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(54) Title: HINGE DEVICE FOR DOORS, SHUTTERS OR THE LIKE

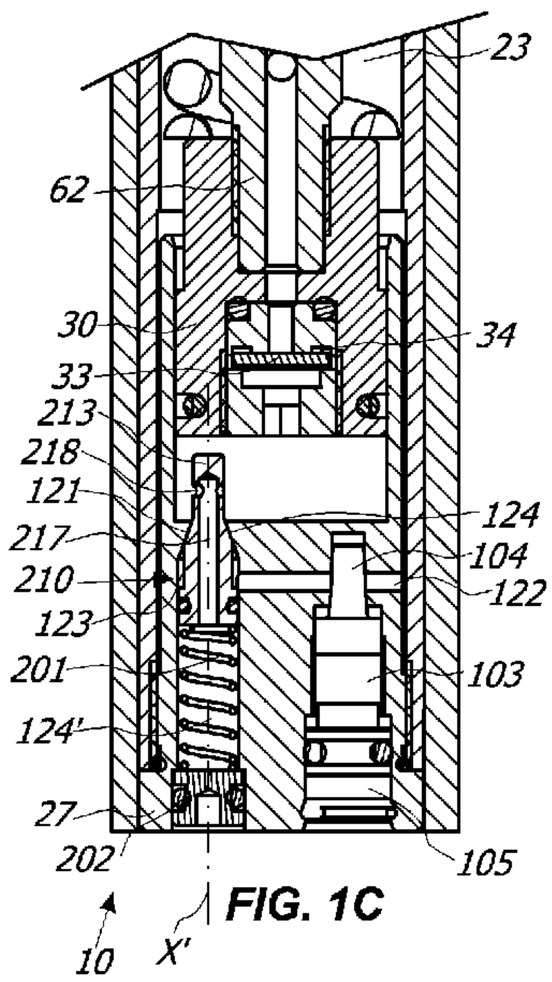

FIG. 1C

(57) Abrégé/Abstract:
A hinge device comprising a fixed element (10), a movable element (11), and a slider (30, 60). One of the fixed element (10) and the movable element (11) comprise a working chamber (20) to slidingly house the slider (30, 60), the other of the fixed element (10) and the movable element (11) comprising a pivot (50) reciprocally coupled to the slider (30, 60) so as the rotation of the movable element (11) corresponds to the sliding of the slider (30, 60) and viceversa. The working chamber (20) includes a closing cap (27) and a working fluid. The slider (30, 60) includes a plunger member (30) separating the working chamber (20) in a first and second variable volume compartments (23, 24) that are fluidly communicating therebetween and preferably adjacent. The plunger member (30) comprises first valve means (32). The first duct (120) passing through the closing cap (27) in fluid communication with both the first and second compartments (23, 24). The duct (120) comprises at least one first opening (121) for the selective passage of the working fluid. The at least one closing cap (27) further includes valve means (200) interacting with the at least one first opening (121) to keep it normally closed. The valve means (200) and the at least one plunger member (30) are in a spacial relationship so as to remain reciprocally spaced apart for a first part of the stroke of the at least one plunger member thereof (30) and such that for a second part of the stroke of the plunger member thereof (30), the latter acts upon the former (200) to open said at least one first opening (121), so that the closing element (D) latches towards the open or closed position.

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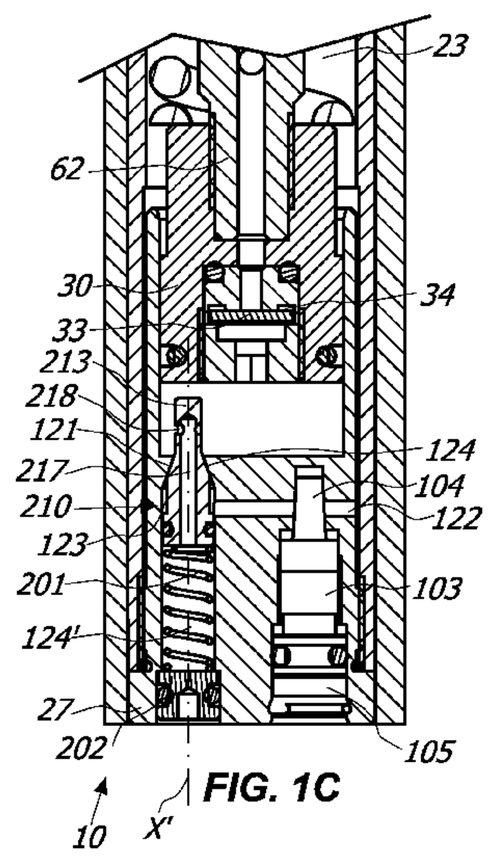

FIG. 1C

(57) Abstract: A hinge device comprising a fixed element (10), a movable element (11), and a slider (30, 60). One of the fixed element (10) and the movable element (11) comprise a working chamber (20) to slidingly house the slider (30, 60), the other of the fixed element (10) and the movable element (11) comprising a pivot (50) reciprocally coupled to the slider (30, 60) so as the rotation of the movable element (11) corresponds to the sliding of the slider (30, 60) and viceversa. The working chamber (20) includes a closing cap (27) and a working fluid. The slider (30, 60) includes a plunger member (30) separating the working chamber (20) in a first and second variable volume compartments (23, 24) that are fluidly communicating therebetween and preferably adjacent. The plunger member (30) comprises first valve means (32). The first duct (120) passing through the closing cap (27) in fluid communication with both the first and second compartments (23, 24). The duct (120) comprises at least one first opening (121) for the selective passage of the working fluid. The at least one closing cap (27) further includes valve means (200) interacting with the at least one first opening (121) to keep it normally closed. The valve means (200) and the at least one plunger member (30) are in a spacial relationship so as to remain reciprocally spaced apart for a first part of the stroke of the at least one plunger member thereof (30) and such that for a second part of the stroke of the plunger member thereof (30), the latter acts upon the former (200) to open said at least one first opening (121), so that the closing element (D) latches towards the open or closed position.

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HINGE DEVICE FOR DOORS, SHUTTERS OR THE LIKE

DESCRIPTION

Field of the Invention

The present invention is generally applicable to the technical field of closing and / or controlling hinges for doors, shutters or similar closing elements, and it particularly relates to a hinge device for rotatably moving and / or controlling during the opening and / or closing a closing element, such as a door, a shutter or the like, anchored to a stationary support structure such as a wall or a frame.

Background of the Invention

As known, hinges generally comprise a movable element, usually fixed to a door, a shutter or the like, hinged on a fixed element, usually fixed to the support frame thereof, or to a wall and / or to the floor.

From documents US7305797, US2004/206007 and EP1997994 are known hinges wherein the action of the closing means ensuring the return of the shutter to the closed position is undisputed. From document EP0407150 it is known a door closer that includes hydraulic damping means to counteract the action of the closing means.

Such known devices all have more or less bulk, and, consequently, they have an unpleasant visual impact. Moreover, they do not allow the adjustment of the closing speed and / or of the latch closing of the door, or anyway they do not allow an easy and quick adjustment.

Moreover, such known devices have a large number of constructive parts, that are difficult to manufacture and relatively expensive, as well as they require frequent maintenance.

Other hinges are known from GB19477, US1423784, GB401858, WO03 / 067011, US2009 / 241289, EP0255781, WO2008 / 50989, EP2241708, CN101705775, GB1516622, US20110041285, WO200713776, WO200636044, WO2006025663 and US20040250377.

From documents GB396673, WO2011 / 141880 and EP0215264 are also known hydraulic hinges wherein the hydraulic circuit is at least partially contained in the closing cap of the hinge thereof.

Such known hinges may be improved in terms of size and / or reliability and / or performance.

Summary of the Invention

Object of the present invention is to at least partially overcome the above-mentioned

drawbacks by providing a hinge device of high functionality, constructive simplicity and low cost.

Another object of the invention is to provide a hydraulic hinge device extremely simple to be manufactured.

Another object of the invention is to provide an extremely safe hydraulic hinge device.

Another object of the invention is to provide a low bulkiness hydraulic hinge device.

Another object of the invention is to provide a hydraulic hinge device that ensures the controlled movement of the door whreto it is bound, upon the opening and / or the closing.

Another object of the invention is to provide a hydraulic hinge device having a minimum number of constituent parts.

