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(54) SELF-LOCKING LACE LOCKING DEVICE

(57) A lace locking device with a sleeve suitable to be fitted on the at least one lace, having an outer surface and an inner surface defining at least one working chamber. The inner surface includes an abutment area with at least one tapered portion and a sliding area. The lace locking device includes actuator means, while the working chamber includes at least one radial locking element integrally joined with the actuator means and susceptible to impact the at least one lace. The actuator means may act on the at least one radial locking element to move it in the working chamber along the first axis. Furthermore, the longitudinal movement causes a transversal movement of the at least one radial locking element along a second axis substantially perpendicular to the first axis. The transversal movement is convergent with respect to the latter at the abutment area following the impact between the at least one radial locking element and the at least one tapered portion for locking the sliding of the lace. On the other hand, the transversal movement is substantially divergent with respect to the first axis at the sliding area so as to allow the free sliding of the at least one lace along the first axis.

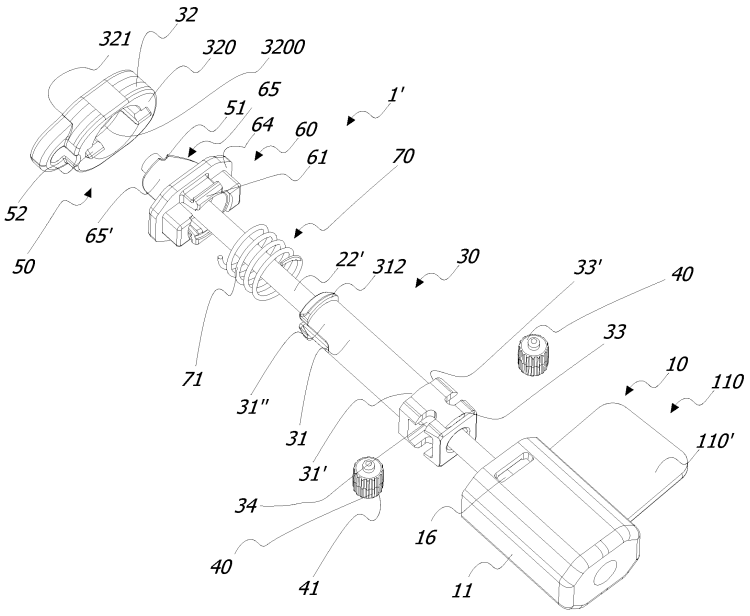

FIG. 1A

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Description

Field of the invention

[0001] The present invention generally relates to the technical field of accessories for shoes and items of clothing and it particularly relates to a self-locking lace locking device with closing function.

Definitions

[0002] In the present document, the expression "safety shoes" and derivatives, is used to indicate safety and/or professional shows subjected to determined laws established by the respective law requirements, including the UNI EN ISO 15090 and/or 17249 and/or 20344 and/or 20345 and/or 20346 and/or 20347 standards and respective law amendments subsequent to the date of filing of this document.

State of the Art

[0003] Typically in the clothing and footwear industry, there is known the use of closing systems of the lace locking device type for locking the sliding of through passing laces for such systems.

[0004] For example, there are known eyelet systems provided with a pair of through holes for the lace, which can be partially closed to constrict the lace in the desired position.

[0005] There are also known systems provided with a shell internally tapered with a wheel, on whose sides the laces pass.

[0006] The adjustment occurs by moving the wheel towards the less tapered area so as to allow the sliding of the laces.

[0007] Furthermore, there are known systems provided with a circular shell in which there are fixed the laces which are constricted and adjusted by rotating the same circular shell.

[0008] However, such known systems require passing several times to allow the adjustment and closure of the lace, by typically acting on one or more components of the lace lock, with resulting engagement over time.

[0009] Such problem is much more felt in emergency situations, such as typically in the civil industry, for example in the case of safety shoes for firefighters, forest guards or military, typically provided with lace loops which allow the free sliding of the lace fixed to the upper of the shoe and special closing systems.

Summary of the invention

[0010] An object of the present invention is to at least partly overcome the aforementioned drawbacks, by providing a lace locking device which allows to reduce the times for locking the lace.

[0011] A further object of the present invention is to at least partially overcome the aforementioned drawbacks, by providing a lace locking device which allows to obtain a ultra safe closure.

[0012] These and other objects that will be more apparent hereinafter, are attained by a lace locking device and/or by an item of clothing and/or a shoe with such lace locking device as described, illustrated and/or claimed herein.

[0013] The dependent claims describe advantageous embodiments of the invention.

[0014] Generally, the self-locking lace locking device for at least one lace, at least one *coulisse* or the like of an item of clothing, of a shoe or the like according to the invention may comprise a sleeve suitable to be fitted on the at least one lace, having an inner surface defining at least one working chamber which extends along a first axis and designed to be faced towards the at least one lace.

[0015] The inner surface may include an abutment area with at least one tapered portion and a sliding area.

[0016] The lace locking device may include actuator means at least partially inserted into the working chamber.

[0017] The latter may include at least one radial locking element integrally joined with the actuator means configured to impact the at least one lace. The actuator means may act on the at least one radial locking element to move it in the working chamber along the first axis.

[0018] Furthermore, the longitudinal movement may cause a transversal movement of the at least one radial locking element along a second axis substantially perpendicular to the first axis.

[0019] The transversal movement may be substantially convergent with respect to the latter at the abutment area following the impact between the at least one radial locking element and the at least one tapered portion.

[0020] On the other hand, the transversal movement may be substantially divergent with respect to the first axis at the sliding area.

[0021] The at least one radial locking element may therefore switch from a tightening or loosening position at the abutment area and respectively a loosening or tightening position at the sliding area.

[0022] When the at least one radial locking element is in the tightening position, the at least one lace is radially compressed to allow the monodirectional sliding thereof along the first axis or an axis parallel or incident thereto and so that when the at least one radial locking element is in the loosening position, there is allowed the bidirectional free sliding of the at least one lace along the first axis or an axis parallel or incident thereto.

[0023] Therefore, it is clear that this allows to obtain a self-locking lace locking device which allows to reduce the times for locking the lace and which allows to obtain an ultra-safe closure.

[0024] In addition, the following characteristics may maximise the solution proposed for the technical problem mentioned above.

[0025] Preferably, the tapered area of the abutment area may include at least one substantially frustoconical or truncated-pyramid portion, while the sliding area may be substantially cylindrical or prismatic or a cylinder portion.

[0026] Advantageously, the inner surface of the sleeve may include a lateral surface with a first and a second opposite portion with respect to the median plane passing through the first axis and a third and fourth opposite portions with respect to the front plane passes through the first axis.

[0027] The inner surface may further include a median portion positioned along the first axis, with extension along the median plane between the third and fourth portions and comprising the abutment area and the sliding area.

[0028] The internal chamber may include a first and a second compartment, each arranged facing towards a respective lace.

[0029] The first portion of the lateral surface and the median portion may at least partially delimit the first compartment, the second portion of the lateral surface and the median portion may at least partially delimit the second compartment.

[0030] Preferably, the sleeve may include an abutment wall and actuator means may include a slider suitable to be fitted on the at least one lace and comprising at least one cavity passing through the latter.

[0031] On the other hand, the slider may be suitable to be at least partially fitted on the median portion.

[0032] The slider may have a first end inserted into the at least one working chamber integrally joined with the at least one radial locking element and the slider may be movable in the working chamber along the first axis between an arming position corresponding to the tightening position wherein the first end is proximal or in contact with the abutment wall and a disarming position corresponding to the loosening position in which the first end is distal from the abutment wall.

[0033] Preferably, the first end of the slider may include at least one housing area for at least one radial locking element.

[0034] The latter may include at least one sphere or one roller or the like and they may preferably have a surface that is at least partially knurled or shaped so as to facilitate gripping with the at least one lace.

[0035] Preferably, the actuator means may include a handle integrally joined with the slider and movable along the first axis, so that the movement of the handle by a user along the first axis corresponds to the movement of the slider between the arming and disarming positions.

[0036] Preferably, the lace locking device may also comprise locking means acting on the slider to keep it in the arming or disarming position.

[0037] The locking means may include at least one first and one second locking element interacting with respect to each other.

[0038] The sleeve may include the at least one first locking element, while the handle may include the at least one second locking element.

[0039] Preferably, a sleeve may include a cap.

[0040] The latter may be fitted on the slider along the first axis and it may include the at least one first locking element.

[0041] On the other hand, the cap may be arranged facing the slider along the first axis and it may comprise a third locking element for locking with the sleeve.

[0042] Preferably, the at least one working chamber may include elastic counteracting means.

[0043] In this case, the slider may include an abutment step susceptible to impact the elastic means, the latter remaining interposed between the abutment step and the cap.

[0044] The elastic means may pass between a retracted position when the at least one first and one second locking element interact and an extended position when the at least one first and one second locking element do not interact with each other.

[0045] The sleeve may include the at least one first locking element and the at least handle may include the at least one second locking element.

[0046] Another aspect of the present invention may relate to an item of clothing which includes at least one closing lace and at least one self-locking lace locking device as described.

[0047] A further aspect of the invention may relate to a shoe comprising an upper with at least one portion for at least one lace and at least one self-locking lace locking device as described and positioned at the portion mentioned above.

[0048] The lace locking device may be fixed at the portion for the lace so as to define a lace loop device.

[0049] The shoe may be a safety shoe, for example for the civil, forestry or military industry, and the lace locking device may be fixed laterally or centrally to the portion of the upper.

[0050] The outer surface of the sleeve may include fixing means for fixing it to the portion for the lace of the upper.

[0051] The fixing means may include at least one fin which can be sewn or riveted at the portion of the upper.

Brief description of the drawings

[0052] Further characteristics and advantages of the invention will be more apparent in the light of the detailed description of some preferred but non-exclusive embodiments of a lace locking device, shown by way of non-limiting example with reference to the attached drawings, wherein:

FIG. 1A is an exploded axonometric view of a lace locking device **1'** provided with fixing means **110** in a first embodiment;

FIG. 1B is an exploded axonometric view of a lace locking device **1'** without fixing means 110 in the first

embodiment;

FIG. 2A is an axonometric view of a lace locking device **1'** provided with fixing means **110** in the first embodiment, in which there is shown the internal of the sleeve **10,** regarding which **FIGS. 2B** and **2C** are respective front and lateral views;

FIG. 2D is an axonometric view of a lace locking device **1'** with the slider **31** in arming position, regarding which **FIG. 2E** is a front axial cross-sectional view;

FIG. 2A' is an axonometric view of a lace locking device **1'** without fixing means **110** in the first embodiment;

FIG. 3A if an axonometric view of the lace locking device **1'** with the slider **31** in a disarming position, regarding which **FIG. 3B** is a front axial cross-sectional view;

FIGS. 4 to **7B** are views of some embodiments of the slider **31** and of the radial locking elements **40** of the lace locking device **1';**

FIG. 8 is an axonometric view of a lace locking device **1'** in the second embodiment;

FIGS. 9A and **9B** are axonometric views respectively in cross-section along a front plane $r\varepsilon F$ of the lace locking device 1' of **FIG. 8** and of some components of the latter;

FIGS. 10A and **10B** are cross-sectional views along a front plane πF of the lace locking device **1'** of **FIG. 8** respectively in tightening and loosening position of the lace **22';**

FIGS. 11 and **12** are axonometric views of safety shoes provided with a lace loop device **1;**

FIG. 13 is an axonometric view of a portion of an item of clothing **3** provided with a lace locking device **1'.**

Detailed description of some preferred embodiments

[0053] With reference to the figures mentioned above, herein described is a lace locking device **1'** for one or more laces **22',** *coulisse* or the like of an item of clothing, a shoe, a bag or any accessory provided with one or more laces which require the adjustment of the tension thereof and obtain a closure.

[0054] Such lace lock **1'** may be defined as a lace loop **1** for one or more laces **22'** when the lace lock **1'** is fixed at a portion **21** of a shoe.

[0055] Therefore, everything that will be described with reference to a lace locking device **1'** may identically refer to a lace loop **1.**

[0056] Therefore, with reference to the present description as well as to the attached drawings and claims, the numbers described below may refer likewise to a lace loop device **1** for one or more laces **22'** or to a lace locking device 1' for one or more laces **22'.**

[0057] For the sake of ease of description, reference will be made to a single lace **22'** passing through the lace locking device **1'.** However, it is clear that even two or more adjacent or non-adjacent laces **22'** may pass through it without departing from the scope of protection of the attached claims.

[0058] For example, there may be provided for two adjacent laces **22'** in the case of laces of the technical type typically used in sports shoes or items of clothing.

[0059] Preferably, the lace locking device **1'** may include a sleeve **10** suitable to be fitted on the lace **22'** and with two opposite ends **10'** and **10".**

[0060] This means that the lace **22'** may pass through it from one end to the other.

[0061] To this end, the sleeve **10** may include an inner surface **12** surrounding a working chamber **13** which may extend along an axis **Y**.

[0062] Therefore, the lace **22'** may be arranged facing the inner surface **12** and it may slide along the axis **Y** or an axis parallel or incident thereto **W.**

[0063] Described below are two embodiments of the lace lock 1', a first embodiment shown in figures **1A** to **7B** and from **11** to **13,** and a second embodiment shown in figures **8** to **10B.**

[0064] In the first embodiment, the inner surface **12** may have an abutment area **120,** for example at the end **10"** and a sliding area **121,** for example at the end **10'.**

[0065] For example, the abutment area **120** may be at the end **10",** while the sliding area **121** may be at the end **10'.**

[0066] Specifically, the abutment area **120** may include a tapered portion **120'.**

[0067] This means that at the abutment area **120** the inner surface **12** may progressively converge towards the axis **Y**.

