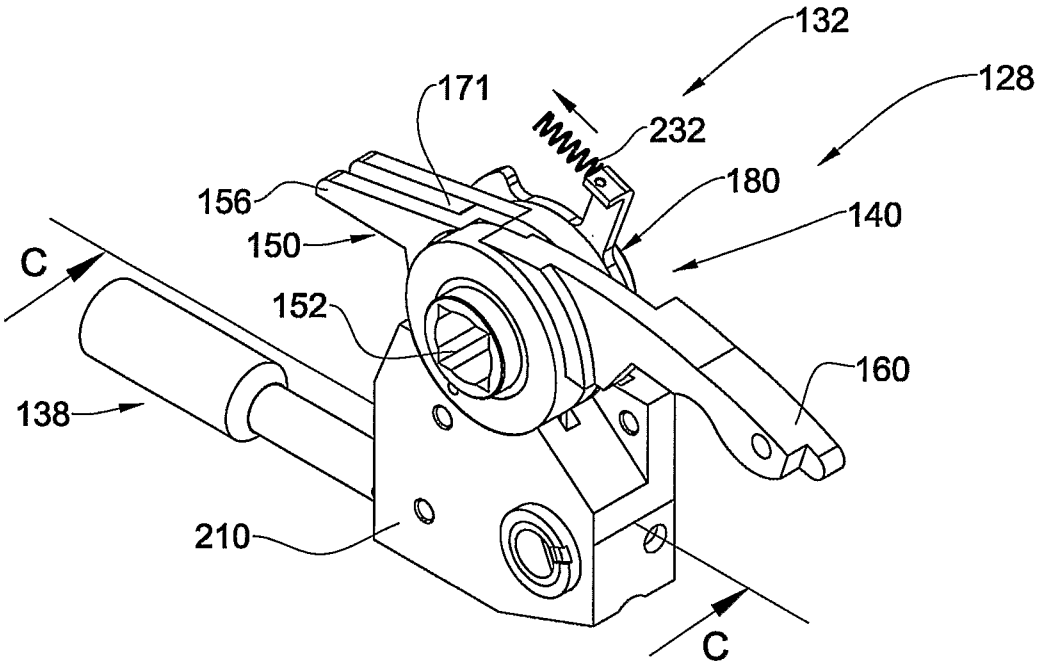

Fig. 15A

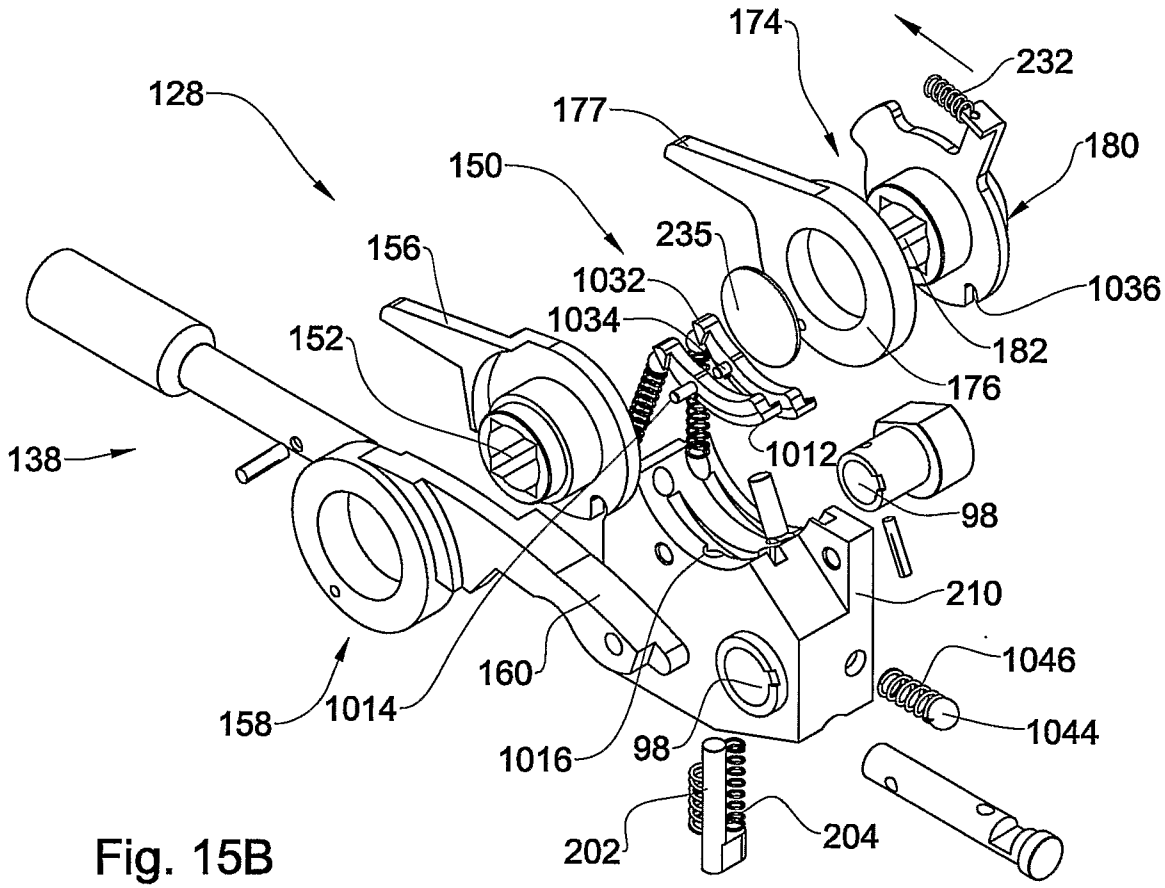

Fig. 15B

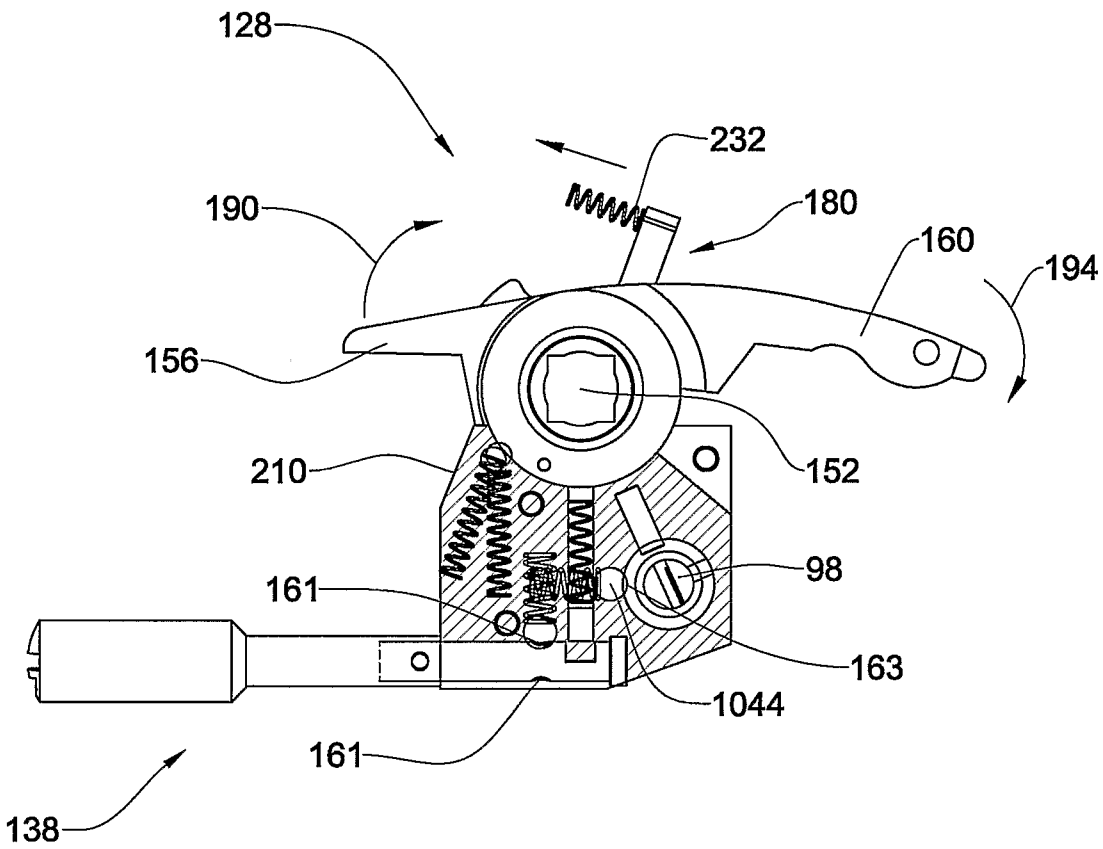

Fig. 15C

