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(71) Applicant: **VKR Holding A/S**
2970 Hørsholm (DK)

(72) Inventor: **Birkkjær, Martin**
2970 Hørsholm (DK)

(74) Representative: **AWA Denmark A/S**
Strandgade 56
1401 Copenhagen K (DK)

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(54) **A SCREENING DEVICE WITH AN IMPROVED MOUNTING BRACKET AND END SECTION**

(57) A screening device (1) adapted for mounting on a frame structure (2) with frame members (4-7) comprising top and bottom members as well as side members and lining an opening in a building, in particular a door or a window, the screening device (1) comprising a top element (13), the top element comprising a roller tube (15) and two mutually opposite end sections (16, 17), at least one end section comprising an end piece (161, 171) adapted for connection to the frame structure, an inner piece (162, 172) adapted for being arranged inside the

roller tube and being connected to the roller tube and/or to a motor (18) adapted for driving the screening device, and a rod element (163, 173) connecting the end piece and the inner piece, where at least one of the end piece and the inner piece of the at least one of the two mutually opposite end sections are connected to the rod element by means of a pin (1611, 1612, 1711, 1712) arranged extending through at least one opening (1631, 1632, 1731, 1732) in the rod element and attached to the at least one of the end piece and the inner piece.

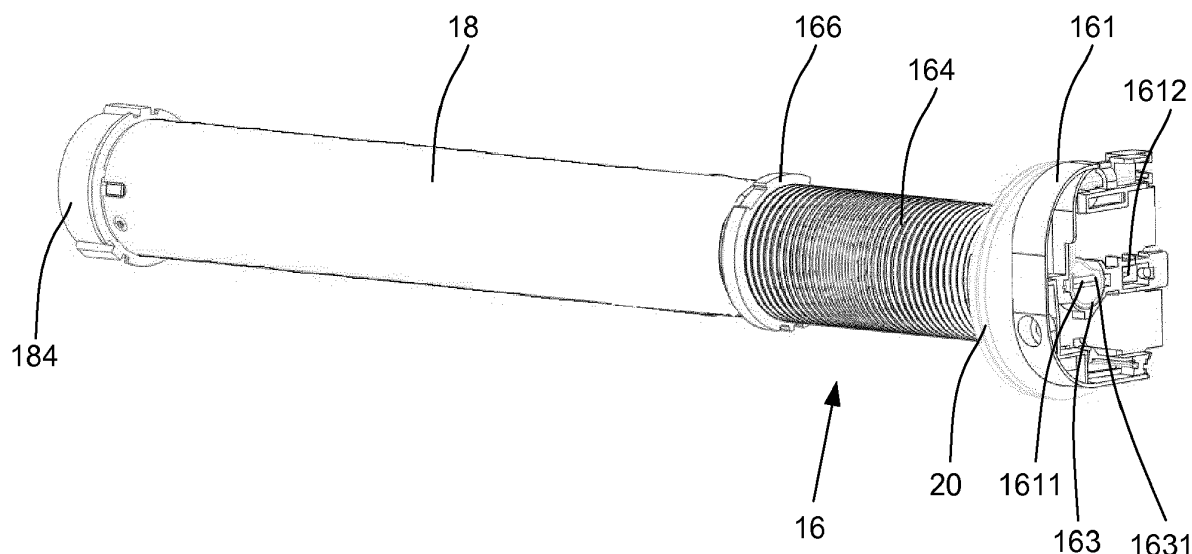


Fig. 6

Description

Technical Field

[0001] The present invention relates to a screening device adapted for mounting on a frame structure with frame members comprising top and bottom members as well as side members and lining an opening in a building, in particular a door or a window, the screening device comprising a top element, the top element comprising a roller tube and two mutually opposite end sections.

[0002] The present invention relates in a second aspect to a roof window with such a screening device.