Another object of the invention is to provide an extremely easy-to-install hydraulic hinge device.

Another object of the invention is to provide a hydraulic hinge device that may be mounted on closing elements having both right and left opening.

Such objects, as well as others that will become more evident hereinafter, are fulfilled by a hinge device having one or more of the features herein described and / or claimed and / or shown.

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

Brief description of the drawings

Further features and advantages of the invention will become more evident by reading the detailed description of some preferred but not exclusive embodiments of a hinge device **1**, shown as not limitative example with the help of the annexed drawings, wherein:

FIG. 1A is a top view of an embodiment of the hinge device **1** in an open door position;

FIG. 1B is section view taken along a plane *I B - I B* in FIG. 1A;

FIG. 1C is an enlarged view of some details of FIG. 1B;

FIG. 2A is a top view of an embodiment of the hinge device **1** in another open door position;

FIG. 2B is a section view taken along a plane *II B – II B* in FIG. 2A;

FIG. 2C is an enlarged view of some details of FIG. 2B;

FIG. 3A is a top view of an embodiment of the hinge device **1** in a closed door position;

FIG. 3B is a section view taken along a plane *III B – III B* in FIG. 3A;

FIG. 3C is an enlarged view of some details of FIG. 3B;

FIG. 4 is an axonometric view of an embodiment of the closing cap **27**.

Detailed description of some preferred embodiments

With reference to the above-mentioned figures, the hinge device **1** is particularly useful for the rotatably moving and / or controlling of a closing element **D**, such as a door, a shutter, a gate or the like, that may be anchored to a stationary support structure **S**, such as a wall and / or the frame of a door or of a window and / or a support pillar and / or the floor.

The hinge device **1** may be of a hydraulic type. Depending on the configuration, and in particular on the presence or absence of elastic counteracting means **40**, the hinge device **1** may only allow the controlling upon the opening and / or the closing of the closing element **D** whereto it is bound, or such last action and the automatic closing of the closing element **D** thereof from the open position.

In the latter case, the elastic means **40** may include a thrust spring with relatively high load. However, the elastic means **40**, although present, may include a counteracting spring with relatively low load, whose load does not allow the action of automatic closing.

In general, the hinge device **1** may include a fixed element **10** anchored to the stationary support structure **S** and a movable element **11** anchored to the closing element **D**.

Preferably, the hinge device **1** may be configured according to the teachings of one or more of patent applications PCT / IB2012 / 051707, PCT / IB2013 / 059120, PCT / IB2013 / 059121 and VI2013A000245, all on behalf of the same Applicant.

In particular, in a preferred but not exclusive embodiment, the fixed **10** and movable **11** elements of the hinge device **1** may include a hinge body **18** with a respective first and second tubular half-shells **12**, **13** reciprocally coupled to rotate around a longitudinal axis **X** between an open position, shown, for example, in FIGs. 2a and 6a, and a closed position, shown, for example, in FIGs. 1a and 5a.

Suitably, the fixed **10** and movable **11** elements may include a respective first and second fastening wing **14**, **15** respectively connected to the first and second tubular half-shell **12**, **13** to anchor the stationary support structure **S** to the closing element **D**.

Preferably, the hinge device **1** may be configured as a hinge of the "*Anuba*" type.

More particularly, the hinge device **1** may be at least partially manufactured according to the teachings of one or more of patent applications PCT / IB2011 / 051688, PCT / IB2012 / 051707, PCT / IB2013 / 059120, PCT / IB2013 / 059121 and / or PCT / IB2014 / 065078.

Advantageously, with the exception of the fastening wings **14**, **15**, all the other components of the hinge device **1** may be included within the first and the second tubular half-shell **12**, **13**.

In particular, the first fixed tubular half-shell **12** may include a working chamber **20** defining the axis **X** and a plunger member **30** sliding therein. Suitably, the working chamber **20** may be closed at the bottom by a closing cap **27** inserted in the tubular half-shell **12**.

It is understood that the axis of rotation of the fixed and movable elements and the axis of sliding of the plunger member may be parallel, perpendicular or coincident therebetween without departing from the scope of protection of the appended claims.

Moreover, the first fixed tubular half-shell **12** may include a working fluid, generally oil, acting upon the plunger member **30** to hydraulically counteract the action thereof. Preferably, moreover, the first fixed tubular half-shell **12** may comprise elastic counteracting means **40**, such as a compression helical spring **41**, acting upon the plunger member thereof **30**.

Suitably, outside the working chamber **20** and coaxially thereto a pivot **50** may be provided, that may advantageously act as an actuator.

In the preferred but not exclusive embodiment shown in FIGs. 1A to 3B, the pivot **50** may be supported by a support portion **84** realized in correspondence to the inner wall **83** of the hinge body **18**, as explained hereinafter.

The end portion **51** of the pivot **50** allows the coaxial coupling, preferably of a removable type, between the same pivot and the second movable tubular half-shell **13** so as the latter and the pivot **50** integrally rotate between the open and the closed positions of the movable tubular half-shell **13**.

Suitablly, the plunger member **30** and the pivot **50** may be operatively connected therebetween by means of the elongated cylindrical element **60** so that the rotation of the latter around the axis **X** corresponds to the sliding of the former along the axis **X** thereof and vice ersa.

To the object, the elongated cylindrical element **60** may include a first end portion **61** reciprocally connected to the plunger member **30** and a second end portion **62** slidable inside the tubular body **52** of the pivot **50**.

The connection between the elongated cylindrical element **60** and the plunger member **30** may make such elements integral so as they may define a slider movable along the axis **X**.

Therefore, the elongated cylindrical element **60** may slide along the axis **X** integrally with

the plunger member **30**. Suitably, the elongated cylindrical element **60** and the pivot **50** may be reciprocally telescopically coupled.

Furthermore, the cylindrical elongated element **60** with the respective plunger member **30** may or may not be rotatably blocked in the working chamber **20** to avoid rotations around the axis **X** during the sliding thereof along the latter. This happens depending on the configuration of the guiding cam slot **81** of the bush **80**.

Therefore, with respect to the pivot **50**, the plunger member **30** may slide along the axis **X** between an end-stroke position proximal thereto, corresponding to one of the open and closed positions of the second movable tubular half-shell **13**, and an end-stroke position distal to the pivot **50**, corresponding to the other of the open and closed positions of the second movable tubular half-shell **13**.

To allow the reciprocal movement between the plunger member **30** and the pivot **50**, the tubular body **52** of the latter may include at least a pair of grooves **70'**, **70"** equal to each other angularly spaced of 180°, each comprising at least one helical portion evolving around the axis **X**. The grooves **70'**, **70"** may communicate to define a single passing-through actuator element **72**.

Suitably, the at least one helical portion may have any inclination, and may have a right-handed path, respectively a left-handed path. Preferably, the at least one helical portion may develop for at least 90° around the axis, **X** and even more preferably for at least 180°.

In a preferred but non-exclusive embodiment, each of the grooves **70'**, **70"** may consist of a single helical portion, possibly with a constant inclination or helical pitch.

Suitably, the actuator element **72** may be closed at both ends so as to define a closed path having two blocking end points for the plug **73** sliding therethrough, the closed path being defined by the grooves **70'**, **70"**.

Regardless of the position or configuration thereof, the actuator passing-through element **72** rotating around the axis **X** allows the reciprocal movement between the pivot **50** and the plunger member **30**.

To guide such a rotation, a guiding tubular bush **80** may be provided coaxially placed outside the tubular body **52** of the pivot **50**. The guiding bush **80** may include a pair of cam slots **81** angularly spaced of 180°.

Although in the preferred but not exclusive embodiment shown in the annexed figures the guiding bush **80** is monolithic with the tubular half-shell **12**, it is understood that such parts may

also be two separate pieces coupled together without departing from the scope of protection of the appended claims.

To allow the reciprocal connection between the pivot **50**, the elongated element **60** and the guiding bush **80**, the second end portion **62** of the elongated element **60** may include a plug **73** inserted in the passing-through actuator element **72** and in the cam slots **81** to slide therein.

Therefore, the length of the plug **73** may be such to allow such a function. Therefore, upon the rotation of the passing-through actuator element **72,** the plug **73** is moved by the latter and guided by the cam slots **81**.

Regardless of the shape of the cam slots **81**, the latter may be closed at both ends so as to define a closed path having two end blocking points for the plug **73** sliding therethrough.