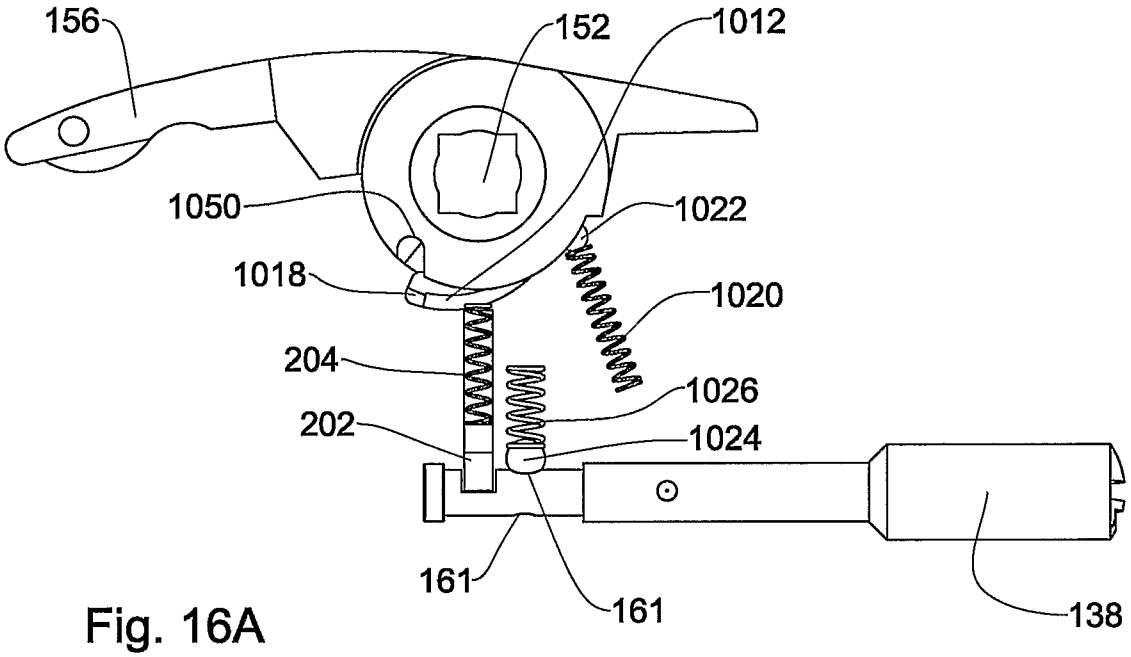

Fig. 16A

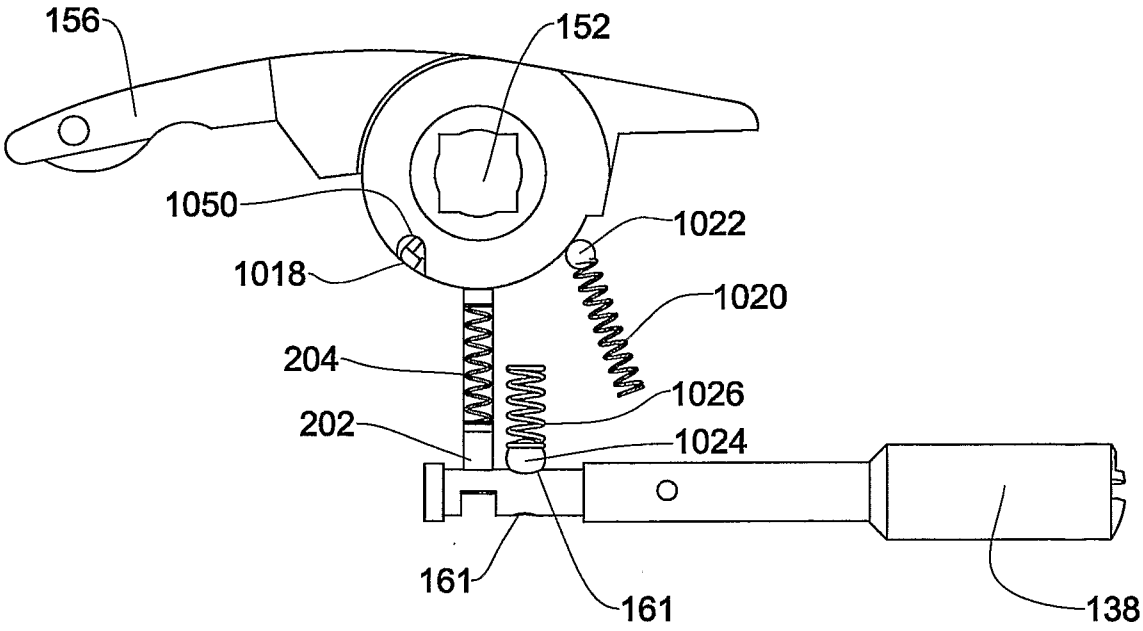

Fig. 16B

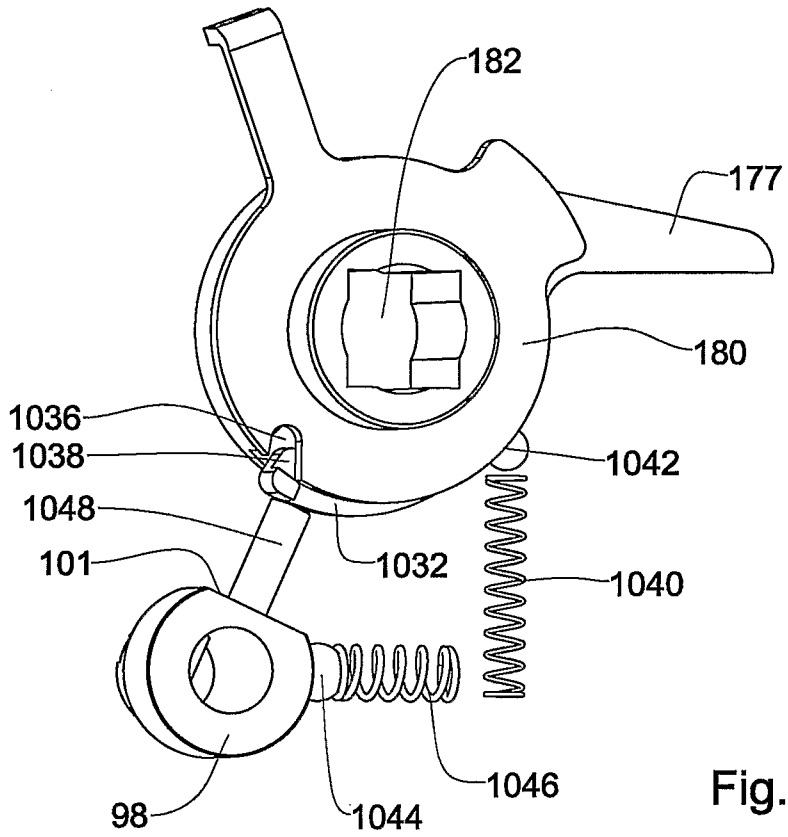

Fig. 17A