Background Art

[0003] Screening devices of the above-mentioned type are commonly known. For instance, US 4,228,843 A discloses such a screening device, which comprises a roll and a screening body as well as a cover adapted for being fitted onto the end of the roll with a pin extending from the end of the roll and extending through an aperture in the cover. The cover is provided on the periphery of its end with a means, such as a pin, made for engaging a winder for turning the roll of the screening device.

[0004] The prior art screening devices, however, have the drawback that the assembly of the mutually opposite end sections, and thus of the screening device, is cumbersome. Consequently, the mounting process is difficult, and the said assembly may not be completed correctly, which may lead to the screening device being damaged during the mounting process. Also, during use a screening devices are subjected to various forces which cause vibrations in the structure of the screening device. Therefore, if not assembled correctly, the end sections may be prone to becoming loose during use, or even falling apart, even at a relatively early point after mounting.

[0005] Furthermore, the prior art screening devices have the drawback that, if the assembly and mounting is not completed correctly, the end sections, and thus the screening device, may be unstable and prone to breaking over time.

Summary of Invention

[0006] It is therefore the object of the invention to provide a screening device of the type mentioned in the introduction with which easy and secure mounting is enabled, and with which the assembly of the end sections is easy and straight forward to complete and also is robust over time.

[0007] These and other objects are in a first aspect of the invention achieved by means of a screening device adapted for mounting on a frame structure with frame members comprising top and bottom members as well as side members and lining an opening in a building, in particular a door or a window, the screening device com-

prising a top element, the top element comprising a roller tube and two mutually opposite end sections, at least one of the end sections, or each or both of the two mutually opposite end sections, comprising an end piece adapted for connection to the frame structure, an inner piece adapted for being arranged inside the roller tube and being connected to the roller tube and/or to a motor adapted for driving the screening device, and a rod element extending between and connecting the end piece and the inner piece and being adapted for being arranged concentrically within the roller tube, wherein at least one of the end piece and the inner piece of the at least one of the two mutually opposite end sections, or of at least one of each or both of the two mutually opposite end sections, are connected to the rod element by means of a pin arranged extending through at least one opening in the rod element and attached to the at least one of the end piece and the inner piece, and where the pin is attached to the at least one of the end piece and the inner piece by means of a snap locking connection.

[0008] By providing a screening device in which at least one of the end piece and the inner piece of at least one of the two mutually opposite end sections are connected to the rod element by means of a pin arranged extending through at least one opening in the rod element and attached to the at least one of the end piece and the inner piece, a simple and straight forward to establish connection between end piece and rod element is provided for with a minimum number of elements to be assembled to complete assembly of the end sections.

[0009] By providing both of the two mutually opposite end sections, comprising an end piece adapted for connection to the frame structure, an inner piece adapted for being arranged inside the roller tube and being connected to the roller tube and/or to a motor adapted for driving the screening device, and a rod element extending between and connecting the end piece and the inner piece and being adapted for being arranged concentrically within the roller tube, a further simplification of the construction is achieved.

[0010] Thereby, easy and secure mounting of the screening device is enabled, and with which the assembly of the end sections, and thus the mounting and assembly of the screening device, is easy and straight forward to complete and also is robust over time.

[0011] By further providing that the pin is attached to the at least one of the end piece and the inner piece by means of a snap locking connection, a particularly simple and straight forward to establish connection between end piece and inner piece, respectively, and rod element is provided for, which is furthermore particularly robust towards the forces inflicted on the screening device during use.

[0012] In a further embodiment both of the end piece and the inner piece of at least one of the two mutually opposite end sections are connected to the rod element by means of a pin arranged extending through at least one opening in the rod element and attached to the at

least one of the end piece and the inner piece.

[0013] In another further embodiment at least one of the end piece and the inner piece of both of the two mutually opposite end sections are connected to the rod element by means of a pin arranged extending through at least one opening in the rod element and attached to the at least one of the end piece and the inner piece.

[0014] In a still further embodiment both of the end piece and the inner piece of both of the two mutually opposite end sections are connected to the rod element by means of a pin arranged extending through at least one opening in the rod element and attached to the at least one of the end piece and the inner piece.

