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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
10 November 2022 (10.11.2022)

WIPO | PCT

(10) International Publication Number
WO 2022/234499 A1

(51) International Patent Classification:
E05F 3/10 (2006.01) *E05D 7/00* (2006.01)
E05D 5/02 (2006.01) *E05F 3/12* (2006.01)

(21) International Application Number:
PCT/IB2022/054145

(22) International Filing Date:
05 May 2022 (05.05.2022)

(25) Filing Language: Italian

(26) Publication Language: English

(30) Priority Data:

102021000011666	06 May 2021 (06.05.2021)	IT
102021000011669	06 May 2021 (06.05.2021)	IT
102021000011678	06 May 2021 (06.05.2021)	IT

(71) Applicant: **COLCOM GROUP S.P.A.** [IT/IT]; Via degli Artigiani, 56 int. 1, 25075 Nave (BS) (IT).

(72) Inventor: **MESAROS, Mihai**; Via San Francesco, 12, 25075 Nave (BS) (IT).

(74) Agent: **AUTUORI, Angelo**; C/O AUTUORI & PARTNERS, Strada del Megiaro, 261, 36100 Vicenza (IT).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM,

(54) Title: SYSTEM FOR THE CONTROLLED ROTARY MOVEMENT OF A DOOR, A LEAF OR THE LIKE

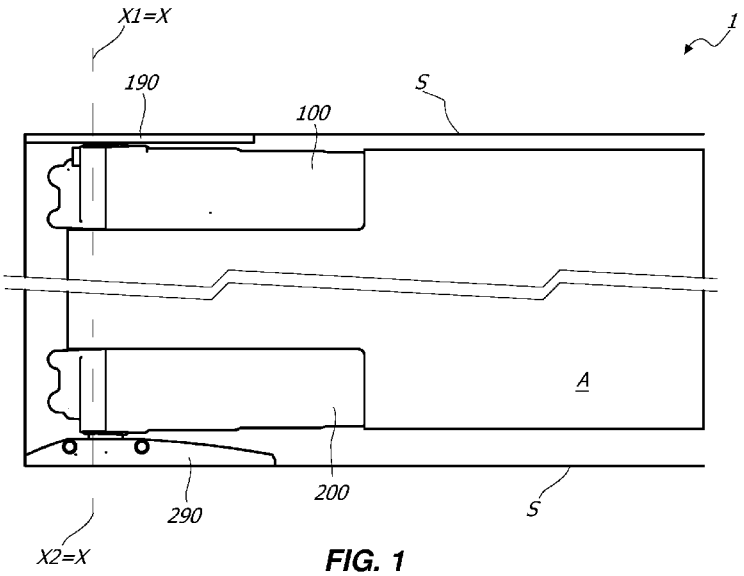

FIG. 1

(57) Abstract: A system for the rotary coupling around a rotation axis (X) a closing element (A), such as a door leaf, a door or the like, and a stationary support structure (S), such as a frame, a wall or the like, the system comprising at least one first hinge device and at least one second hinge device. The hinge devices (100, 200) comprise a fixed element which can be anchored to one of the stationary support structure (S) and the closing element (A) and a movable element which can be anchored to the other of the stationary support structure (S) and the closing element (A). The movable element includes a hinge body (130) and the fixed element comprises a pivot (120,220) defining a respective first and second axis (XI,X2). The hinge body (130) and the pivot (100,200) are rotatably coupled to each other to mutually rotate between the open position of the closing element (A) and the closed position of the closing element (A). The hinge devices (100,200) can be coupled with the same coupling element (A) so that they cooperate to control the rotation of the

WO 2022/234499 A1

[Continued on next page]

TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

closing element (A) around the rotation axis (X) between the door open position and the door closed position.

SYSTEM FOR THE CONTROLLED ROTARY MOVEMENT OF A DOOR, A LEAF OR THE LIKE

DESCRIPTION

Field of the invention

The present invention generally relates to the technical field of hinges, and in particular it relates to a system for the controlled rotary movement of a closing element, such as a door, a door leaf or the like, with respect to a stationary support structure, such as for example a frame, a false frame or a floor.

State of the Art

Hinges for the rotary movement of a closing element, such as a door or door leaf, in particular made of glass, with respect to a supporting structure, are known.

Such hinges typically comprise a fixed element anchored to the support structure and a movable element articulated to the door, susceptible to mutually rotate with respect to each other.

The need to dampen the opening and/or closing of such glass door leaves, in order to avoid breakage thereof caused by impacts or forcing by an incautious user is known.

In this regard, hinges which allow simultaneously to carry out a plurality of functions including damping, braking, final snapping or other functions depending on the needs are known.

This requirement is generally met by using adjustment systems which are difficult to manufacture, typically acting on the internal mechanical part of the hinge. Such hinges are particularly complex and difficult to assemble. Furthermore, such hinges allow to move the door only in some predetermined ways, that is according to a so-called single predetermined “law of motion”.

Summary of the invention

An object of the present invention is to at least partially overcome the drawbacks outlined above, by providing a system for the controlled rotary movement of a closing element that is highly functional and cost-effective.

Another object of the present invention is to provide a system that allows to control the movement of the closing element in a particularly effective manner.

Another object is to provide a system that allows to compensate for any gaps between the closing element and the stationary support structure during assembly.

These and other objects that will be more apparent hereinafter, are attained as described and/or claimed and/or illustrated herein.

Advantageous embodiments of the invention are defined according to the dependent claims.

Brief description of the drawings

Further characteristics and advantages of the invention will be more apparent in light of the detailed description some preferred but non-exclusive embodiments of the invention, illustrated by way of non-limiting example with reference to the attached drawings, wherein:

FIG. 1 is a front schematic view of a system **1**;

FIGS. 2 and **3** are an exploded view of the hinges **100** and **200**;

FIGS. 4, **5**, **6** and **7** are schematic cross-sectional views of the hinges **100** and **200** with the respective fixing plates **190** and **290** are in different operating steps, respectively with an angle of mutual rotation of 0°, 30°, 60° and 90°;

FIGS. 8 and **9** are a cross-sectional view of a different shape of the system **1** in which the hinges **100**, **200** have an angle of 0° and 90° respectively with the respective fixing plates **190 290**;

FIGS. 10, **12** and **14** are a cross-sectional view the hinge **100** with a different embodiment of the valve means **181** in different operative positions, with **FIGS. 11**, **13** and **15** showing an enlargement of some details respectively of FIGS. 10, 12 and 14;

FIG. 16 is an exploded view of some details of the valve means **181** of the hinge **100** of FIG. 12;

FIGS. 17 and **19** are a cross-sectional view of a different embodiment of the valve means **181** with **FIGS. 18** and **20** showing an enlargement of some details respectively of FIGS. 17 and 19;

FIG. 21 is an exploded view of some details of the valve means **181** of the hinge **100** of FIG. 17;

FIGS. 22 and **23** are a cross-sectional view of some enlarged details of hinge **100** of FIG. 4 with a different embodiment of the valve means **181**;

FIGS. 24, **26** and **28** are a cross-sectional view a hinge **100** with a different embodiment of the valve means **181** in different operative positions, with **FIGS. 25**, **27** and **29** showing an enlargement of some details respectively of FIGS. 24, 26 and 28;

FIGS. 30 and **32** are a cross-sectional view of some details of the hinge **100** with the fixing plate **190** respectively in the proximal and distal position, with in **FIGS. 31** and **33** showing an enlarged view respectively of FIG. 30 and FIG. 32.

Detailed description of some preferred embodiments

With reference to the mentioned figures, herein described is a system **1** for the rotary movement of a closing element **A**, such as a door leaf, a door, or the like, with respect to a stationary support structure **S**, such as a wall, a floor, a frame or the like.

The present invention may include various parts and/or similar or identical elements. Unless otherwise specified, similar or identical parts and/or elements will be indicated using a single reference number, it being clear that the described technical characteristics are common to all similar or identical parts and/or elements.

Essentially, the system **1** may comprise two or more hinge devices **100**, **200** which may cooperate to move the door **A** around a rotation axis **X.**

To this end, each hinge device **100**, **200** may be connected to the stationary support structure by means of respective fixing means, for example fixing plates **190**, **290**, and it may rotate around a

respective axis **X1**, **X2**. Once installed, the axes **X1**, **X2** of the hinge devices **100**, **200** may coincide to define the rotation axis **X** of the closing element between one or more open and closed positions.

FIG. 1 shows fixing plates **190**, **290** fixed to the frame **S** and hinge devices **100**, **200** with the door **A**. Although hereinafter reference will be made to such embodiment for the sake of simplicity, it is clear that the latter is not exclusive. As a matter of fact, one or both of the hinge devices **100**, **200** may be coupled to the frame **S** while one or both of the fixing plates **190**, **290** may be coupled to the door **A**. Furthermore, the hinge devices **100**, **200** and the fixing plates **190**, **290** may be fixed to any closing element and to any stationary support structure.

It is clear that the door **A** may also be moved by a single hinge device, for example the device **100**. For example, a movement system comprising the hinge device **100** mounted at the lower part and an idle hinge mounted at the upper part may be provided for.

It is also clear that the hinge devices **100**, **200** may include any means for fixing to the door **A** or to the frame **S**, without departing from the scope of protection of the attached claims.

Possibly, each of the hinge devices **100**, **200** may be a closing and/or control hinge. For the sake of simplicity, the hinge device positioned at the upper part was indicated with reference numeral **100** while the one positioned at the lower part was indicated with reference numeral **200** in the attached drawings.

Advantageously, the hinge devices **100** and **200** can be synchronised. In particular, both the hinge devices **100** and **200** may cooperate to control the movement of the door **A** for one or more sections of the movement of the latter between the open and closed position. Preferably, the hinge devices **100** and **200** may cooperate to control the movement of the door **A** along the entire movement from the open to the closed position and/or vice versa or for part thereof.

Each of the hinge devices **100**, **200** may therefore dampen or promote the rotation of the door **A** between the open and closed position. Preferably, as better explained hereinafter, each of the hinge devices **100 200** may exert a different action along different sections of the rotation of the door **A.**

The control of the movement of the door **A** may therefore be the result of the action of both the hinge devices **100** and **200**.

In other words, the so-called "law of motion" of door **A**, that is the equation that describes the motion of the latter as a function of the position in space and of time, may be the combination of the "law of motion" of the individual hinged devices **100**, **200**.

It is clear that the hinge devices **100**, **200** may be of any type, without departing from the scope of protection of the present invention.

Preferably, the hinge devices **100**, **200** may comprise a pivot **120**, **220**, which may be fixed to one of the door **A** and the frame **S**, and a hinge body **130**, **230** which may be fixed to the other of the door **A**

and the frame **S.**

The hinge body **130**, **230** and the pivot **120**, **200** may therefore be rotatably coupled to each other to mutually rotate respectively around the axes **X1**, **X2** respectively between a respective operative position corresponding to the open or closed position of the closing element **A** and an operative position corresponding to the closed or open position of the closing element **A**.

Advantageously, in the non-limiting examples of the system **1** shown in FIGS. 4-9, both hinge devices **100**, **200** may have the fixed pivot **120**, **220** and the hinge body **130**, **233** rotating between the door closed position (FIG. 4 and FIG. 8) and the door open position (FIG. 7 and FIG. 9).

Preferably, the pivot **120**, **220** may be fixed to the frame **S** by means of the fixing plate **190**, **290**, while the hinge body **130**, **230** may be fixed to the door **A** in a per se known manner to rotate integrally joined therewith.

Each of the hinge devices **100**, **200** may comprise means **150**, **250** for controlling the mutual rotation of the pivot **120**, **220** and of the hinge body **130**, **230**.

In general, the means **150**, **250**, which may be of the mechanical and/or hydraulic type, may be configured so as to dampen or promote the rotation of the hinge body **130**, **230** with respect to the pivot **120**, **220** for at least one section of the rotation of the door **A** between the open and closed position.

Advantageously, the means **150**, **250** may operate simultaneously when closing the door **A**.

Although not shown, it is however clear that the system **1** may have different configurations. For example, the means **150**, **250** may operate along different sections of the closure, for example the means **150** at the beginning and the means **250** at the end. Possibly, one of the means **150** and **250** may operate when opening while the other of the means **150** and **250** may operate when closing the door **A**.

On the other hand, the hinge **100** and the hinge **200** may be configured so that the means **150** and/or **250** operate only upon the rotation of the door **A** for a section from one of the open position and the closed position toward the other of the open position and the closed position and not operate upon the rotation of the door **A** for the same section from the other of the open position and the closed position toward the one of the open position and the closed position but the only means **250** operate.

According to a preferred embodiment of the invention, the means **250** of the hinge **200** may be configured to promote the closing of the door **A** while the means **150** of the hinge **100** may be configured to dampen the closing of the door **A**.

In other words, when closing the door **A**, the hinge device **100** opposes the action of the hinge device **200**.

It is clear that this configuration may be obtained by means of different types of hinge devices **100**, **200** which may comprise different types of means **150**, **250**.

Preferably, the hinge devices **100** and **200** may comprise the hinge body **130**, **230** which internally

comprises a working chamber **135** defining a respective axis **Y**, **Y'** substantially perpendicular to the respective axis **X1** and **X2**.

Furthermore, the hinge devices **100** and **200** may comprise a slider element **140**, **240** slidable in the respective working chamber **135**. In particular, the chamber **135** may comprise a pair of opposite bottom walls **138**, **138'.** The slider **140**, **240** may then slide along the respective axis **Y**, **Y'** between a position proximal to the bottom wall **138** and a position distal therefrom.

Suitably, the pivot **120**, **220** may be operatively connected with or include respective cam means **125**, **225**, while the slider element **140**, **240** may be operatively connected with or include cam follower means **145**, **245**.

The cam **125**, **225** and cam follower **145**, **245** means may be operatively connected to each other so that the rotation of the hinge body **130**, **230** corresponds to the sliding of the respective slider **140**, **240** between the distal and proximal positions.

Advantageously, the means **150** and **250** can control the sliding of the slider **140** and **240** and therefore control the rotation of the door **A**.

Preferably, the control means **150** may be hydraulic and they may be configured to dampen the sliding of the slider **140** at least upon the movement of the door from the open position to the closed position. On the other hand, the control means **250** may be of the mechanical type and they may be configured to promote the sliding of the slider **140** at least upon the movement of the door from the open position to the closed position.

For example, the means **250** may comprise a spring **251** interposed between the slider element **240** and the bottom wall **138** so as to promote the sliding of the slider **240** from the proximal position to the distal position.

It is clear that according to the configuration of the cam **125** and cam follower **145** means and of the means **150** for controlling the sliding of the slider **140**, same case applying to the configuration of the cam **225** and cam follower **245** means and of the means **250** for controlling the sliding of the slider **240**, the respective hinge device **100**, **200** may control the rotation of the door **A** in a different manner.

Advantageously, as better explained hereinafter, the hinge device **200** may promote the closing of the door **A**, while the hinge device **100** may counteract the action of the hinge **200** so that the closing speed of the door **A** along a predetermined section is predetermined. This speed may vary or it may be substantially constant.

This section may vary depending on the configurations of the hinge devices **100**, **200**, as better explained hereinafter. For example, such an angular section may be the segment comprised between 0° and 90°, or between 10° and 90° (for example in case of a final snap), or between 0° and 80° (in case of a door open stop position), or between 10° and 80° (in case of stop and snap).

In other words, as described above, the laws of motion of the hinge devices **100** and **200** may be combined to define the law of motion of the door **A**. The latter may vary depending on the configuration of the hinge devices **100**, **200**, preferably it may allow the closing of the door **A** at a constant speed.

Below is the description of some preferred but not exclusive examples of the hinge devices **100** and **200** having the advantages described above.

The cam means **125** and the cam means **225** may be shaped differently with respect to each other. In this manner, the rotation of the door **A** for at least one section during the closing may correspond to a different sliding of the respective slider **140** and **240**.

Suitably, the cam means **125**, **245** may be configured to promote the sliding of the slider element **140**, **240** in an opposite manner. For example, when closing the door **A**, the slider **140** may slide in one direction while the slider **240** may slide in the opposite direction.

In FIG. 4 and in FIG. 8, the slider **140** is in a position proximal to the wall **138** and the slider **240** is in a position distal from the wall **138**, while in FIG. 7 and in FIG. 9 the slider **140** is in a position distal from the wall **138** and the slider **240** is in a position proximal to the wall **138**.

Preferably, the pivot **120**, **220** may include an operative surface **126**, **226** defining the cam means **125**, **225**, while the slider element **140**, **240** may include respective surfaces **141**, **241** suitable to interact with the surfaces **126**, **226** thus defining the cam follower means **145 245**.

Preferably, the slider **140**, **240** may comprise a cylinder **142** having an axis substantially perpendicular to the axis **Y**, **Y'** which includes the respective surface **141**, **241**.

In this manner, the action of the spring **251** will promote the sliding of the slider **240** toward the distal position, the corresponding rotation of the pivot **220**, the corresponding rotation of the pivot **120** and the corresponding sliding of the slider **140** toward the proximal position. The hydraulic means **150** may dampen the sliding of the plunger **140** from the distal position to the proximal position.

In the event of the closure of the door **A**, of the spring **251** may not be constant, that is it may be maximum with the door **A** open and minimum with the door **A** closed, while the hydraulic means **150,** depending on the configuration, may dampen the closing of the door **A** in a substantially constant manner.

Therefore, the surfaces **126** and **226** of the respective pivots **120** and **220** may be shaped so as to compensate for these imbalances so that the door **A** has a substantially constant rotation speed.

In general, depending on the configuration of the surfaces **126** and **226** or, depending on the configurations of the potions **128**, **228**, the door **A** may rotate with a first predetermined speed for at least one section of the rotation from the open position to the closed position and with a second predetermined speed for at least one second section of the rotation thereof between the door open position and the door closed position.

In greater detail, the surface **126** of the pivot **120** of the hinge device **100** and the surface **226** of the pivot **220** of the hinge device **200** may therefore be shaped so as to have a variable shape. Preferably substantially curved or convex.

In particular, the surface **126** of the pivot **120** of the hinge **100** and the surface **226** of the pivot **220** of the hinge device **200** may comprise, with an initial section **127**, **227**, a final section **129**, **229** and a substantially convex intermediate operative section **128**, **228**.

The profile of the convex surfaces **128** and **228** may be mutually configured so that, upon the rotation of the door **A**, the variable action of the spring **251** is counteracted by the action of the hydraulic means **150**.

In other words, the hinge device **200** may provide a torque which operates to close the door **A**, while the hinge device **100** may provide a torque which operates in an opposite manner, that is counteracting the torque **200** to brake the closing of the door **A**. The former torque may therefore be greater than the latter one.

The hinge devices **100** and **200** may be configured so that the resulting of the two opposite torques allows the movement of the door **A** with the predetermined speed, preferably but not exclusively constant, along at least one section of the rotation thereof from the open position to the closed position.

For example, the difference between the two torques may be constant over such section of the rotation thereof from the open to the closed position.

It is clear that such torques will not be constant during the rotation, given that the elastic means provide a variable torque upon the rotation of the door **A**, that is the rotation of the hinge body **230** and of the pivot **120**.

For example, when the second torque increases, also the first torque may increase and, vice versa, when the second torque decreases the second torque decreases too.

It is clear that should there be required a different speed for closing the door for example incremental or decreasing, or for a fast and for a slow section, the torque provided by one or both hinges may be varied by acting on the means 150**,** 250**,** or preferably, on the cam means **125**, **225**. In particular, the shape of the surface **226**, **126** of the latter may be varied.

Suitably, the cam **125**, **225** and cam follower **145**, **245** means may be mutually configured to provide such first and second torque.

In particular, the operative portions **128**, **228** may be mutually configured so that the first and second torques are variable upon the rotation of the respective first and second hinge body **130**, **230** and pivots **120**, **220** along such section of the rotation thereof from the open to the closed position in order to allow the rotation with said at least one predetermined speed of the door **A** along such section of the rotation thereof from the open to the closed position.

For example, the surface **228** may be configured so that as the door closes, at a rotation angle of the pivot **220** there corresponds a significantly greater sliding of the slider **240**. While the surface **128** may be configured so that the sliding of the slider **140** remains substantially constant or varies slightly during the closing of the door.

Below is the description of the system **1** with particular reference to the FIG. 4 to FIG. 7.

In particular, the pivot **120** may comprise the outer surface **126** with the initial angular section **127**, the convex operative section **128** and the final concave section **129**, while the pivot **220** may comprise the outer surface **226** with the initial concave section **227**, the convex operative section **228** and the final concave section **229**.

In FIG. 7 the door **A** is in the open position and the cam **125** may be at the concave section **129** while the cam **225** may be at the concave section **229**. In this case the door **A** is therefore stable in a stop position. This position may correspond to the door open at 90° position.

When closing the door **A**, FIG. 6 and FIG. 5, the hinge body **130**, **230** of both hinges **100**, **200** may be moved so that the surface **141** is at the convex section **128**, while the surface **241** is at the convex section **228**.