[0068] In a preferred but non-exclusive embodiment, should the inner surface **12** define a rotary geometry, the tapered area **120'** may include at least one frustoconical portion **1200,** while the sliding area **121** may be cylindrical.

[0069] In any case, the abutment area **120** may include a frustoconical or truncated-pyramid portion **1200,** while the sliding area **121** may be cylindrical, prismatic of a cylinder portion.

[0070] In addition, the tapered area **120'** may include a guide portion **1201** adjacent to the sliding area **121.**

[0071] In the rotary geometry example mentioned above, the tapered area **120'** may therefore include a first frustoconical portion **1200,** a second frustoconical portion acting as a guide portion **1201** and the cylindrical sliding area **121,** so that they are consecutive with respect to each other as shown in **fig. 2E.**

[0072] Suitably, the lace locking device **1'** may include actuator means **30** at least partly inserted into the working chamber **13.**

[0073] Specifically, such actuator means **30** may include a slider **31** suitable to be fitted on the lace **22'** and therefore extending along the axis **Y**.

[0074] As a result, the slider **31** may have one or more through cavities **310** so as to allow the through passing of the lace **22'.**

[0075] Such slider **31** may include an end **31'** inserted

into the working chamber **13** and an opposite end **31".**

[0076] The slider **31** may be slidable along the axis **Y** between an arming position and a disarming position.

[0077] In the described example, the slider **31** may be in an arming position when it is moved from the end **10'** to the end **10"** and vice versa disarming position when it is moved from the latter to the end **10'.**

[0078] However, it is clear that also the contrary may occur and therefore the slider **31** may be in a disarming position when it is moved from the end **10'** to the end **10"** and vice versa arming position when it is moved from the latter to the end **10'.**

[0079] In order to delimit such movement, the sleeve **10** may include an abutment wall **14** against which the end **31'** may impact or be proximal in arming position.

[0080] Even more specifically, the abutment wall **14** may be at the end **10".**

[0081] In order to facilitate such movement, the actuator means **30** may include a handle **32** integrally joined with the slider **31** and therefore movable along the axis **Y**.

[0082] Such handle **32** may be suitable to be gripped by a user so as to allow the movement thereof, as well as the slider **31** along the latter.

[0083] Specifically, the handle **32** may include an opening **3200** which may be fitted on the slider **31,** a surface **320** arranged facing the sleeve **10** and an opposite surface **321.**

[0084] In this case, the end **31"** and the handle **32** may be connected to each other by means of any type of integrally joined connection.

[0085] In a preferred but non-exclusive embodiment, the end **31"** may include appendages **312** protruding with respect to the opening **3200** and susceptible to abut against the surface **321.**

[0086] However, it is clear that the handle **32** may also be a portion of the slider **31,** for example a portion of the end **31"** without departing from the scope of protection of the attached claims.

[0087] In the second embodiment, the sleeve **10** may have an inner surface **12** with a lateral surface **124.**

[0088] The latter may include a first and a second opposite portions **124', 124"** with respect to the median plane π**M** passes through the axis **Y** and a third and fourth opposite portions **125', 125"** with respect to the front plane π**F** passes through the axis **Y**.

[0089] The inner surface **12** may further include a median portion **123** positioned along the axis **Y**, with extension along the median plane π**M** between the portions **125', 125",** extending from one side to the other.

[0090] Advantageously, the internal chamber **13** may include a first and a second compartment **13', 13",** each arranged facing towards a respective lace **22'** and each at least partly defining the axis **W.**

[0091] As a result, the portion **124'** and the median portion **123** may at least partially delimit the compartment **13',** while the portion **124"** and the median portion **123** may at least partially delimit the compartment **13".**

[0092] In any case, the compartments **13'** and **13"** may be communicating with respect to each other.

[0093] The median portion **123** may comprise an abutment area **120** with a tapered portion **120'** and a sliding area **121.**

[0094] At the abutment area **120** the inner surface **12** may progressively converge towards the axis **Y**.

[0095] For example, the abutment area **120** may be arranged facing towards the end **10',** while the sliding area **121** may be arranged facing towards the end **10".**

[0096] Advantageously, such second embodiment may be particularly suitable for example when the lace lock 1' is used with a pair of laces **22'** that are particularly large and thick.

[0097] In this case, the laces **22'** may slide along the axes **W.**

[0098] In a preferred but non-exclusive embodiment, the abutment area **120** may include a frustoconical or truncated-pyramid portion **1200,** while the sliding area **121** may be cylindrical, prismatic of a cylinder portion.

[0099] Suitably, the lace locking device **1'** may include actuator means **30** at least partly inserted into the working chamber **13.**

[0100] Specifically, such actuator means **30** may include a slider **31** suitable to be fitted on the median portion **123** and extending along the axis **Y**.

[0101] As a result, the slider **31** may have a portion **3123** to allow the shape coupling with the median portion **123.**

[0102] Therefore, the portion **3123** may be counter-shaped with respect to the area **120,** in particular of the tapered portion **120'.**

[0103] Furthermore, the portion **3123** may act as an end-of-stroke for the translation of the slider **31** along the axis **Y** following the abutment with the median portion **123.**

[0104] Such slider **31** may include an end **31'** inserted into the working chamber **13** and an opposite end **31"** comprising the portion **3123.**

[0105] The slider **31** may be slidable along the axis **Y** between an arming position and a disarming position.

[0106] In the described example, the slider **31** may be in an arming position when it is moved from the end **10"** to the end **10'** and vice versa disarming position when it is moved from the latter to the end **10".**

[0107] However, it is clear that also the contrary may occur and therefore the slider **31** may be in a disarming position when it is moved from the end **10"** to the end **10'** and vice versa arming position when it is moved from the latter to the end **10".**

[0108] The sleeve **10** may include an abutment wall **14** against which the end **31'** may impact or be in proximity in disarming position.

[0109] Even more specifically, the abutment wall **14** may be at the end **10".**

[0110] In order to facilitate such movement, the actuator means **30** may include a handle **32** integrally joined with the slider **31** and therefore movable along the axis **Y**.

[0111] For example, the handle **32** may be a protruding

fin **3232** extending along the body of the slider **31.**

[0112] Such handle **32** may be suitable to be gripped by a user so as to allow the movement thereof, as well as the slider **31** along the latter.

[0113] Therefore, the fin **3232** may protrude with respect to the sleeve **10** which may have a special slot **1032** for the through-passage thereof.

[0114] A cover button **3232'** which can be coupled with the sleeve **10** may be possibly provided for so as to facilitate the movement of the fin **3232** by a user.

[0115] In the two embodiments described above, the working chamber **13** may include one or more radial locking elements **40** which may be integrally joined with the actuator means **30.**

[0116] Preferably, such radial locking elements **40** may be integrally joined with the slider **31.**

[0117] In any case, the radial locking elements **40** may be in contact with the lace **22'.**

[0118] In a first embodiment, the end **31'** of the slider **31** may include one or more housing areas **34** where the radial locking elements **40** may be positioned.

[0119] For example, the latter may be a sphere or a roller or the like or one or more pairs of spheres or rollers or the like, as particularly shown in FIGS. **1A** to **3B**, **6** and from **9A** to **10B.**

[0120] Such spheres or rollers may have a smooth surface or with at least one knurled or shaped portion **41** so as to increase the friction of the radial locking elements **40** with the lace **22'.**

[0121] However, such knurled or shaped portion **41** may extend to the entire surface of the sphere or of the roller.

[0122] On the other hand, even the tapered area **120'** may have a surface that is counter-knurled or however counter-shaped to facilitate the gripping thereof.

[0123] For example, the portion **1200** may have a knurled portion so as to maximise the friction with the surface **41** of the elements **40** and facilitate the retention thereof in such position.

[0124] In a different embodiment, particularly shown in **figs. 4** and **5,** the radial locking elements **40** may be in the form of one or more prismatic elements with a tapered portion **42** arranged facing the inner surface **12** and a knurled or shaped portion **41** at the lace 22'.

[0125] In a further embodiment, the radial locking elements **40** may be directly obtained at the end **31'** of the slider **31.**

[0126] For example, they may be in the form of flexible strips, obtained by providing grooves at the end 31' and as particularly shown in **figs. 7A** and **7B.**

[0127] Despite the embodiments of the radial locking elements **40** shown in **figs. 4** and **5** and **7A** and **7B** referring to the first embodiment of the lace lock 1', it is clear that the embodiments may also refer to the lace locking device **1'** of the second embodiment.

[0128] Suitably, the radial locking elements **40** may be designed to constrict the lace **22'.**

[0129] As a matter of fact, the longitudinal movement of the actuator means **30,** in particular of the slider **31,** between the arming and disarming positions, may cause the longitudinal movement of the radial locking elements **40** along the axis **Y**, given that the latter are integrally joined with the actuator means **30.**

[0130] In addition, such longitudinal movement, may cause the transversal movement of the locking elements **40** along an axis **X** perpendicular to the axis **Y**.

[0131] As a matter of fact, in the first embodiment described above, the locking elements **40** may impact the tapered portion **120'** when the slider **31** is in arming position moving, due to the impact, in the direction converging towards the axis **Y**.

[0132] Therefore, it is clear that the tapered portion **120',** as well as the abutment area **120** may have an abutment function for the locking elements **40** when the latter are at the abutment area **120,** that is when they are in the tightening position.

[0133] On the other hand, the locking elements **40** may be moved in a divergent direction with respect to the axis **Y** when the slider **31** is in a disarming position and therefore the locking elements **40** may be at the sliding area **121.**

[0134] Basically, when the end **31'** will impact the abutment surface **14** and it will be arranged facing the tapered portion **120',** the slider **31** may be in the arming position and the locking elements **40** may be in a position for tightening the lace **22'** given that the thrust towards the cavity **310,** caused by the impact with the tapered portion **120',** may cause the impact against the lace **22',** occupying the latter.

[0135] In this case, the lace **22'** may solely slide along the axis **Y** in a single pulling direction and it may therefore stop in the position in which the lace **22'** is released.

[0136] For example, as particularly shown in **fig. 2B,** the lace **22'** may be pulled along a direction identified by the sleeve **10** to the handle **32,** but not vice versa.

[0137] As a matter of fact, the pulling in the opposite direction may maximise the constriction of the lace **22'** by the radial locking elements **40** completely preventing the movement thereof.

[0138] It is therefore clear that when the slider **31** is in the arming position, it will be sufficient to pull the lace **22'** in the direction identified by the end **10"** to the end 10' to ensure the sliding of the lace **22'** with a single movement.

[0139] On the other hand, when the end **31'** will be distal from the abutment surface **14** and it will be arranged facing the sliding area **121** or the guide surface **1201,** where present, the slider **31** may be in the disarming position and the locking elements **40** may be in a position for loosening the lace **22** given that the thrust towards the cavity **310** it will be loosened and it may cause the moving away of the locking elements **40** from the lace **22,** leaving it free to slide along both directions of the axis **Y**.

[0140] On the other hand, in the second embodiment described above, the locking elements **40** may impact the tapered portion **120'** when the slider **31** is in arming position moving, due to the impact, in the direction con-

verging towards the axis **Y**.

[0141] Therefore, it is clear that the tapered portion **120',** as well as the abutment area **120** may have an abutment function for the locking elements **40** when the latter are at the abutment area **120,** that is when they are in the loosening position so as to allow the bidirectional sliding of the lace **22'.**

[0142] On the other hand, the locking elements **40** may be moved in a divergent direction with respect to the axis **Y** when the slider **31** is in a disarming position and the locking elements **40** may be at the sliding area **121** therefore in a tightening position so as to allow the monodirectional sliding of the lace **22'.**

[0143] Basically, when the end **31'** will impact the abutment surface **14** or will be proximal to the latter, the locking elements **40** may be in a position for tightening the laces **22'** and the monodirectional sliding thereof along the axis **W** will be allowed.

[0144] In this case, the laces **22'** may solely slide along the axis **W** in a single pulling direction and it may therefore stop in the position in which the lace **22'** is released.

[0145] For example, the laces **22'** may be pulled along a direction identified by the end **10"** to the end **10',** but not vice versa.

[0146] As a matter of fact, the pulling in the opposite direction may maximise the constriction of the laces **22'** by the radial locking elements **40** completely preventing the movement thereof.

[0147] It is therefore clear that it will be sufficient to pull the lace **22'** in the direction identified by the end **10"** to the end **10'** to ensure the fastening of the lace **22'** with a single movement.

[0148] On the other hand, when the end **31'** will be distal from the abutment surface **14** and will be arranged facing the abutment area **120,** the locking elements **40** may be in a position for loosening the lace **22,** leaving it free to slide along both directions of the axis **W.**

[0149] Advantageously, in both embodiments, the sleeve **10** may be provided with at least one cap **60** at the end **10'.**

[0150] Preferably, in the first embodiment, the cap **60** may be single and it may comprise a base **64** and a body **65** protruding therefrom.

[0151] Such cap **60** may be fitted on the slider **31** along the axis **Y** and therefore it may be provided with a cavity **62** passing through the latter.