[0015] By, in other words, providing two, three or all four of the connections between respective end pieces, inner pieces and rod elements, a further simplification of the screening device is obtained. Thereby, a particularly easy and secure mounting of the screening device is enabled, and the assembly of the end sections, and thus the mounting and assembly of the screening device, are particularly easy and straight forward to complete and are also robust over time.

[0016] In an embodiment the snap locking connection is provided by at least one snap locking element provided in the at least one of the end piece and the inner piece and being adapted for receiving the pin. Preferably, the at least one snap locking element and the at least one of the end piece and the inner piece are integral elements.

[0017] Thereby, a particularly simple end piece and inner piece, respectively, which is easy and cheap to manufacture is provided for.

[0018] In a further embodiment the at least one snap locking element comprises any one or more of a flexible arm or a recess adapted for receiving the pin in a snap locking manner, an opening adapted for keeping the pin in position, and a recess adapted for accommodating a section of the pin.

[0019] By providing a flexible arm or a recess adapted for receiving the pin in a snap locking manner, a particularly simple and straight forward to operate snap locking element is provided for.

[0020] The flexible arm may be any one of straight or curved, thereby providing further degrees of freedom in constructing the end piece or inner piece, as the case may be.

[0021] By providing an opening adapted for keeping the pin in position, especially after assembly of the end section, a particularly robust and durable end section is provided for.

[0022] By providing a recess adapted for accommodating a section of the pin, and in particular an intermediate section of the pin, a particularly easy and secure mounting is enabled and the end section is provided with further robustness and durability.

[0023] In an embodiment the pin is any one of linear, L-shaped and T-shaped.

[0024] While a linear pin has the advantage of being particularly simple in construction and thus particularly

simple and cheap to manufacture, an L-shaped or T-shaped pin has the further advantage of being particularly simple to manoeuvre during assembly and of providing an incorporated end stop in the form of a transverse section prohibiting further insertion of the pin.

[0025] In an embodiment the pin comprises a cross section being any one of circular and rectangular.

[0026] While a pin with a circular cross section has the advantage of optimal manoeuvrability during insertion, a pin with a rectangular - or for that matter any other angular, such as triangular or hexagonal - cross section has the advantage of enabling insertion in a limited number of predetermined orientations only, thus further simplifying the mounting.

[0027] In an embodiment the rod element is any one of hollow and massive.

[0028] By providing a hollow rod element, a simple and robust construction is provided for while keeping the weight down. In comparison, a massive rod element has the advantage of being even more robust and durable.

[0029] In an embodiment the at least one opening provided in the rod element is any one of an opening provided in the wall of the rod element, and an opening provided in a lug of the rod element, the lug being provided extending from a longitudinal end surface of the rod element.

[0030] By providing the at least one opening as an opening provided in the wall of the rod element, a particularly simple and robust construction, which is also particularly simple to manufacture, is provided for. By providing the at least one opening as an opening provided in a lug of the rod element, the lug being provided extending from a longitudinal end surface of the rod element, a further advantage is obtained in that material may be saved in the production of the rod element, since the part of the rod element having a continuous periphery may be shortened.

[0031] In an embodiment the end piece of at least one of the two mutually opposite end sections comprises an opening adapted for guiding the pin during assembly of the end section.

[0032] Thereby, a particularly easy and secure assembly of the end sections and thus mounting of the screening device is enabled.

[0033] In an embodiment the at least one of the end piece and the inner piece comprises a recess adapted for receiving an end of the pin, at least one end stop arranged to and adapted for preventing movement of the pin in a direction out of the at least one opening in the rod element, and/or at least one stop surface adapted for preventing movement of the pin in a direction out of the at least one opening in the rod element.

[0034] By providing a recess adapted for accommodating a section of the pin, and in particular an end section opposite to an end held in place by the flexible arm or the recess adapted for receiving the pin in a snap locking manner, a particularly easy and secure mounting is enabled and the connection is provided with further robust-

ness and durability.