In order to minimize the friction between the moving parts, at least one anti-friction element may be provided, for example an annular bearing **110**, interposed between the pivot **50** and the support portion **84** of the bush **80**.

As above-mentioned, in fact, thanks to the configuration above, the plug **73** is pulled down dragging the pivot **50** therewith so that the latter rotates around the axis **X** on the bearing **110** with minimum friction.

Moreover, at least one further anti-friction element may be provided, for example a further annular bearing **112**, interposed between the bush **80** and the second tubular half-shell **13**, so that the latter rotates around the axis **X** on the bearing **112**.

Therefore, the bearing **112** lays on the upper portion of the bush **80** so as the pivot **50** is not affected by the weight of the closing element upon the rotation thereof around the axis **X**.

Preferably, moreover, the bush **80** and the second tubular-half shell **13** may be in a reciprocal spatial relationship such that the second tubular half-shell **13** once coupled to the bush **80** remains spaced apart from the first tubular half-shell **12**, for example of a distance equal to some tenth of a millimeter.

As above-mentioned, the hinge device **1** may include a working fluid, such as oil.

Advantageously, one or more sealing elements **22** may be provided to prevent it from spilling, for example one or more o-rings.

The plunger member **30** may be susceptible to separate the working chamber **20** in at least two variable volume compartments **23**, **24** fluidly communicating therebetween and preferably adjacent. Suitably, when present, the elastic counteracting means **40** may be inserted in the

compartment **23**.

In a first preferred but not exclusive embodiment, the elastic counteracting means **40** may be interposed between the pivot **50** and the plunger member **30**. For example, the elastic counteracting means **40** may include a spring fitted on the elongated element **60**.

To allow the passage of the working fluid between the compartments **23**, **24**, the plunger member **30** may comprise a passing-through opening **31** and valve means, that may include a disc **33** inserted with a minimum play in a suitable housing **34** to axially move along the axis **X**. The assembly disc **33** - housing **34** defines a non-return valve **32** to intercept the working fluid.

Depending on the direction wherewith the non-return valve is mounted, it may open upon the opening or the closing of the closing element **D**, so as to allow the passage of the working fluid between the compartment **23** and the compartment **24** during one of the opening or closing of the closing element **D** and to prevent the backflow thereof during the other of thr opening or closing thereof.

For the controlled backflow of the working fluid between the compartment **23** and the compartment **24** during the other of the opening or closing of the closing element **D**, a suitable hydraulic circuit **100** may be provided.

Suitably, the plunger member **30** may include, respectively may consist of, a cylindrical body sealingly inserted in the working chamber **20** and faced to the inner side wall **25** thereof.

Moreover, the hydraulic circuit **100** may include a duct **120** passing through the closing cap **27** that includes an opening **121** fluidly communicating with the compartment **24** and an opening **122** fluidly communicating with the compartment **23**.

Moreover, the hydraulic circuit **100** may further include further ducts **150** and **130** passing through the closing cap **27** to put in fluid communication the compartment **23** and the compartment **24**.

Suitably, the closing cap **27** may further include valve means **140** acting upon the duct **130** to selectively open when the pressure **PC** in the working chamber **20** exceeds a predetermined threshold value **PT**.

To protect the integrity of the closing element **D** that mounts the hinge device **1**, the threshold value **PT** may be calibrated so as to avoid the unhinging of the closing element **D** thereof by a user who forces the opening and / or closing thereof. In practice, the duct **130** in cooperation with the valve means **140** define an overpressure valve for the hinge device **1**.

Suitably, the valve means **140** may be manufactured according to the teachings of the International Application PCT / IB2015 / 057625, whereto reference is made for consultation.

On the other hand, an adjustment element **170** may be inserted in the duct **150** having an end **171** interacting with the duct **150** thereof and an end **172** operable from the outside by a user to adjust the passage section of the working fluid passing therethrough.

Suitably, the adjustment element **170** may be manufactured according to the teachings of the International Application PCT / IB2015 / 057625, whereto reference is made for consultation. More particularly, the adjustment element **170** may adjust the closing / opening speed of the closing element **D**.

It is understood that although the annexed figures show an embodiment of the closing cap **27** including three ducts **120**, **130** and **150**, the closing cap **27** may also include only the duct **120**, or the latter and only one of duct **130** or **150**, or other ducts, without departing from the scope of protection of the appended claims.

In a preferred but not exclusive embodiment, the closing cap **27** may include an elongated tubular wall **28** extending inside the working chamber **20**. In this case, the hydraulic circuit **100** may include the tubular interspace **29** between the working chamber **20** and the elongated tubular wall **28** of the closing cap **27**.

Suitably, the plunger member **30** may be sealingly inserted in the elongated tubular wall **28**, while the elongated tubular wall **28** may be inserted into the working chamber **20** with a predetermined tolerance so as the tubular interspace **29** is defined therebetween.

Preferably, the length of the elongated tubular wall **28** may be equal to or greater than the stroke of the plunger member so as the compartment **24** is defined inside the elongated tubular wall **28**. More paricularly, the compartment **24** may have a top wall defined by the plunger member **30**, a lower wall defined by the closing cap **27** and a side wall defined by the elongated tubular wall **28** of the cap **27** thereof.

Preferably, the elongated tubular wall **28** may be monolithically coupled to the closing cap **27** so as the screwing of the latter in the hinge body **18** defines the hydraulic circuit **100**. In fact, the latter consists exclusively of the cavity **29** between the working chamber **20** and the elongated tubular wall **28** and of the ducts **120**, **130** and **150**.

Since the plunger member **30** and the elongated tubular wall **28** are sealingly inserted in one another and the working chamber **20** and the elongated tubular wall **28** define the cavity **29**,

the assemblies cavity **29** - duct **120**, cavity **29** - duct **130** and cavity **29** - duct **150** define respective independent hydraulic circuits.

In a preferred but not exclusive embodiment, when the working chamber **20** is pressurized, for example during the opening of the door, the valve means **32** open to make the working fluid pass from the compartment **23** to the compartment **24**. On the other hand, during the closing of the door, the valve means **32** close, forcing the working fluid from the compartment **24** into the ducts **120**, **130** and **150**.

It is understood that the valve means **32** may also operate at the opposite, or even be absent, so as the oil may flow from one compartment to the other in a reverse way with respect to the aforementioned, without departing from the scope of protection of the appended claims.

In the case described above, particularly with refernce to the duct **120**, the opening **121** defines the inlet of the working fluid therein from the compartment **24**, while the opening **122** defines the outlet of duct **120**. It is evident that the working fluid passing through the outlet **122** goes back through the tubular cavity **29** and flows into the variable volume compartment **23**.

The passage of the working fluid through the opening **121** may be of a selective type, that is, it occurs only and exclusively upon the occurrence of certain conditions.

To the object, valve means **200** may be provided interacting the opening **121** to keep it normally closed.

More in particular, the valve means **200** may include a stopper **210** inserted in an enlarged portion **123** of the duct **120** defining a seat to receive it. In corrispondence to such a seat **123** a passing-through hole **124'** may be provided wherein the stopper **210** may be sealingly inserted.

In a preferred but not exclusive embodiment, the stopper **210** may include, respectively may consist of, an elongated body **211** having a shaped central portion **212** susceptible to couple to a corresponding counter-shaped portion **124** of the seat **123** to close the opening **121** .

Furthermore, the elongated body **211** may include a first end portion **213** sucpetible to lay in the compartment **24** when the shaped portion **212** closes the opening **121**.

Furthermore, the elongated body **211** may include an end portion **214** opposite to the first end portion **213** that includes an annular projection **215** suceptible to receive a sealing O-ring **21**. The end portion **214** may abut against a spring **201** .

Suitably, the stopper **210** and the plunger member **30** may be in a spacial relationship such that they remain reciprocally spaced apart (FIG. 1C) for a first part of the stroke of the plunger

member **30** thereof corresponding for example to a first step of the stroke upon the closing of the plunger member thereof **30**, and such that for a second part of the stroke of the plunger member thereof **30** the latter acts upon the first end portion **213** of the stopper **210** to open the opening **121** (FIGs. 2C - 3C)

This provokes a sudden flow of working fluid in the compartment **24**, that makes the closing element **D** moving towards the closed position.

Certainly, by appropriately dimensioning the valve means **200** and the plunger member **30**, it is possible to adjust the position from which the opening **121** is opened, and, therefore, the angular position wherefrom the closing element **D** moves to the closed position.