[0152] Preferably, the sleeve **10** may include a female connection element **16,** while the cap **60** may include a male connection element **61.**

[0153] It is clear that the opposite may also occur, that is the cap **60** may include a female connection element and the sleeve **10** a male connection element without departing from the scope of protection of the attached claims.

[0154] In a preferred but non-exclusive embodiment, the female connection element **16** may be a slot obtained at the end **10',** while the male connection element **61** may be an appendage obtained along an edge area of the base **64** of the cap **60.**

[0155] Therefore, the connection between the female connection element **16** and the male connection element **61** may allow to integrally join the sleeve **10** and the cap **60.**

[0156] In the second embodiment, the cap **60** may be arranged facing the slider **31** along the axis **Y** and it may include at least one locking element **53** with the sleeve **10,** for example a pair of locking appendages.

[0157] The sleeve **10** may therefore include suitable housing areas **1053,** for example slots, for coupling with the elements **53.**

[0158] Suitably, the cap **60** may be of the type concealable in the sleeve **10** as particularly shown in **fig. 8.**

[0159] Both in the first and in the second embodiment, in order to ensure that the arming or disarming position is maintained, the lace locking device **1'** may include locking means **50** which may act on the slider **31.**

[0160] In this case, the locking means **50** may include a pair of locking elements **51** and **52.**

[0161] In the first embodiment, the sleeve **10** may include the locking element **51,** while the handle **32** may include the locking element **52.**

[0162] Advantageously, the locking element **51** may be in the form of a depression obtained along the side wall **65'** of the body **65,** while the locking element **52** may be in the form of a notch obtained at the surface **320** of the handle **32.**

[0163] Advantageously, when the locking element **52,** or notch, may interact with the locking element **52,** that is it may house in the depression, the slider **31** may be in the disarming position.

[0164] Vice versa, when the locking element **52,** does not interact with the locking element **52,** the slider **31** may be in the arming position.

[0165] Suitably, the side wall **65'** may have a concavity **66** extending along it in the direction of the axis **Y**, which may be substantially V-shaped.

[0166] Therefore, the concavity **66** may have a lower end area **66'** and a pair of facing segments **67'** and **67".**

[0167] It is therefore clear that the end area **66'** will be shared by the segments **67'** and **67"** as particularly shown in **fig. 3A.**

[0168] In a preferred but non-exclusive embodiment, the locking element **51** may be obtained at the end of one of the segments **67'** and **67"** opposite with respect to the area **66'.**

[0169] For example, the locking element **51** may be obtained at the end of the segment **67'** proximal to the handle **32.**

[0170] Advantageously, the segment **67'** may be oblique with respect to the axis **Y** and it may act as a guide for the locking element **52** during the movement of the slider **31** from the arming position to the disarming position.

[0171] In this case, such movement may be promoted by a rotation of the handle **32** which may cause the sliding of the locking element **52** along the segment **67'** up to the

locking element **51** with which the locking element **52** may interact.

[0172] In the example mentioned above, the movement promoted by the rotation of the handle **32** may cause the sliding of the notch along the segment **67'** until the depression, in which the notch may lie.

[0173] In a preferred but non-exclusive embodiment, the side wall **65'** may have a pair of concavities **66** and a pair of locking elements **51** as described above, while the handle **32** may have a pair of locking elements **52** so as to allow an ambidextrous rotation of the handle **32.**

[0174] In the second embodiment, the slider **31** may include the element **52** which, in the example mentioned above, may coincide with the fin **3232.**

[0175] On the other hand, the sleeve **10** may include the element **51** which may for example be in the form of two clamping elements positioned on the sides of the slot **1032** so as to clamp the fin **3232** when moved by a user.

[0176] In this case, when the locking elements **51** and **52** interact, the slider **31** may be in the arming position.

[0177] In any case, in any of the two embodiments, when the locking elements **51** and **52** interact, the slider **31** may be in one of the arming and disarming positions, while when the locking elements **51** e **52** do not interact, the slider **31** may be in the other of the arming and disarming positions.

[0178] Advantageously, in both embodiments, the working chamber **13** may include elastic counteracting means **70,** for example a counteracting spring **71** with an end **71'** and an end **71".**

[0179] However, it is clear that the elastic counteracting means **70** may include a return spring or the like without departing from the scope of protection of the attached claims.

[0180] In order to contain the latter, the slider **31** may include an abutment step **33** with a surface 33' adapted to impact the end **71'** of the spring **71.**

[0181] On the other hand, the cap **60** may include an abutment surface **63** adapted to impact the end **71"** of the spring **71.**

[0182] In the first embodiment, the elastic counteracting means **70,** in the example mentioned above the spring **71,** may switch between an extended position when the slider 31 is in an arming position, as well as the locking elements **40** are in tightening position and a retracted position when the slider **31** is in a disarming position, as well as the locking elements **40** are in loosening position.

[0183] In other words, the elastic means **70,** in the example in question the spring **71,** may switch between a retracted position when the locking elements **51** and **52** interact, and therefore in the example mentioned above the step is inserted into the depression, and an extended position when the latter do not interact with each other, and therefore in the example mentioned above the step may be at the end area **66'.**

[0184] Concretely, the elastic means **70** will be subjected to an axial compression along the axis **Y** given that they may abut against the step **33** at the surface **33'** and the surface **63** of the cap **60.**

[0185] It is therefore clear that only the presence of locking means **51** and **52** may retain the slider **31** in the disarming position given that the elastic means **70** would tend to push the latter towards the return to the arming position, as well as the locking elements **40** in the tightening position to prevent the free sliding of the lace **22'.**

[0186] Therefore, in this latter case, when the slider **31** may be in the arming position, the pulling of the lace **22'** along the axis **Y** may be monodirectional and braked in the position in which the lace **22'** is released.

[0187] In the second embodiment, the elastic counteracting means **70,** in the example mentioned above the spring **71,** may switch between an extended position when the slider **31** is in a disarming position, as well as the locking elements **40** are in tightening position and a retracted position when the slider **31** is in arming position, as well as the locking elements **40** are in loosening position.

[0188] In other words, the elastic means **70,** in the example in question the spring **71,** may switch between a retracted position when the locking elements **51** and **52** interact, and therefore in the example mentioned above the fin **3232** is clamped between the grippers **51,** and an extended position when the latter do not interact with each other.

[0189] It is therefore clear that only the presence of locking means **51** and **52** may retain the slider **31** in the arming position given that the elastic means **70** would tend to push the latter towards the return to the disarming position, as well as the locking elements **40** in the tightening position to prevent the free sliding of the lace **22'.**

[0190] Therefore, in this latter case, when the slider **31** will be in the disarming position, the pulling of the lace **22'** along the axis **W** may be monodirectional and braked in the position in which the lace **22'** is released.

[0191] In any case, it is clear that in the first and in the second embodiment, the fact that the slider **31** is in arming or disarming position does not depend on the fact that the locking elements **40** are in the tightening or loosening position.

[0192] As a matter of fact, the arming or disarming position is correlated to the positioning of the slider **31,** and therefore the locking elements **40,** in the chamber **13,** that is if in proximal or distal position from the abutment wall **14,** by the elastic means **70** and the locking elements **51, 52** which keep the slider **31** in a position such to counteract the return thrust of the elastic means **70.**

[0193] With regard to the materials, generally the components of the lace locking device 1' may be made of polymeric material, while the elastic counteracting means **70** made of metal material.

[0194] A different aspect of the invention may relate to an item of clothing which includes at least one locking lace **22'** and at least one lace locking device **1'.**

[0195] A further aspect of the invention may relate to a shoe which comprises an upper with at least one portion

21 for the lace **22'** and at least one lace locking device **1'** positioned at the portion **21.**

[0196] Furthermore, the lace locking device 1' may be fixed at the portion **21** defining a lace loop device **1.**

[0197] Suitably, the shoe may be a safety shoe **2,** for example a shoe for the civil industry, in particular firefighters, forest guards or military.

[0198] Such footwear **2** may be provided with all the per se known components and with one or more lace loop devices **1** through which one or more laces **22'** may pass.

[0199] Suitably, the shoe **2** may solely include consecutive lace loop devices **1** along the portion **21,** fixed in a per se known manner along the same, so as to ensure a quick adjustment and fixing of laces **22'.**

[0200] However, it is clear that the shoe **2** may include both lace loops known in the prior art which allow the free sliding of the laces **22',** and the lace loop devices **1** according to the invention.

[0201] In a preferred but non-exclusive embodiment, particularly shown in **figs. 11** and **12,** the shoe **2** may include some lace loops known in the prior art which allow the free sliding of the laces **22',** and a pair of lace loop devices **1** according to the invention.

[0202] In any case, such lace loop devices **1** may be fixed to the portion **21** of the upper **20** in lateral position, for example for forest boots, or in central position, for example for firefighter boots.

[0203] Furthermore, the lace loop devices **1** may be fixed to the upper, for example in the case of lateral or central positioning described above.

[0204] To this end, the sleeve **10** may include an outer surface **11** with fixing means **110** so as to allow the fixing thereof to the portion **21.**

[0205] In particular, the fixing means **110** may include a fin **110'** which can be rivetted or sewn in a per se known manner along the portion **21.**

[0206] In any case, even in case of a generic lace locking device **1',** the sleeve **10** may include an outer surface **11** with fixing means **110** which may include a fin **110'** which can be rivetted or sewn in a per se known manner to the shoe or item of clothing or the like of interest.

[0207] 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.

[0208] In the light of the above, the present invention attains the pre-established objects.

[0209] The invention is susceptible to numerous modifications and variants. 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 defined by the attached claims.

Claims

1. A self-locking lace locking device for an item of clothing **(3),** a footwear, for example a safety shoe **(2)** or the like comprising at least one lace **(22'),** at least one *coulisse* or the like, comprising:

- a sleeve **(10)** configured to be suitable to be fitted on the at least one sleeve **(22'),** having an inner surface **(12)** defining at least one working chamber **(13)** extending along a first axis (**Y**) and designed to be faced toward the at least one lace **(22'),** the latter being slidable along the same first axis (**Y**) or an axis parallel or incident thereto **(W),** said inner surface **(12)** including at least one abutment area **(120)** with at least one tapered portion (**120'**) and at least one sliding area **(121);**
- actuator means **(30)** at least partially inserted into said at least one working chamber **(13);**

wherein said at least one working chamber **(13)** includes at least one radial locking element **(40)** integrally joined with said actuator means **(30)** and configured to impact the at least one lace **(22'),** said actuator means **(30)** acting on said at least one radial locking element **(40)** to move it in said working chamber **(13)** along said first axis (**Y**), the longitudinal movement further causing a transversal movement of the same at least one radial locking element **(40)** along a second axis **(X)** substantially perpendicular to said first axis (**Y**);

wherein the transversal movement is substantially convergent with respect to said first axis (**Y**) at said abutment area **(120)** after the impact between said at least one radial locking element **(40)** and said at least one tapered portion **(120')** and being substantially divergent with respect to said first axis **(y)** at said sliding area **(121),** said at least one radial locking element **(40)** switching between a tightening or loosening position at said abutment area **(120)** and respectively a loosening or tightening position at said sliding area **(121),** so that when said at least one radial locking element **(40)** is in said tightening position, the at least one lace **(22')** is radially compressed to allow the monodirectional sliding thereof along said first axis (**Y**) or an axis parallel or incident thereto **(W)** and so that when said at least one radial locking element **(40)** is in said loosening position, there is allowed the bidirectional sliding of the at least one lace **(22')** along the first axis (**Y**) or an axis parallel or incident thereto **(W).**

2. Lace locking device according to the preceding claim, wherein said tapered area (**120'**) of said abutment area **(120)** includes at least one substantially frustoconical or truncated-pyramid portion **(1200),** said sliding area **(121)** being substantially cylindrical or prismatic or at least partly a cylinder portion.

3. Lace locking device according to any one of the preceding claims, wherein said inner surface **(12)** of said sleeve **(10)** includes a lateral surface **(124)** with a first and a second opposite portion **(124', 124")** with respect to the median plane (**πM**) passing through said first axis (**Y**) and a third and fourth opposite portions **(125', 125")** with respect to the front plane (**πF**) passing through said first axis (**Y**), said inner surface **(12)** further including a median portion **(123)** positioned along said first axis (**Y**), with extension along said median plane **(πM)** between said third and fourth portions **(125', 125")** and comprising said abutment area **(120)** and said sliding area **(121),** said internal chamber **(13)** including a first and a second **(13', 13"),** each facing towards a respective lace **(22'),** said first portion **(124')** of said lateral surface **(124)** and said median portion **(123)** at least partially delimiting said first compartment **(13'),** said second portion **(124")** of said lateral surface **(124)** and said median portion **(123)** at least partially delimiting said second compartment **(13").**

4. Lace locking device according to any one of the preceding claims, wherein said sleeve (10) includes a first and a second end **(10', 10"),** the latter including an abutment wall **(14),** said actuator means **(30)** including a slider **(31)** suitable to be fitted on said at least one lace **(22')** and comprising at least one through cavity **(310)** for the latter or suitable to be at least partially fitted on said median portion **(123),** said slider **(31)** having a first end **(31')** inserted into said at least one working chamber **(13)** and a second opposite end **(31"),** said first end **(31')** being integrally joined with said at least one radial locking element **(40),** said slider **(31)** being movable in said at least one working chamber **(13)** along said first axis (**Y**) between an arming or disarming position corresponding to said tightening position in which said first end **(31')** is proximal or in contact with said abutment wall **(14)** and a respectively disarming or arming position corresponding to said loosening position in which said first end **(31')** is distal from said abutment wall **(14).**

5. Lace locking device according to the preceding claim, wherein said first end **(31')** of said slider **(31)** includes at least one housing area **(34)** for said at least one radial locking element **(40),** the latter including preferably at least one sphere or one roller or the like preferably having a surface **(41)** at least partially knurled or shaped so as to facilitate gripping with the at least one lace **(22').**

6. Lace locking device according to any one of claims 4 to the preceding one, wherein said actuator means **(30)** include at least one handle **(32)** integrally joined with said slider **(31)** and movable along said first axis (**Y**), upon movement of said at least one handle **(32)** by a user along said first axis (**Y**) corresponding the movement of said slider **(31)** between said arming and disarming positions.