[0035] By providing an end stop and/or an end surface, the pin is kept securely in place after mounting, and thus a particularly secure mounting is enabled and the connection is provided with further robustness and durability.

[0036] In an embodiment the at least one end stop and/or the at least one stop surface is arranged on a line defined by the part of the pin extending through the rod element in the assembled condition of the end section, or offset from a line defined by the part of the pin extending through the rod element in the assembled condition of the end section.

[0037] In both embodiments a stop being in direct functional relationship with the pin is provided for. By providing the stop arranged with an offset, a stop being in direct functional relationship with a transverse section of a pin, such as a pin being T- or L-shaped, is provided for. Both embodiments thereby provide further robustness and durability to the connection.

[0038] In an embodiment at least one of the end piece and the inner piece of at least one of the two mutually opposite end sections are connected to the rod element by means of the pin in such a way as to allow for play between the end piece and the pin and/or the inner piece and the pin.

[0039] Such a play provides a means for absorbing vibrations caused by forces inflicted during use of the mounted screening device without compromising the connection between end piece and inner piece, respectively, and rod element. Thereby, a particularly robust screening device is obtained.

[0040] In an embodiment a spring element having one end attached to a first rotatable holder and an opposite end attached to a second rotatable holder is arranged concentrically on the rod element between the end piece and the inner piece.

[0041] In an embodiment a winding wheel adapted for receiving a wire is arranged concentrically on the rod element adjacent to the end piece.

[0042] In a second aspect of the invention, the above and other objects and advantages are achieved by means of a window, such as a roof window, or a door comprising a screening device according to the first aspect of the invention.

Brief Description of Drawings

[0043] In the following description embodiments of the invention will be described with reference to the schematic drawings, in which

Fig. 1 is a perspective view of a roof window according to the second aspect of the invention comprising a screening device according to the first aspect of the invention,

Figs. 2 and 3 are close ups of the top element and screening device of Fig. 1 and comprising a roller

tube, with and without the frame member being shown, respectively.

Fig. 4 is a partially exploded view of the top element of a screening device according to the first aspect of the invention, the roller tube and thus also the screening body being removed for the sake of simplicity,

Fig. 5 is an exploded view of a first end section of a screening device according to the first aspect of the invention,

Fig. 6 is a perspective view of a first end section of the top element of a screening device according to the first aspect of the invention,

Fig. 7 is a perspective view of a second end section of the top element of a screening device according to the first aspect of the invention opposite to the first end section according to Figs. 5 and 6,

Fig. 8 is an end view of the end section according to Fig. 7,

Fig. 9 is a perspective view of an end piece adapted for connection to a frame element of a window of an end section, the end piece being connected to a rod element by means of a pin,

Fig. 10 is an end view of the end piece according to Fig. 9,

Fig. 11 is an exploded view of the end section according to Fig. 7, showing only the end piece according to Fig. 9 and 10,

Figs. 12a and 12b illustrate schematically two different embodiments of a rod element of an end section of a screening element according to the invention,

Figs. 13a, 13b and 13c illustrate schematically three different embodiments of a pin of an end section of a screening element according to the invention,

Fig. 14 is a perspective view of an inner piece arranged inside the roller tube and being connected to the roller tube, the inner piece being connected to a rod element by means of a pin, and

Fig. 15 is a partially exploded view of the inner piece according to Fig. 14.

Description of Embodiments

[0044] Referring initially to Figs. 1 and 2, a first embodiment of a screening device 12 mounted in a roof window 1 is shown. The roof window 1 shown in Fig. 1 is adapted for mounting in an inclined roof. The roof window 1 comprises a frame 2 and an openable sash supporting a glass pane. For the sake of simplicity, the openable sash and the glass pane are omitted on Fig. 1. In the embodiment shown, the roof window is of the kind shown and described in for instance Applicant's WO 2015/028031 A1; however, the principle underlying the invention is applicable to all kinds of roof windows, in that the sash may be top hung, centre hung, have hinge axis at position between the top and centre or of the kind that is top hung during normal operation but which pivots for cleaning by means of an intermediate frame. The frame 2 comprises

a top frame member 4, a bottom frame member 5 and two side frame members 6, 7. The sash comprises a top sash member, a bottom sash member and two side sash members.