Suitably, the sections **128** and **228** may have different convexities so that the decremental action of the spring **251** is compensated and the door **A** rotates with constant or predetermined speed, as described above.

In FIG. 4 the door **A** may be in the closed position. The hinge **100** may have the surface **141** in contact with the angular section **127**, while the hinge **200** may have the surface **241** in contact with the concave section **227**. The door **A** may therefore be in a stop position corresponding to the door closed position.

The door may be rotated by about 10° in order to overcome the door open stop position. In this case, the rotation of the door **A** may be controlled starting from 80°.

Similarly, with particular reference to FIG. 8 (door closed) and FIG. 9, the surface **126** may comprise a convex section **127**, a second convex section **128** and a substantially flat section **129**, while the surface **226** may comprise a substantially flat section **227**, a second convex section **228** and a slightly convex section **229**.

When the door **A** is in the closed position, the surface **241** abuts against the flat surface **227** so that the hinge **200** is stable and therefore the door **A** remains in the closed position. On the other hand, when the door **A** is in the open position, the surface **241** may abut against the substantially convex section **229** so that the hinge **100** returns to the closed position.

It is clear that the described above regarding the closing of the door **A** may be similarly provided for the opening of the door **A**.

Preferably, the pivot **120** and/or **220** may be substantially symmetrical so that the hinges **100** and/or **200** are ambidextrous.

Generally, it is clear that depending on the shape of the cam means **125 225**, and of the control means **150**, **250**, the hinge **100** or **200** may behave differently, therefore a different law of motion and, as a result, the movement of the door **A** may be different.

Advantageously, the behaviour of the hinge **100** or **200** may be modified simply by replacing the cam means **125**, **225**, for example by replacing the pivot **120** or **220**.

Furthermore, similarly, there may be provided a system **1** for the movement of the door **A** having different configurations depending on the preferences by providing different pivots **120**, **220**.

Due to these characteristics, the system **1** may be particularly versatile and at the same time simple, quick and cost-effective to produce.

According to a particular embodiment of the invention, the distance **d** between the hinge **100** and the fixing plate **190** may be variable between a minimum distance **d** (FIG. 30) and a configuration in which the distance **d** is maximum (FIG. 32).

The maximum distance **d** may be greater than 5 mm, preferably of about 8 mm, while the minimum distance **d** may be less than 5 mm, preferably smaller than 1 mm.

In any case, the maximum variation of the operative distance may be comprised between 1 mm and 10 mm, preferably it may be about 7 mm.

In particular, the hinge **100** and the fixing plate **190** may slide mutually along the axis **X**, so as to compensate for possible gaps between the frame and the door during the assembly.

In greater detail, the hinge body **130** may comprise an upper wall **131** facing the fixing plate **190**. The latter may comprise a plate **191**. The maximum variation in the operative distance **d** may therefore be the distance between the upper wall **131** and the plate **191**.

The hinge **100** may comprise a pivot **120** and a hinge body **130**. The pivot **120** may be engaged with the hinge body **130** and it may be fixed with the fixing plate **190**. On the other hand, the hinge body **130** may comprise a seat **110** for the pivot **120.**

The pivot **120** and the hinge body **130** may be mutually rotatably coupled to each other to rotate around the axis **X1** between at least one operative position corresponding to the open position of the closing element and an operative position corresponding to the closed position of the closing element.

Preferably, the pivot **120** may be integrally coupled with the fixing plate **190**. For example, the pivot **120** may comprise an end portion **121'** which may be integrally coupled with the plate **191**, for example by means of one or more screws **192**, while the hinge body **130** may be coupled with the closing element **A**.

Suitably, the pivot **120** and the seat **110** may be mutually configured so as to mutually slide along

the axis **X**. Preferably, the pivot **120** and the hinge body **130** may slide for a section substantially equal to the distance **d**.

For example, the end **121'** of the pivot **120** may protrude from the wall **131** of the hinge body **130** for a length equal to or greater than the maximum variation in the distance **d**. The pivot **120** may therefore be movable between an extended configuration (FIG. 32) in which the distance **d** is maximum and a retracted position (FIG. 30) in which the distance **d** is minimum.

Suitably, the hinge body **130** may comprise a through opening **132** to allow the sliding of the pivot **120**. In greater detail, the wall **131** may comprise such a through opening **132**.

The pivot **120** may therefore comprise at least one portion **121** passing through the opening **132** and slidable therein between the retracted configuration and the extended configuration. The portion **121** may include the end **121'**.

Preferably, when the pivot **120** is in the retracted configuration, the portion **121** and the part **131** may be substantially flush, and the minimum distance **d** may be particularly small. For example, it may be less than 1 mm. Possibly, when the pivot **120** is in the retracted configuration, the wall **131** and the plate **191** may be in contact and the distance **d** may be substantially equal to zero. In this case, the minimum distance **d** may be small, and that is close to zero, while the maximum operative distance **d** may be substantially equal to the maximum variation of the sliding.

It is clear that the distance **d** may preferably be considered between the surface **131'** of the wall **131** at the opening **132** and the surface **191'** of the plate **191**.

The seat **110** and the pivot **120** may be mutually configured to avoid mutual disengagement.

Suitably, the seat **110** may comprise a pair of opposite abutment surfaces **111**, **111'** designed to act as abutment for the pivot **120**. The latter may comprise corresponding opposite abutment surfaces **122**, **122'** designed to abut against the corresponding surfaces **111**, **111'**.

When the pivot **120** is in the retracted configuration, the surfaces **111** and **122** may be in abutment position while the surfaces **111'** and **122'** may be spaced apart, while when the pivot **120** is in the extended configuration, the surfaces **111** and **122** may be spaced apart while the surfaces **111'** and **122'** they may be in abutment position.

Suitably, means for guiding the sliding of the pivot **120** between the extended and retracted position and means for guiding the rotation of the pin around the axis **X**, may be provided for.

The seat **110** may comprise a portion **112** and a portion **113** suitable to guide the pivot **120** in rotation and to guide it to slide with respect to the axis **X**. In particular, the portion **112** may comprise or consist of the opening **132**. In other words, the side wall **132'** of the latter may define the means for guiding the portion **121** of the pivot **120** slidably and rotatably.

On the other hand, the pivot **120** may comprise a portion **123** opposite the portion **121** which

may remain at the portion **113** of the seat **110**.

Preferably, the portions **121** and **123**, as well as the portions **112** and **113**, may be substantially cylindrical-shaped and they may have substantially the same diameter. In this manner, the portions **121** and **123**, **112** and **113** may mutually interact to guide the pivot **120** in rotation and translation with respect to the axis **X1**.

Preferably, the hinge **100** may be an automatic and/or control hinge.

In particular, the pivot **120** may comprise cam means so that the rotation thereof around the axis **X1** promotes the sliding of a slidable element **140.** Suitably, the hinge **100** may therefore comprise means for damping, promoting, hindering or freely allowing the sliding element **140** to slide.

The hinge **100** may be of the mechanical, hydraulic type or it may comprise both mechanical means and hydraulic means. For example, FIG. 30 and FIG. 30 show a hinge **100** with hydraulic means **150** for controlling and damping the sliding of the sliding element **140**.

Suitably, therefore, the pivot **120** may comprise a central portion **125** interposed between the portions **121** and **123** which may define the cam means.

On the other hand, the seat **110** may comprise a corresponding central portion **115**, interposed between the portions **112** and **113** for housing the central portion **125**.

Advantageously, such central portion **115** may comprise the abutment surfaces **111** and **111'**. On the other hand, the central portion **125** of the pivot **120** may comprise the respective abutment surfaces **122** and **122'**.

Preferably, the surfaces **111** and **111'**, **122** and **122'** may be substantially transversal or perpendicular to the axis **X**.

Advantageously, the distance between the abutment surfaces **111**, **111'** may be greater than the distance between the surfaces **122** and **122'**. In this manner, the portion **125** may slide along the axis **X1** in the portion **115** of the seat **110**.

Preferably, the difference between the distance between the abutment surfaces **111**, **111'** and the distance between the surfaces **122** and **122'** may define the maximum variation of the operative distance **d**.

Suitably, the slider element **140** may slide along an axis **Y** substantially perpendicular to the axis **X1**. The slider element **140** may comprise an operative surface **141** designed to interact with the portion **125** of the pivot **120** so that the rotation of the latter promotes the sliding of the former and vice versa.

In other words, the surface **141** may define the cam follower means **145**.

Advantageously, the surface **141** may extend substantially parallel to the axis **X1** for a length such that it interacts with the cam elements **125** in any operative position of the pivot **120** between the retracted and extended position.

Preferably but not exclusively, the system **1**, as schematically shown in FIG. 1, may comprise the hinge **100** which allows the adjustment of the distance **d** and therefore the installation thereof at the unevenness.

Described below are some embodiments of a hinge **100** which may be used in the system **1** or it may be used in any manner so as to move a closing element, for example a door **A.**

As better described below, the hinge **100** may be hydraulic and it may comprise a valve assembly **181** configured to open in the event of excessive pressure (so-called overpressure valve), and/or to prevent the backflow of the working liquid (so-called check valve) and/or to allow an increase in the fluid flow in proximity of the closing of the door **A** (so-called final snap). In other words, advantageously, a single particularly compact valve assembly **181** may provide one or more of the functions described above.

The hinge device **100** may comprise the hinge body **130** which may include a working chamber **135**. Preferably, the working chamber **135** may comprise a portion **136** for housing the pivot **120** therefore defining the seat **110**, and an elongated portion **137** defining the axis **Y** for housing a slidable slider element **140**.

In particular, the chamber **135** may comprise a pair of opposite bottom walls **138, 138'.** Preferably, the portion **136** may comprise the wall **138'** while the portion **137** may comprise the wall **138**.

The slider **140** may therefore slide between a position distal to the wall **138** (FIG. 7, FIG. 9, FIG. 14 and FIG. 28) and a position proximal to the wall **138** (FIG. 4, FIG. 8, FIG. 10 and FIG. 24).

The pivot **120** may comprise the cam means **125** while the slider **140** may comprise the cam follower means **145** so that the rotation of the former around the axis **X1** promotes the sliding of the latter along the axis **Y**.

Suitably, a plunger element **160** which may slide in the chamber **135** along the axis **Y** may be provided for.

Possibly, the plunger element **160** may be connected to the slider **140** so as to slide with the latter. Possibly, the slider **140** may comprise or consist of the plunger element **160**.

In any case, the plunger element **160** may be operatively connected with the cam follower means **145** so that the rotation of the pivot **120** promotes the sliding thereof and vice versa.

Advantageously, a partitioning element **1000** may be provided for between the portion **137**, which will define the hydraulic portion of the hinge, and the seat **110**, which will define the dry mechanical one.

As a result, the pivot **120** will dry work in the seat **110**, so as to be able to move vertically to adjust the distance **d** without leakage of hydraulic working fluid, in particular oil.

For example, the partitioning element **1000** may be a sealing plug. Possibly, the partitioning

element **1000** may be fixed with respect to the hinge body **130** and be cylindrical-shaped with an annular seat for a return spring **1010** acting on the cylinder **1020**.

This will allow to promote the return of the plunger **160** from the proximal position to the distal position.

According to a preferred but not exclusive embodiment, the plunger element **160** may comprise a stem **161** operatively connected to the slider element **140** to slide therewith, and a head **165** slidable in the chamber **135**.

The plunger **160** and the slider **140** may be integrally connected, for example by means of a pin, may be forced against each other by means of elastic means or suitable means **149** may be provided for the operative coupling of the slider **140** and of the plunger **160**.

For example, such connection may be obtained according to the teachings of patent applications WO2018116275 and WO2020044143 on behalf of the Applicant in question.

As shown in the attached drawings, the slider **140** may partition the chamber **135** into a first half-chamber **136** for the plunger **120** and into a second half-chamber **137** for the plunger **160**.

Suitably, the portion **137** of the chamber **135** may define a closed chamber which may contain a working fluid, for example oil.

The plunger element **160** may therefore slide in the chamber **137** between an operative end-of-stroke position in which the head **165** is proximal to the bottom wall **138** and an opposite operative position in which the head **165** is distal from the bottom wall **138** corresponding to the distal position and proximal to the wall **138** of slider **140** described above.

The head **165** may be sealingly inserted into the chamber **137** in order to partition the latter into at least one first and second variable volume compartment **176**, **177**.

In this manner, when the plunger element **160** is in the proximal position, the compartment **176** may have a maximum volume and the compartment **177** may have a minimum volume, while when the plunger element **160** is in the distal position the compartment **176** may have a minimum volume and the compartment **177** may have a maximum volume.

The hinge **100** may therefore comprise one or more hydraulic circuits to allow the working fluid to flow between the compartments **176**, **177** upon the sliding of the plunger element **160** and therefore upon the rotation of the hinge body **130** and of the pivot **120** between the door open and closed position.

In particular, the hinge **100** may comprise at least one circuit **171** for placing in fluidic communication the compartments **176**, **177** so that the fluid flows between the compartments **176** and **177** when the plunger element **160** moves between the proximal position and the distal position, that is between the open and closed positions of door **A.**

Preferably, this circuit **171** may be of the per se known type and it may comprise at least one duct

arranged inside the hinge body **130** having an opening in the compartment **176** and an opening in the compartment **177**.

Although not shown in the attached figures, means **180** may be provided for controlling the flow of the working liquid in the circuit **171**. For example, a calibrated opening may be provided for so as to adjust the flow rate of the working fluid flowing through and therefore the sliding of the plunger element **160**.

Advantageously, a circuit **172** may also be provided for selectively fluidically connecting the compartments **176**, **177** so that the working fluid flows from the compartment **177** to the compartment **176** when the plunger element **160** passes from the distal position to the proximal position, upon closing the door **A**.

Suitably, this circuit **172** may be inside the plunger element **160**. Preferably, this circuit **172** may pass through the head **165** of the plunger **160**.

The hinge **100** may further comprise valve means **181** acting on the circuit **172** to selectively allow or prevent the working fluid from flowing therethrough.

Possibly, the head **165** may comprise both the circuit **172** and the valve means **181**.

It is clear that should such hinge **100** be used in the system **1** described above, the hydraulic circuit **171** and/or **172,** same case applying to the valve means **181** acting thereon may define the means **150** for controlling the sliding of the slider **140**.

As better explained hereinafter, depending on the configuration of the valve means **181**, the latter may act on the circuit **172** as a check valve, as an overpressure valve and/or as a final snap.

The figures from FIG. 11 to FIG. 29 show different configurations of the circuit **172** and of the valve means **181**.

It is clear that such valve means **181** may be used in any hinge **100**, and in particular, regardless of the configuration of the cam and cam follower means **125**, **145** described above and/or regardless of the possible sliding of the pivot **120** along the rotation axis **X1** thereof.

Below is the description of a particular embodiment of the valve means **181**, for example shown in FIG. 10 to FIG. 15, FIG. 22 to FIG. 23, and FIG. 24 to FIG. 29.

The circuit **172** may comprise a duct **173** which may have an opening **175'** at the compartment **177** and an opposite opening **175**.

Preferably, the duct **172** may comprise the opening **175'** fluidically connected with the compartment **177** and the opening **174''** fluidically connected with the compartment **176**.

The hinge **100** may further comprise a disc-shaped element **166** with an internal through hole defining the duct **173** and a shutter **184**, for example a ball, for acting on the end opening **175** of the duct **173**. Preferably, the opening **175** may be circular and may have a diameter smaller than that of the ball

184.

The circuit **172** may comprise a chamber **174**. Preferably, the shutter **184** can be arranged in the chamber **174**.

In particular, the shutter **184** may be movable between a closed position in proximity of the opening **175** in which it shuts the latter and prevents the working fluid from flowing through the duct **173**, and an open position distant from the opening **175** in which it allows the working fluid to flow through the duct **173**.

Suitably, means **189** configured to force the shutter **184** to close may be provided for. The means **189** may for example comprise or consist of a spring.

In this manner, the valve means **181** may be normally closed, and the oil may be prevented from flowing from the compartment **177** to the compartment **176** through the circuit **172**, therefore defining a check valve.

Advantageously, an annular element **185** arranged in the chamber **174** may be provided for and it is interposed between the shutter **184** and the spring **189**. Preferably, the annular element **185** may be fitted on a cylindrical portion **166''** of the disc-shaped element **166**.

Possibly, the annular element **185** may be configured to guide the shutter **184** between the open and closed positions. For example, the annular element may comprise an inner portion that is substantially cylindrical and coaxial with the axis **Y** to guide the sliding of the shutter **184** along the same axis.

The chamber **174** may therefore comprise an abutment wall **174'** for abutting against the spring **189**, while the annular element **185** may comprise a corresponding annular relief **186**. The spring **189** may therefore remain interposed between the part **174'** and the surface **186'** of the relief **186** to force the annular element **185** against the ball **184** and therefore against the opening **175**.

The annular element **185** may therefore slide along the axis **Y** between a position distal from the opening **175** in which the shutter **184** allows the fluid to flow through and a position proximal to the opening **175** in which the shutter **184** prevents the fluid from flowing through.

The chamber **174** may comprise an opening **174''** to allow the fluid to flow through. In particular, the circuit **172** may therefore comprise the duct **173** with the opening **175'** and **175**, the chamber **174** and the opening **174''**.

The annular element **185** may cooperate with the ball **184** to selectively prevent or allow the fluid to flow through the circuit **172**.

Should the pressure inside the compartment **177** be particularly high, the fluid may flow into the duct **173** and force against the ball **184**. When the force exerted is greater than that exerted by the spring **189**, the ball **184** may move away from the opening **175** and therefore allow the working fluid to flow

through the opening **175**.

The fluid may therefore flow through the opening **174''** into the compartment **176**. Such opening **174''** may for example be obtained on the stem **161** of the plunger **160**.

In this case, the valve means **181** may therefore be configured to open upon exceeding a predetermined pressure value, therefore acting as an overpressure valve. This overpressure value may depend on the resistance of the spring **189**.

According to a particular aspect of the invention, as shown in the figures from FIG. 10 to FIG. 15, the disc-shaped element **166** may comprise one or more through openings **167**, preferably a pair of through openings **167** designed to house a corresponding pair of pins **168**. The openings **167** may be substantially parallel to the axis **Y** and/or it may be coaxial thereto.

The pins **168** may have an end **169'** designed to interact with the annular element **185** and an opposite end **169** designed to interact with the bottom wall **138**. In particular, the pins **168** may have a length substantially greater than the thickness of the disc-shaped element **166**.

The through holes **167** may be configured so that once the pins **168** have been inserted thereinto, the ends **169'** are at the surface **186''** of the relief **186** opposite to the surface **186'**.

In the embodiment shown in FIG. 11, FIG. 13 and FIG. 15, there are present two pins **168** passing through the peripheral openings **167**. Preferably, the pins **168** may have a diameter substantially equal to that of the openings **167** so that the oil flows only through the duct **173**.

Possibly, the annular element **185** may comprise a blind hole **185'** for the end **169'** of the pin **168**. The blind hole **185'** may include the surface **186''**. In particular, the end **169'** of the pin **168** may be inserted into the hole **185'** by interference so that the pin **168** is coupled with the annular relief **185** and moves integrally therewith.

It is clear that any number of pins **168** and peripheral openings **167** may be provided for. Preferably, three pins **168** which are angularly equally spaced so as not to promote the rotation of the head **165** in a plane perpendicular to the sliding axis **Y** thereof may be provided for.

On the other hand, in the embodiment shown in FIG. 22 and FIG. 23 and in the one shown in FIG. 25, FIG. 27 and FIG. 29 a single pin **168** is present. In this case, the pin **168** may pass through the duct **173** so that the end **169'** thereof is inside the duct **173** and abuts against the ball **184** when the opposite end **169** abuts against the wall **138**. In other words, the duct **173** may therefore define the through openings **167**.

In this case, the pin **168** may have a diameter substantially smaller than the diameter of the hole **173** so that the oil can flow through the interspace between the latter up to the opening **175**. In other words, the circuit **172** may include such interspace.

In particular, in the embodiment shown in FIG. 22 and FIG. 23, the end **169'** of the pin **168** is fixed

with the disc-shaped element **166**, preferably at the annular portion **166''** thereof, so that the pin **168** slides with the head **165**, while in the embodiment shown in FIG. 25, FIG. 27 and FIG. 29, the end **169** of the pin **168** may be fixed to the wall **138** so that the pin **168** remains substantially stationary upon the sliding of the head **165**.

The end **169** may be fixed in the wall **138** in a per se known manner, for example by interference.

On the other hand, according to a different embodiment shown in FIG. 18 and FIG. 20, the stem **161** may comprise an annular relief **162** which may therefore include the abutment surface **174''** for the spring **189**. Furthermore, the disc-shaped element **166** may comprise one or more peripheral through openings **167** for the pin **168**. Possibly, the annular element **185** may comprise a blind hole **185'** for the end **169'** of the pin **168**. The blind hole **185'** may include the surface **186''** and it may be at the one or more through openings **167**.