Thanks to such features, it is possible to obtain the latch of the closing element in a simple and practical way, without piercing the hinge body. Therefore, it is possible to obtain vary low bulky hinges both in terms of diameter and length.

Preferably, an adjustment grain **202** may be provided acting upon the spring **201** to allow an operator to adjust the preload thereof and, therefore, the elastic force thereof.

In a preferred but not exclusive embodiment, the elongated body **211** may internally include a channel **217** to keep in fluid communication the compartments **23** and **24** through the duct **120** when the opening **121** is closed.

The inner channel **217** may include a port **218** at the first end portion **213** in fluid communication with said compartment **24** and a port **219** in fluid communication with the seat **123**.

The inner channel **217** allows the stopper **210** to remain forced against the opening **121**. In fact, when the latter is closed, the pressure acting on the lower end portion **214** is, in fact, greater than the one acting on the upper end portion **213**. Therefore, the pressure of the working fluid keeps the opening **121** closed until the plunger member **30** impacts against the stopper **210**, thus opening it. In such a case, the spring **201** may be a restore spring, susceptible to make the stopper **210** moving back against the opening **121** once the action of the plunger member **30** is finished.

It is understood that in the embodiment wherein the stopper **210** has no inner channel, the stopper thereof **210** may be elastically forced against the opening **121** by the spring **201**. In such a case, the latter may be a thrust spring.

Advantageously, an adjustment element **103** may be inserted into the duct **120** having an end **104** preferably truncated-cone shaped interacting with the duct thereof **120** and an end **105**

operatable from the outside by a user to adjust the cross section of the working fluid passing therethrough.

The adjusting element **103** may thus adjust the intensity with which the closing element **D** latches towards the closed position.

Although in the annexed figures the two adjustment elements **103** and **170** are substantially parallel to the axis **X**, they may also be substantially perpendicular thereto without departing from the scope of protection of the appended claims.

Therefore, the adjustment element **103** may be susceptible to adjust the closing or opening speed of the closing element **D**, while the adjustment element **170** may be susceptible to adjust the power of the latch of the closing element **D** towards the closed or open position.

Moreover, the ducts **130**, **120**, **150** may also be reciprocally misaligned.

This allows the two adjustment elements **103**, **170**, the overpressure valve means **140** and the valve means **200** to be in an extremely small space.

For the aforementioned, the closing cap **27** may allow to obtain an extremely safe hinge device thanks to the overpressure valve means **140** and easily adjustable both in speed and in latch thanks to the adjustment elements **103**, **170**, requiring a very small space.

The closing cap **27** and the respective tubular wall **28** are simple to manufacture and do not require any special making.

Moreover, thanks to the above-mentioned features it is possible to obtain very low bulky hinges.

For the aforementioned, it is evident that the invention fulfills the intended objects.

The invention is susceptible of numerous modifications and variations, all falling within the inventive concept expressed in the appended claims. All the details may be replaced by other technically equivalent elements and the materials may be different according to requirements without departing from the scope of protection of the invention defined in the appended claims.

CLAIMS

1. A hinge device for rotatably moving and/or controlling a closing element (**D**), such as a door, a shutter or the like, during the closing and/or opening, anchored to a stationary support structure (**S**), such as a wall or a frame, the device including:

- a fixed element (**10**) anchorable to the stationary support structure (**S**);

- a movable element (**11**) anchorable to the closing element (**D**), said movable element (**11**) and said fixed element (**10**) being reciprocally coupled to rotate around said first longitudinal axis (**X**) between an open position and a closed position;

- at least one plunger member (**30**) slideable along a second axis (**X**) between a first end-stroke position, corresponding to one of said closed and open positions, and a second end-stroke position, corresponding to the other of said closed and open positions;

wherein one of said fixed element (**10**) and movable element (**11**) comprises at least one working chamber (**20**) defining said second longitudinal axis (**X**) to slidably house said at least one plunger member (**30**), said at least one working chamber (**20**) including at least one closing cap (**27**);

wherein said at least one working chamber (**20**) includes a working fluid acting upon said at least one plunger member (**30**) to hydraulically counteract the action thereof, said at least one plunger member (**30**) separating said working chamber (**20**) into at least one first and second variable volume compartments (**23**, **24**) fluidly communicating with each other and preferably adjacent, said plunger member (**30**) allowing the passage of the working fluid between said first compartment (**23**) and said second compartment (**24**) during one of the opening or closing of the closing element (**D**), a hydraulic circuit (**100**) being provided to allow the passage of the working fluid between said first compartment (**23**) and said second compartment (**24**) during the other of the opening and the closing of the closing element (**D**);

wherein said hydraulic circuit (**100**) includes at least one duct (**120**) passing through said at least one closing cap (**27**) comprising at least one first opening (**121**) for the selective passage of said working fluid, said at least one closing cap (**27**) further including valve means (**200**) interacting with said at least one first opening (**121**) to keep it normally closed, said valve means (**200**) and said at least one plunger member (**30**) being in a spatial relationship such as to remain reciprocally spaced apart for a first part of the stroke of said at least one plunger member (**30**) and such that for a second part of the stroke of the plunger member thereof (**30**) the latter acts upon the former

(**200**) to open said at least one first opening (**121**), so that the closing element (**D**) latches towards the open or closed position.

2. Device according to claim 1, wherein said valve means (**200**) include at least one stopper (**210**) normally engaged with said at least one first opening (**121**), said at least one plunger member (**30**) during the second part of the stroke thereof acting upon said at least one stopper (**210**) to disengage it from said at least one first opening (**121**).

3. Device according to claim 2, wherein said stopper (**210**) includes a first end portion (**213**) susceptible to lay in said one of said first compartment (**23**) and second compartment (**24**) when said at least one first opening (**121**) is closed, said first end portion (**213**) being further susceptible to interact with said at least one plunger member (**30**) during the second part of the stroke thereof.

4. Device according to claim 2 or 3, wherein said stopper (**210**) includes a channel (**217**) to maintain in fluid communication said first compartment (**23**) and second compartment (**24**) through said at least one duct (**120**) when said at least one first opening (**121**) is closed.

5. Device according to claim 3 and 4, wherein said channel (**217**) includes a first port (**218**) at said first end portion (**213**) in fluid communication with said one of said first compartment (**23**) and second compartment (**24**) and a second port (**219**) in fluid communication with said at least one duct (**120**).

6. Device according to one or more of claims 2 to 5, wherein said valve means (**200**) include at least one spring (**201**) acting upon said at least one stopper (**210**).

7. Device according to one or more of claims 3 to 6, wherein said at least one duct (**120**) has a seat (**123**) to receive at least partially said valve means (**200**), said seat (**123**) including said at least one first opening (**121**), said stopper (**210**) including an elongated body (**211**) defining a third longitudinal axis (**X'**) substantially parallel to said second longitudinal axis (**X**) slidably inserted in said seat (**123**), said elongated body (**211**) including said first end portion (**213**), a central shaped portion (**212**) susceptible to couple with a corresponding countershaped portion (**124**) of said seat (**123**) to close said at least one first opening (**121**) and a second end portion (**214**) interacting with said spring (**201**).

8. Device according to the preceding claim, wherein said at least one closing cap (**27**) includes at least one passing-through hole (**124'**) in correspondence of said seat (**123**), said elongated body (**211**) being sealingly inserted in said at least one passing-through hole (**124'**), the

latter further housing said at least one spring (**201**).

9. Device according to any one of the preceding claims, wherein said at least one closing cap (**27**) further includes at least one first adjustment element (**103**) having a first end (**104**) interacting with said at least one duct (**120**) and a second end (**105**) operateable from the outside by a user to adjust the flow section of the working fluid passing therethrough, in such a manner to adjust the latching force of the closing element (**D**) towards the open or closed position.

10. Device according to any one of the preceding claims, wherein said at least one closing cap (**27**) includes an elongated tubular wall (**28**) extending within said at least one working chamber (**20**), said elongated tubular wall (**28**) being monolithic with said at least one closing cap (**27**) so that the inserting of the latter within said at least one working chamber (**20**) defines said hydraulic circuit (**100**), so that the latter consists exclusively of the gap between said working chamber (**20**) and said elongated tubular wall (**28**) and of said at least one duct (**120**) passing through said at least one closing cap (**27**).