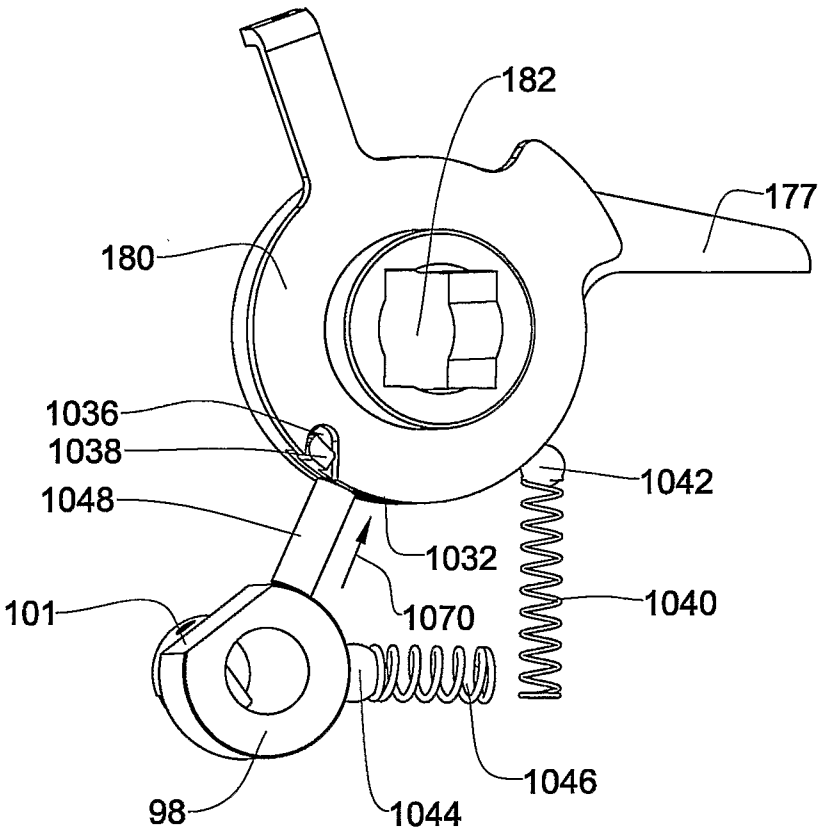

Fig. 17B

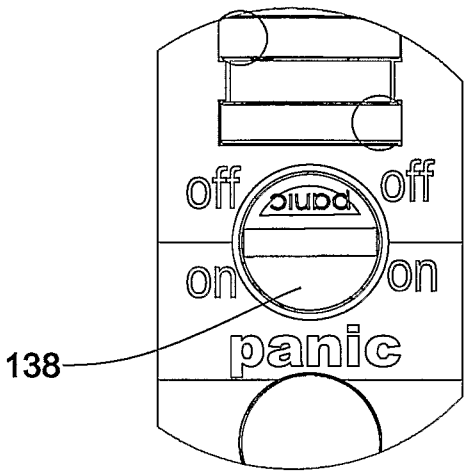

Fig. 18A

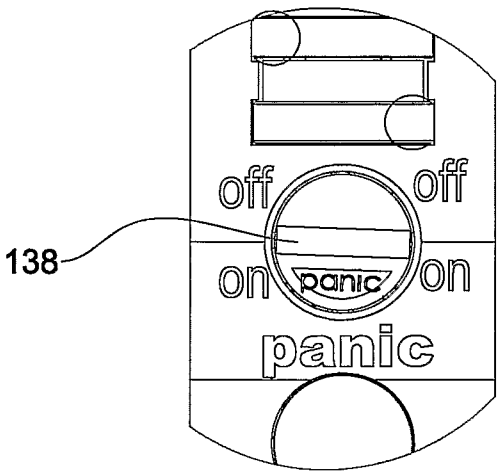

Fig. 18B