Suitably, the pin **168** may have a diameter substantially smaller than the diameter of the openings **167** so that the oil can seep into the interspace between the latter. In particular, when the annular element **185** is spaced apart from the disc-shaped element **166** (FIG. 20), the oil may seep into the interspace between the pin **168** and the through hole **167** and flow out through the opening **174''** in the stem **161**. On the other hand, when the annular element **185** abuts against the disc-shaped element **166** (FIG. 18) the oil cannot flow out from the compartment **177** to the compartment **176**.

It is therefore clear that the circuit **172** may include both the interspace and the duct **173**.

Therefore, when the end **169** of the pin **168** abuts against the wall **138**, the pins **168** may promote the moving away of the annular element **185** from the disc-shaped element **166** and therefore they may allow the oil to flow out from the compartment **177** to the compartment **176** through the circuit **172** therefore defining the function of final snap of the valve means **181** as better described below.

Furthermore, in this case, the spring **189** may act both against the annular element **185**, which may therefore act as a shutter as described above, and against the ball **184**. This may allow to obtain the check function of the valve means **181**.

Lastly, in case of overpressure, the oil may flow into the duct **173** and force the ball **184** to open, therefore allowing the overpressure function of the valve means **181**.

In any case, when the plunger **160** is in a position distal from the wall **138**, the valve means **181** may be normally closed thanks to the action of the spring **189** (FIG. 15, FIG. 18, FIG. 23 and FIG. 29).

Suitably, when the valve means **181** are closed, the pins **168** may have a portion **168'** protruding from the disc-shaped element **166**. In particular, the pins **168** may protrude with respect to the surface **166'** of the disc-shaped element **166** facing the bottom wall **138**.

Upon the movement of the plunger element **160** toward the bottom wall **138**, the end **169** of the pin or pins **168** m ay interact with the bottom wall **138**, that is abut thereagainst.

Such position of the plunger element **160** may correspond to a predetermined angle **α**. Such angle **α** may vary according to the length of the portion **168'** of the pin **168** protruding from the wall **166'** of the disc-shaped element **166**.

It is clear that in the embodiment of FIG. 24, the portion **168'** may be the portion protruding from the bottom wall **138**.

Possibly, a hinge **100** with a different snap angle may be obtained by changing the length of the pins **168**.

For example, in the shown figures, the snap angle measures approximately 10°. Therefore, the door **A** may be controlled to close between 80° and 10°. It is clear that such angle may vary depending on the needs.

Should the plunger element **160** continue the stroke thereof toward the bottom wall **138**, the pins **168** will promote the opening of the valve means **181**, for example the moving away of the shutter **184** from the opening **175** or of the annular element **185** away from the disc-shaped element **166**, therefore allowing the flow of the working fluid through the circuit **172** from the compartment **177** to the compartment **176**, therefore obtaining the so-called final snap up to the end-of-stroke position of the plunger **160** (FIG. 11, FIG. 20, FIG. 22 and FIG. 25).

In particular, in the latter configuration, in the embodiment from FIG. 4 to FIG. 7, the end **169** may abut against the bottom wall **138** while the opposite end **169'** may abut against the ball **184**, in the embodiment of figures FIG. 10 to FIG. 16, the end **169** may abut against the bottom wall **138** while the opposite end **169'** may abut against the surface **186''** of the annular relief **186**, while in the embodiment from FIG. 17 to FIG. 21, the end **169** may abut against the bottom wall **138** while the opposite end **169'** may be in the blind hole of the annular element **185**, while in the embodiment from FIG. 24 to FIG. 29, the end **169** may be fixed with the bottom wall **138** while the opposite end **169'** may abut against the ball **184**.

In the light of the above, the head **165** of the plunger **160** may be configured so as to act as a check valve, as an overpressure valve and as a final snap.

In this manner, the hinge **100** may be particularly compact.

It is clear that the plunger element **160** with the valve means **181** described above may be used in any hydraulic hinge. Preferably, the hinge **100** may comprise a plunger **160** with a head **165** sealingly inserted into a chamber **135** to partition the latter into the two compartments **176**, **177**.

The invention is susceptible to numerous modifications and variants all falling within the inventive concept outlined in the attached claims. All details can be replaced by other technically equivalent elements, and the materials can be different depending on the needs, without departing from the scope of protection of the invention.

Even though the invention has been described with particular reference to the attached figures, the reference numbers utilised in the description and in the claims are meant for improving the intelligibility of the invention and thus do not limit the claimed scope of protection in any manner whatsoever.

5

CLAIMS

1. A system for the controlled rotary movement of a closing element (**A**), such as a door leaf, a door or the like, around a rotation axis (**X**) with respect to a stationary support structure(**S**), such as a frame, a wall or the like, the system comprising at least one first hinge device (**100**) and at least one second hinge device (**200**);

wherein each of said first and second hinge device (**100**, **200**) comprises:

- a fixed element which can be anchored to one of the stationary support structure (**S**) and the closing element (**A**);
- a movable element which can be anchored to the other of the stationary support structure (**S**) and the closing element (**A**);

wherein one of said movable and fixed element includes a respective first and second hinge body (**130**, **230**), the other of said movable or fixed element comprising a respective first and second pivot (**120**, **220**) defining a respective first and second axis (**X1**, **X2**), said first and second hinge body (**130**, **230**) and first and second pivot(**100**, **200**) being mutually rotatably coupled to mutually rotate around said first and second axis (**X1 X2**) between a respective first operative position corresponding to the open or closed position of the closing element (**A**) and a second operative position corresponding to the closed or open position of the closing element (**A**);

wherein said first and second hinge device (**100**, **200**) can be coupled with the same closing element (**A**) in longitudinally staggered positions so that said first and second axis (**X1 X2**) coincide with each other and with said rotation axis (**X**);

wherein said first and second hinge device (**100**, **200**) cooperate to control the rotation of the closing element (**A**) around the rotation axis (**X**) between the door closed position and the door open position.

2. System according to claim 1, wherein said first and second hinge device (**100**, **200**) cooperate to control the rotation of the closing element (**A**) so that the latter has a predetermined rotation speed upon the movement of said first and second hinge body (**130**, **230**) and of said first and second pivot (**120**, **220**) from one of the first and the second operative position to the other of the first and the second operative position.

3. System according to claim 2, wherein said predetermined rotation speed is constant upon the movement of said first and second hinge body (**130**, **230**) and of said first and second pivot (**120**, **220**) along at least one section of the rotation from one of the first and the second operative position to the other of the first and the second operative position.

4. System according to any one of the preceding claims, wherein each of said first and second hinge body (**130**, **230**) comprises a working chamber (**135**) defining a respective third axis (**Y1**, **Y2**)

substantially perpendicular with respect to said first and second axis (**X1**, **X2**) and a respective slider element (**140**, **240**) slidable in said working chamber (**135**), said first and second pivot (**120**, **220**) including first and second cam means (**125**, **225**), said first and second slider element (**140**, **240**) comprising first and second cam follower means (**145**, **245**) operatively connected with said first and second cam means (**125**, **225**) so that to the relative rotation of said first and second pivot (**120**, **220**) and said first and second hinge body (**130**, **230**) there corresponds the sliding of said first and second slider element (**140**, **240**).

5. System according to the preceding claim, wherein one of said first and second hinge device (**100**) comprises control means (**150**) acting on the respective first and second slider element(**140**) to brake the mutual rotation of the respective first or second hinge body (**130**) and first or second pivot (**120**), the other of said first and second hinge device (**200**) comprising motion promotion means (**250**) acting on the respective first or second slider element (**240**) to promote the mutual rotation of the respective first or second hinge body (**230**) and first or second pivot (**220**).

6. System according to claim 4 or 5, wherein said first cam (**125**)and cam follower (**225**) means and said second cam (**125**) and cam follower (**225**) means are mutually configured so that the action of said motion promotion means (**250**) counteracted by the action of said control means (**150**) imparts to the closing element (**A**) a predetermined rotation speed along at least one section of the rotation thereof between the open position and the closed position, preferably from the open position toward the closed position.

7. System according to claim 5 or 6, wherein the first or second slider (**140**) of said one of said first and second hinge device (**100**) comprises at least one plunger element (**160**) inserted into at least one portion (**137**) of the respective working chamber (**135**) to partition the latter into a first and second variable volume compartment (**176**, **177**), said control means (**150**) being of the hydraulic type.

8. System according to the preceding claim, wherein said at least one plunger element (**160**) is sealingly inserted into said at least one portion (**137**) of said respective working chamber (**135**), said hydraulic control means (**150**) comprising at least one hydraulic circuit (**171**, **172**) for placed in fluidic communication said first and second variable volume compartment (**176**, **177**) and valve means (**180**, **181**) for controlling the flow in said at least one hydraulic circuit (**171**, **172**).

9. System according to one or more of claims 5 to 8, wherein the working chamber (**135**) of said other of said first and second hinge device (**200**) comprises a bottom wall(**138**), said slider element (**240**) being slidable between a proximal position from and a distal position to said bottom wall (**138**), said motion promotion means (**250**) including elastic counteracting means (**251**) interposed between the respective first or second slider element (**240**) and said bottom wall (**138**) to promote the sliding of the latter between the proximal position and the distal position.

10. System according to any one of claims 5 to 9, wherein the first and second cam means (**125**) of

said one of said first and second hinge device (**100**) comprise a first operative surface (**126**) having at least one first substantially convex operative portion (**128**), the first or second cam means (**225**) of said other of said first and second hinge device (**200**)comprising at least one second operative surface (**226**) having at least one second operative portion (**228**) substantially convex and different from said first operative portion (**128**), said first and second operative portions (**128**, **228**) being mutually configured so that upon the rotation of said first hinge body (**130**) and of said first pivot (**120**) from said one of the first and second operative positions over an angular section, said first slider (**140**) and said second slider (**240**) slide over a different length section.

11. System according to the preceding claim, wherein said first and second operative portions (**128**, **228**) are mutually configured so that along said at least one section of the rotation of the closing element (**A**) from the open position to the closed position, said second hinge device (**200**) acts on said closing element with a first pair and said second hinge device (**100**) acts on said closing element with a second pair counteracting said first pair, said second pair being lower than said first pair so as to allow the rotation along said at least one section of the rotation of the closing element (**A**) from the open position to the closed position, said operative portions (**128**, **228**) being mutually configured so that said first and second pair are variable upon the rotation of said first and second hinge body (**130**, **230**) and of said first and second pivot (**120**, **220**) along said at least one section of the rotation from said one of the first and the second operative position to the other of the first and the second operative position so as to allow the rotation with said at least one predetermined speed of the closing element (**A**) along said at least one section from the open position to the closed position.

12. System according to claim 10 or 11, wherein said first and second operative portion (**128**, **228**) are mutually shaped so that the closing element (**A**) rotates with a first predetermined speed for at least one section of the rotation from the open position to the closed position and with a second predetermined speed for at least one second section of the rotation thereof between the open position of the closing element (**A**) and the closed position of the closing element (**A**).

13. System according to any one of the preceding claims, wherein at least one of said at least one first and one second hinge device (**100**) comprises respective means (**190**) for fixing to the respective stationary support structure (**S**) or closing element (**A**), said at least one of said at least one first and one second hinge device (**100**) and the respective fixing means (**190**) being mutually engageable to each other to have a mutual predetermined distance (**d**), said at least one of said at least one first and one second hinge device (**100**) and the respective fixing means (**190**) being mutually configured so that once engaged, they are mutually slidable along a respective axis (**X1**) to vary said predetermined operative distance (**d**), said fixing means (**190**) preferably comprising or preferably consisting of a fixing plate.

14. System according to the preceding claim, wherein said at least one of said at least one first

and one second hinge device (**100**) is arranged at the upper part with respect to the other of said at least one first and one second hinge device (**200**).

15. System according to claim 13 or 14, wherein the first or second pivot (**120**) of said at least one of said at least one first and one second hinge device (**100**) is integrally coupled with the respective fixing means (**190**), the respective hinge body (**130**) comprising a respective seat (**110**) for the respective pivot (**120**) configured so that the respective hinge body (**130**) slides along said respective axis (**X1**) with respect to said respective pivot (**120**) to define maximum variation of said predetermined operative distance (**d**).

16. System according to the preceding claim when dependent one or more of claims 7 to 12, wherein said respective working chamber (**135**) includes a partitioning element (**1000**) interposed between said respective seat (**110**) for said respective pivot (**120**) and said at least one portion (**137**) into which there is inserted said at least one plunger element (**160**), so as to prevent the hydraulic working fluid from flowing out from the latter.

17. System according to one or more of claims 13 to 16, wherein the first or second slider (**140**) of said one of said first and second hinge device (**100**) comprises at least one plunger element (**160**) inserted into at least one portion (**137**) of the respective working chamber (**135**) to partition the latter into a first and second variable volume compartment (**176**, **177**), said control means (**150**) being of the hydraulic type.

18. System according to the preceding claim, wherein said respective pivot (**120**) comprises a portion (**121**) for integrally coupling with respective fixing means (**190**), said respective hinge body (**130**) having an upper wall (**131**) designed to face respective fixing means (**190**), said upper wall(**131**) comprising a through opening (**132**) for said coupling portion (**121**) of said respective pivot (**120**), the latter being slidable relatively to said through opening (**132**) upon the sliding of said respective hinge body (**130**) with respect to said respective pivot (**120**).

19. System according to claim 17 or 18, wherein said respective hinge body (**130**) has a pair of first and second opposite abutment surfaces (**111**, **111'**), said respective pivot (**120**) comprising respective first and second abutment surfaces (**122**, **122'**) designed to interact with said first and second abutment surfaces (**111**, **111'**) of said respective hinge body (**130**), said respective pivot (**120**) being movable between a retracted position in which said first abutment and end-stroke surfaces (**111, 122**) are at mutual contact and said second abutment and end-stroke surfaces (**111'**, **122'**) are spaced apart from each other, and an extended position in which said first abutment and end-stroke surfaces (**111, 122**) are mutually spaced apart and said second abutment and end-stroke surfaces (**111'**, **122'**) are in contact with each other.

20. System according to the preceding claim, wherein the maximum distance between said first abutment and end-stroke surfaces (**111, 122**) defines the maximum variation of said operative distance

(**d**).

21. System according to one or more of claims 13 to 20, wherein said maximum variation of the operative distance (**d**) is comprised between 1 mm and 10 mm, preferably about 7 mm.

22. System according to one or more of claims 13 to 21, wherein said seat (**110**) comprises guide walls (**112**, **113**) in contact with said respective pivot (**120**) to guide the sliding of said respective hinge body (**130**) along said respective axis (**X1**) and the relative rotation around the latter.

23. System according to the preceding claim, wherein said respective pivot (**120**) comprises a first and a second substantially cylindrical operative portion (**121**, **123**) and a third operative portion (**125**) interposed between said first (**121**) and second (**123**) portion which includes said cam means, said seat (**110**) having corresponding fourth and fifth shaped portions (**112**, **113**) designed to interact respectively with first and second portions (**121**, **123**) which include said guide walls.

24. System according to the preceding claim, wherein said seat (**110**) further comprises a sixth central portion (**115**) designed to house said cam means (**125**), said sixth portion (**115**) comprising said abutment surfaces (**111**, **111'**) substantially perpendicular with respect to said respective axis (**X1**), said abutment surfaces (**111**, **111'**) having a distance substantially greater than the height of said third portion (**125**) of said pivot (**120**) so as to allow the sliding of the latter along the respective axis (**X1**) between said abutment surfaces (**111**, **111'**).

25. System according to one or more of claims 7 to 24, wherein said at least one plunger element (**160**) is operatively coupled with the respective pivot (**120**) so that to the rotation of the latter (**120**) there corresponds the sliding of the former (**160**), the latter being slidable along said respective second axis (**Y**) between at least one first operative position in which said first compartment (**176**) has a maximum volume and said second compartment (**177**) has a minimum volume and at least one second operative position in which said first compartment (**176**) has a minimum volume and said second compartment (**177**) has a maximum volume.

26. System according to the preceding claim, wherein said plunger element (**160**) includes a circuit (**172**) for fluidically connecting said first (**176**) and second (**177**) variable volume compartment and valve means (**181**) acting on said circuit (**172**) to selectively allow/prevent the fluid from flowing therethrough.

27. System according to the preceding claim, wherein said valve means (**181**) are normally closed, said valve means (**181**) being configured to open when the pressure in said second compartment (**177**) exceeds a predetermined threshold value and/or when said plunger element (**160**) is in proximity of said second operative position.

28. System according to the preceding claim, wherein said plunger element (**160**) includes said valve means (**181**) or it includes said circuit (**172**) and said valve means (**181**).

29. System according to any one of claims 25 to 28, wherein said circuit (**172**) comprises an

opening (**175**), there being provided for a shutter (**184**) movable between a first closed position in which it shuts said opening (**175**) so as to prevent the working fluid from flowing from said second (**177**) to said first compartment (**176**) and second position distal from said opening (**175**) so as to allow the working fluid to flow from said second (**177**) to said first (**176**) compartment, elastic means(**189**) being further provided for to force said shutter (**184**) to close against said opening (**175**).

30. System according to the preceding claim, wherein said circuit (**172**) comprises a duct (**173**) having a first end defining said opening (**175**) and a second opposite end (**175'**) connected with said second compartment (**177**) so that when the pressure in the latter compartment (**177**) exceeds the threshold value, the working fluid forces said shutter (**184**) to open so as to allow the working fluid to flow out from said second compartment (**177**) through said opening (**175**).

31. System according to claim 29 or 30, wherein said working chamber (**137**) comprises a bottom wall (**138**), said plunger element (**160**) comprising a disc-shaped element (**166**) which includes at least one through opening (**167**), at least one pin (**168**) being further provided for inserted into said at least one through opening (**167**) having a first end (**169**) designed to interact with said bottom wall (**138**) and a second opposite end (**169'**) operatively connected with said shutter(**184**) to open the latter once said first end (**169**) abuts against said bottom wall (**138**).

32. System according to the preceding claim, comprising an annular element (**185**) interposed between said shutter (**184**) and said elastic means (**189**), said annular element (**185**) being slidable between a first and second operative position corresponding to said open and closed position of said shutter (**184**), said second end (**169'**) of said at least one pin (**168**) being designed to interact with said annular element (**185**) to promote the passage thereof from the second to the first operative position once said first end(**169**) of said at least one pin (**168**) abuts against said bottom wall (**138**).

33. System according to claim 31 or 32, wherein said disc-shaped element (**166**) comprises a central through hole (**173**) defining said at least one through opening (**167**), said through hole (**173**) including said opening (**175**), said pin (**168**) being inserted into said through hole (**173**) so that said second opposite end (**169'**) impacts with said shutter (**184**) to open the latter once said first end (**169**) of said pin (**168**) abuts against said bottom wall (**138**), said pin (**168**) having a diameter slightly smaller than the diameter of said through hole (**173**) so that upon opening said shutter (**184**) the working fluid flows out through said through opening (**173**) and said opening (**175**) from the second to the first variable volume compartment (**176**, **177**).

34. System according to claim 31 or 32, comprising an annular element (**185**) interposed between said shutter (**184**) and said elastic means (**189**), said plunger element (**160**) comprises a stem (**161**) with an annular relief (**162**), said annular element (**185**) being fitted onto said stem (**161**), said elastic means (**189**) being interposed between said annular relief (**162**) and said annular element (**185**), said second end (**169'**)

of said at least one pin (**168**) being designed to interact with said annular element (**185**) to promote the passage thereof from the second to the first operative position once said first end (**169**) of said at least one pin (**168**) abuts against said bottom wall (**138**).

35. System according to the preceding claim, wherein said at least one pin (**168**) has a diameter slightly smaller than the diameter of said at least one through opening (**167**) so that when said annular element (**185**) is in said first operative position, the working fluid flows out from said second compartment (**177**) through said at least one through opening (**167**).

36. System according to any one of claims 31 to 35, wherein when said at least one pin (**168**) is inserted into said at least one opening (**167**), the former has a portion (**168'**) protruding from said disc-shaped element (**166**) for a predetermined length to define the length of the section of the rotation of said hinge body (**130**) and said pivot (**120**) wherein said valve means (**181**) are open to define the snap of the closing element (**A**).

37. An assembly for the rotatable coupling around a rotation axis (**X**) of a closing element (**A**), such as a door leaf, a door or the like, and a stationary support element (**S**), such as a frame, a wall or the like, the assembly comprising:

- a coupling element (**190**) which can be anchored to one of the stationary support structure (**S**) and the closing element (**A**),
- a hinge device (**100**) which can be anchored to the other of the stationary support structure (**S**) and the closing element (**A**);

wherein said coupling element (**190**) and said hinge device (**100**) are rotatably coupled to each other to mutually rotate around the axis (**X**) between at least one open position of the closing element and a closed position of the closing element (**A**);

wherein when said coupling element (**190**) and said hinge device (**100**) are mutually engaged, they have a predetermined operative distance (**d**), said coupling element (**190**) and said hinge device (**100**) being mutually configured so that once engaged they are mutually slidable along the axis (**X**) to vary said predetermined operative distance (**d**).