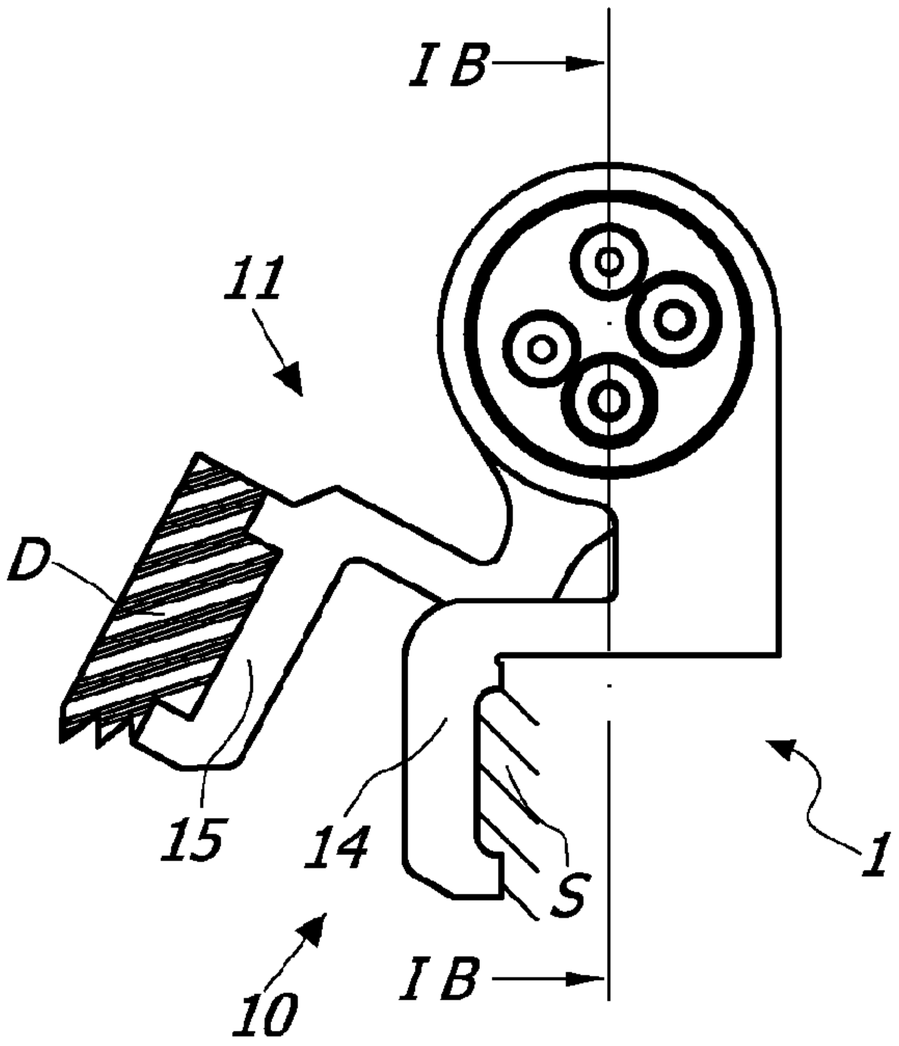

FIG. 1A

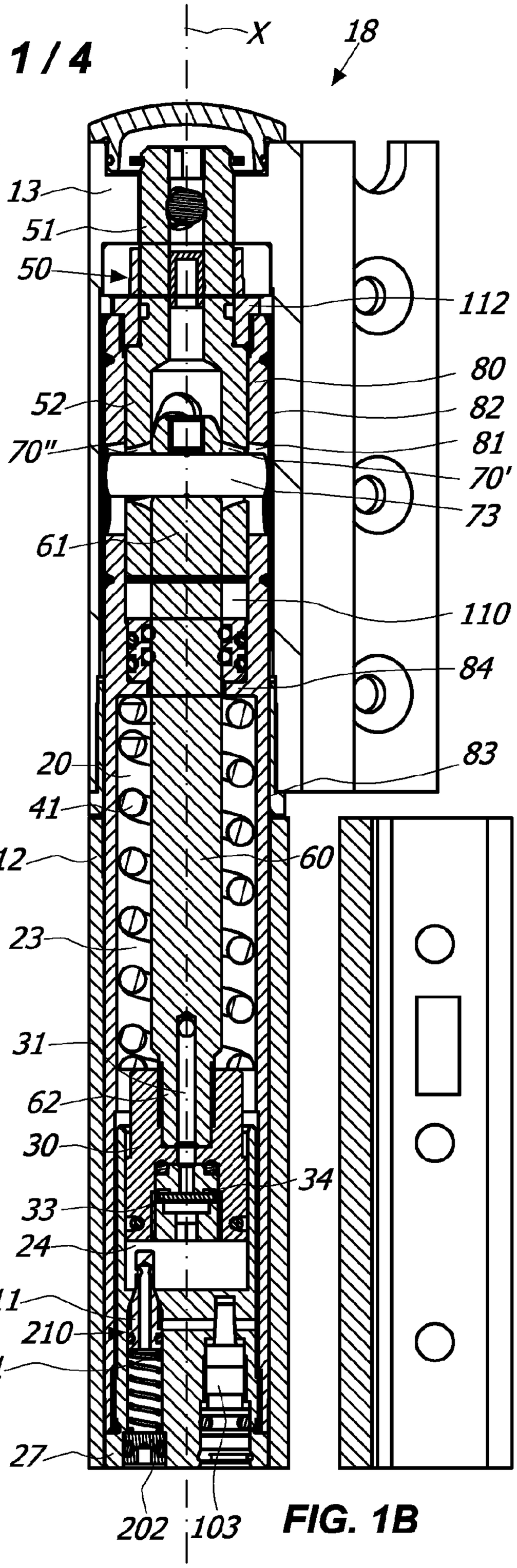

FIG. 1B

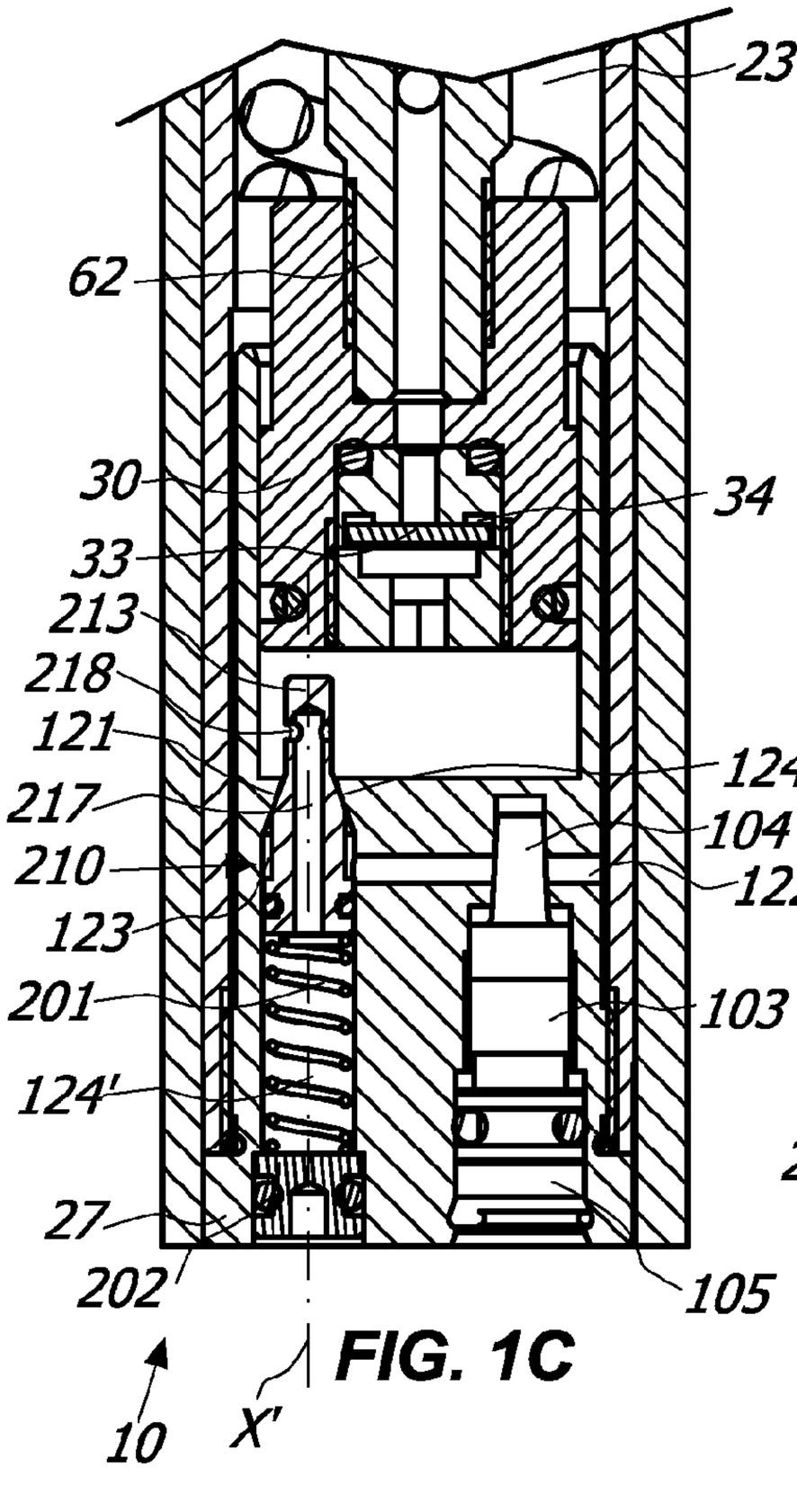

FIG. 1C