7. Lace locking device according to the preceding claim, further comprising locking means **(50)** acting on said slider **(31)** to keep it in one of said arming and disarming positions, the same locking means **(50)** including at least one first and one second locking element **(51, 52)** mutually susceptible to interact when said slider **(31)** is in said one of said arming and disarming positions and being susceptible not to interact when said slider **(31)** is in said other of said arming or disarming positions, said sleeve **(10)** including said at least one first locking element (51), said at least one handle **(32)** including said at least one second locking element **(52).**

8. Lace locking device according to the preceding claim, wherein said sleeve **(10)** includes at least one cap **(60)** at said first end **(10'),** the same being fitted on said slider **(31)** along said first axis (**Y**) and comprising said at least one first locking element **(51)** or said at least one cap **(60)** being arranged mutually facing said slider **(31)** along said first axis (**Y**) and comprising said at least one third locking element **(53)** with said sleeve **(10).**

9. Lace locking device according to the preceding claim, wherein said at least one working chamber **(13)** includes elastic counteracting means **(70),** said slider **(31)** including an abutment step **(33)** susceptible to impact said elastic counteracting means **(70),** the latter remaining interposed between said abutment step **(33)** and said at least one cap **(60)** and switching from a retracted position when said at least first and one second locking element **(51, 52)** interact with each other and said slider **(31)** is in said one of said arming and disarming positions and an extended position when said at least one first and one second locking element **(51, 52)** do not interact with each other and said slider **(31)** is in the other of said arming and disarming positions.

10. An item of clothing including at least one locking lace **(22')** and at least one self-locking lace locking device **(1')** according to one or more of claims 1 to the preceding one.

11. A shoe comprising an upper with at least one portion **(21)** for at least one lace **(22')** and at least one lace

locking device **(1')** according to one or more of claims 1 to 9 positioned at said portion **(21)** for at least one lace **(22').**

12. Shoe according to the preceding claim, wherein said at least one lace locking device **(1')** is fixed at said portion **(21)** for at least one lace **(22'),** the at least one lace locking device **(1')** defining a lace loop device **(1)** for the at least one lace **(22').**

13. Shoe according to the preceding claim wherein the same is a safety shoe, for example for the civil, forest or military industry, said at least one lace loop device **(1)** being laterally or centrally fixed on said portion **(21).**

14. Shoe according to the preceding claim, wherein said outer surface **(11)** of said sleeve **(10)** includes fixing means **(110)** for fixing it to said at least one portion **(21)** for at least one lace **(22').**

15. Shoe according to the preceding claim, wherein said fixing means **(110)** include at least one fin **(110')** which can be sewn or rivetted at said at least one portion **(21)** for the at least one lace **(22')** of said upper **(20).**

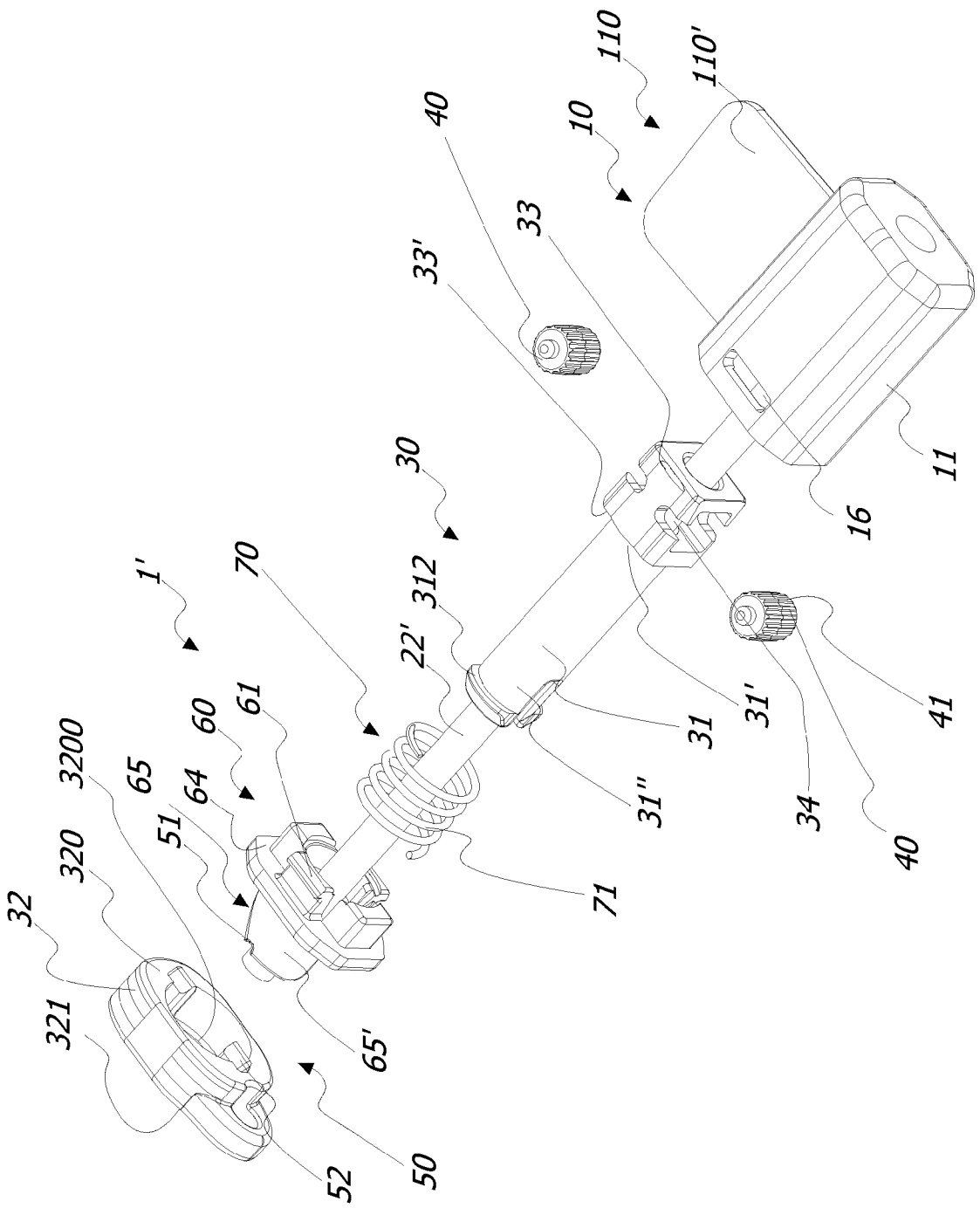
1'
10
11
16
22'
30
31
31'
31''
312
32
320
321
3200
33
33'
34
40
40
41
50
51
52
60
61
64
65
65'
70
71
110
110'

FIG. 1A

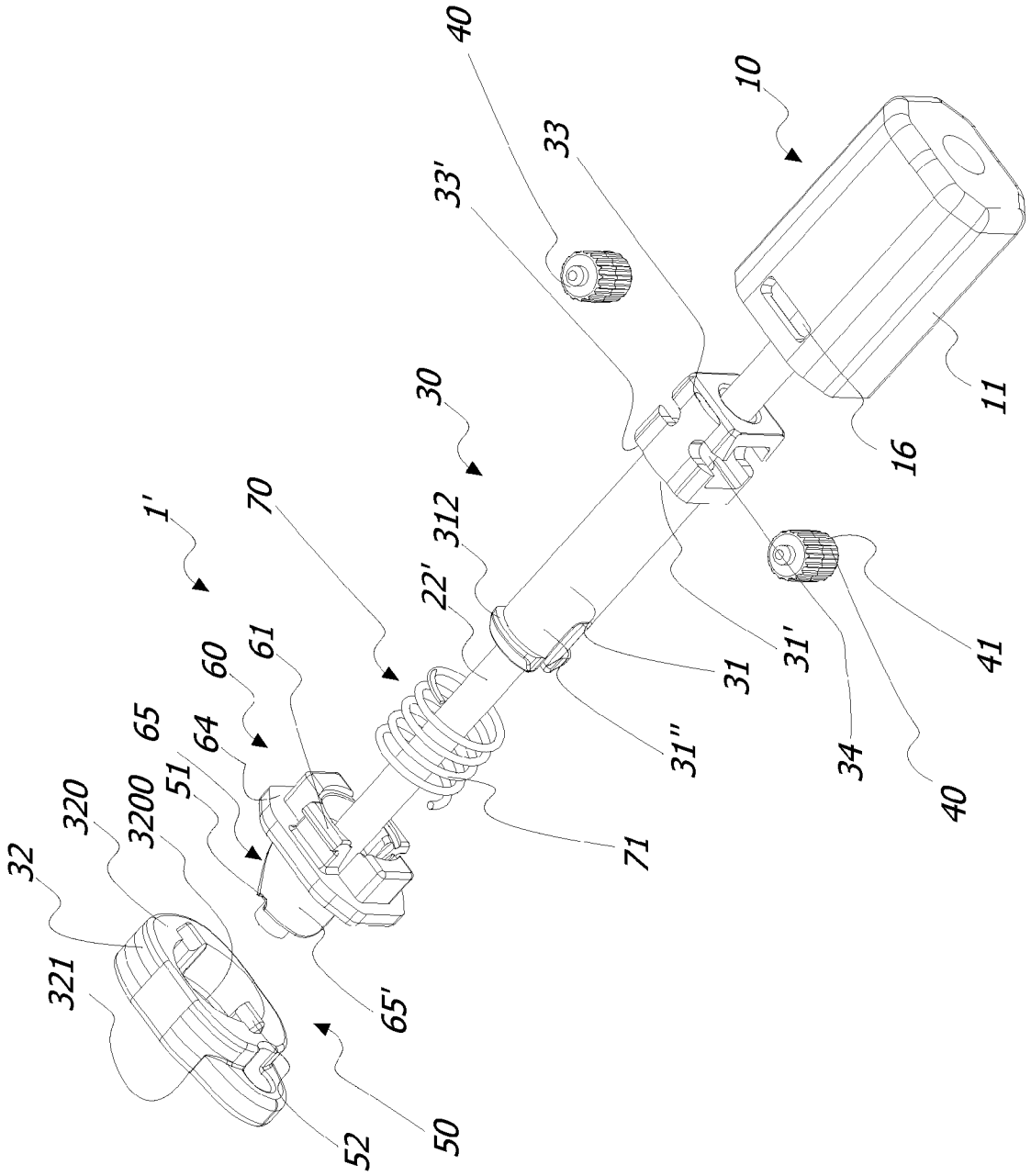
40
10
33
33'
30
1'
70
312
22'
16
11
60
61
65
64
51
320
3200
32
321
31
31'
31''
41
34
40
71
65'
52
50

FIG. 1B

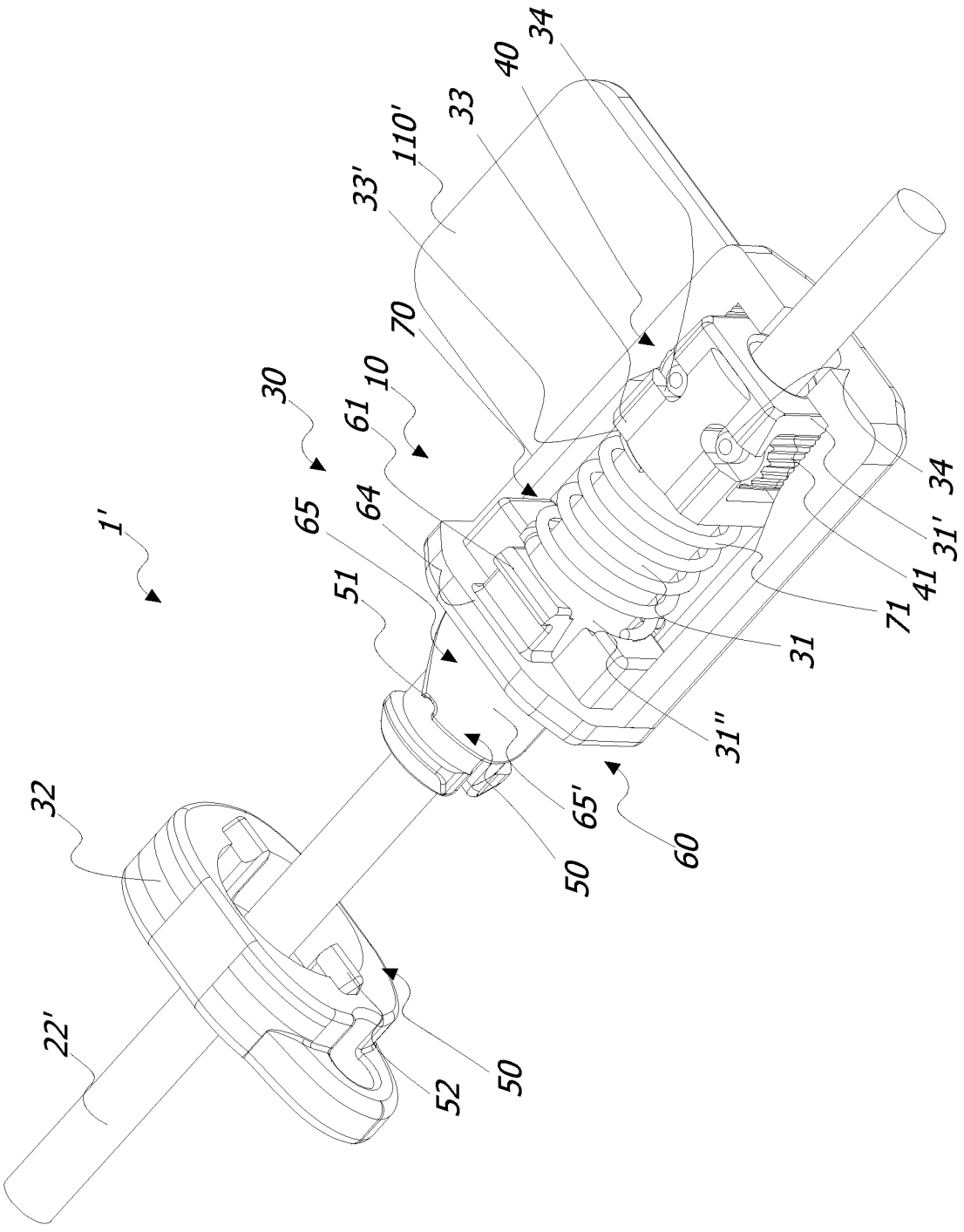
1'
22'
32
52
50
50
60
65'
31''
31
71
41
31'
34
64
65
51
61
10
30
70
110'
33'
33
40
34