38. Assembly according to the preceding claim, wherein said hinge device (**100**) includes a hinge device (**130**) and a pivot (**120**) defining the axis (**X**), said hinge device (**130**) and said pivot (**120**) being mutually rotatably coupled to each other to mutually rotate around the axis (**X**) between at least one first operative position corresponding to the open or closed position of the closing element (**A**) and a second operative position corresponding to the closed or open position of the closing element (**A**),

wherein said pivot (**120**) is integrally coupled with said coupling element (**190**), said hinge body (**130**) comprising a seat (**110**) for said pivot (**120**), said seat (**110**) and said pivot (**120**) being mutually configured so that the latter is slidable along the axis (**X**) in the former, the sliding of said pivot (**120**) in

said seat (**110**) defining the maximum variation of said predetermined operative distance (**d**).

39. Assembly according to the preceding claim, wherein said pivot (**120**) comprises a portion (**121**) for integrally coupling with said coupling element (**190**), said hinge body (**130**) having an upper wall (**131**) designed to face said coupling element (**190**), said wall (**131**) comprising a through opening (**132**) for said coupling portion (**121**) of said pivot (**120**), the latter being slidable through said through opening (**132**).

40. Assembly according to claim 38 or 39, wherein said hinge body (**130**) has a pair of first and second opposite abutment surfaces (**111**, **111'**), said pivot (**120**) comprising respective first and second abutment surfaces (**122**, **122'**) designed to interact with said first and second abutment surfaces (**111**, **111'**) of said hinge body (**130**), said pivot (**120**) being movable between a retracted configuration in which said first abutment surfaces (**111, 122**) of respectively said hinge body (**130**) and said pivot (**120**) abut with respect to each other and said second surfaces (**111'**, **122'**) of respectively said hinge body (**130**) and said pivot (**120**) are spaced apart from each other, and an extended configuration wherein said first abutment surfaces (**111, 122**) of respectively said hinge body (**130**) and said pivot (**120**) are spaced apart and said second surfaces (**111'**, **122'**) of respectively said hinge body (**130**) and said pivot (**120**) abut with respect to each other.

41. Assembly according to the preceding claim, wherein the distance between said first surfaces (**111, 122**) of respectively said hinge body (**130**) and said pivot (**120**) defining the maximum variation of said operative distance (**d**).

42. Assembly according to one or more of claims 38 to 41, wherein said maximum variation of the operative distance is comprised between 1 mm and 10 mm, preferably about 7 mm.

43. Assembly according to any one of claims 38 to 42, wherein said hinge body (**130**) comprises a working chamber (**135**) defining a second axis (**Y**) substantially perpendicular with respect to said rotation axis (**X**) and a slider element (**140**) slidable in said working chamber (**135**), said pivot (**120**) including cam means (**125**), said slider element (**140**) further comprising cam follower means (**145**) operatively connected with said cam means (**125**) so that to the mutual rotation of said pivot (**120**) and said hinge body (**130**) there corresponds the sliding of said slider element (**140**).

44. Assembly according to the preceding claim, wherein said seat (**110**) comprises guide means (**112**, **113**) for guiding said pivot (**120**) to slide along and rotate with respect to axis (**X**).

45. Assembly according to the preceding claim, wherein said pivot (**120**) comprises a first substantially cylindrical operative portion (**121**) and a second substantially cylindrical operative portion (**123**), and a third operative portion (**125**) interposed between said first (**121**) and second (**123**) portion which includes said cam means, said seat (**110**) having corresponding fourth and fifth shaped portions (**112**, **113**) designed to interact with respectively said first and second operative portions (**121**, **123**) to guide the latter.

46. Assembly according to the preceding claim, wherein said seat (**110**) further comprises a sixth central portion (**115**) designed to house said cam means (**125**), said sixth portion (**115**) comprising said abutment surfaces (**111**, **111'**) substantially perpendicular with respect to said axis (**X**), said abutment surfaces (**111**, **111'**) having a distance substantially greater than the height of said third portion (**125**) of said pivot (**120**) so as to allow the sliding of the latter along the axis (**X**) between said abutment surfaces (**111**, **111'**).

47. A hydraulic hinge device for the controlled rotary movement around a rotation axis (**X1**) of a closing element (**A**), such as a door leaf, a door or the like, and a stationary support element (**S**), such as a frame, a wall or the like, the device comprising:

- a hinge body (**130**) which can be anchored to one of the stationary support structure and the closing element;
- a pivot (**120**) which can be anchored to the other of the stationary support structure and the closing element,

wherein said hinge body (**130**) and said pivot (**120**) are mutually coupled so as to mutually rotate around a first longitudinal axis (**X1**);

wherein said hinge body (**130**) includes at least one working chamber (**137**) for a working fluid defining a second longitudinal axis (**Y**), said at least one working chamber (**137**) including at least one plunger element (**160**) slidable along said second axis (**Y**), said at least one plunger element (**160**) being operatively coupled with said pivot (**120**) so that to the rotation of the latter (**120**) there corresponds the sliding of the former (**160**);

wherein said plunger element (**160**) includes a head (**165**) sealingly inserted into said working chamber (**137**) to partition the latter into a first (**176**) and a second (**177**) variable volume compartment which are fluidically independent;

wherein said plunger element (**160**) is slidable along said second axis (**Y**) between at least one first operative position in which said first compartment (**176**) has a maximum volume and said second compartment (**177**) has a minimum volume and at least one second operative position in which said first compartment (**176**) has a minimum volume and said second compartment (**177**) has a maximum volume;

wherein said plunger element (**160**) includes a circuit (**172**) for fluidically connecting said first (**176**) and second (**177**) variable volume compartment and valve means (**181**) acting on said circuit (**172**) to selectively allow/prevent the fluid from flowing therethrough;

wherein said valve means (**181**) are normally closed, said valve means (**181**) being configured to open when the pressure in said second compartment (**177**) exceeds a predetermined threshold value and/or when said plunger element (**160**) is in proximity of said second operative position.

48. Device according to the preceding claim, wherein said head (**165**) of said plunger element

(**160**) includes said valve means (**181**) or it includes said circuit (**172**) and said valve means (**181**).

49.Device according to claim 47 to 48, wherein said circuit (**172**) comprises an opening (**175**), there being provided for a shutter (**184**) movable between a first closed position in which it shuts said opening (**175**) so as to prevent the working fluid from flowing from said second (**177**) to said first compartment (**176**) and second open position distal from said opening (**175**) so as to allow the working fluid to flow from said second (**177**) to said first (**176**) compartment, elastic means(**189**) being further provided for to force said shutter (**184**) to close against said opening (**175**).

50.Device according to the preceding claim, wherein said circuit (**172**) comprises a duct (**173**) having a first end defining said opening (**175**) and a second opposite end (**175'**) connected with said second compartment (**177**) so that when the pressure in the latter compartment (**177**) exceeds the threshold value, the working fluid forces said shutter (**184**) to open so as to allow the working fluid to flow out from said second compartment (**177**) through said opening (**175**).

51.Device according to claim 49 or 50, wherein said working chamber (**137**) comprises a bottom wall (**138**), said head (**165**) of said plunger element (**160**) comprising a disc-shaped element (**166**) which includes at least one through opening (**167**), at least one pin (**168**) being further provided for inserted into said at least one through opening (**167**) having a first end (**169**) designed to interact with said bottom wall (**138**) and a second opposite end (**169'**) operatively connected with said shutter(**184**) to open the latter once said first end (**169**) abuts against said bottom wall (**138**).

52.Device according to the preceding claim, comprising an annular element (**185**) interposed between said shutter (**184**) and said elastic means (**189**), said annular element (**185**) being slidable between a first and second operative position corresponding to said open and closed position of said shutter (**184**), said second end (**169'**) of said at least one pin (**168**) being designed to interact with said annular element (**185**) to promote the passage thereof from the second to the first operative position once said first end(**169**) of said at least one pin (**168**) abuts against said bottom wall (**138**).

53.Device according to claim 52, wherein said disc-shaped element (**166**) comprises a central through hole (**173**) defining said at least one through opening (**167**), said through hole (**173**) including said opening (**175**), said pin (**168**) being inserted into said through hole (**173**) so that said second opposite end (**169'**) impacts with said shutter (**184**) to open the latter once said first end (**169**) of said pin (**168**) abuts against said bottom wall (**138**), said pin (**168**) having a diameter slightly smaller than the diameter of said through hole (**173**) so that upon opening said shutter (**184**) the working fluid flows out through said through opening (**173**) and said opening (**175**) from the second to the first variable volume compartment (**176**, **177**).

54.Device according to claim 52, comprising an annular element (**185**) interposed between said shutter (**184**) and said elastic means (**189**), said plunger element (**160**) comprises a stem (**161**) with an

annular relief (**162**), said annular element (**185**) being fitted onto said stem (**161**), said elastic means (**189**) being interposed between said annular relief (**162**) and said annular element (**185**), said second end (**169'**) of said at least one pin (**168**) being designed to interact with said annular element (**185**) to promote the passage thereof from the second to the first operative position once said first end (**169**) of said at least one pin (**168**) abuts against said bottom wall (**138**).

55.Device according to the preceding claim, wherein said at least one pin (**168**) has a diameter slightly smaller than the diameter of said at least one through opening (**167**) so that when said annular element (**185**) is in said first operative position, the working fluid flows out from said second compartment (**177**) through said at least one through opening (**167**).

56.Device according to any one of claims 52 to 55, wherein when said at least one pin (**168**) is inserted into said at least one opening (**167**), the former has a portion (**168'**) protruding from said disc-shaped element (**166**) for a predetermined length to define the length of the section of the rotation of said hinge body (**130**) and said pivot (**120**) wherein said valve means (**181**) are open to define the snap of the closing element (**A**).

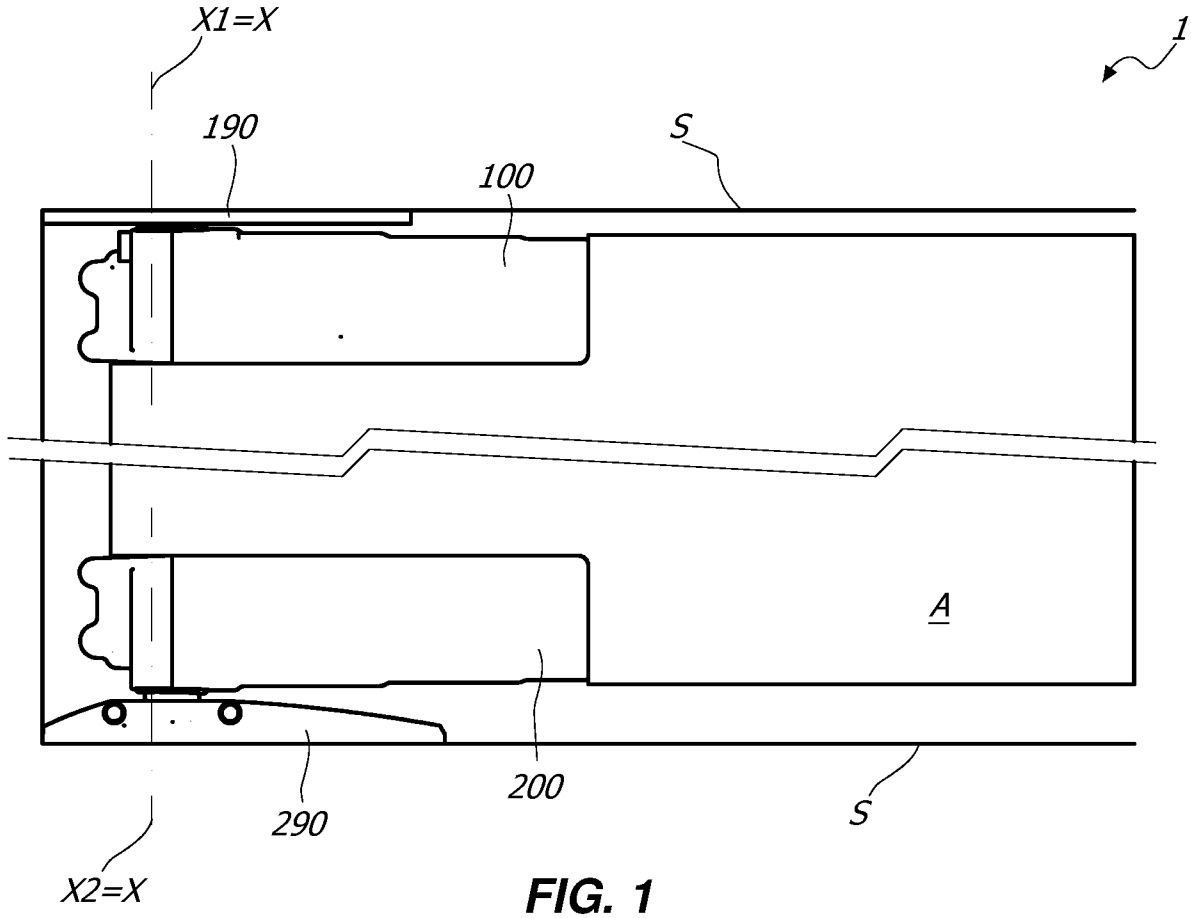

FIG. 1

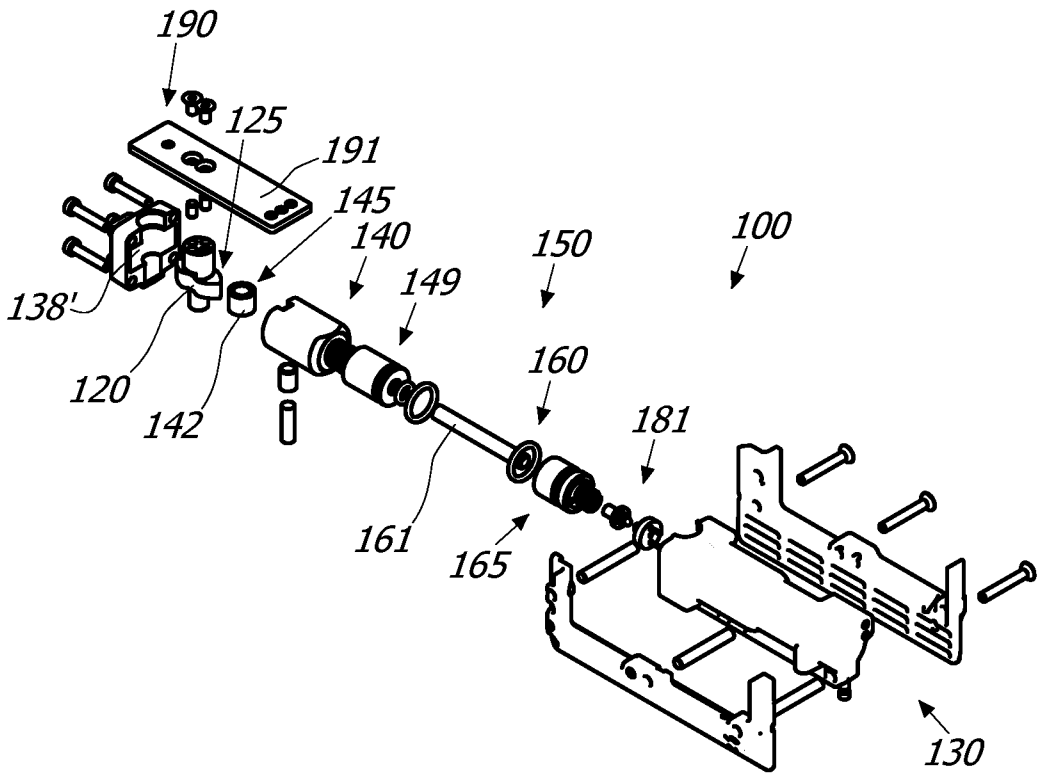

FIG. 2

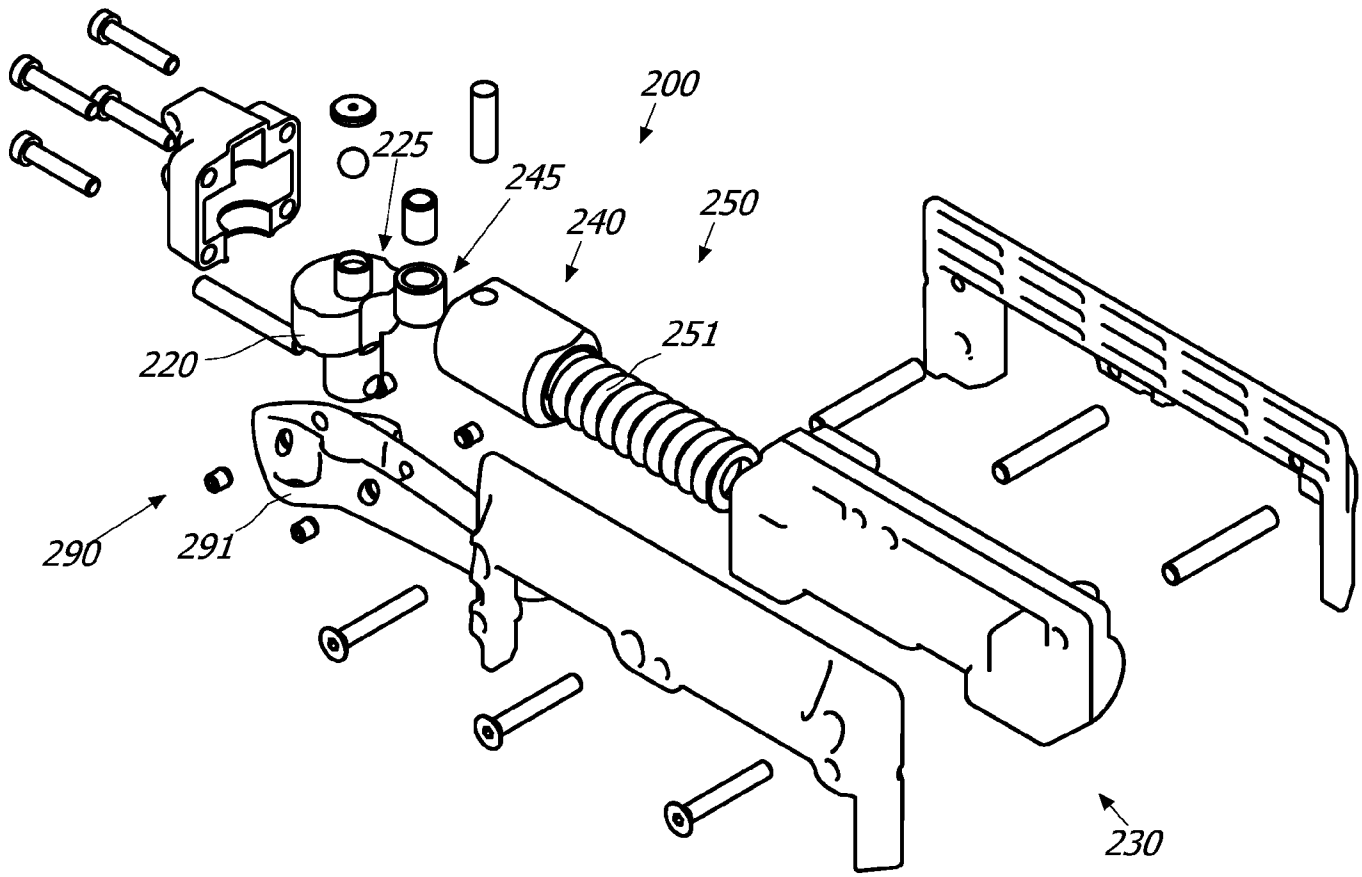

FIG. 3

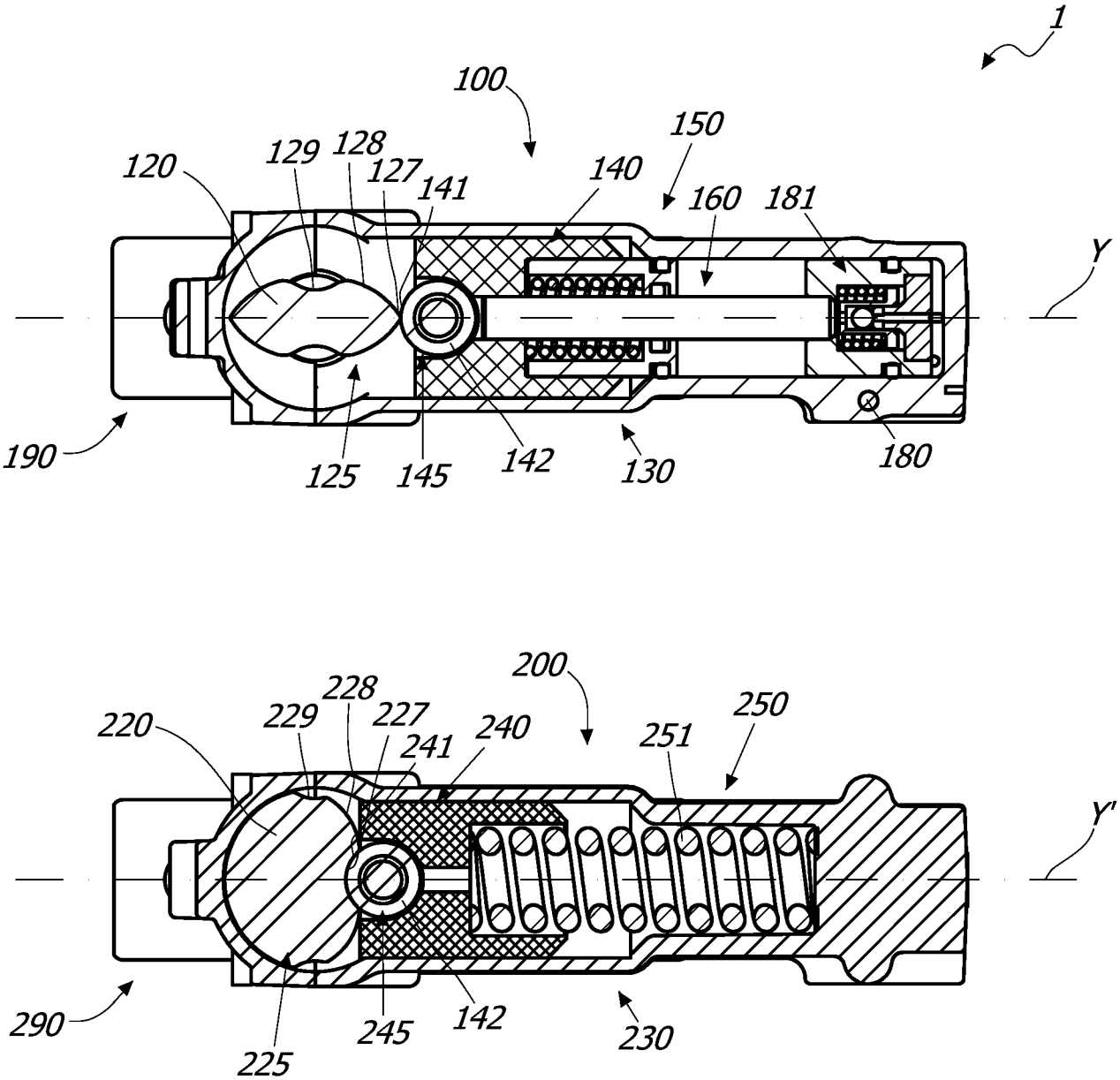
1
100
150
120
129
128
127
141
140
160
181
Y
190
125
145
142
130
180
200
228
220
229
227
241
240
251
250
Y'
290
225
245
142
230