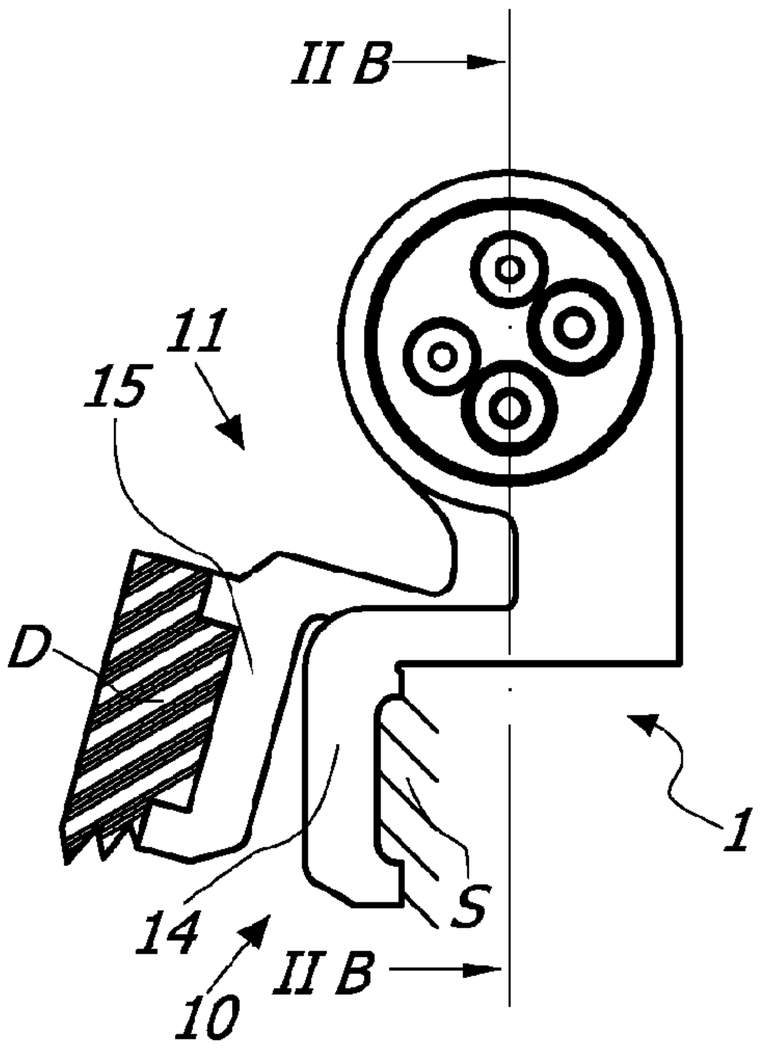

FIG. 2A

FIG. 2C

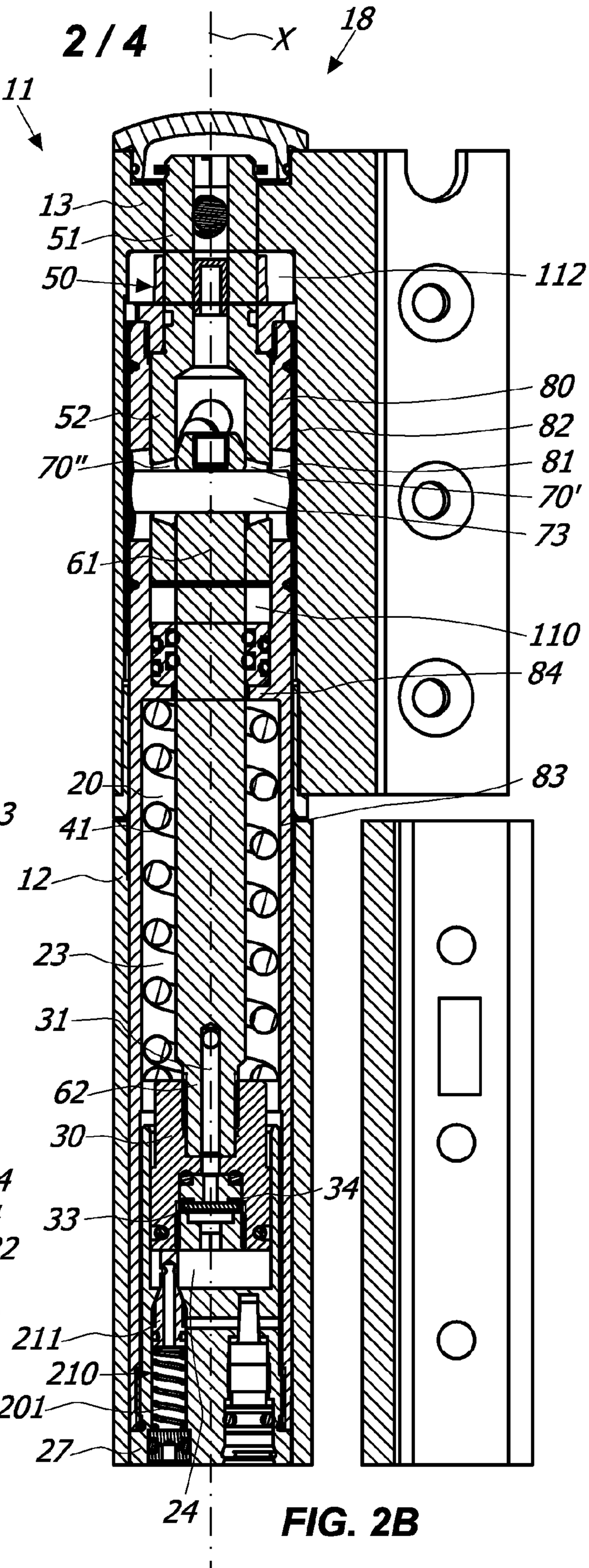

FIG. 2B

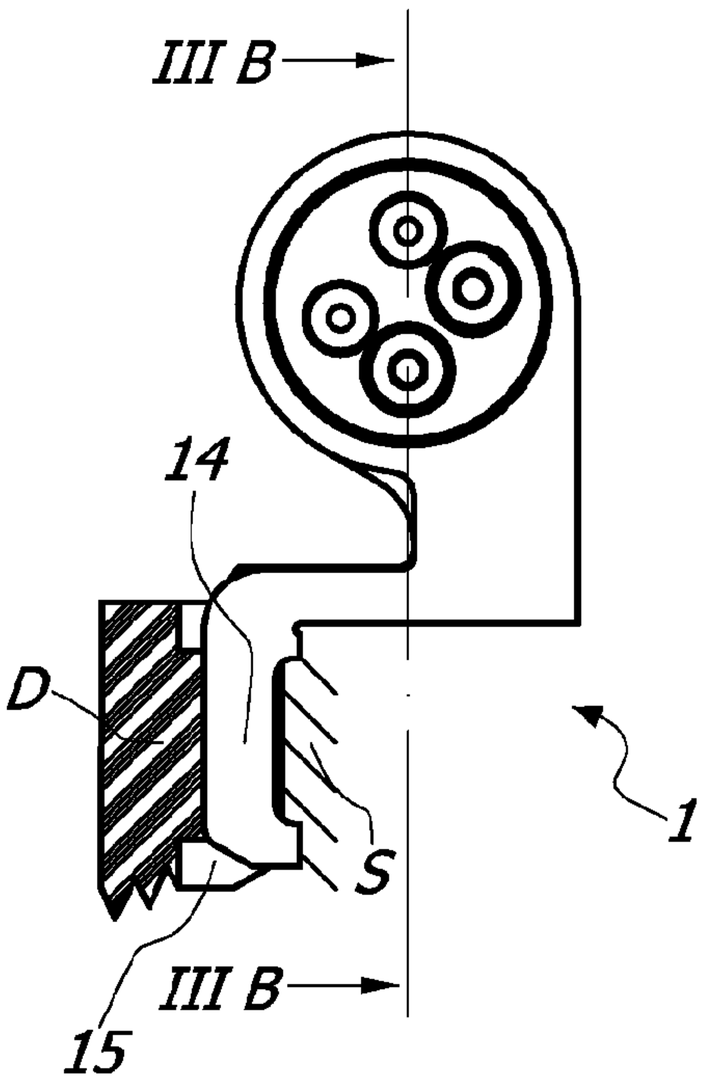

FIG. 3A

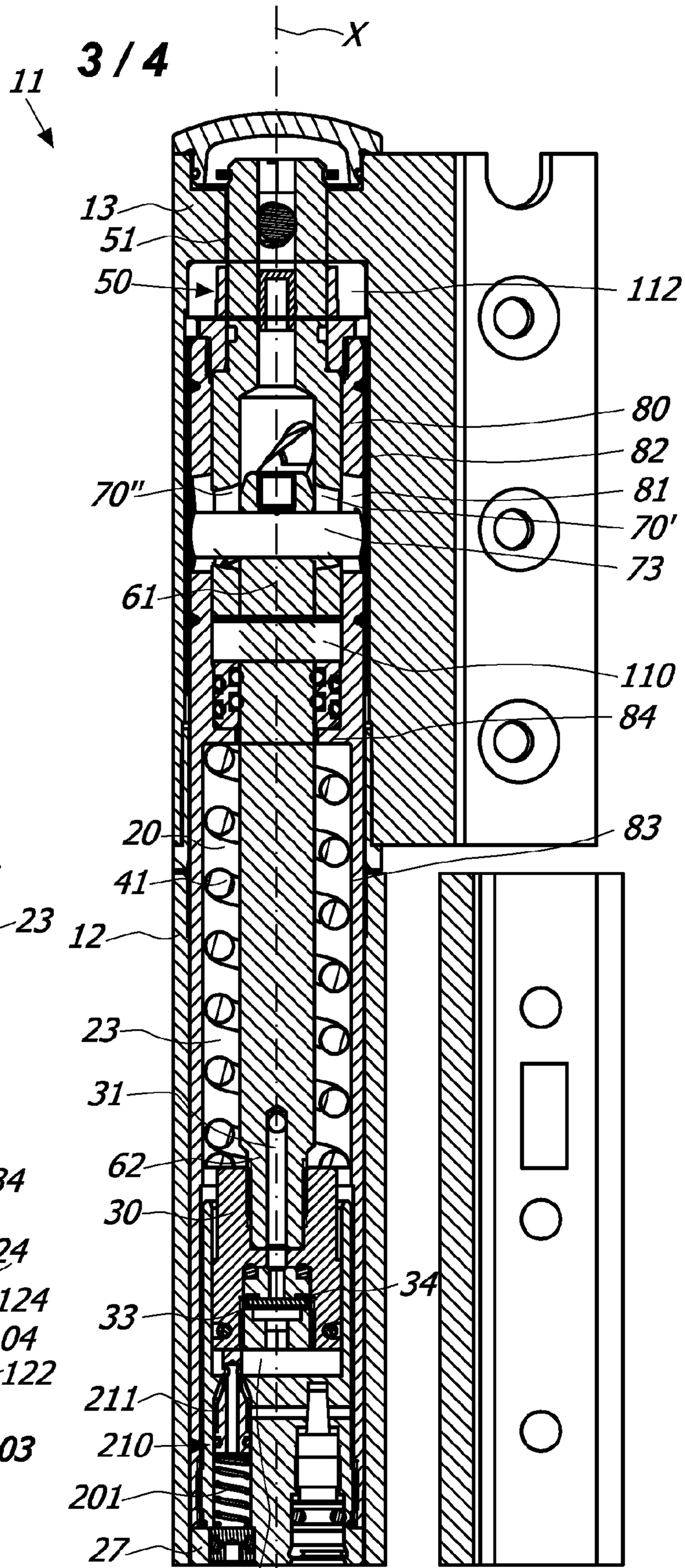