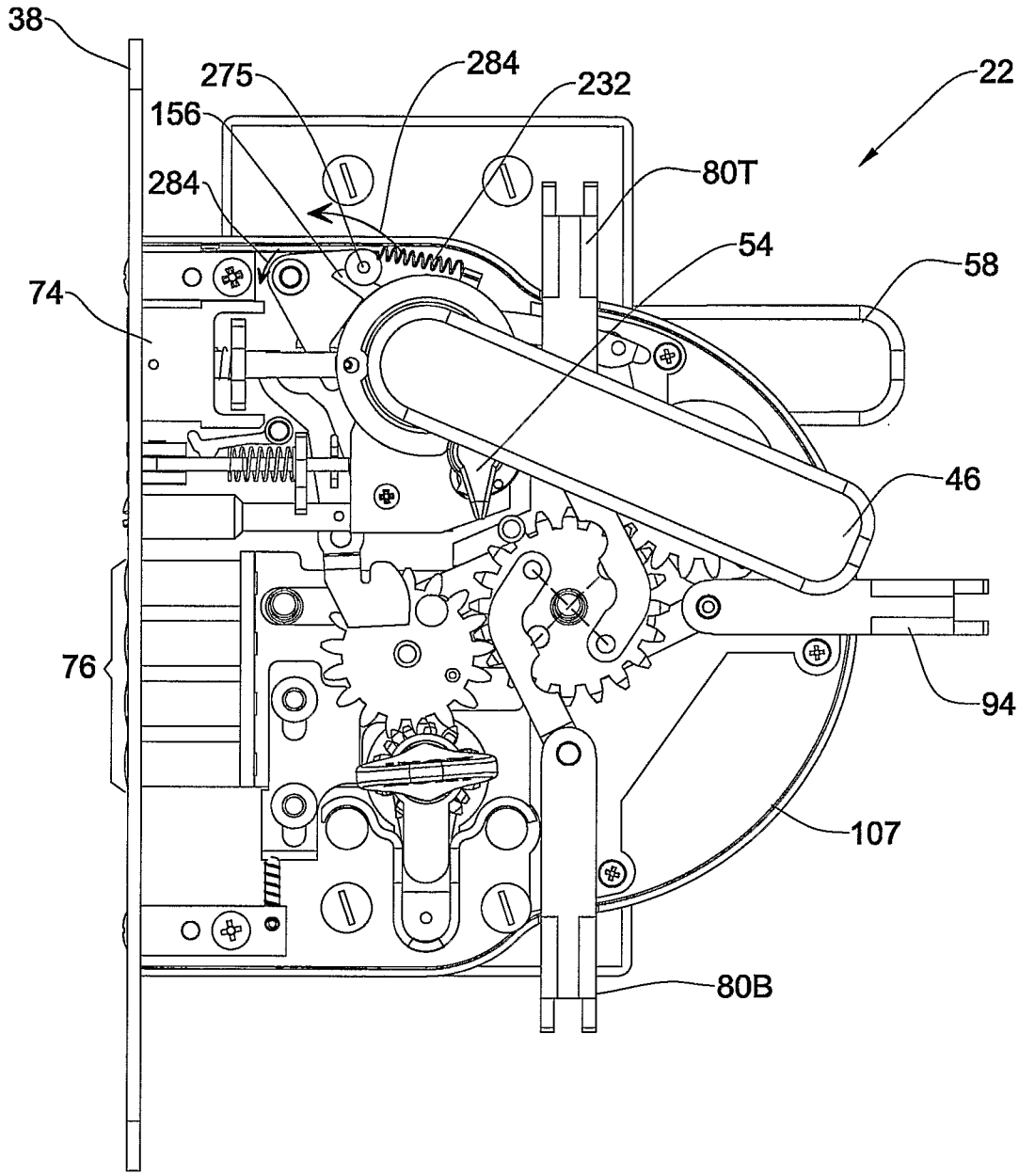

Fig. 19

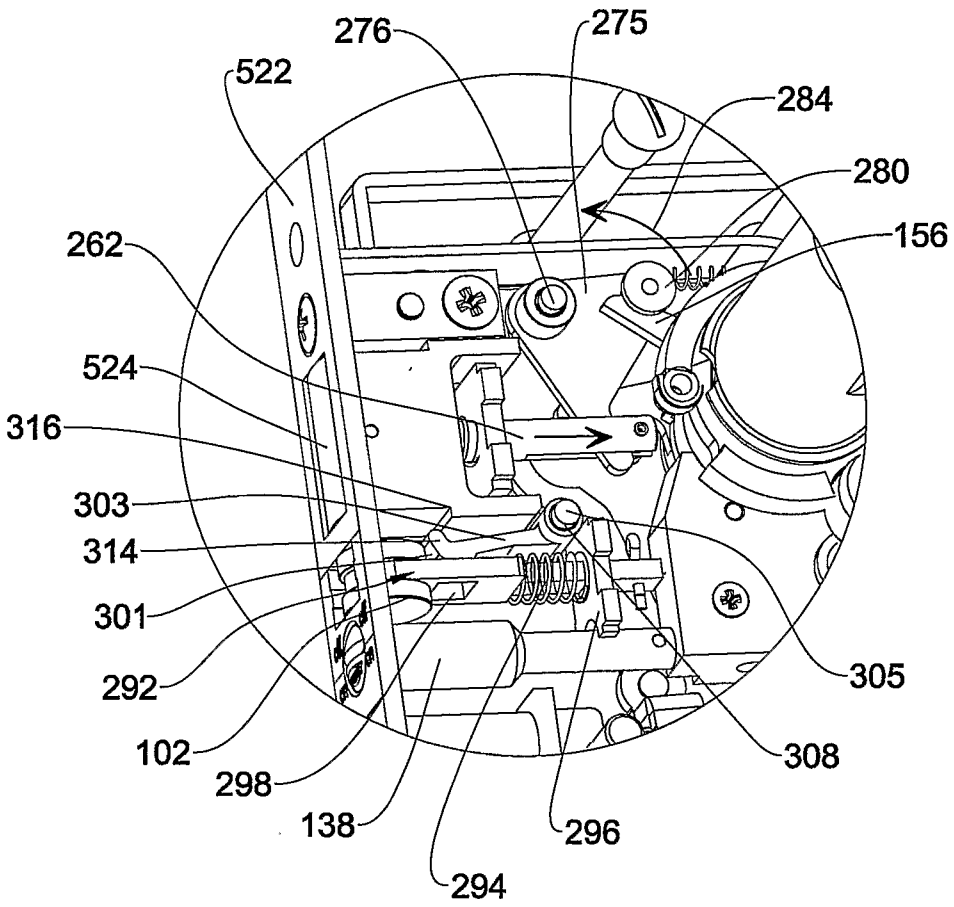
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Fig. 20