FIG. 4

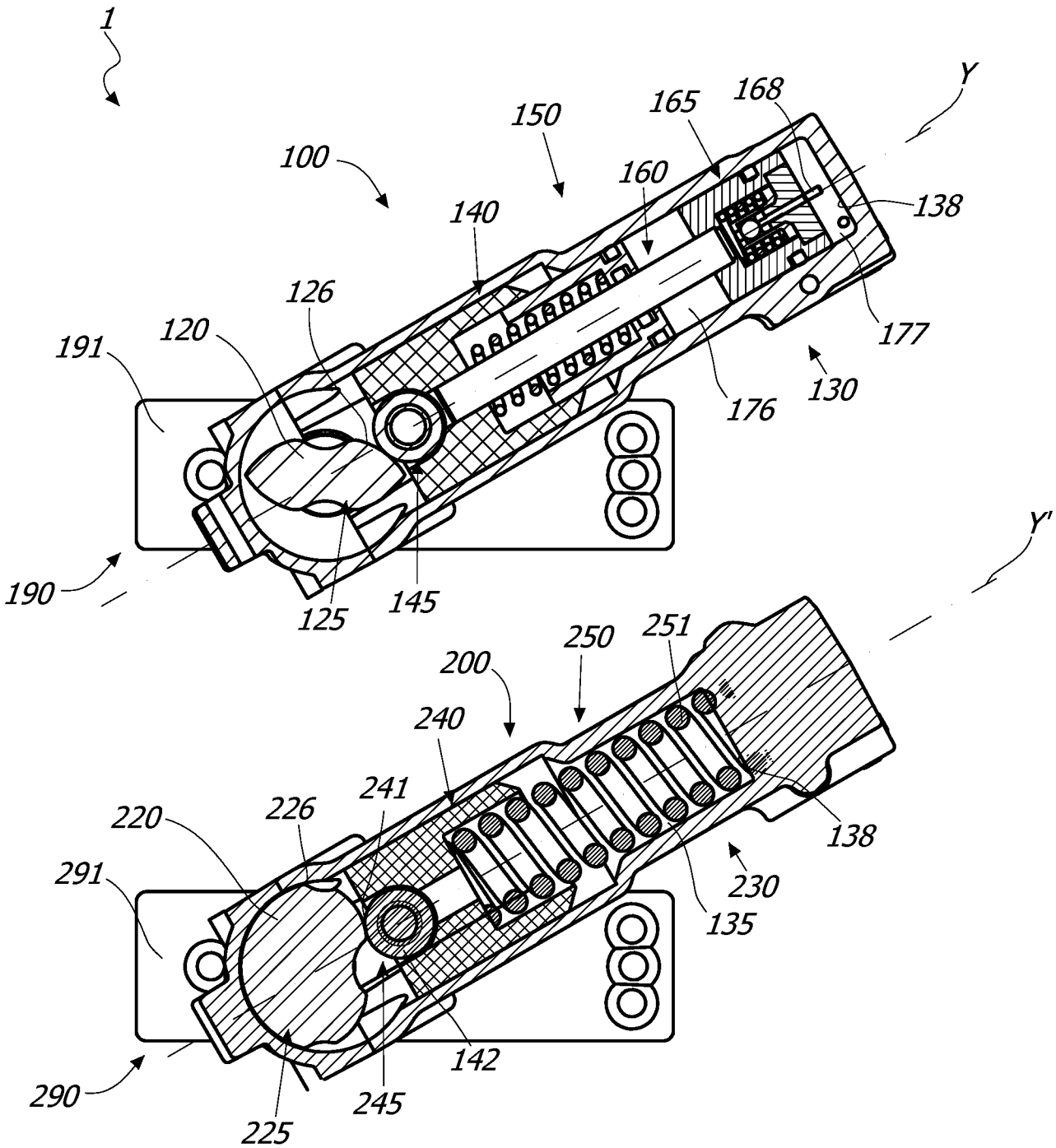
1
Y
168
165
150
100
160
138
140
126
120
191
177
130
176
190
125
145
Y'
250
251
200
240
241
226
220
138
291
230
135
142
290
245
225

FIG. 5

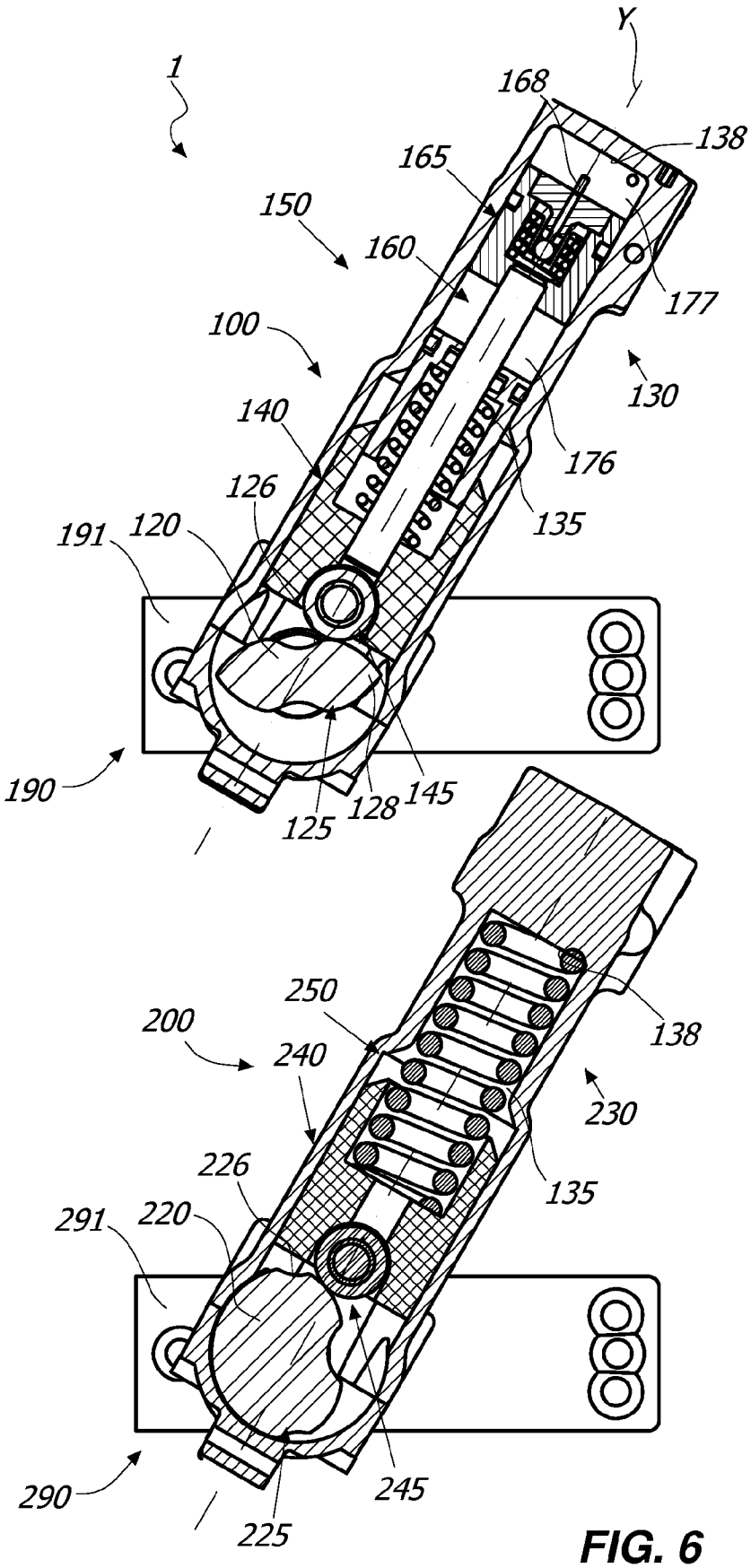
Y
1
168
138
165
150
160
177
100
130
140
176
126
135
191
120
190
125
128
145
250
200
138
240
230
226
135
291
220
245
290
225

FIG. 6

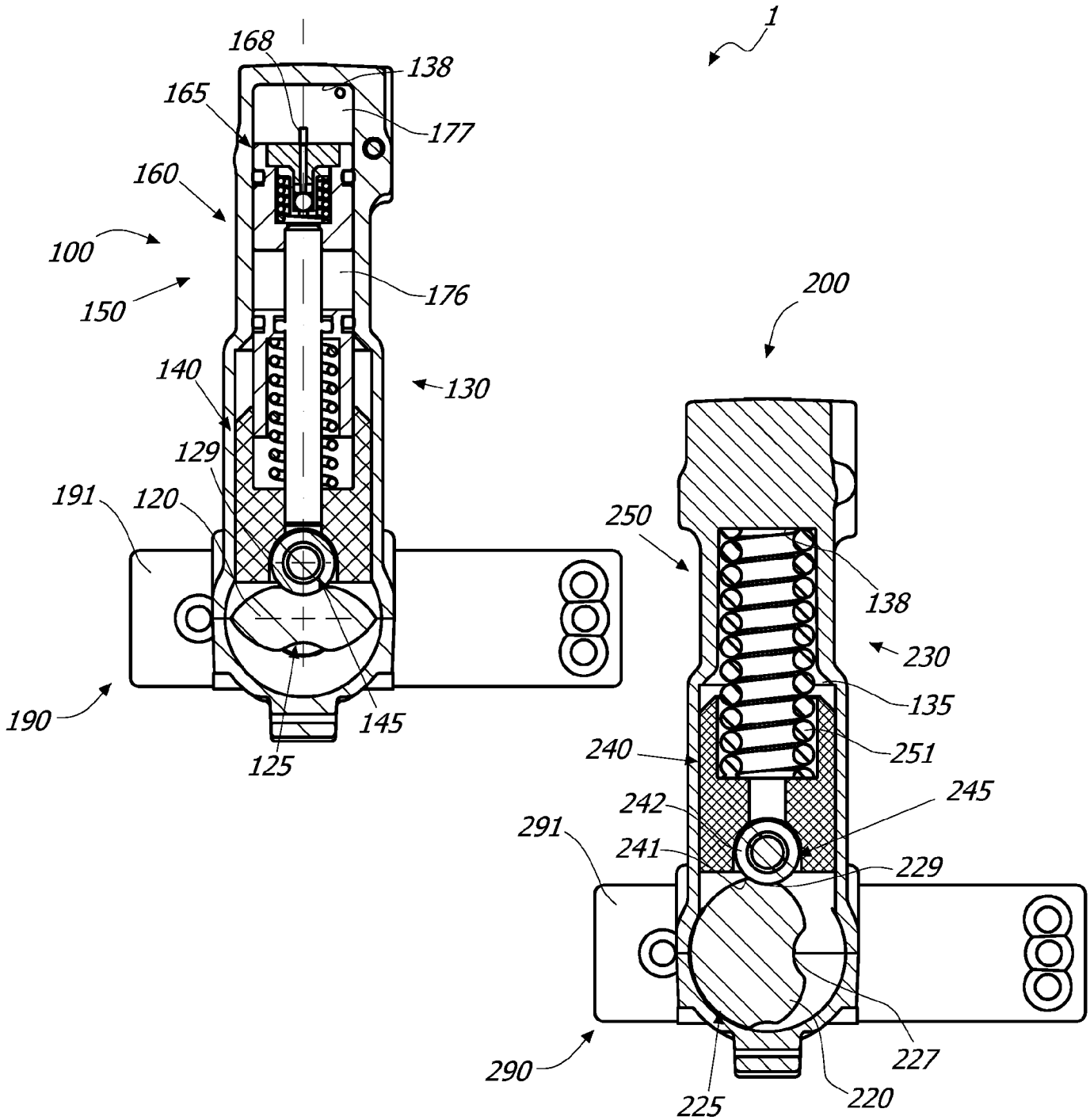
1
168
138
165
177
160
100
150
176
200
140
130
129
191
120
250
138
230
135
251
240
242
245
291
241
229
190
145
125
290
227
225
220

FIG. 7

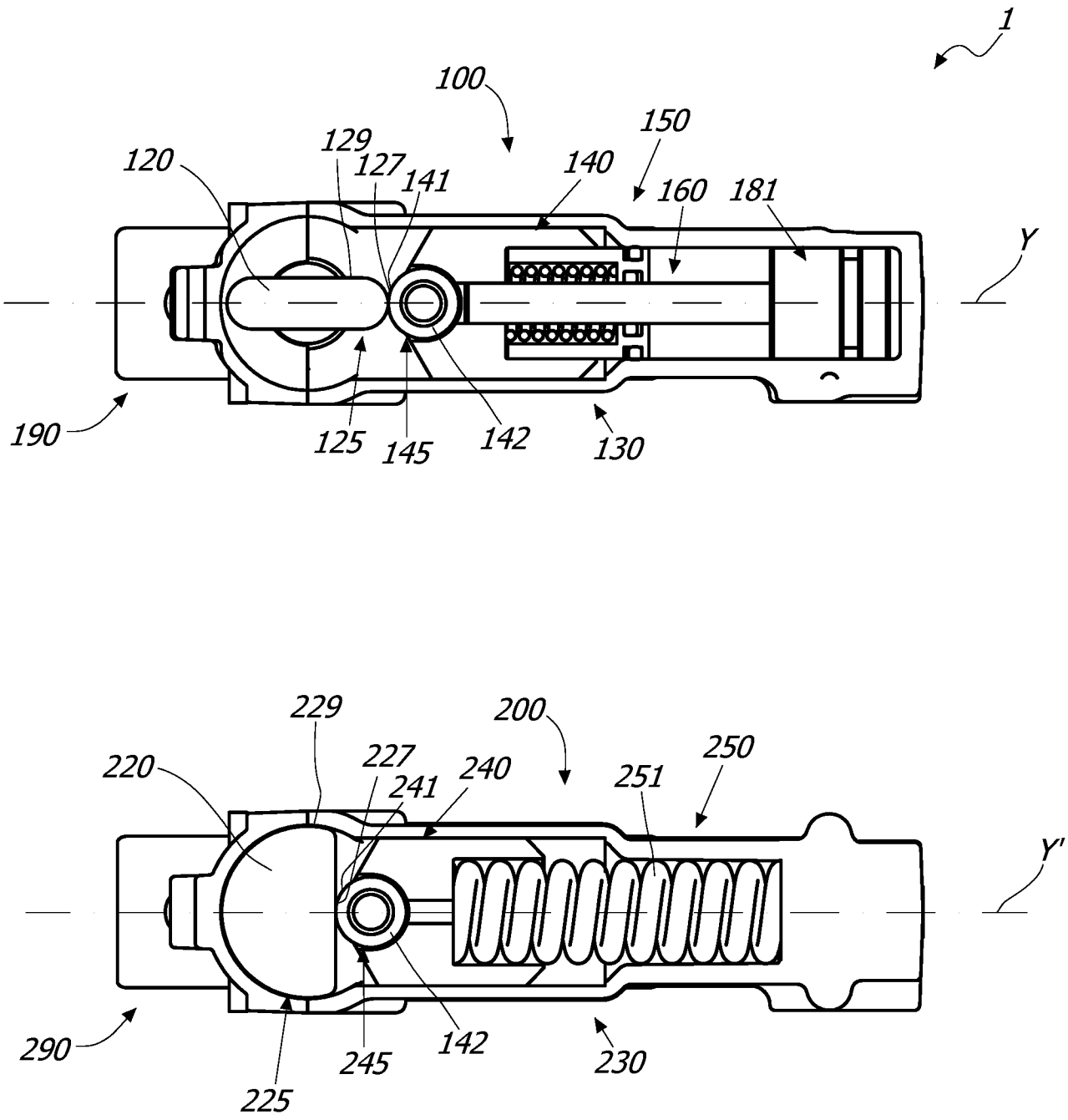
1
100
150
129
120
127
141
140
160
181
Y
190
125
145
142
130
229
200
220
227
241
240
251
250
Y'
290
245
142
230
225

FIG. 8

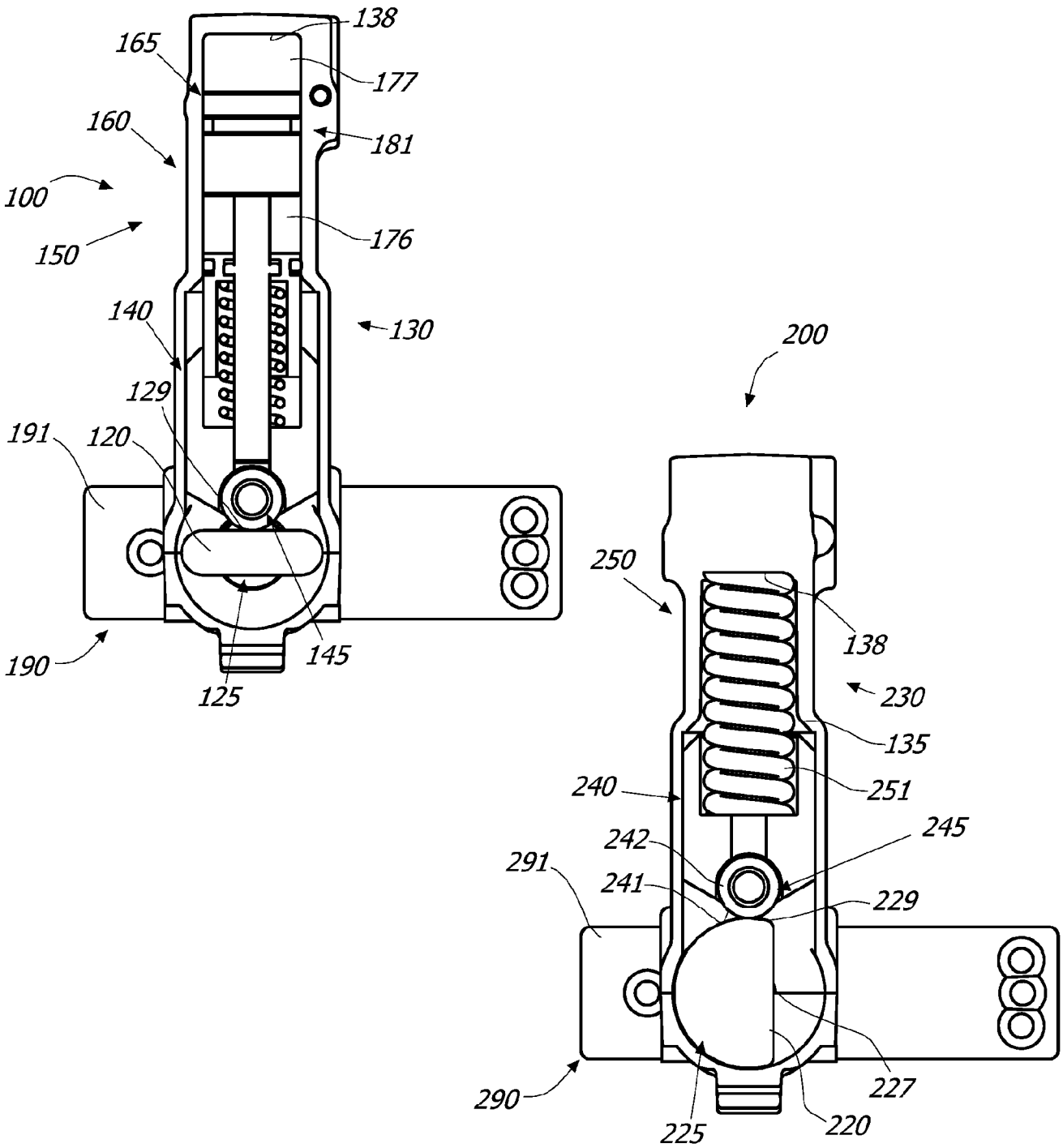
138
165
177
160
181
100
176
150
140
130
129
191
120
145
190
125
200
250
138
230
135
240
251
245
242
291
241
229
227
290
225
220