FIG. 2A

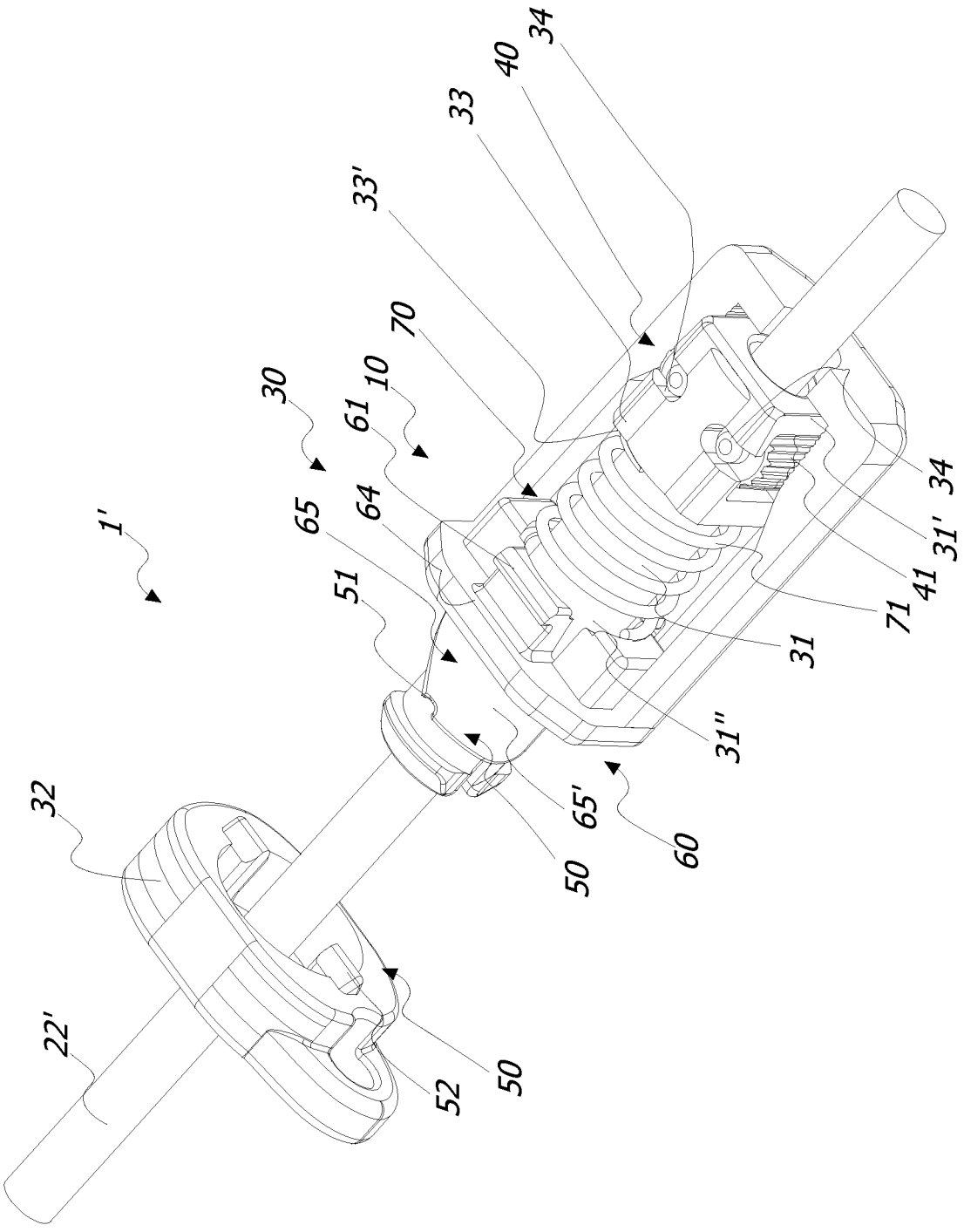

FIG. 2A'

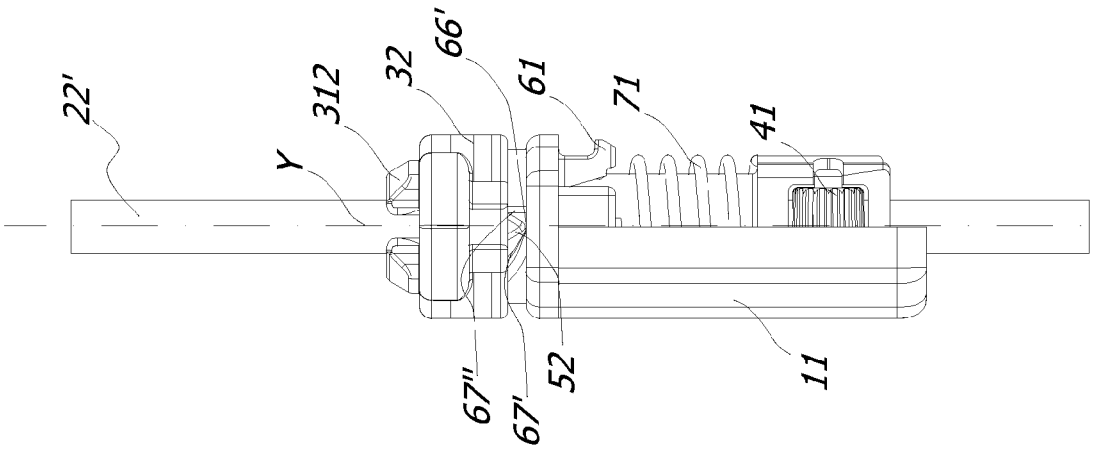
22'
312
Y
32
66'
61
71
41
67''
67'
52
11

FIG. 2C

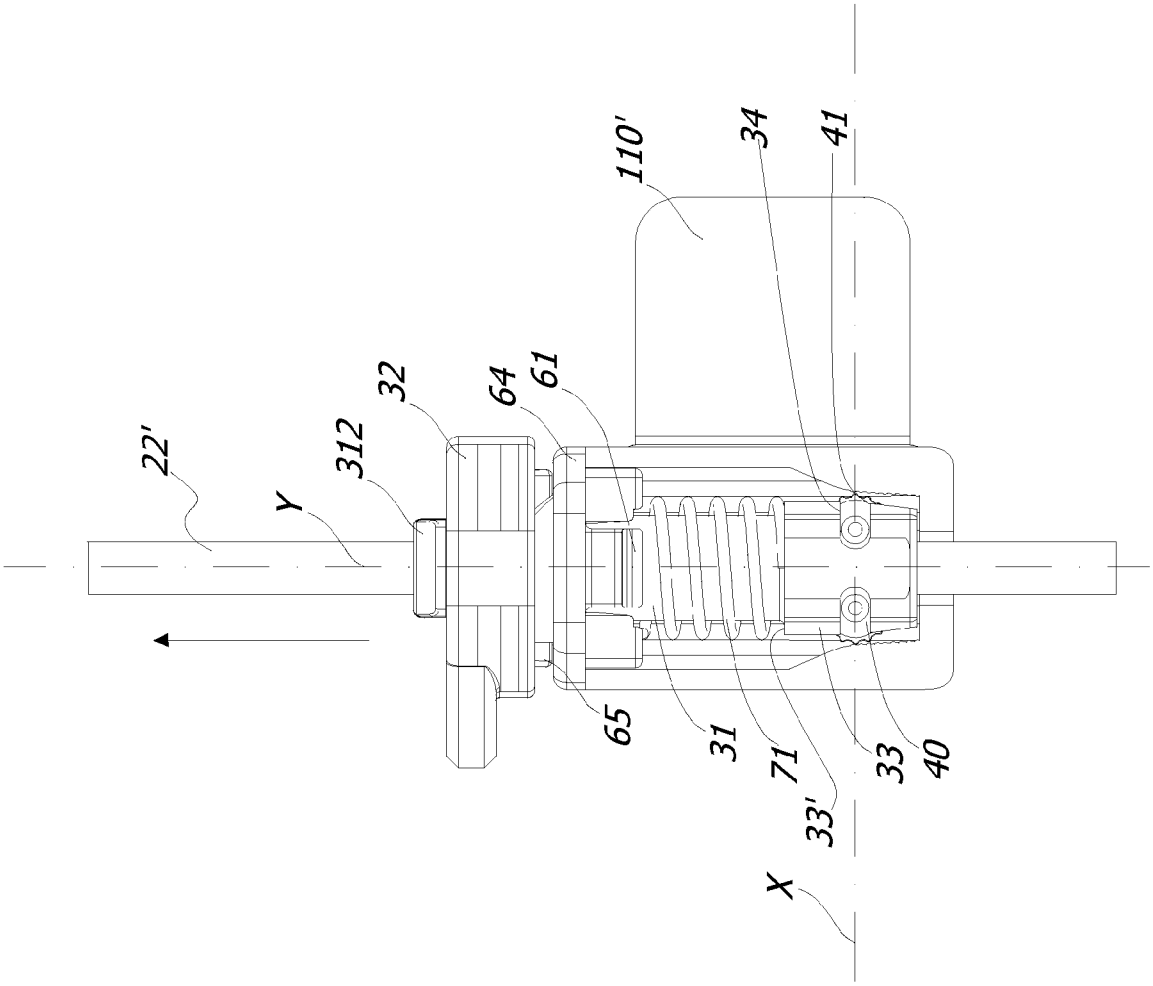
110'
34
41
22'
312
Y
32
64
61
65
31
71
33'
33
40
X

FIG. 2B

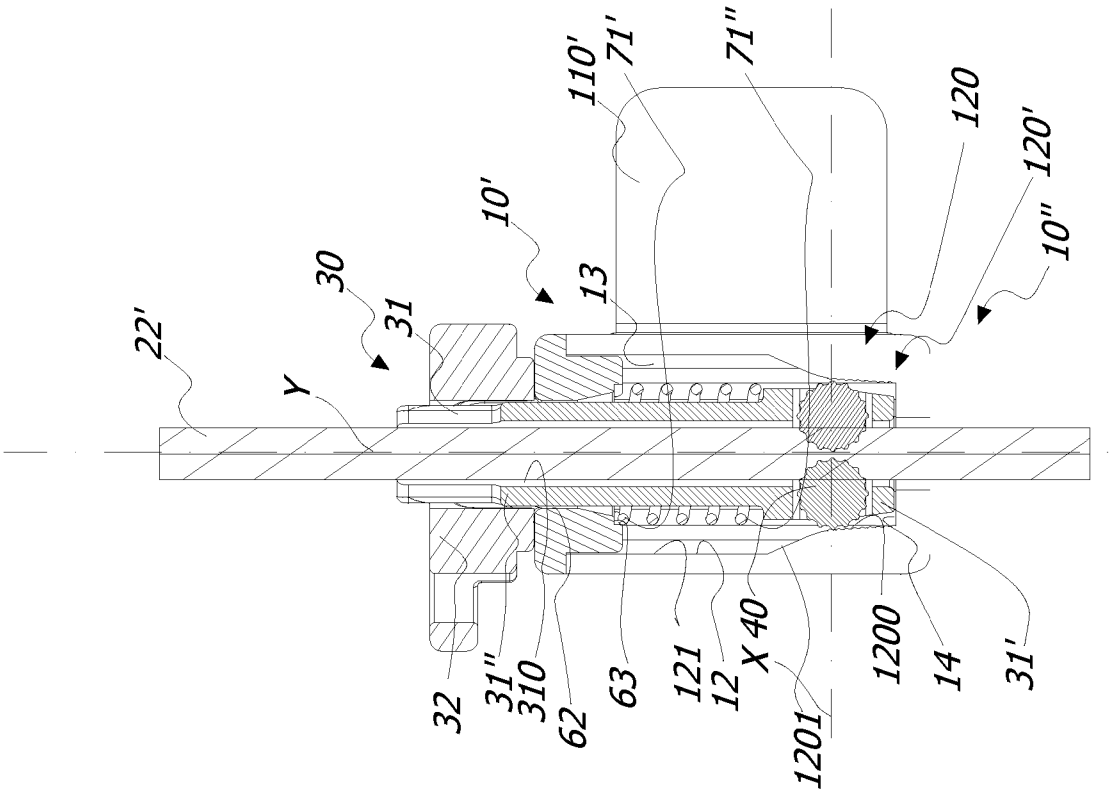
110'
71'
71''
120
120'
10'
10''
30
13
31
22'
Y
32
31''
310
62
63
121
12
X
40
1201
1200
14
31'