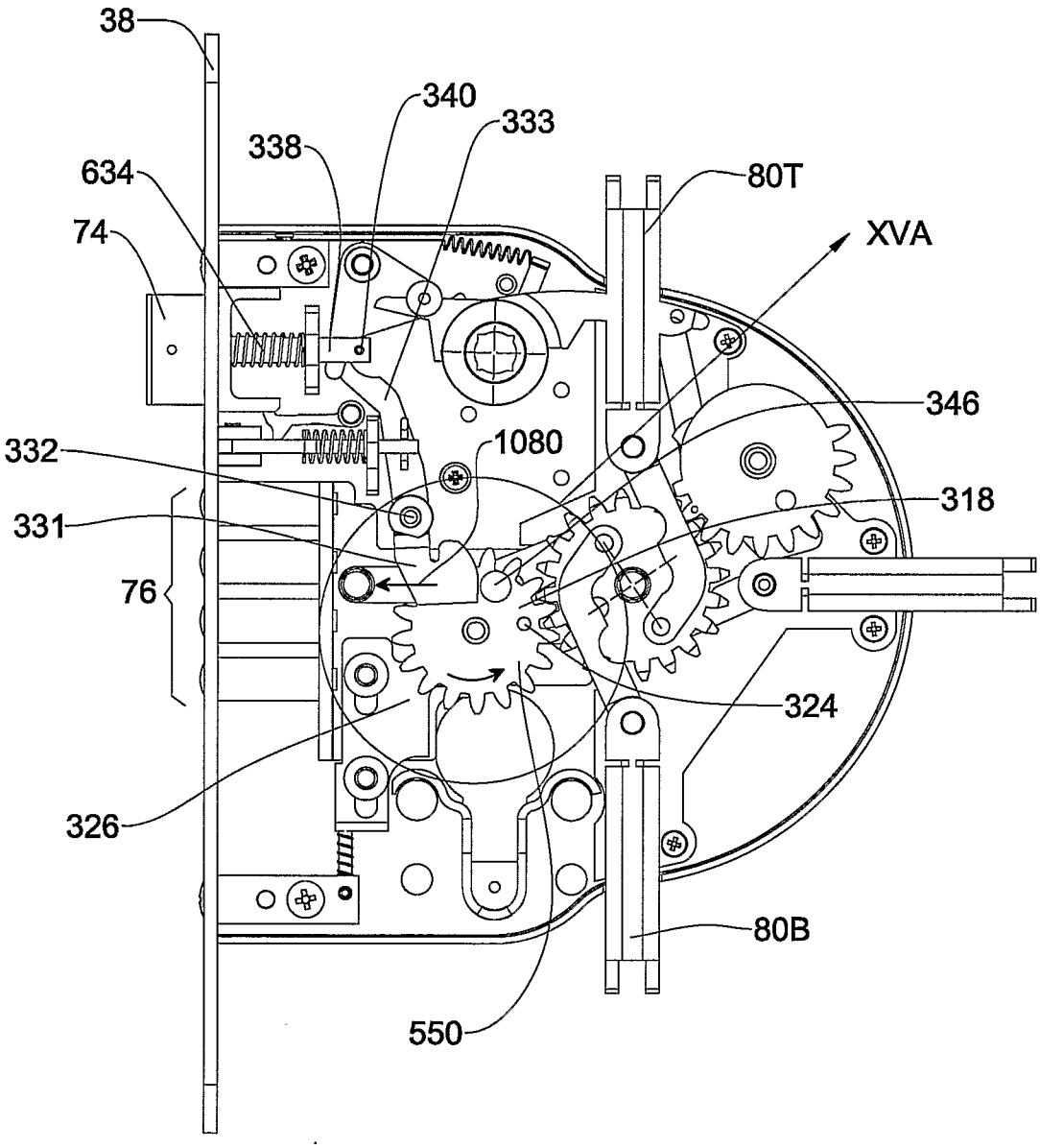
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Fig. 21A