FIG. 9

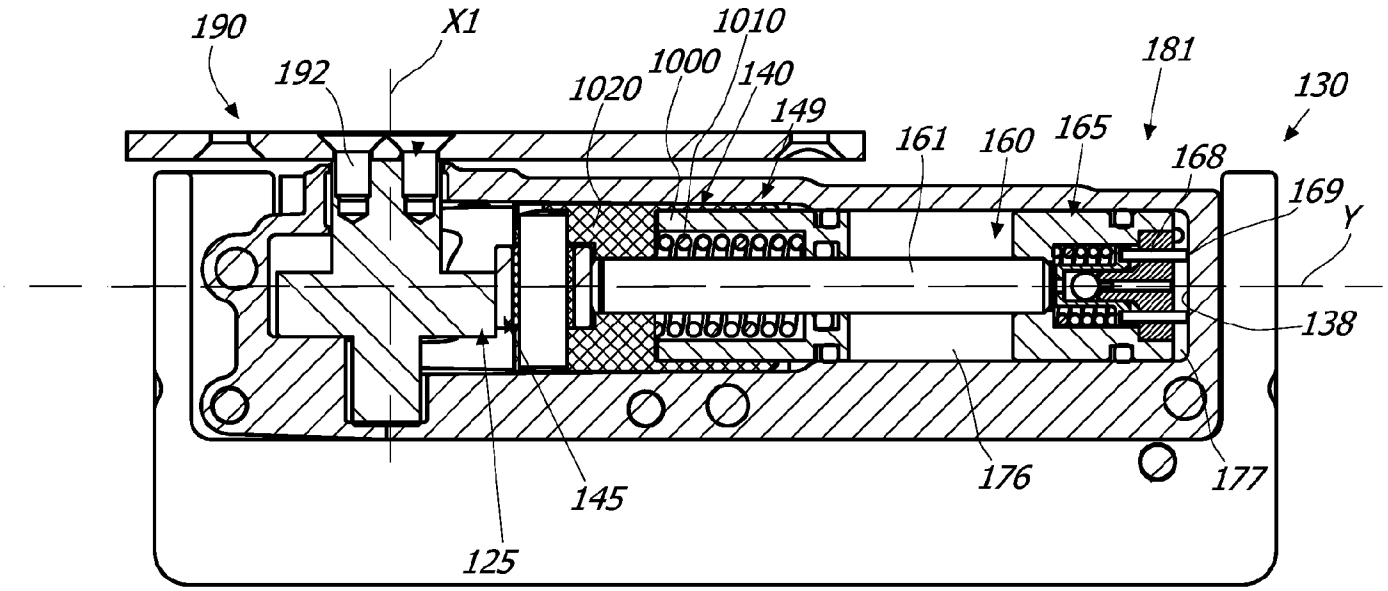
190
X1
1010
192
1000
140
1020
149
181
130
161
160
165
168
169
Y
138
145
176
177
125

FIG. 10

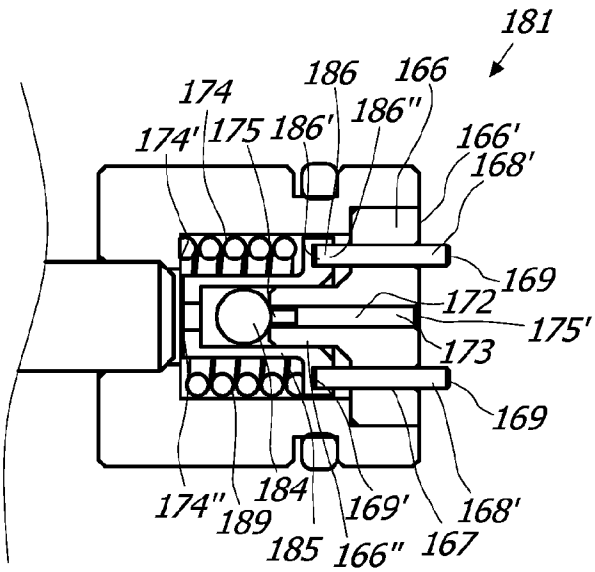
181
174
186
166
186"
174'
175
186'
166'
168'
169
172
175'
173
169
174"
189
184
185
166"
169'
167
168'

FIG. 11

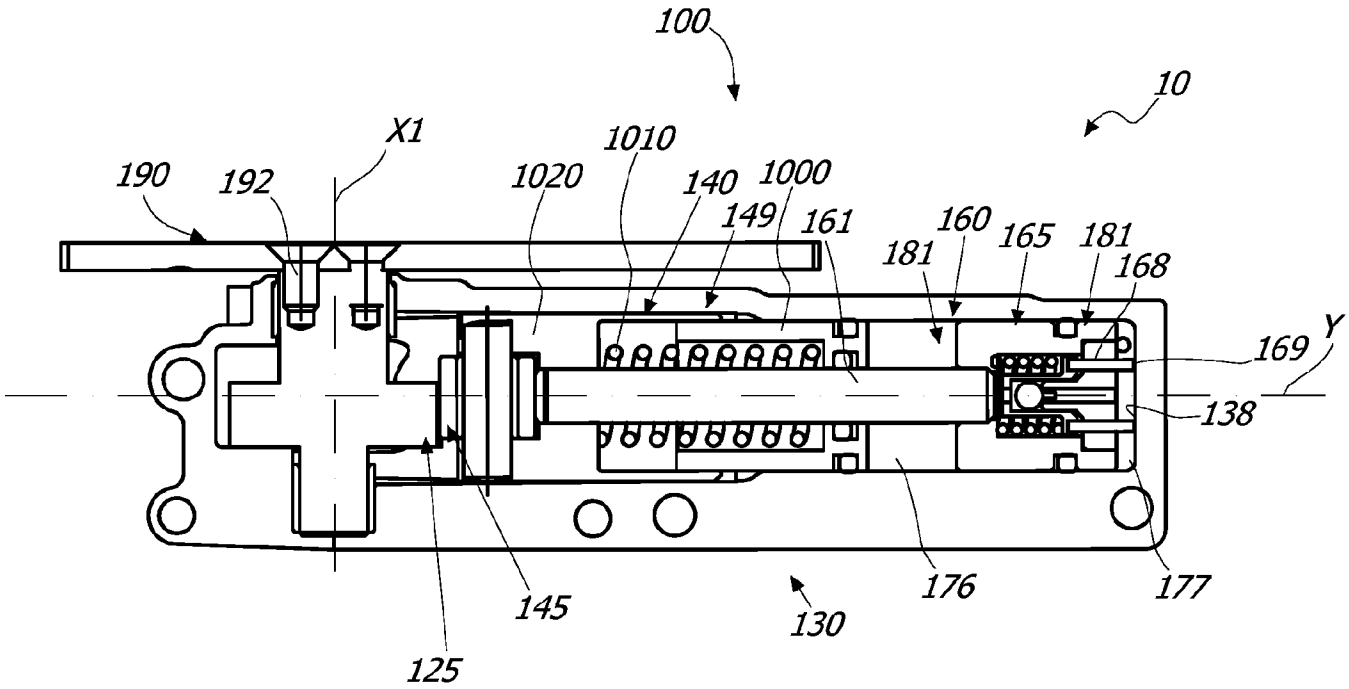
100
10
X1
190
192
1020
1010
140
1000
149
161
181
160
165
181
168
169
Y
138
145
125
130
176
177

FIG. 12

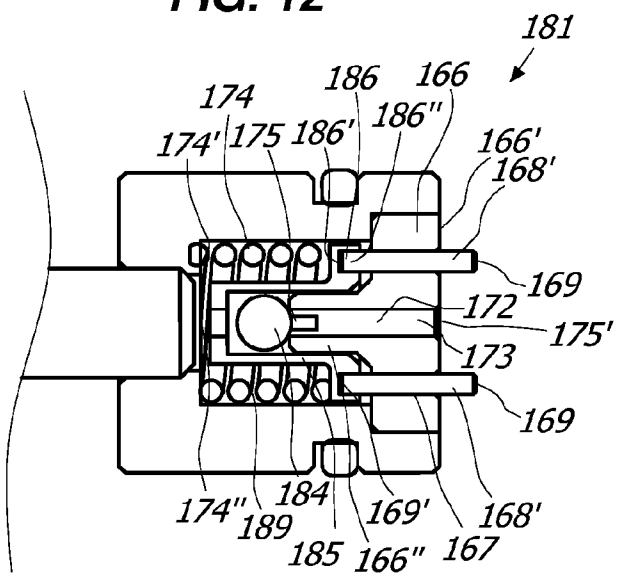
181
186
166
174
186"
174'
175
186'
166'
168'
169
172
175'
173
169
174"
189
184
185
169'
166"
167
168'

FIG. 13

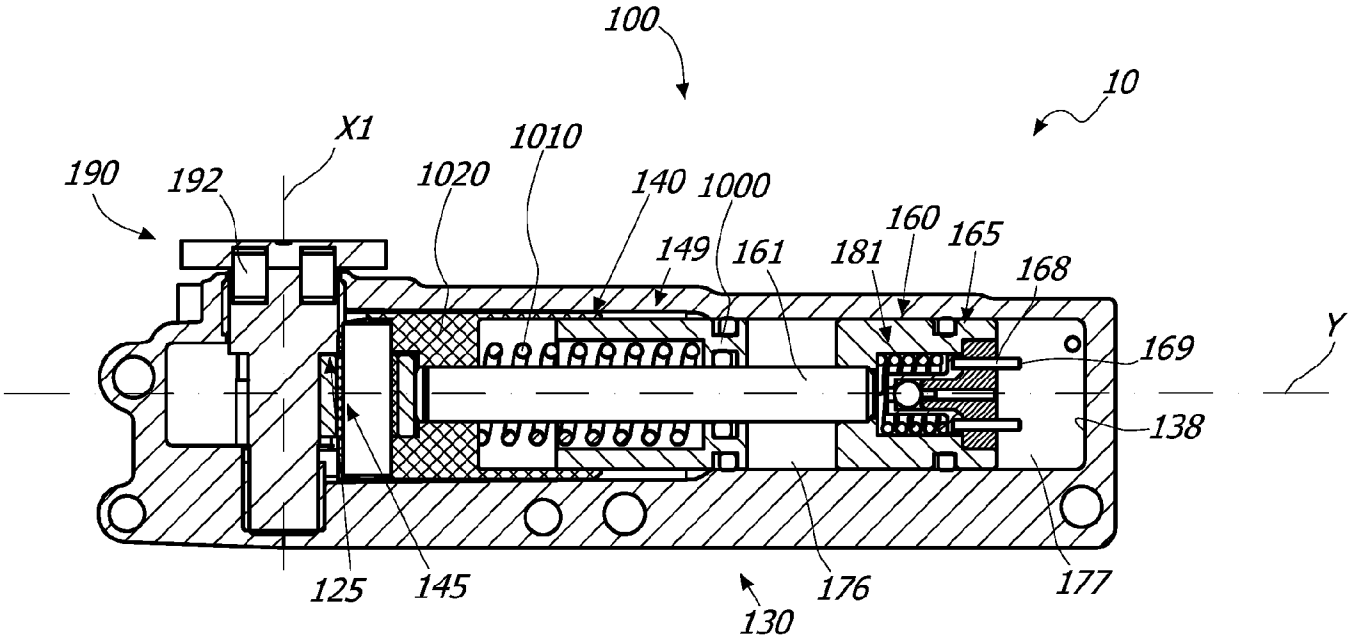
100
10
X1
190
192
1010
1020
140
1000
149
161
181
160
165
168
169
Y
138
125
145
176
177
130

FIG. 14

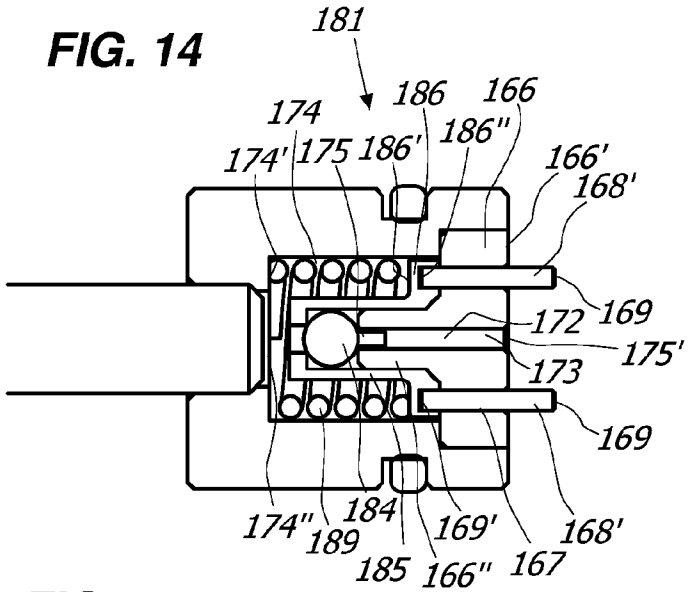
181
186
166
174
174'
175
186'
186"
166'
168'
169
172
175'
173
169
174"
189
184
185
166"
169'
167
168'

FIG. 15

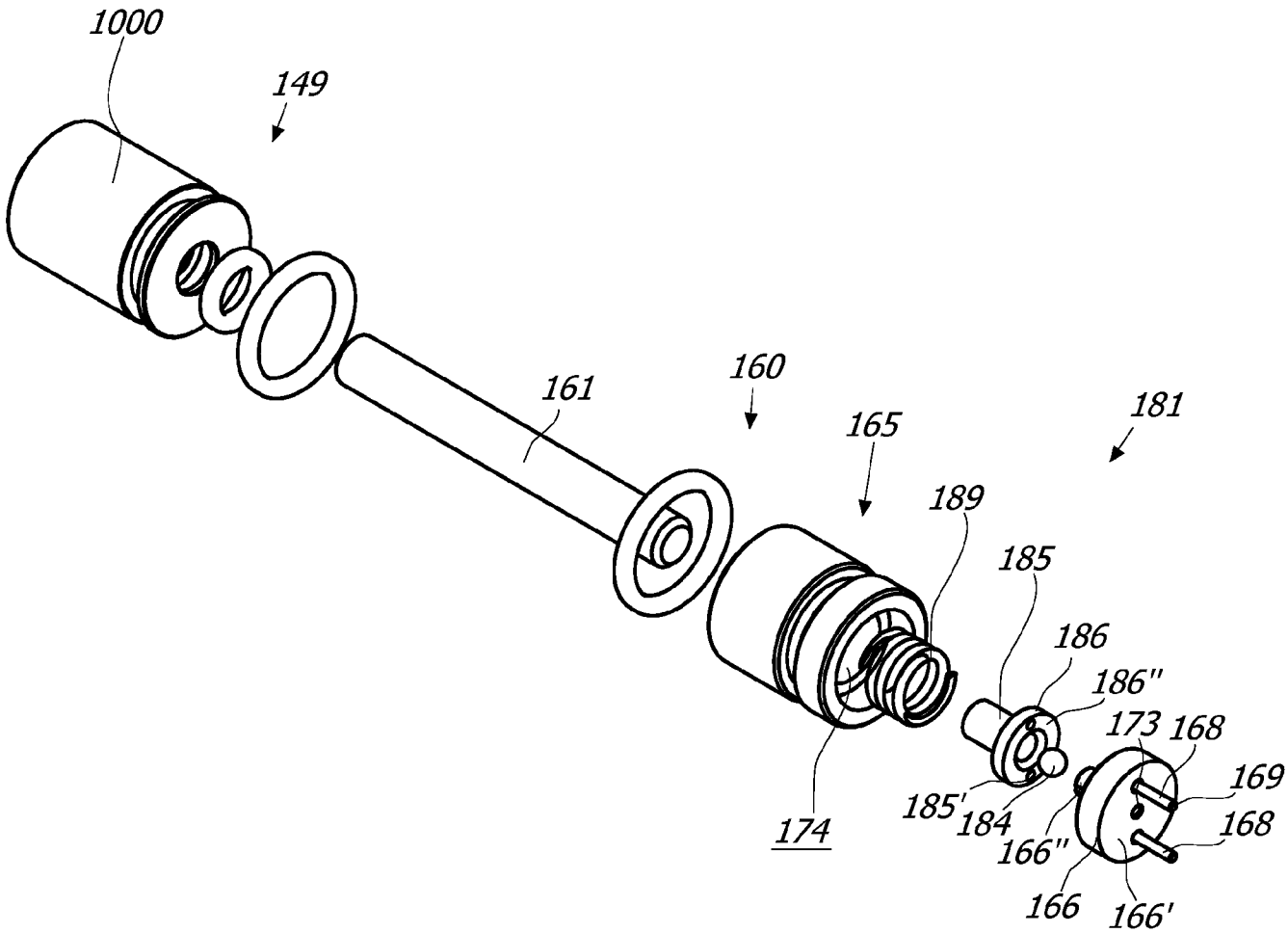
1000
149
161
160
165
181
189
185
186
186"
173
168
169
168
185'
184
166"
166
166'
174

FIG. 16

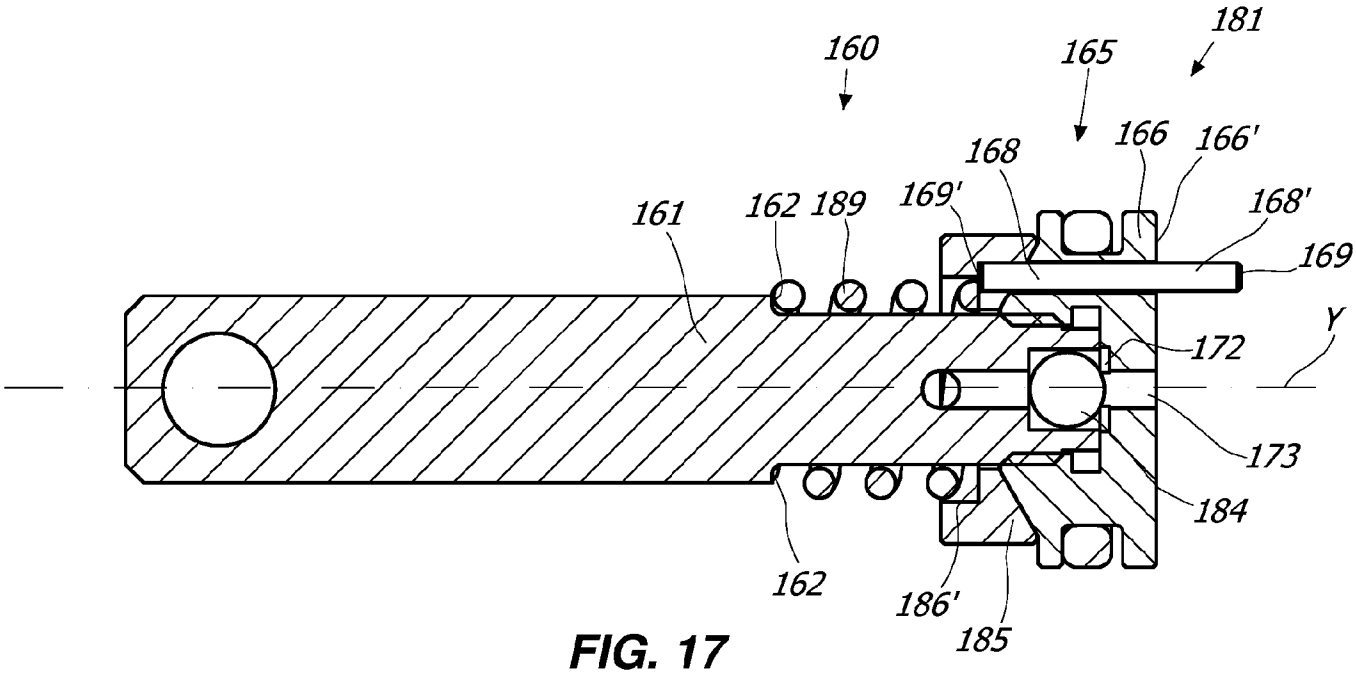
181
160
165
166
166'
168
169'
161
162
189
168'
169
Y
172
173
184
162
186'
185