FIG. 2E

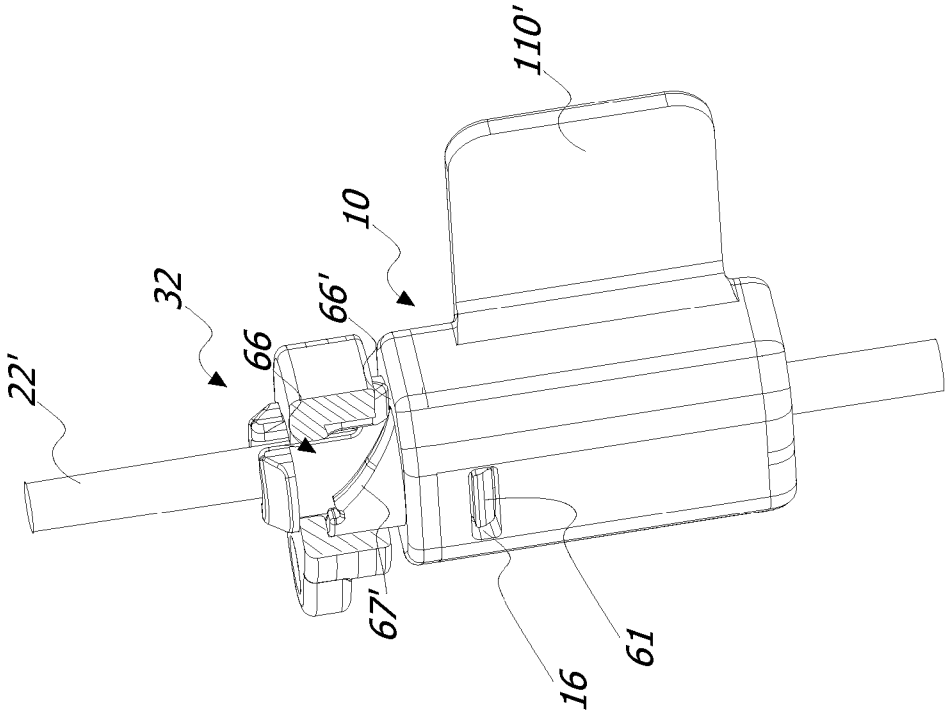
110'
10
32
66'
66
22'
67'
16
61

FIG. 2D

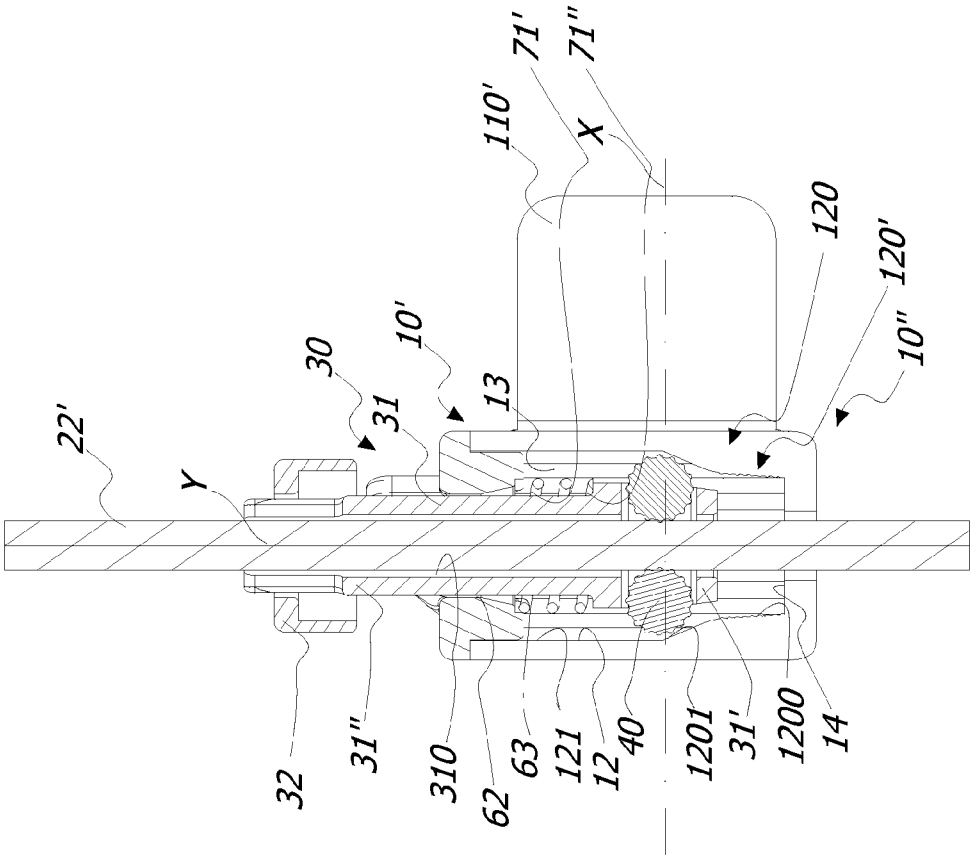
71'
71''
110'
X
120
120'
10''
10'
30
31
13
22'
Y
32
31''
310
62
63
121
12
40
1201
31'
1200
14