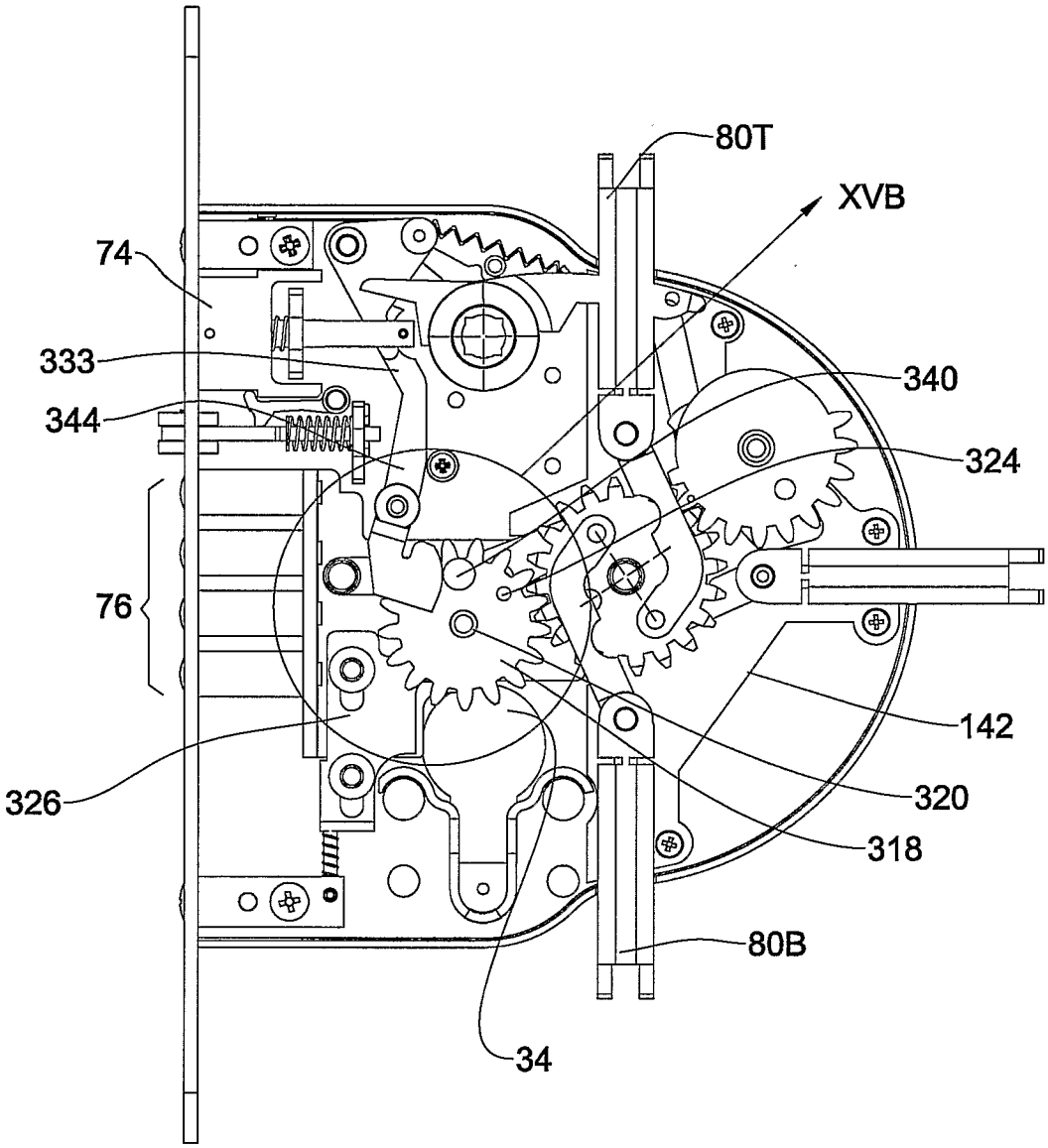


Fig. 21B

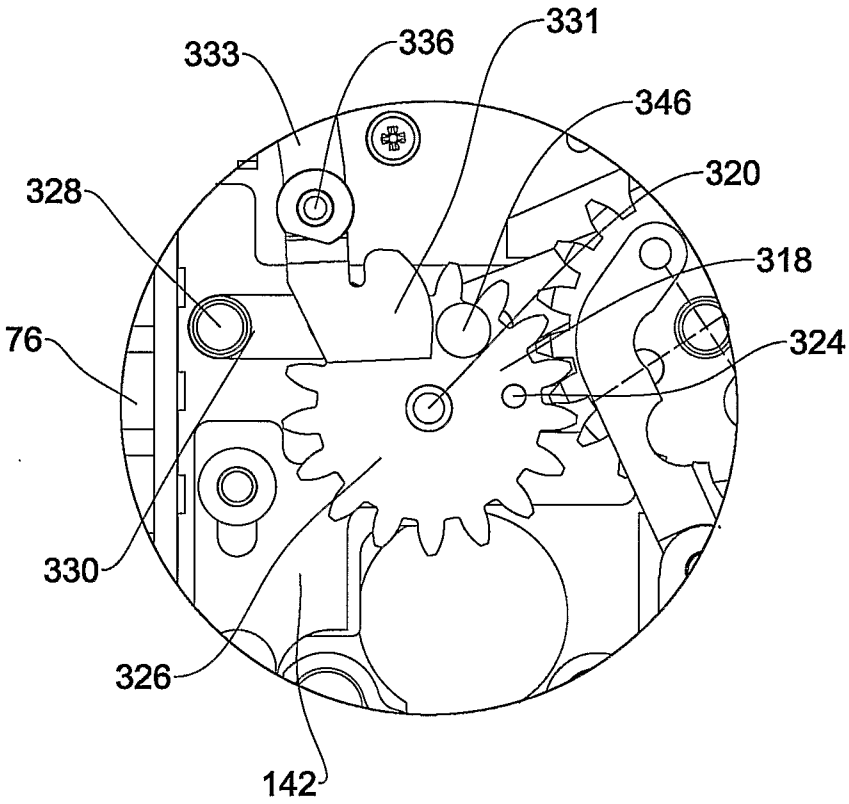


Fig. 22A

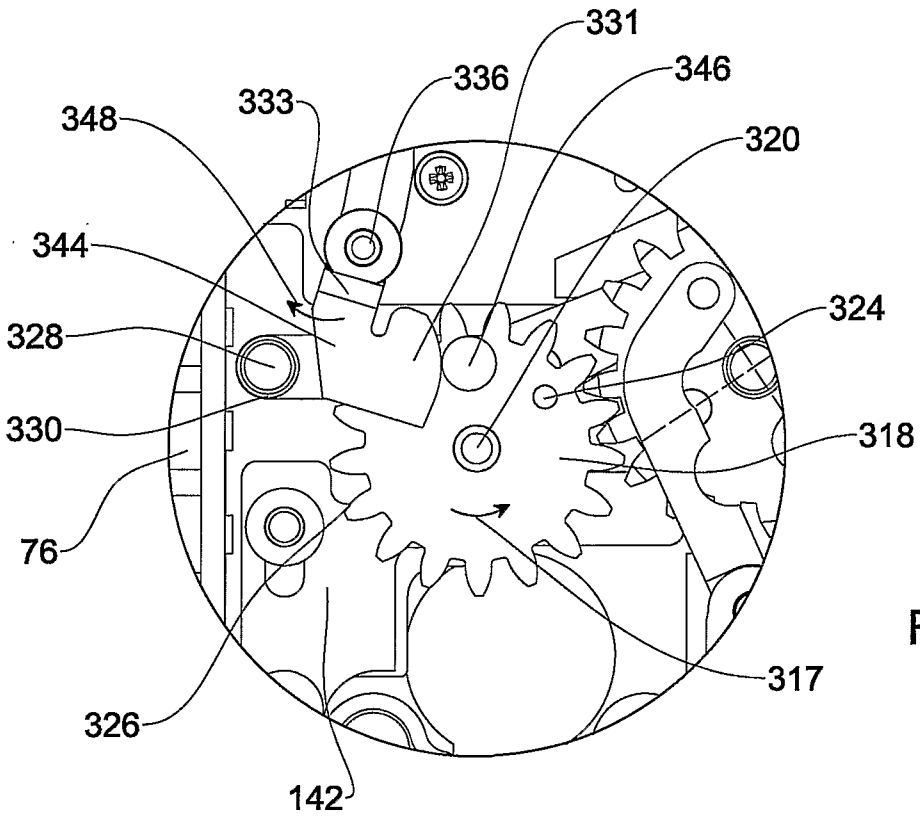


Fig. 22B

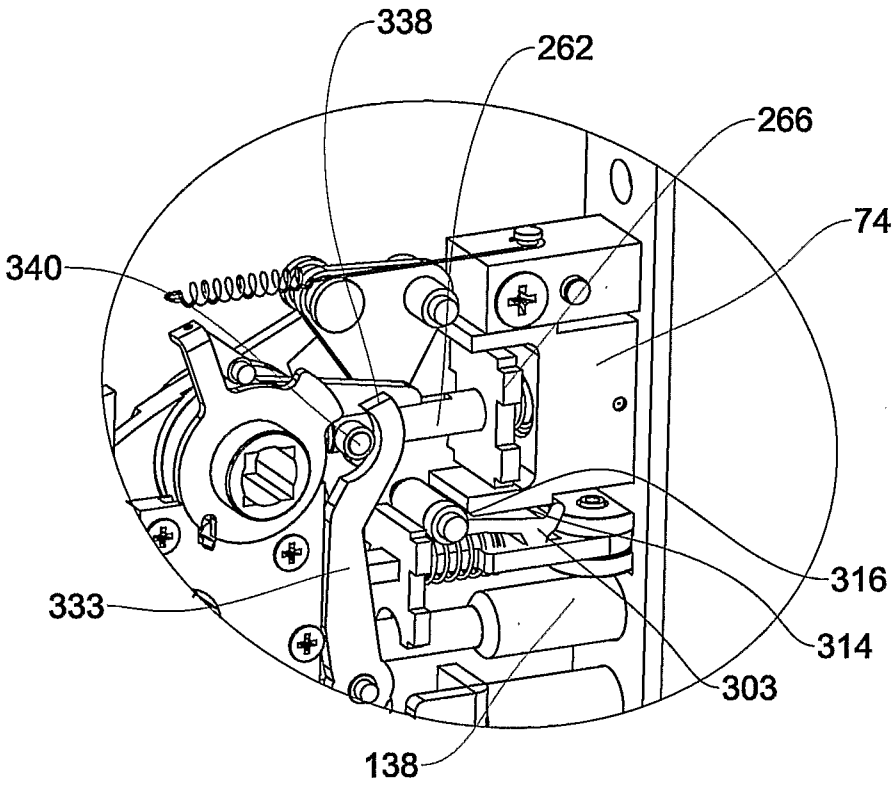


Fig. 23

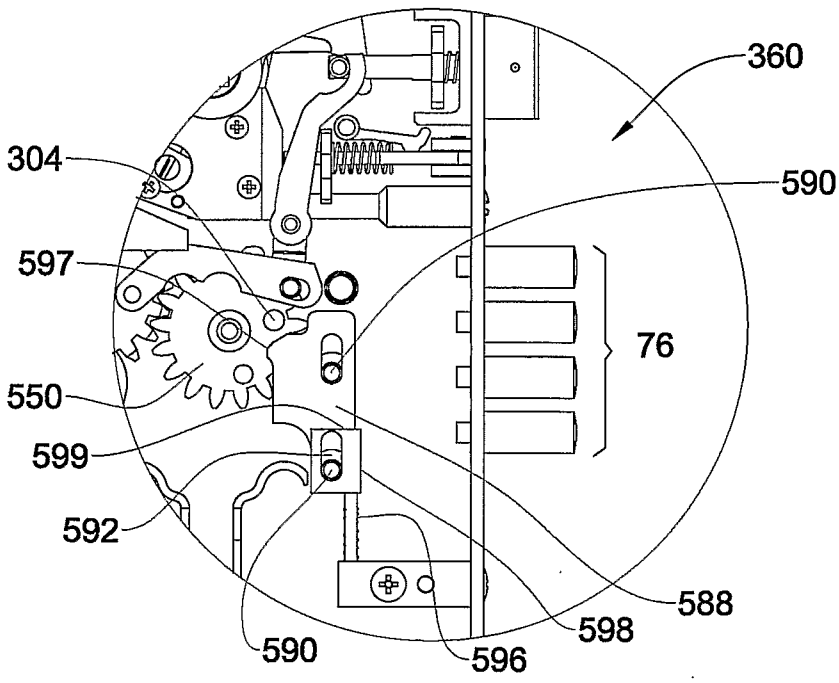


Fig. 24A

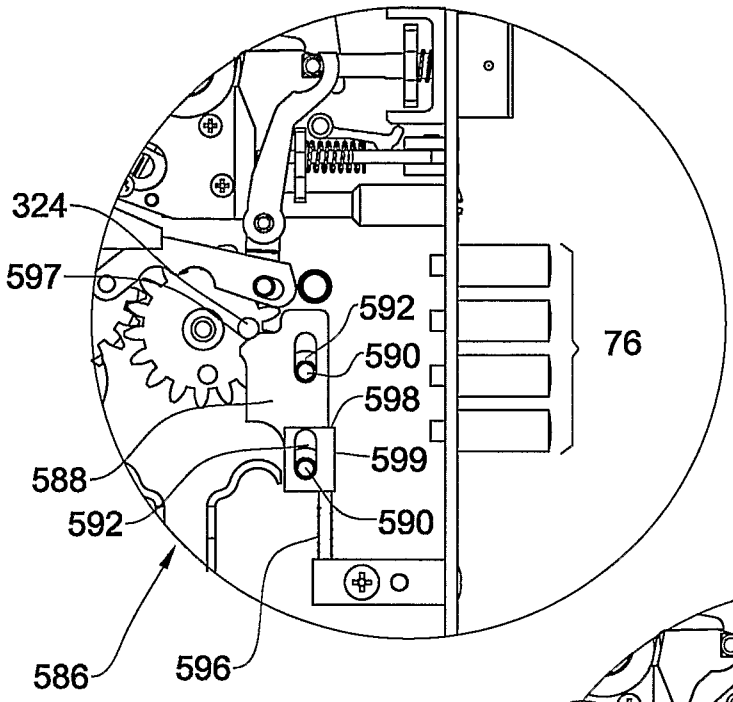


Fig. 24B

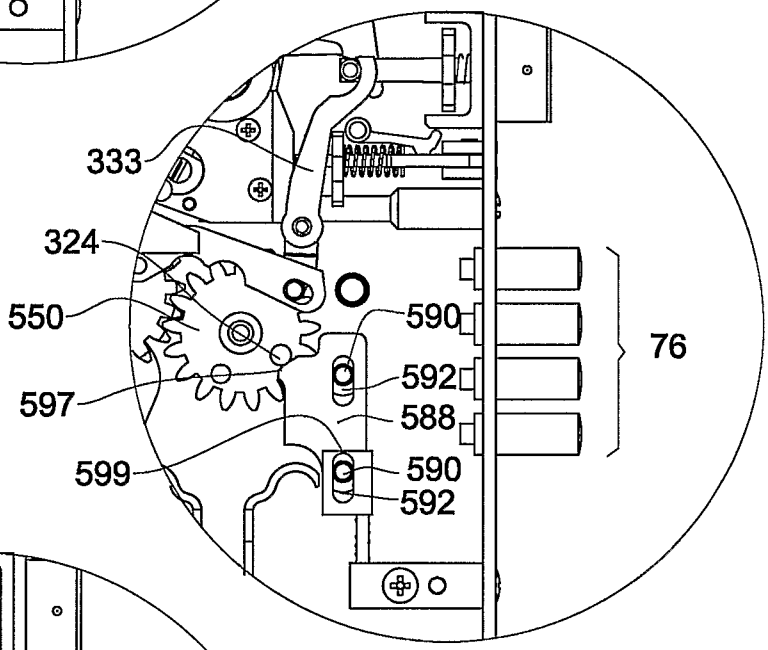


Fig. 24C

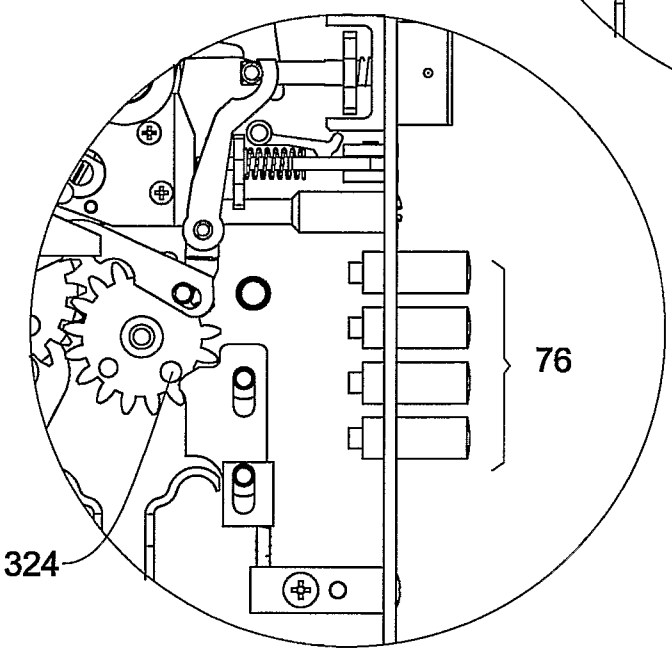


Fig. 24D

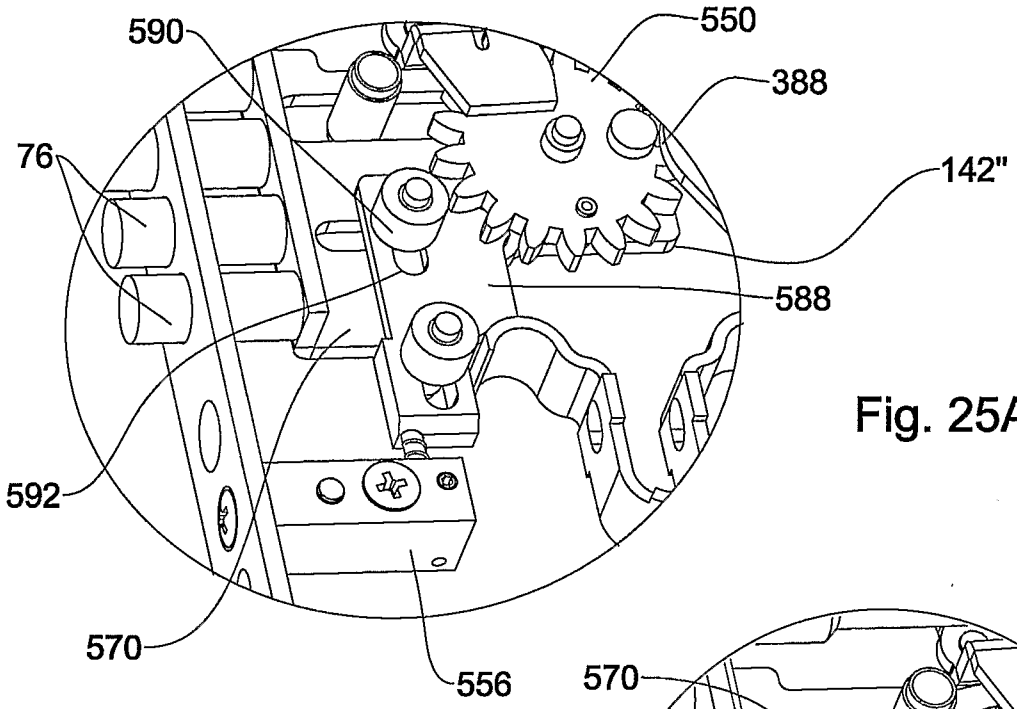
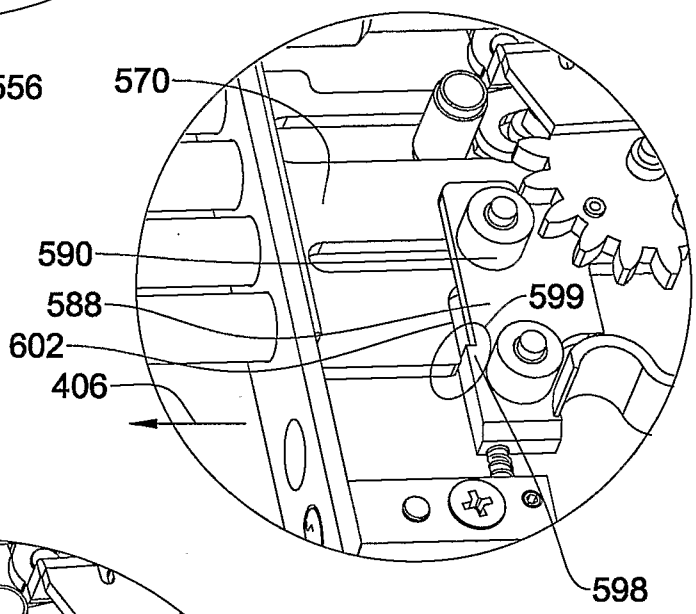


Fig. 25A

Fig. 25B



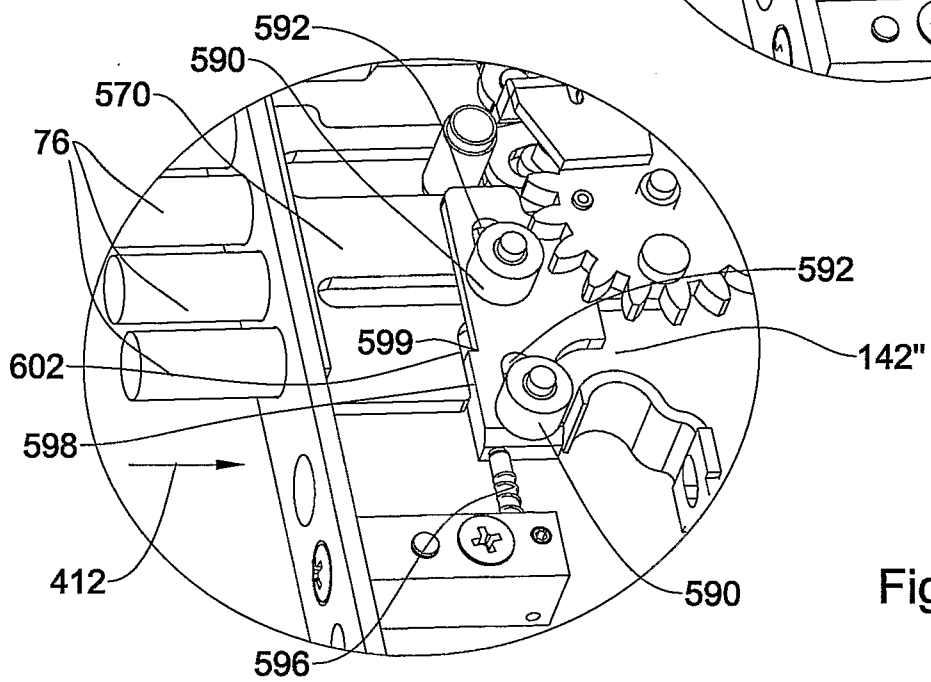


Fig. 25C

INTERNATIONAL SEARCH REPORT

International application No
PCT/IL2006/000746

A. CLASSIFICATION OF SUBJECT MATTER
INV. E05B65/10 E05B63/20 E05C9/04 E05C9/00
ADD. E05B63/00 E05B17/20 E05B59/00 E05B15/10 E05B63/16
E05C9/18 E05C9/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