FIG. 17

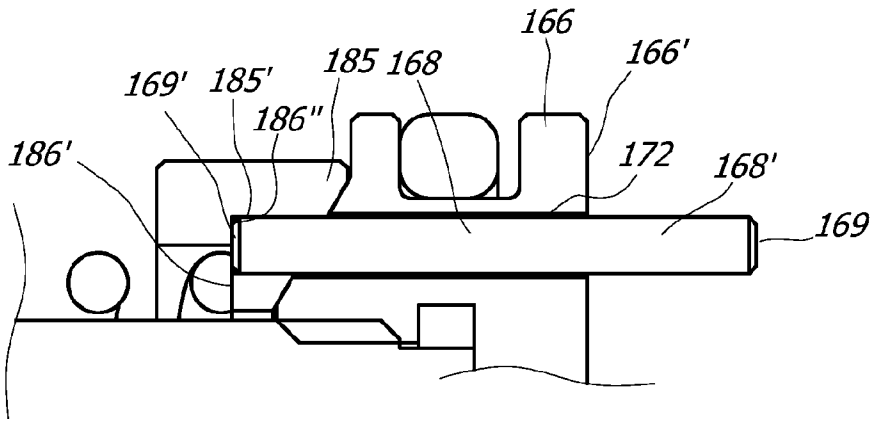
166
166'
169'
185'
185
168
186"
186'
172
168'
169

FIG. 18

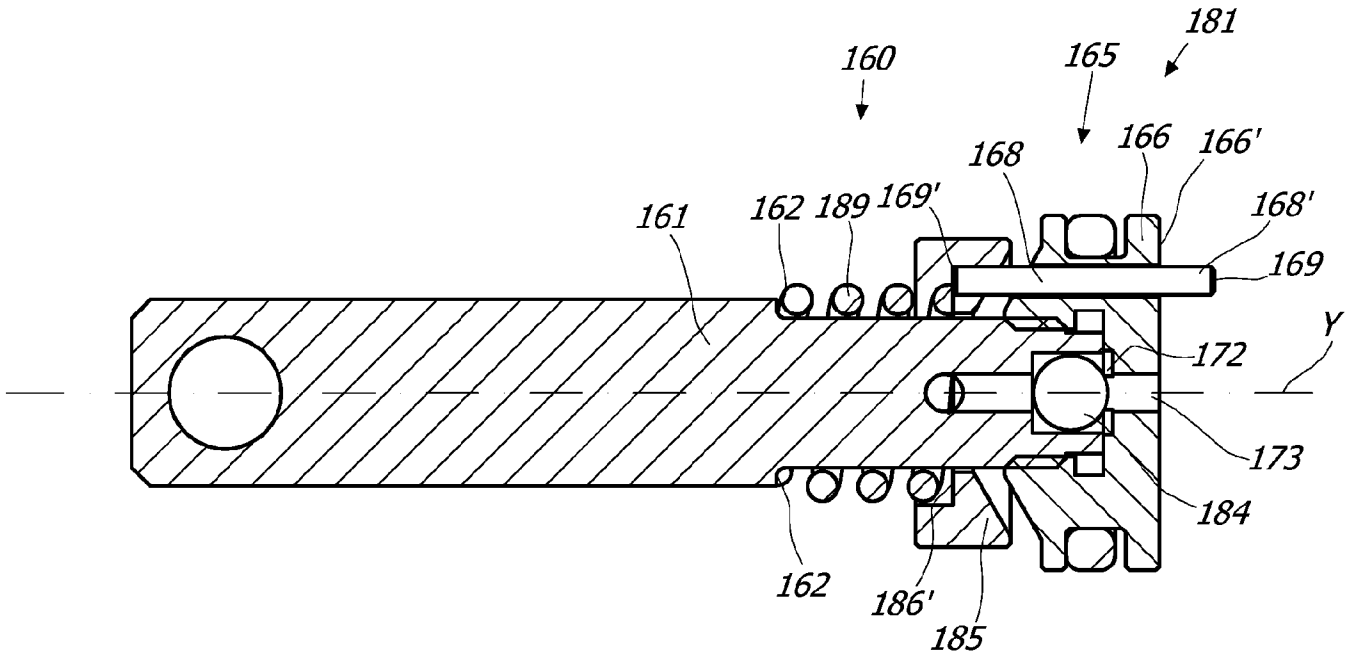
181
160
165
166
166'
168
168'
161
162
189
169'
169
172
Y
173
184
162
186'
185

FIG. 19

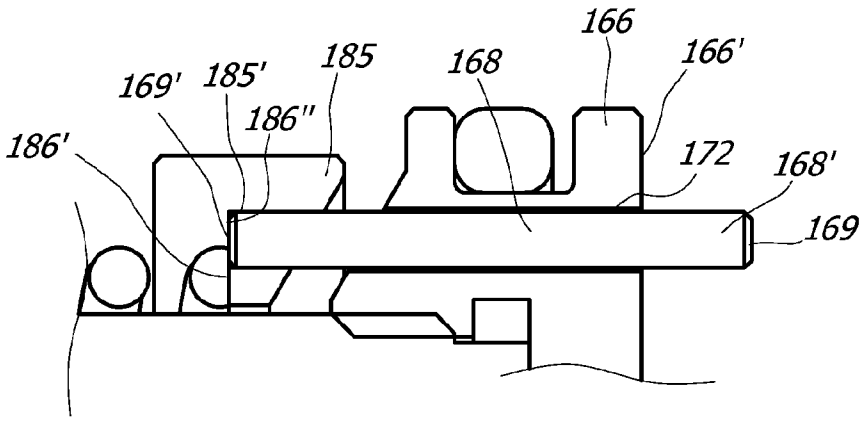
166
166'
185
168
169'
185'
186"
186'
172
168'
169

FIG. 20

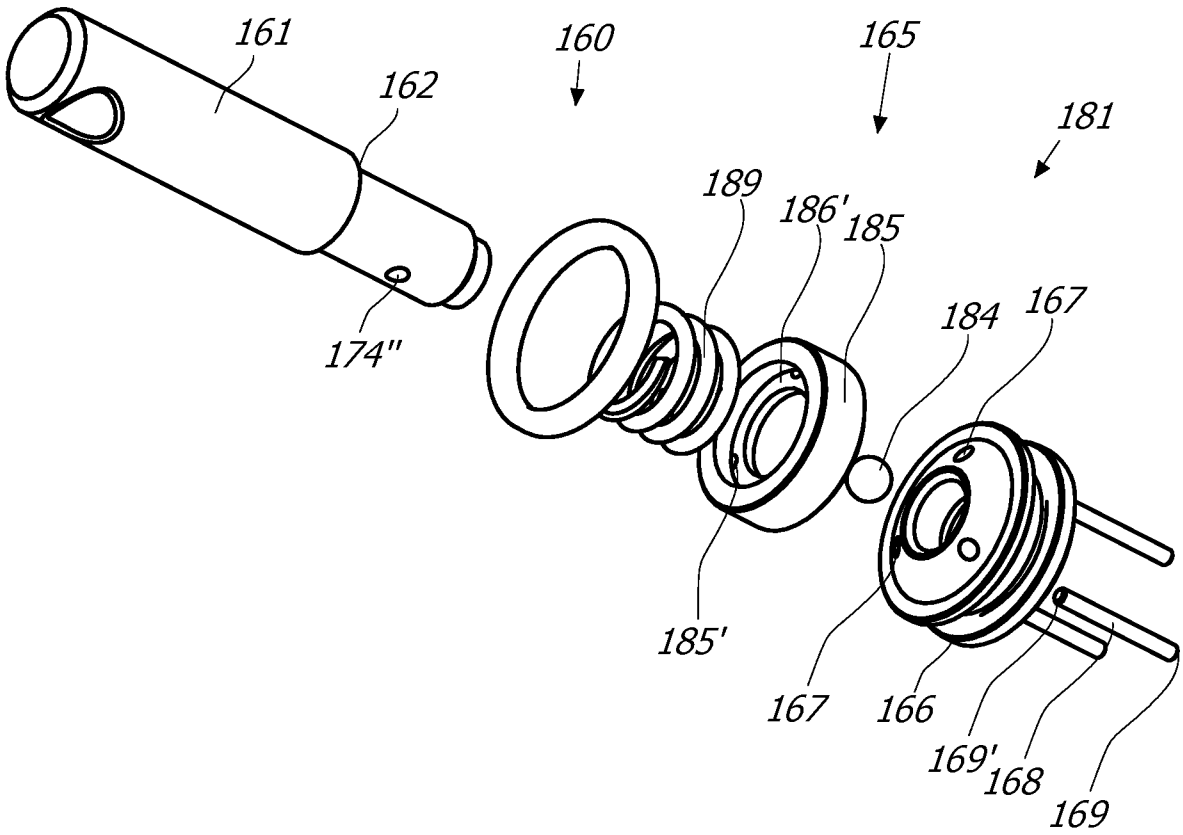
161
162
160
165
181
189
186'
185
184
167
174"
185'
167
166
169'
168
169

FIG. 21

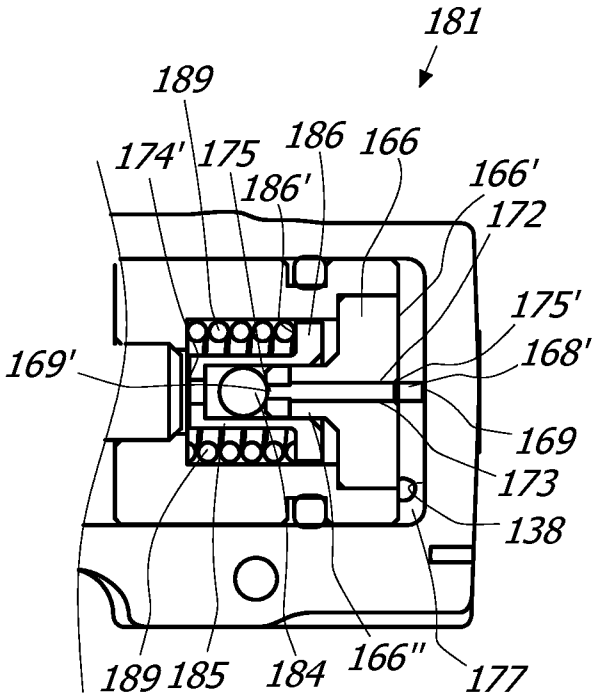
181
189
174'
175
186
166
186'
166'
172
175'
168'
169'
169
173
138
189
185
184
166"
177

FIG. 22

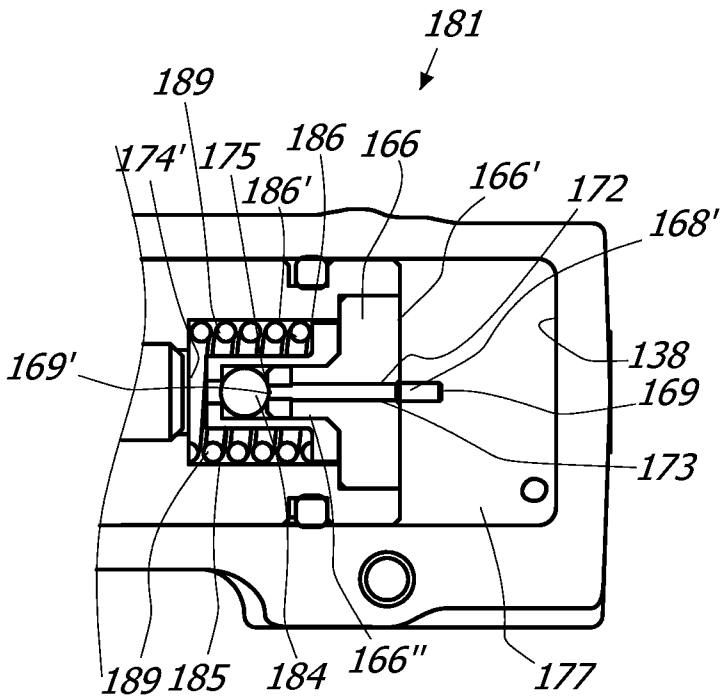
181
189
174'
175
186
166
186'
166'
172
168'
138
169'
169
173
189
185
184
166"
177

FIG. 23

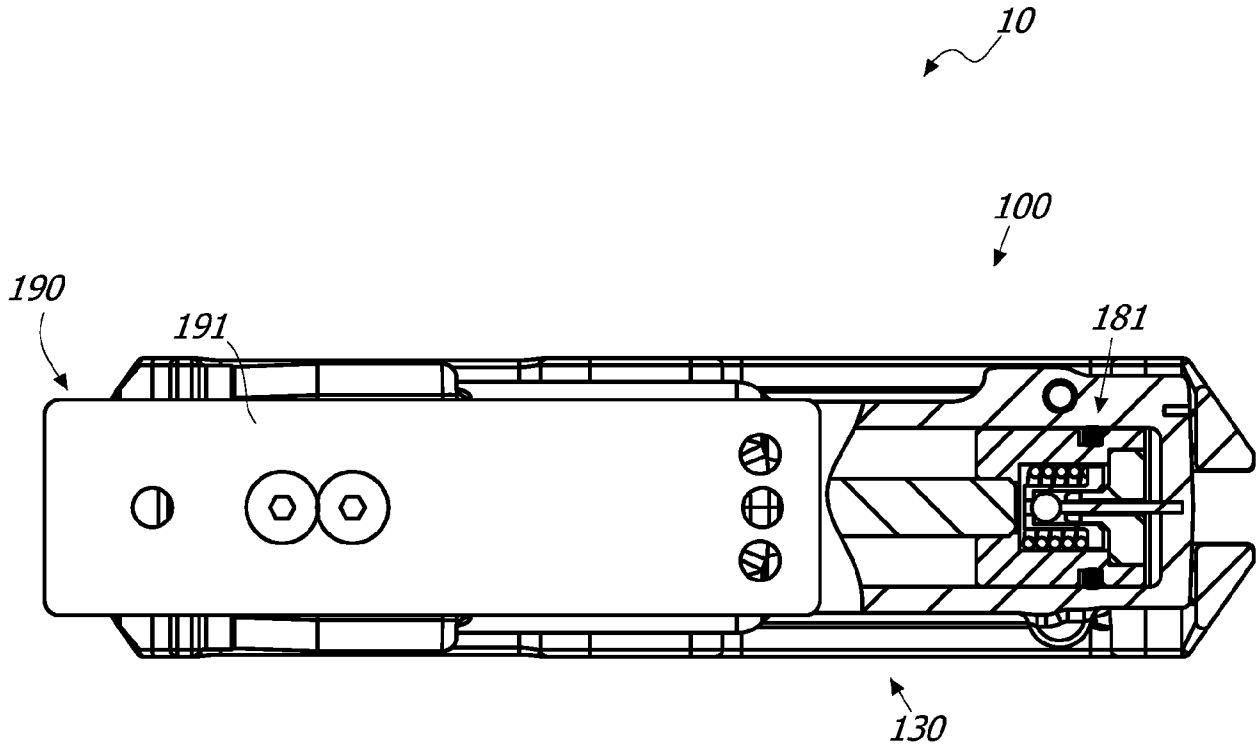
10
100
190
191
181
130

FIG. 24

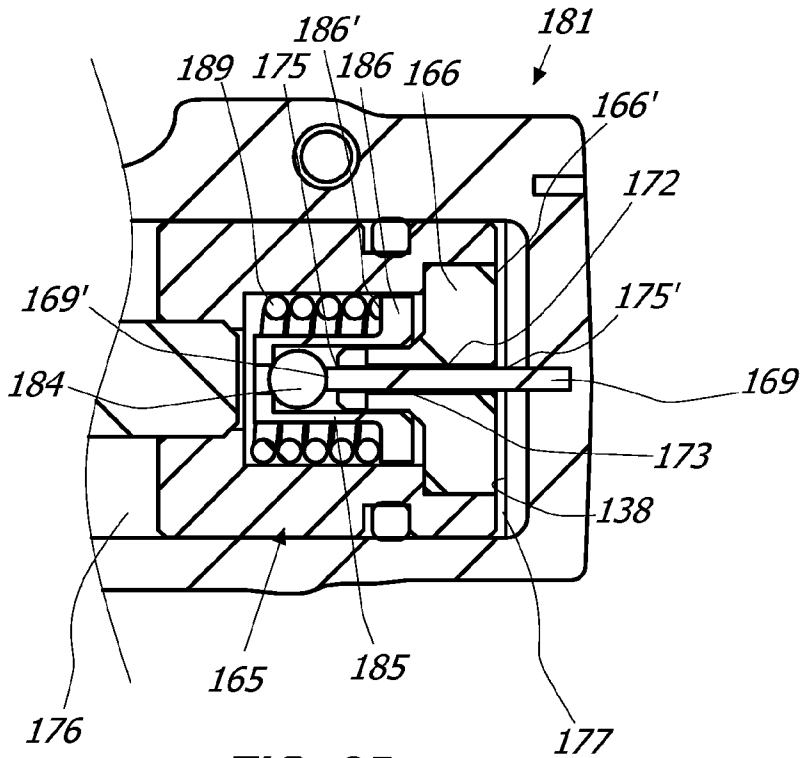
186'
181
189
175
186
166
166'
172
169'
175'
184
169
173
138
165
185
176
177

FIG. 25

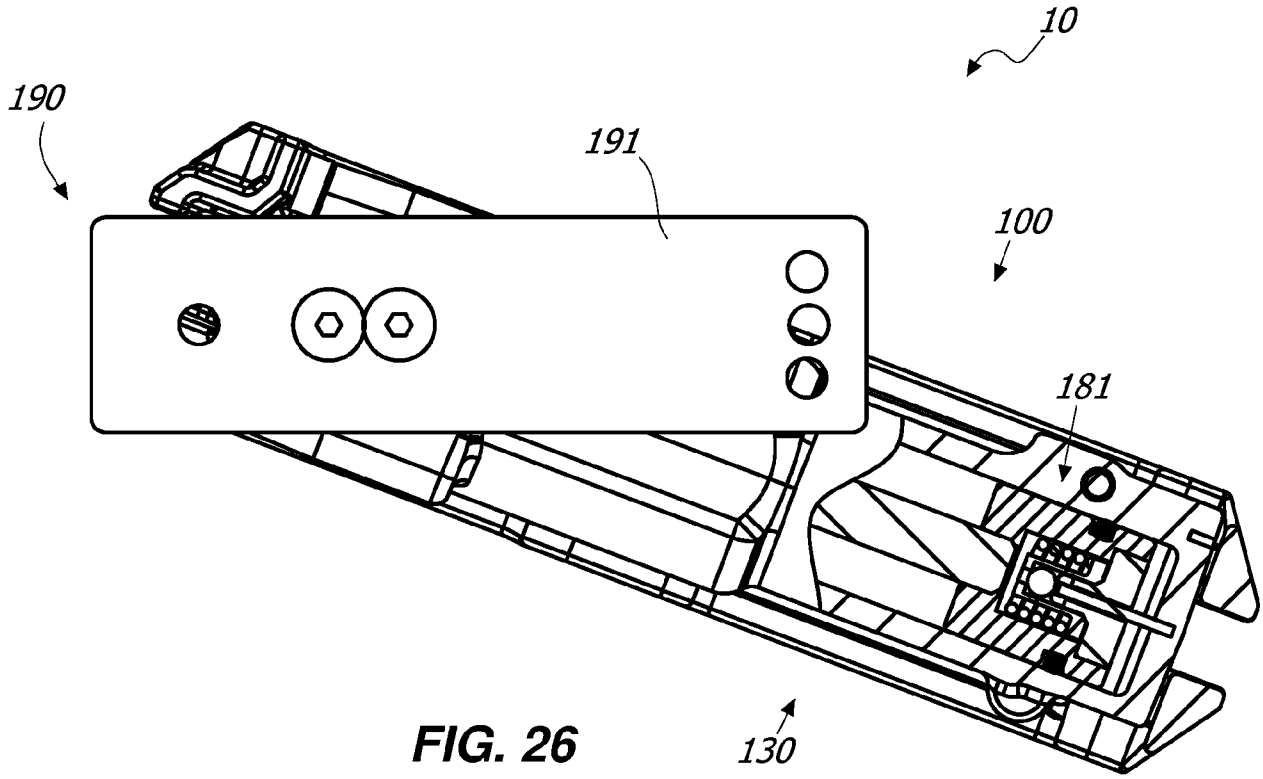
10
190
191
100
181
130

FIG. 26

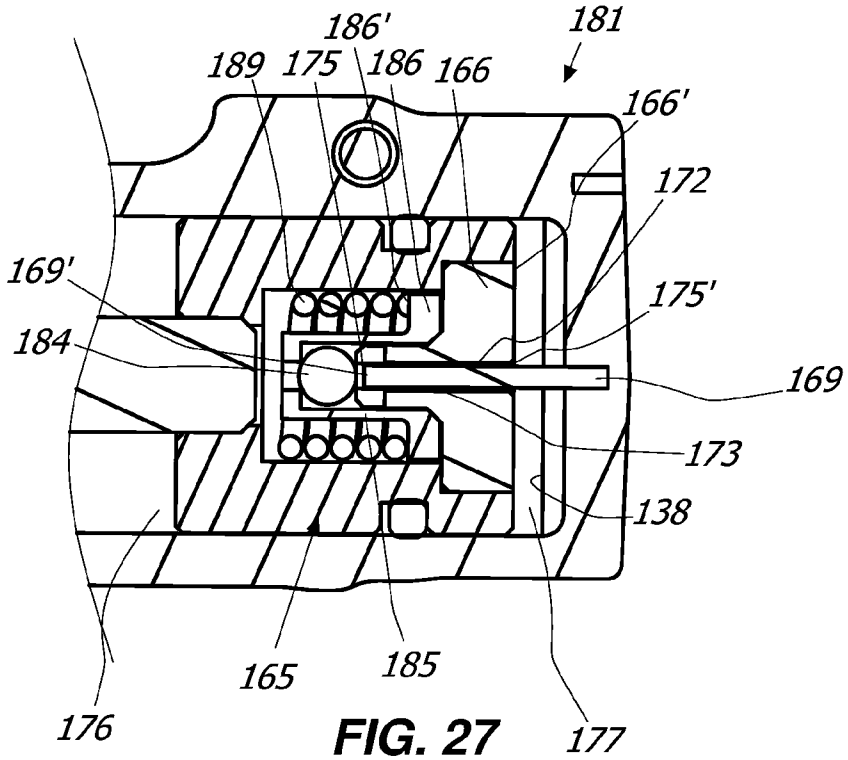
186'
181
189
175
186
166
166'
172
169'
175'
184
169
173
138
165
185
176
177