FIG. 3B

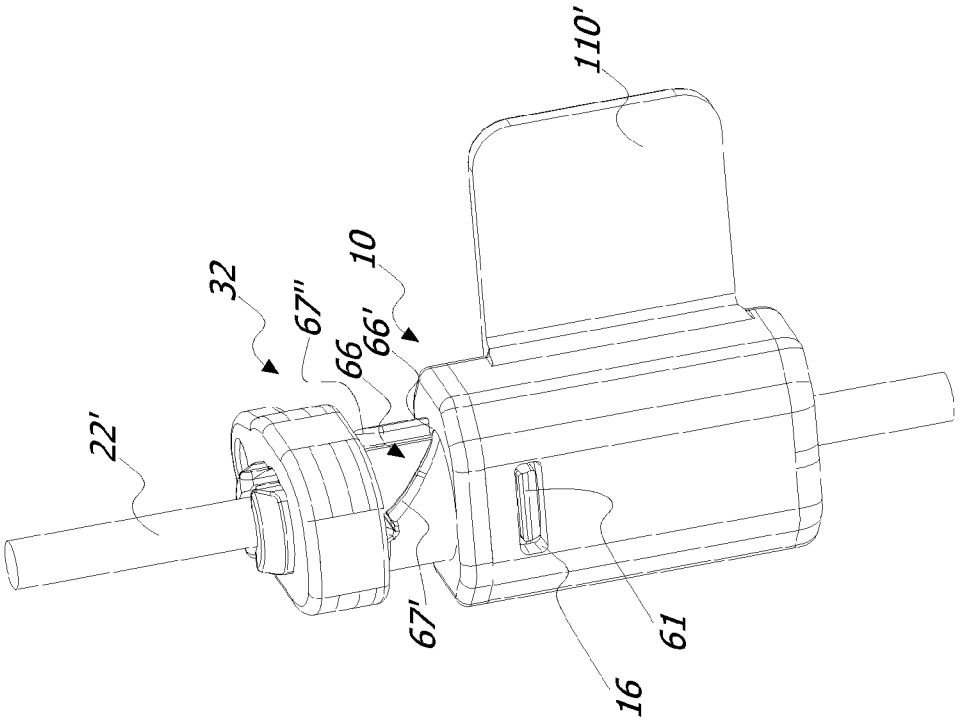
110'
32
67''
10
66
66'
22'
67'
61
16

FIG. 3A

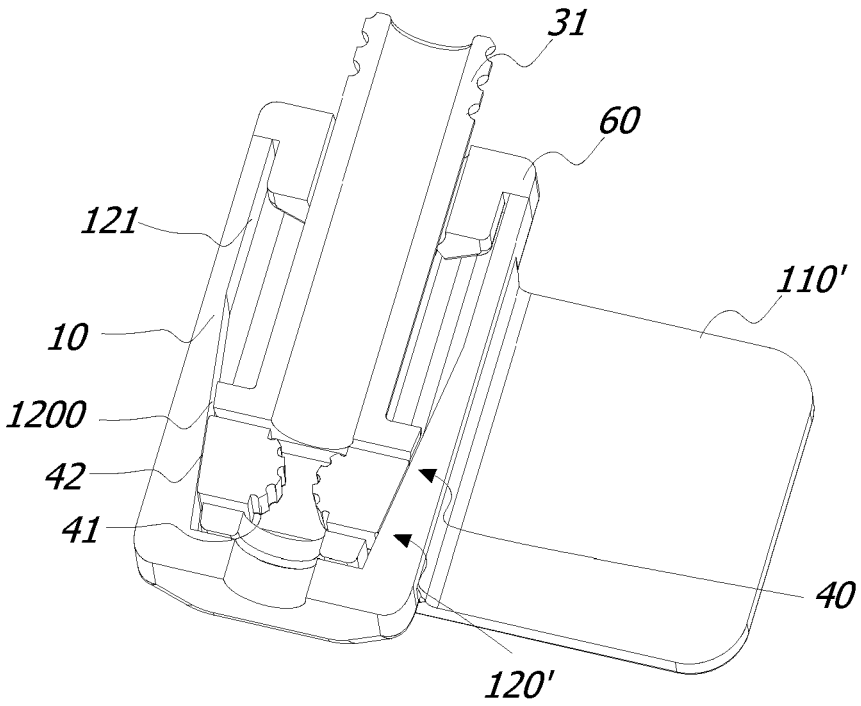

FIG. 4

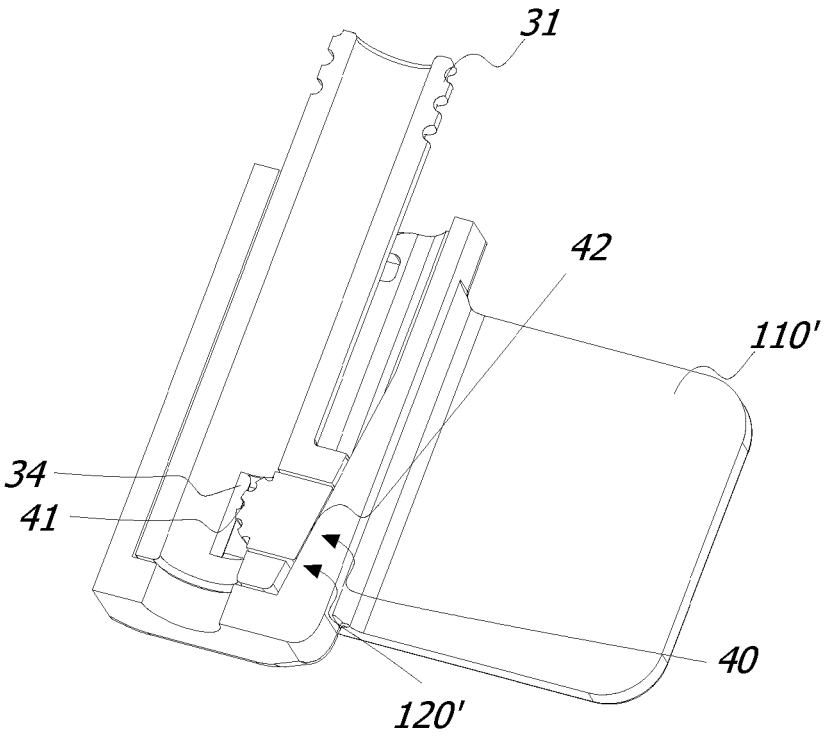

FIG. 5

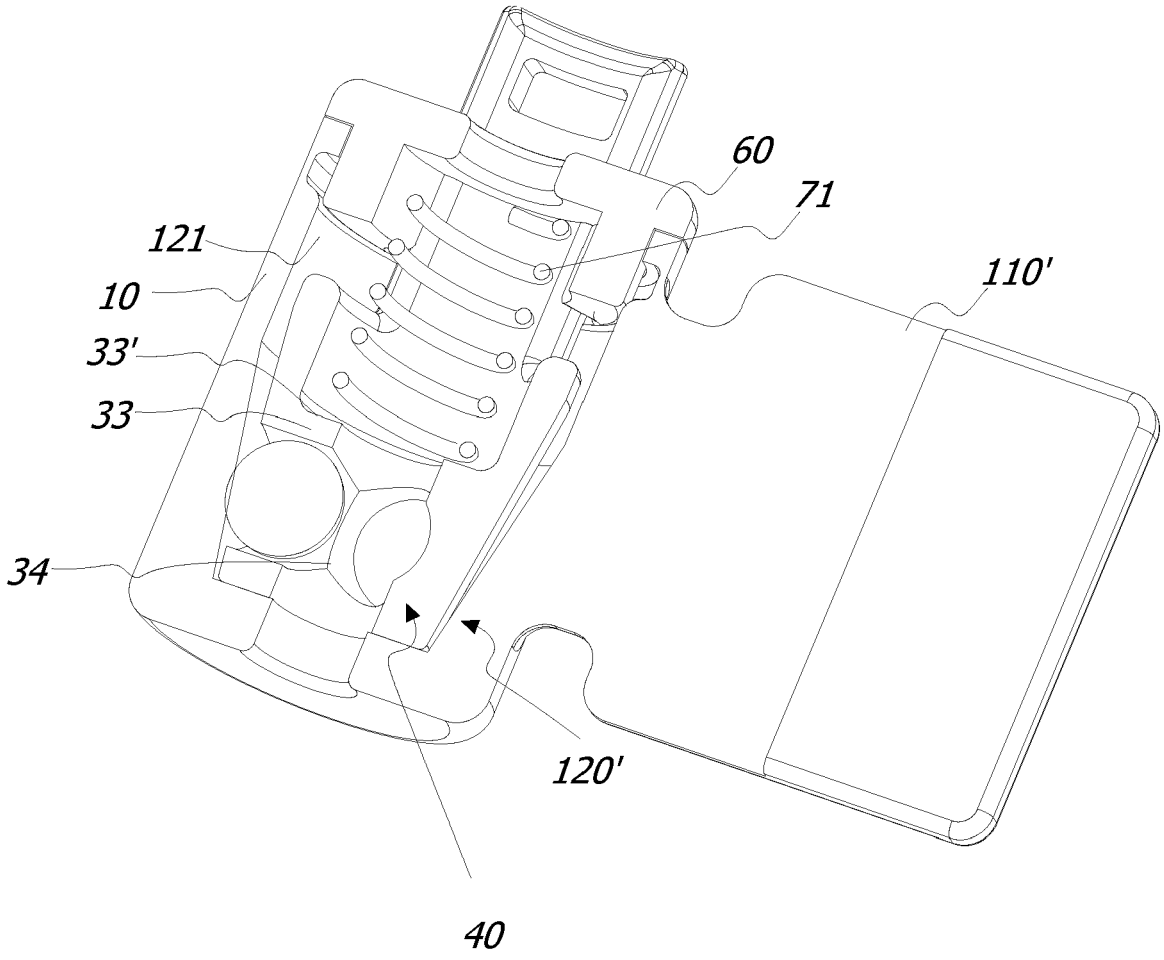

FIG. 6

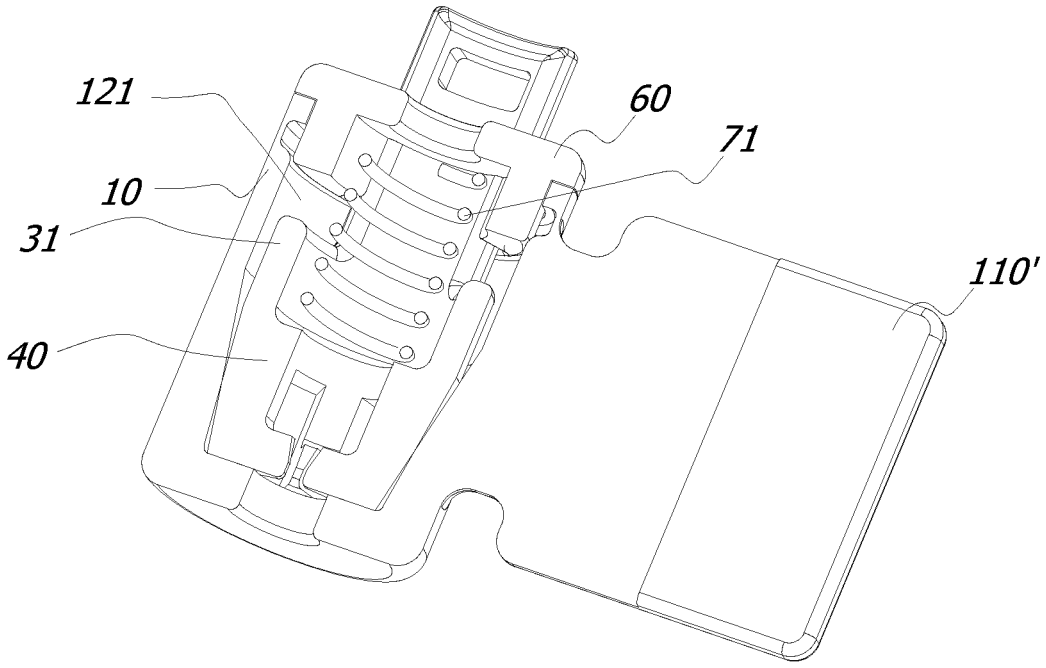

FIG. 7A

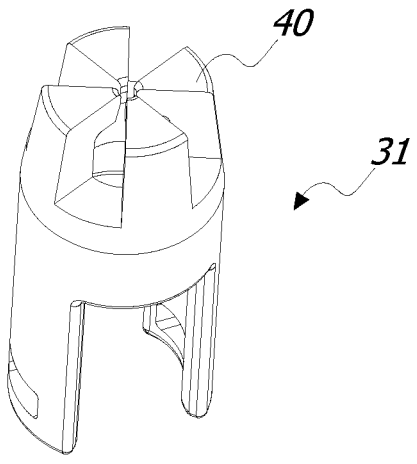

FIG. 7B

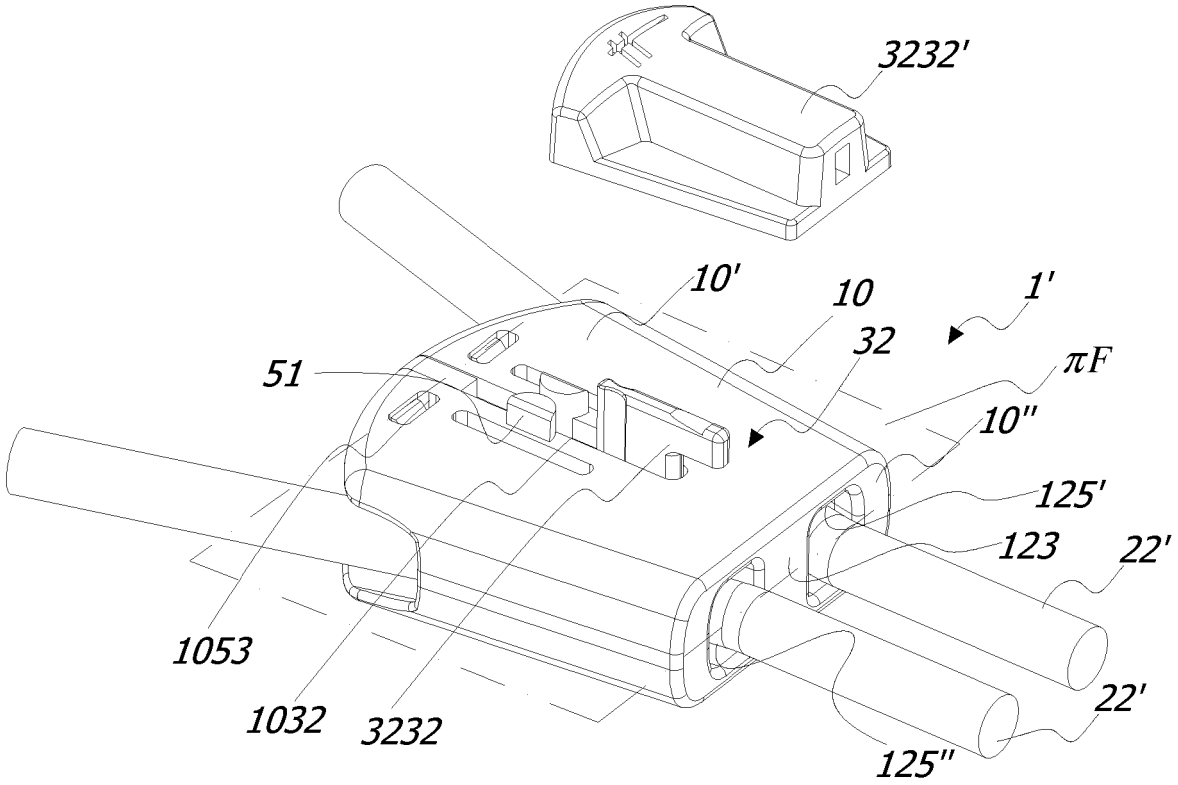

FIG. 8

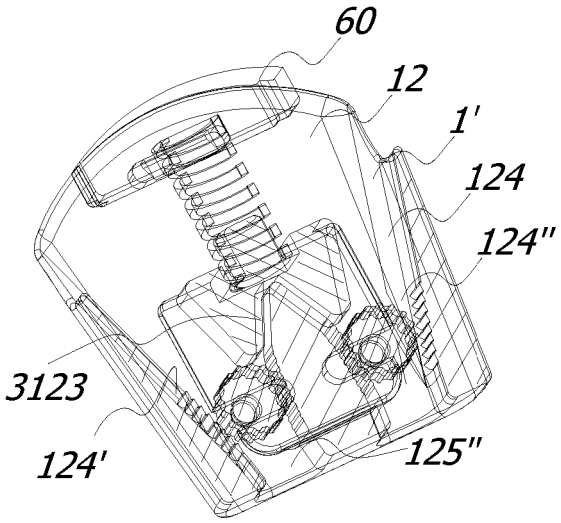

FIG. 9A

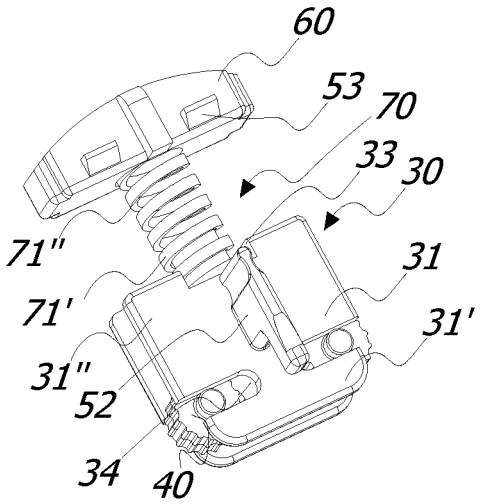

FIG. 9B