E05B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 651 466 B1 (SHIH SIMON [TW]) 25 November 2003 (2003-11-25) column 2, line 21 - line 27 column 3, line 5 - line 8 column 3, line 19 - line 22 column 3, line 41 - line 49 column 3, line 63 - column 4, line 62 figures 1-7	27
A	DE 36 31 118 A1 (BKS GMBH [DE]) 24 March 1988 (1988-03-24) column 2, line 47 - line 52 column 4, line 42 - column 6, line 8 figures 1,3,4	1

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
26 October 2006	09/11/2006

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Bitton, Alexandre

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No
PCT/IL2006/000746

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 101 29 759 A1 (GRUNDMANN BESCHLAGTECHNIK GMBH [AT]) 17 January 2002 (2002-01-17) column 2, line 36 - line 44 figures 1,2	1
A	DE 197 07 762 C1 (FUSS FRITZ GMBH & CO [DE]) 16 April 1998 (1998-04-16) column 3, line 66 - line 68 figure 1	1
A	EP 0 620 341 A (ITALIANA SERRATURE AFFINI [IT]) 19 October 1994 (1994-10-19) column 3, line 18 - line 33 figures 1-5	2,9,16, 27
A	US 4 154 070 A (BAHRY ABRAHAM [IL] ET AL) 15 May 1979 (1979-05-15) cited in the application the whole document	13,14, 20,22-26
A	DE 44 07 244 C1 (FUSS FRITZ GMBH & CO [DE]) 17 August 1995 (1995-08-17) column 3, line 7 - line 11 column 4, line 5 - line 11 figures 1-5	1
A	DE 405 226 C (ADOLF KIRSTEIN) 29 October 1924 (1924-10-29) the whole document	1
A	FR 2 832 447 A (LAPERCHE SA [FR]) 23 May 2003 (2003-05-23) page 4, line 27 - page 5, line 2 page 7, line 1 - line 8 figures 1,2	1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IL2006/000746

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FR 2832447 A	23-05-2003	NONE	