FIG. 27

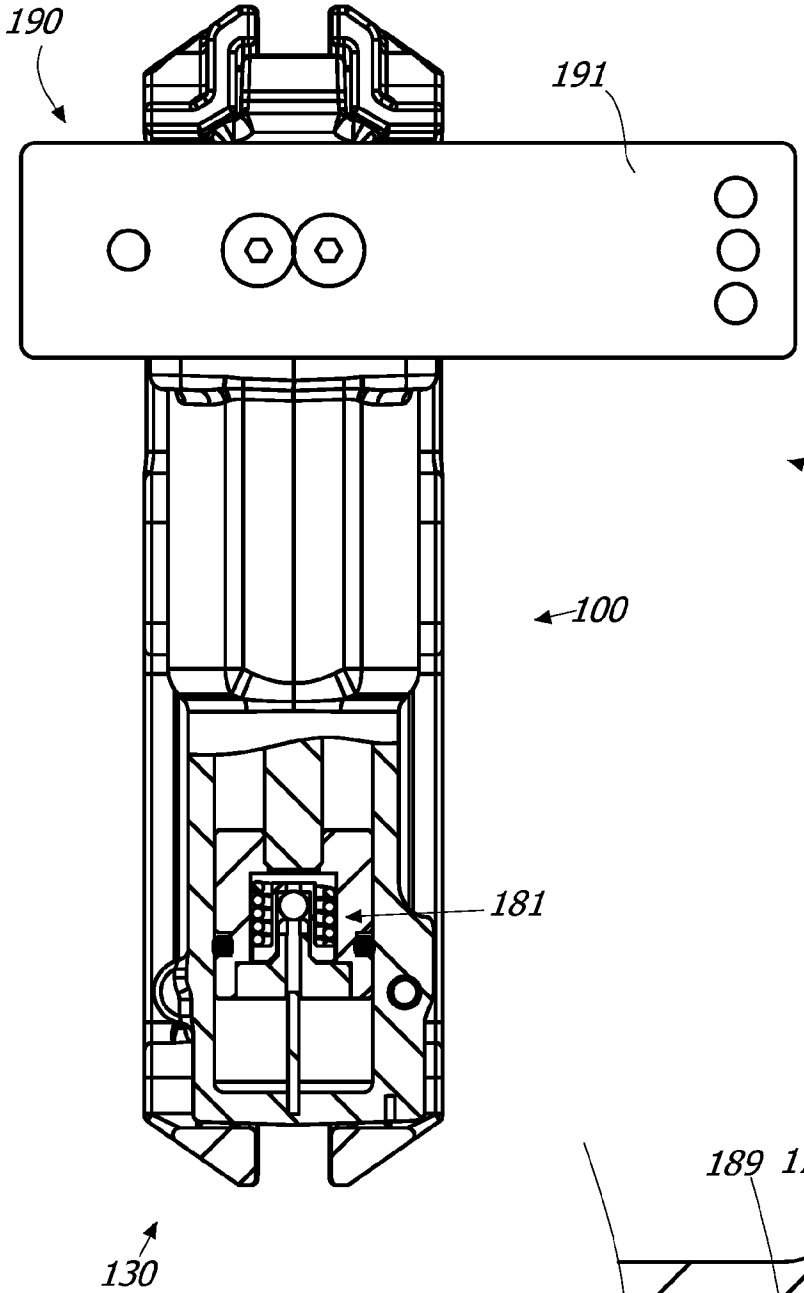
190
191
10
100
181
130

FIG. 28

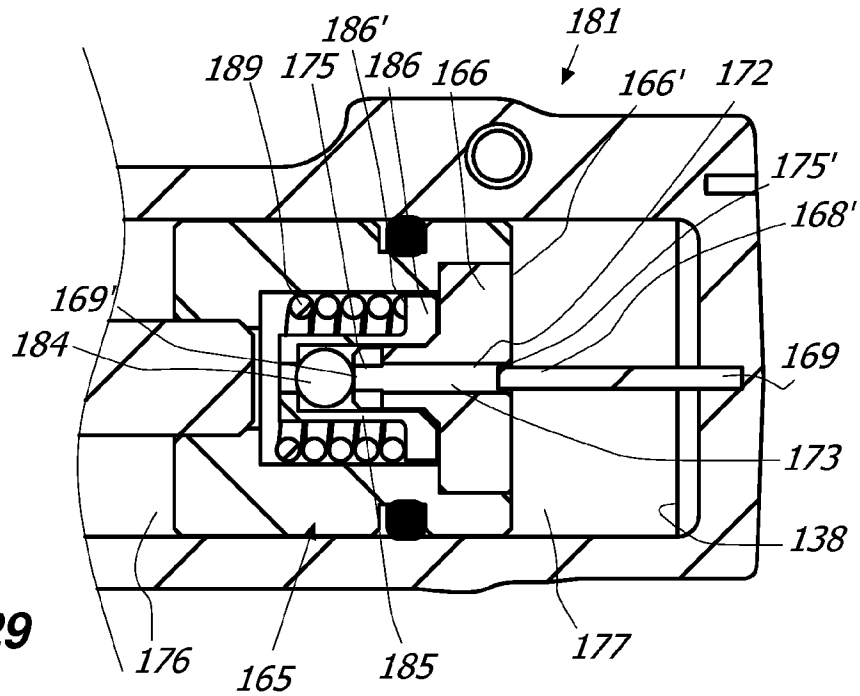
186'
181
189
175
186
166
166'
172
175'
168'
169'
184
169
173
138
176
165
185
177

FIG. 29

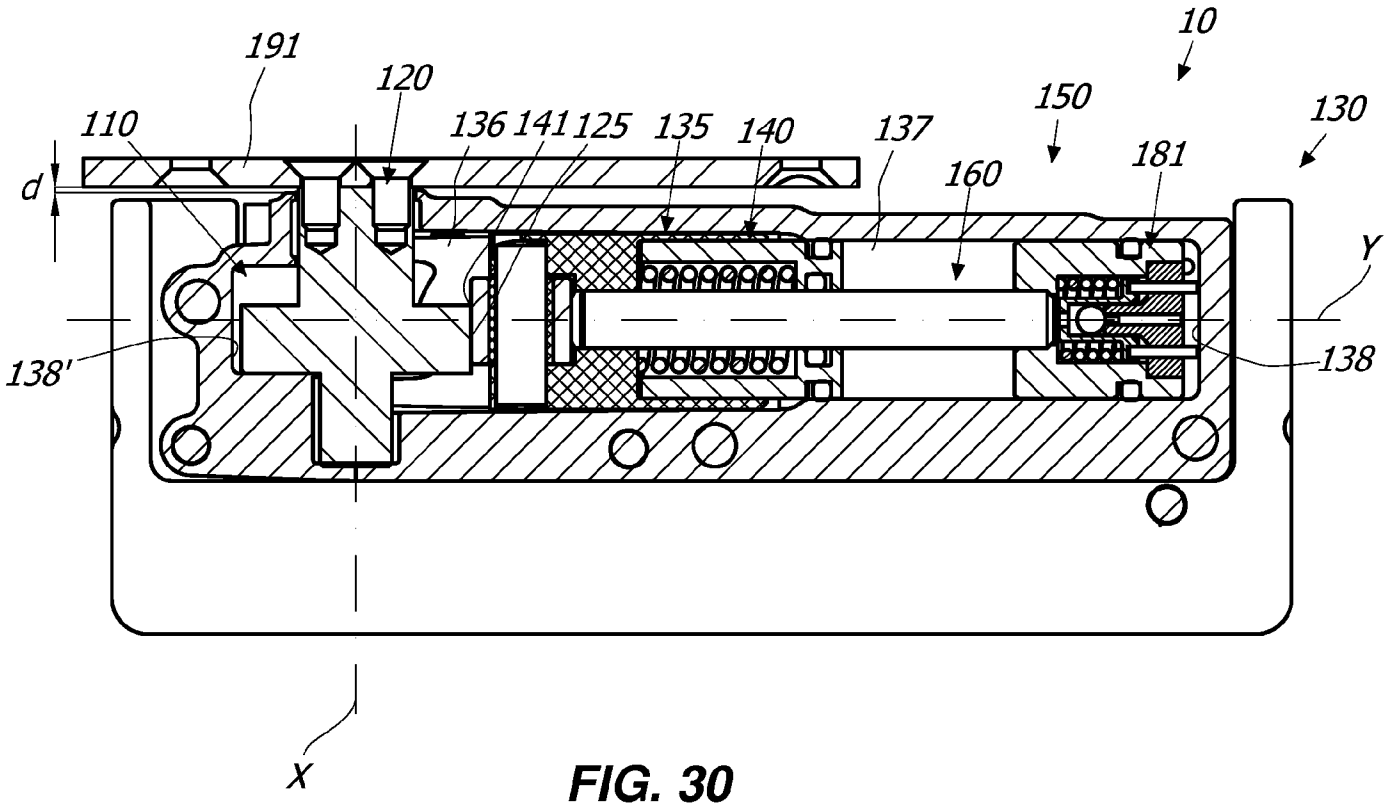
10
191
120
110
136
141
125
135
140
137
150
160
181
130
d
Y
138'
138
X

FIG. 30

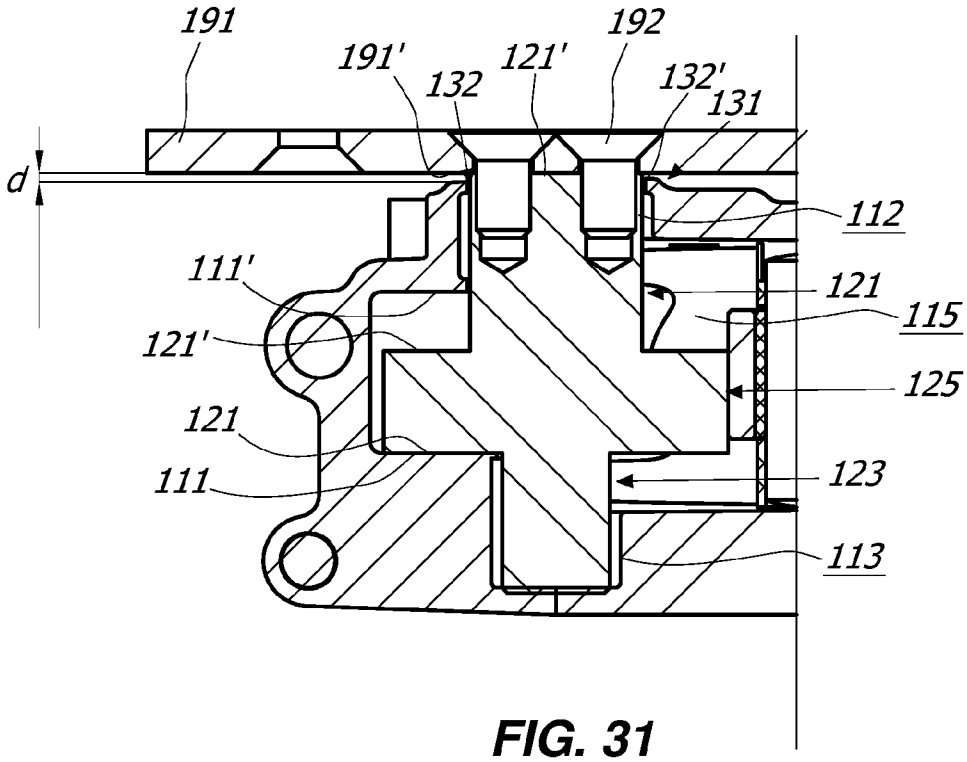
191
191'
132
121'
192
132'
131
d
112
111'
121
115
121'
125
121
123
111
113

FIG. 31

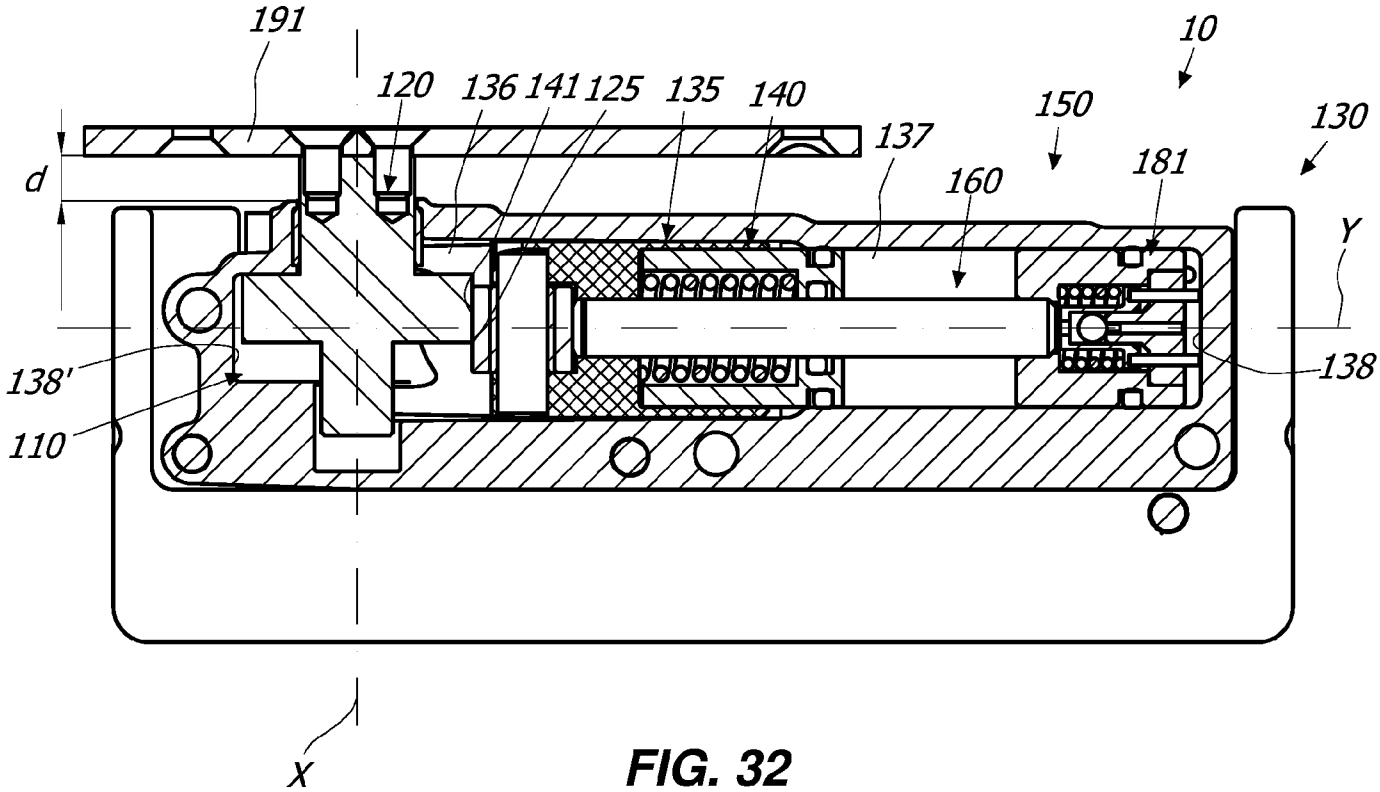
191
120
136
141
125
135
140
137
150
10
130
181
160
d
Y
138'
110
138
X

FIG. 32

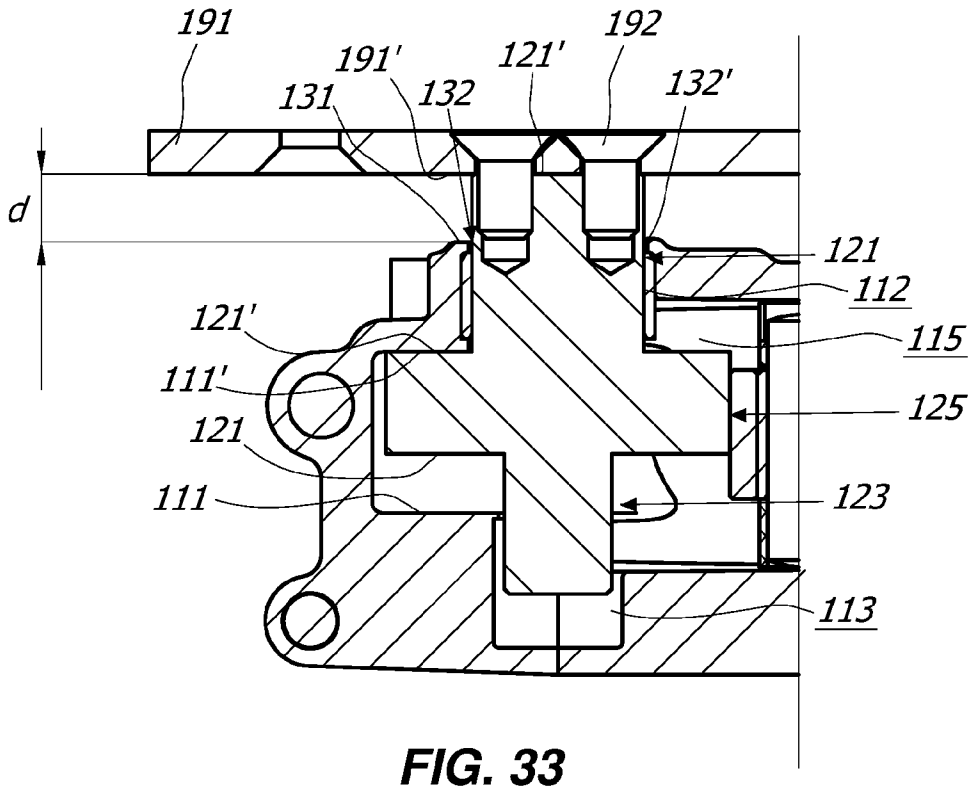
191
191'
131
132
121'
192
132'
d
121
112
121'
115
111'
125
121
111
123
113

FIG. 33

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2022/054145

A. CLASSIFICATION OF SUBJECT MATTER

INV. E05F3/10 E05D5/02 E05D7/00 E05F3/12
ADD. E05D7/081

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)
E05F E05D

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 practicable, 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 A	DE 10 2017 104304 B3 (SPEEDYBYCASMA SRL [IT]) 17 May 2018 (2018-05-17) paragraph [0041] - paragraph [0062] figures 1-15	1-10,12, 25-30 11, 16-20, 23,24, 31-36

X	KR 102 095 384 B1 (LEEKADOOR IND CO LTD [KR]) 31 March 2020 (2020-03-31) paragraph [0050] - paragraph [0056] paragraph [0060] - paragraph [0061] figures 1-4	1,13-15, 21,22

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance;; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance;; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
4 August 2022	14/10/2022

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, Fax: (+31-70) 340-3016	Prieto, Daniel

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2022/054145

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims;; it is covered by claims Nos.:

1-36

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2022/054145

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 102017104304 B3	17-05-2018	NONE	
KR 102095384 B1	31-03-2020	NONE	

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-36

   System for the controlled rotary movement of a closing element.

   ---

2. claims: 37-46

   Assembly for the rotatable coupling around a rotation axis of a closing element.

   ---

3. claims: 47-56

   Hydraulic hinge device