FIG. 3B

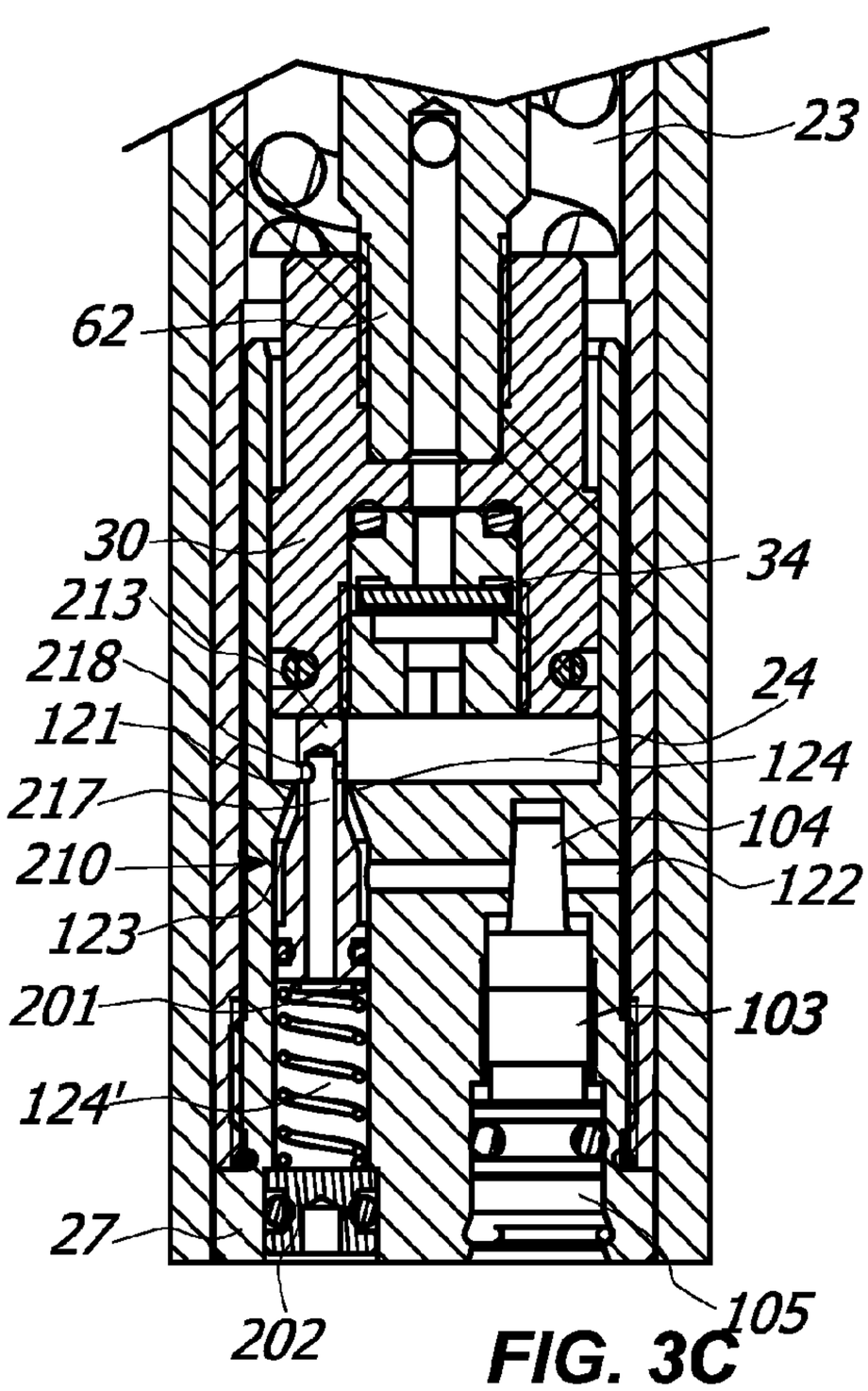

FIG. 3C

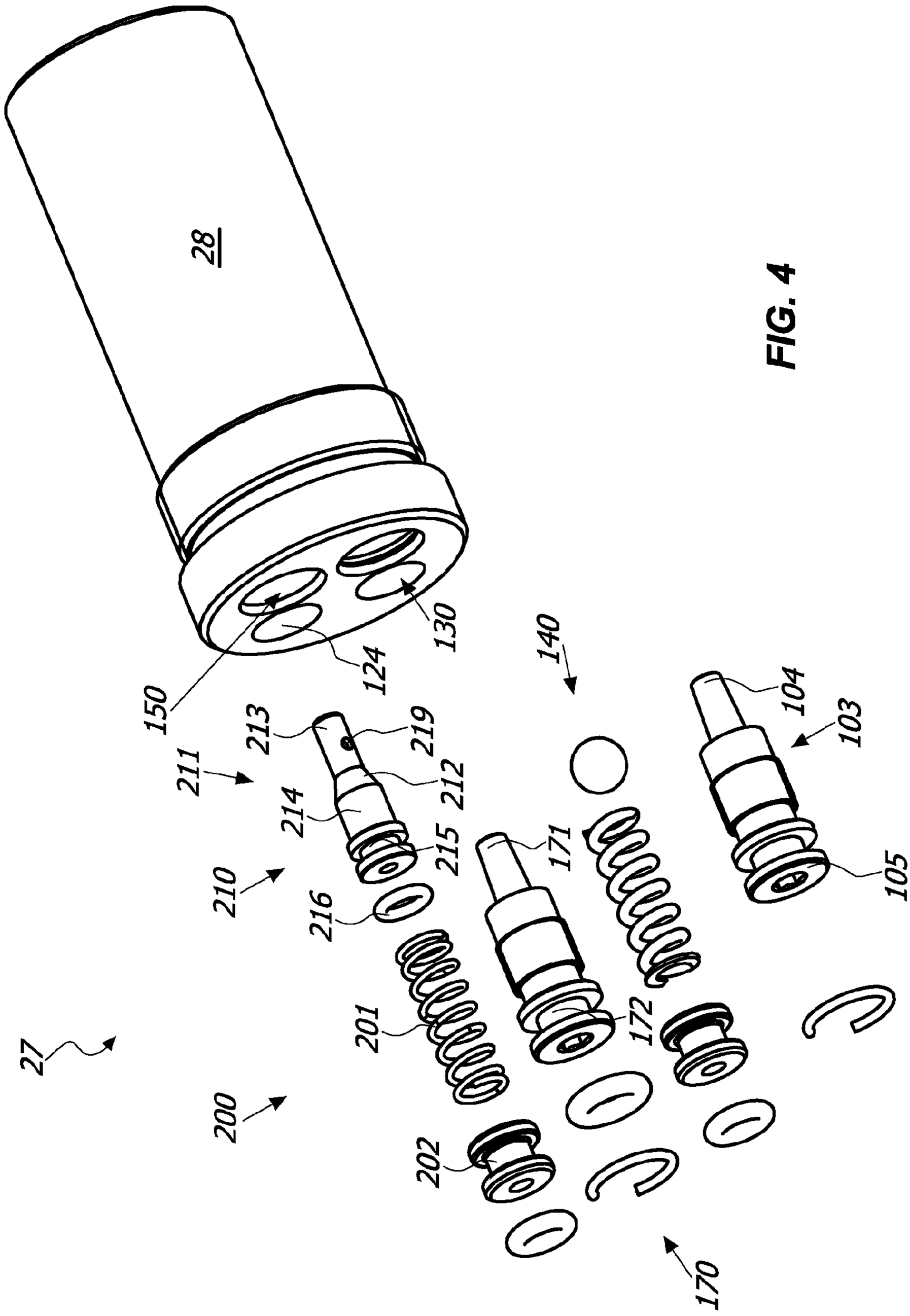
28
150
124
130
140
213
219
211
212
214
215
210
216
104
103