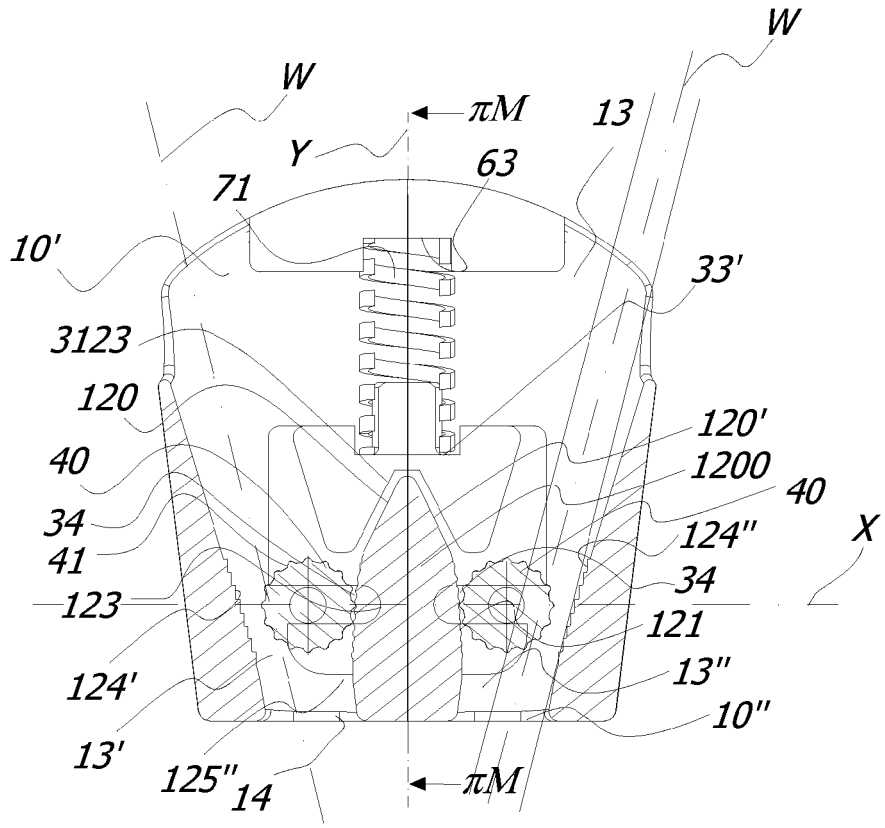

FIG. 10A

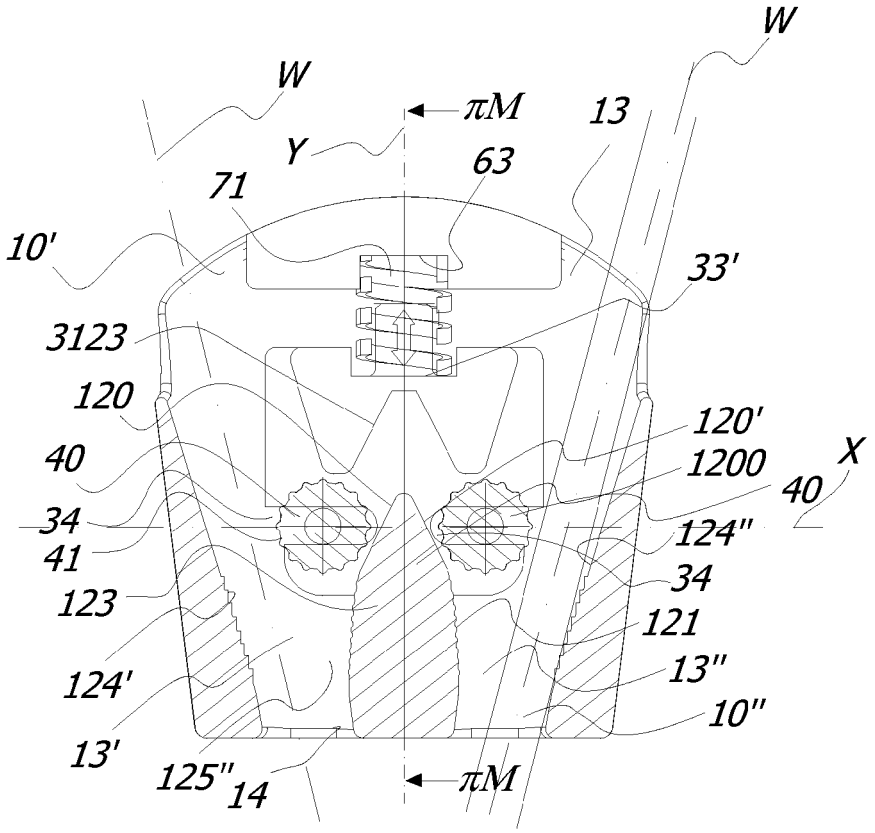

FIG. 10B

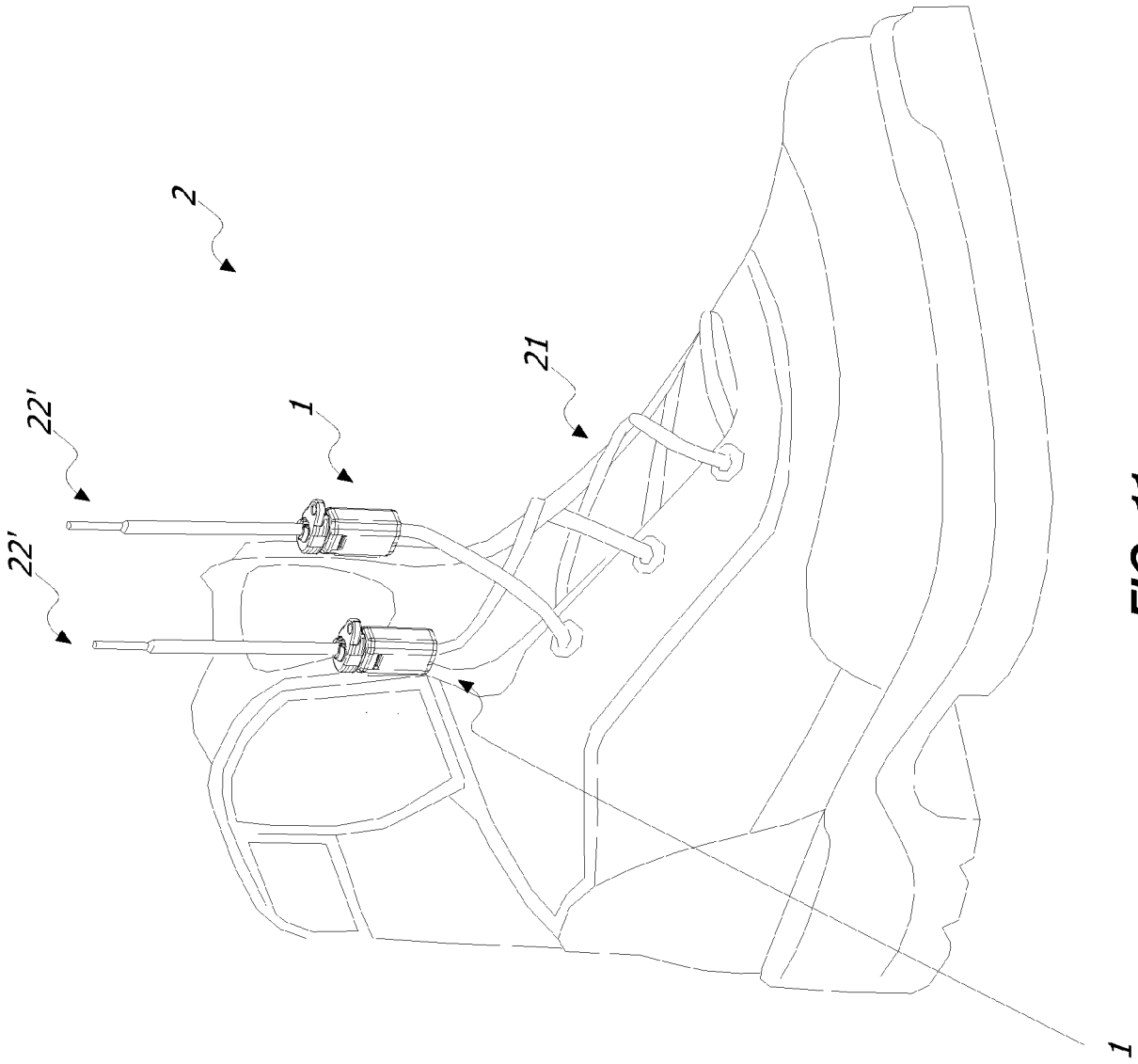

FIG. 11

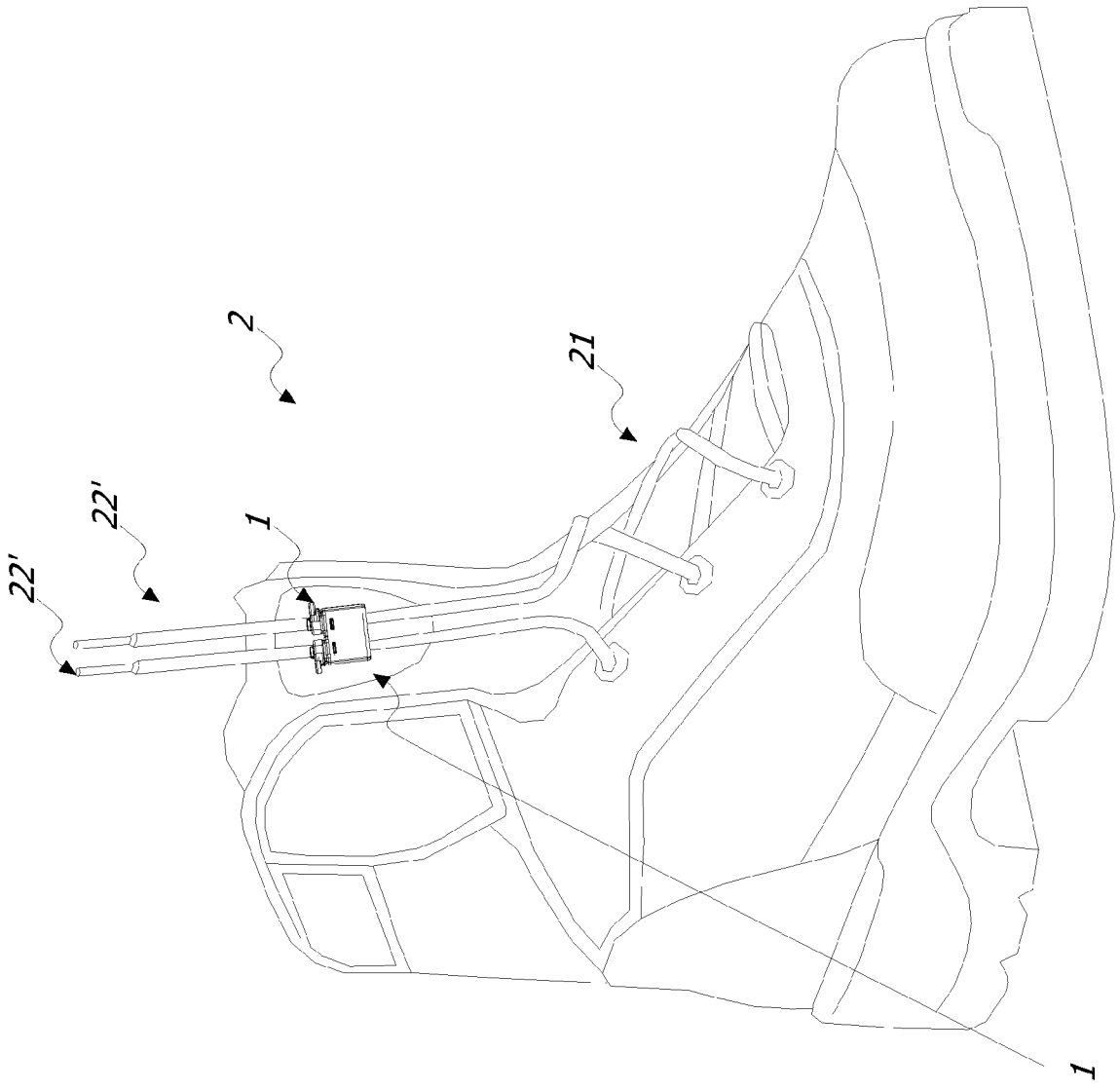

FIG. 12

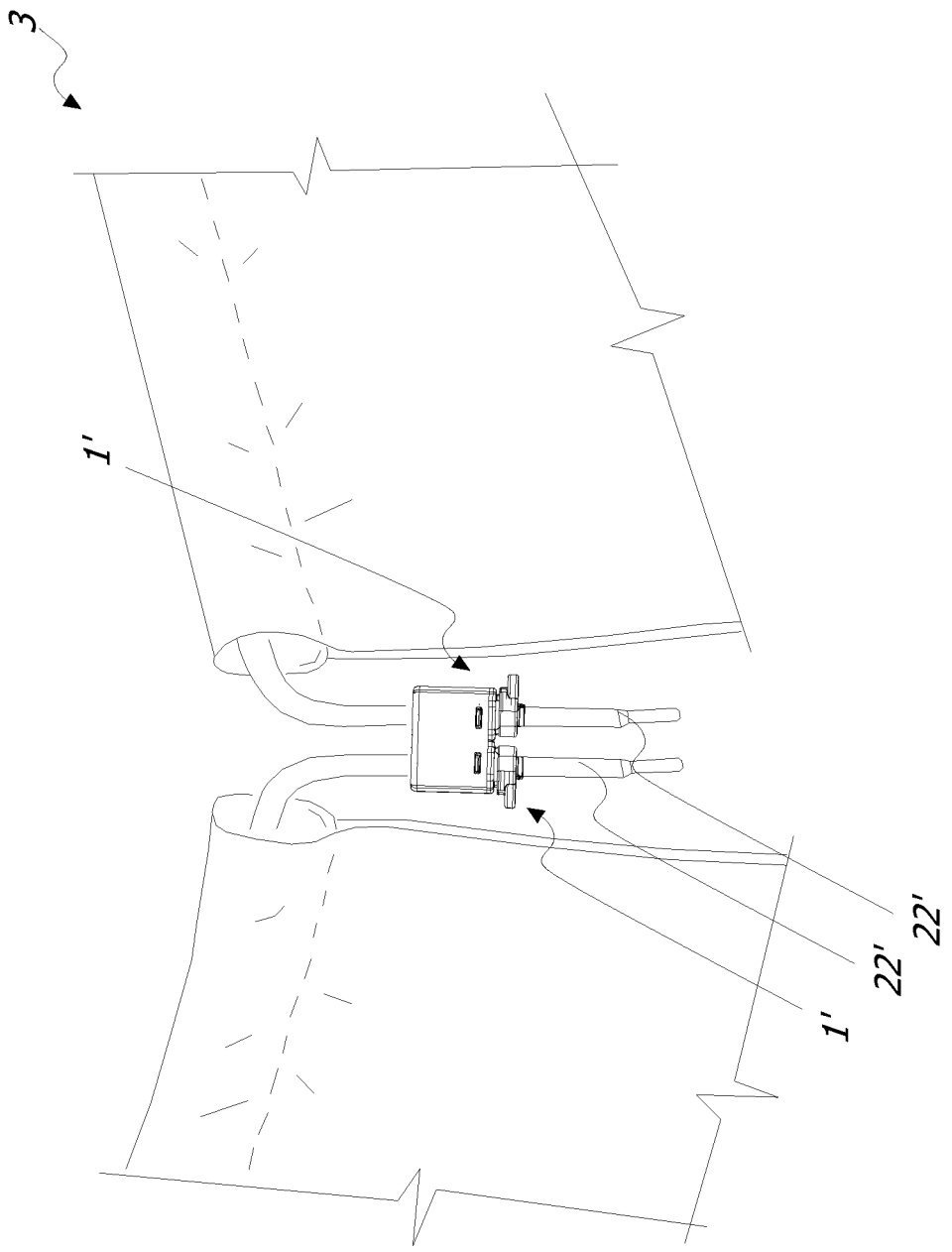

FIG. 13

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EUROPEAN SEARCH REPORT

Application Number
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	7 February 2025	Ciubotariu, Adrian

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