105
171
201
172
27
200
202
170

FIG. 4

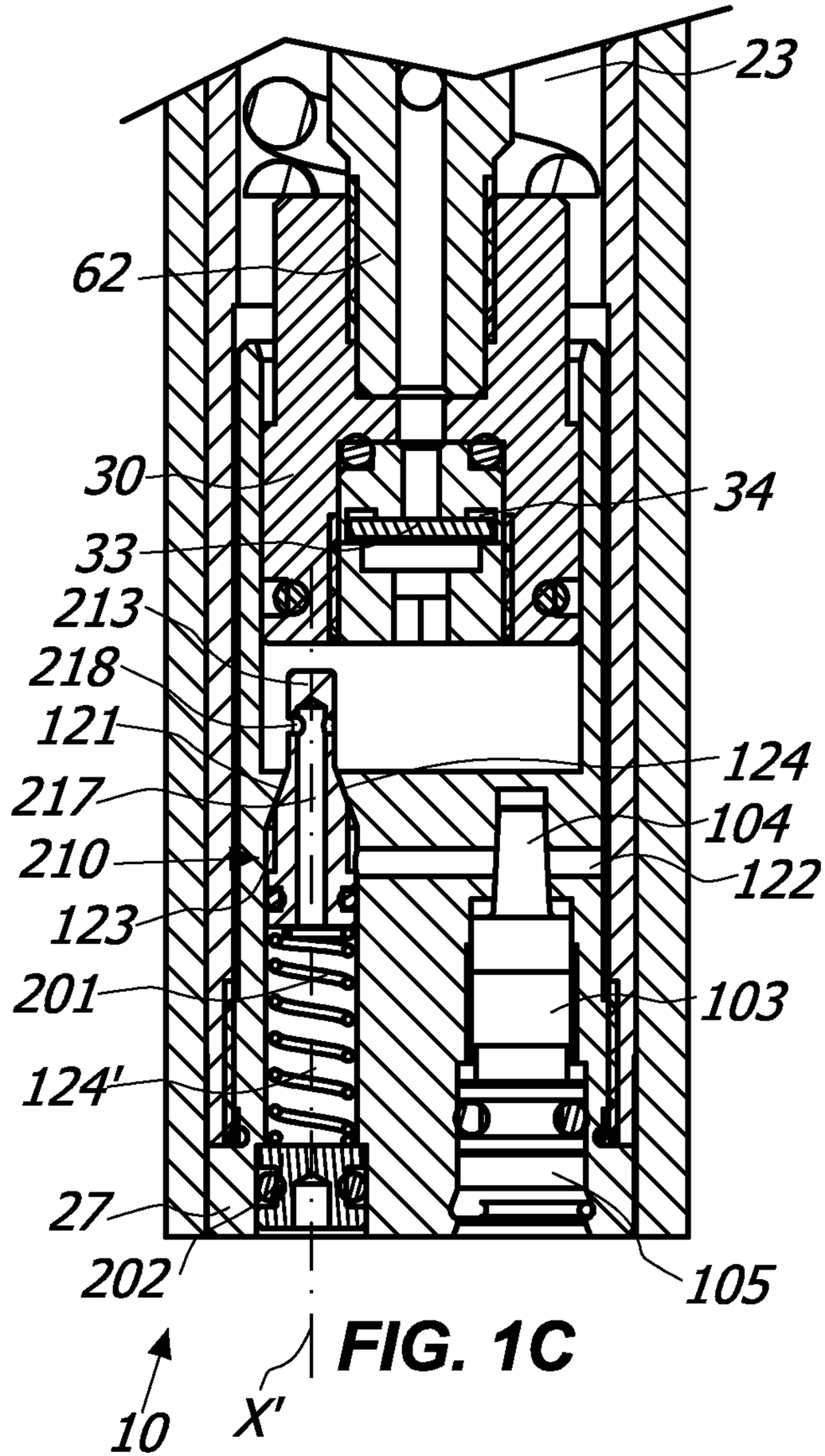
23
62
30
34
33
213
218
121
124
217
104
210
122
123
201
103
124'
27
202
105
10
X'

FIG. 1C