[0045] The screening device 12 in the embodiment shown is installed at the top frame member 4 of the roof window 1. The screening device 12 may in principle be any feasible type of screening device 12. In the embodiment shown the screening device is a roller blind. In another embodiment the screening device may be a roller shutter. It is noted that a screening device 12 according to the invention may also be mounted at other frame members of the roof window, or on a façade window or a door.

[0046] Turning now also to Figs. 3 and 4, an embodiment of a screening device 12 according to the invention will be described in more detail. The screening device 12 generally comprises a screening body 14 and a top element 13 with two end sections 16, 17. The screening device 12 is connected to the side frame members 6 and 7 at the end sections 16, 17 of the top element 13 by means of supporting means including a set of mounting brackets (not visible in Figs. 1 and 2) fastened to the respective side frame member 6, 7 cooperating with end sections 16, 17 as will be described in further detail below. The set of mounting bracket may be fastened to the frame at the factory such that the roof window is prepared for subsequent mounting of the screening device, and possibly the screening device 12 may be pre-mounted at the factory as well. In a manner known *per se* the screening body 14 is wound on a roller tube indicated by reference numeral 15 in Figs. 2 and 3, but in fact hidden behind the screening body 14. In Fig. 4, the roller tube 15 and thus also the screening body 14 has been removed for easy readability. In the embodiment shown, the screening device 12 further comprises a bottom bar 19 and two winding wheels 20. The winding wheels 20 are adapted for receiving a respective wire 21 (Fig. 3) which is wound onto the winding wheels 20 when pulling up the screening body 14 and out from the winding wheels 20 when pulling down the screening body 14. To this end the screening device 12 further comprises return pulleys 22 (Fig. 3) around which the wires 21 are lead and returned to the bottom bar 19.

[0047] As shown on Fig. 4 the screening device 12 further comprises a motor 18 accommodated in the top element 13, in the embodiment shown an electric motor, adapted for driving the screening device 12. To this end the motor 18 is connected to the winding wheels 20 via a suitable transmission such as to enable moving the screening body 14 between a fully retracted position, in which the screening body 14 does not cover the glass pane of the window, and is completely wound onto the roller tube 15, and a fully extended position, in which the screening body 14 covers substantially all of the glass pane of the window and is fully extended from the roller tube 15. The motor 18 comprises in the embodiment shown a tachometer 181, a printed circuit board 182 and

a planetary gear 183. The motor 18 is connected to a rotatable cap 184, which in turn is connected to the roller tube 15 at an inner side of the roller tube 15 such that the motor 18 in operation may rotate the roller tube 15.

[0048] Referring now also to Figs. 5, 6 and 7, each end section 16 (Figs. 5 and 6) and 17 (Fig. 7) generally comprises an end piece 161 and 171, respectively, an inner piece 162 and 172, respectively, and a rod element 163 and 173, respectively. The rod element 163 connects the end piece 161 and the inner piece 162 of the end section 16, and the rod element 173 connects the end piece 171 and the inner piece 172 of the end section 17. The end piece 161 and the inner piece 162 of the end section 16 are connected to opposite longitudinal ends of the rod element 163, and the end piece 171 and the inner piece 172 of the end section 17 are connected to opposite longitudinal ends of the rod element 173.

[0049] Referring to Figs. 5 and 6, the end section 16 further comprises a spring element 164 having one end attached to a first rotatable holder 166 and the opposite end attached to a second rotatable holder 167 (Fig. 5), which in turn is attached fixedly to the winding wheel 20. A rotatable element 165 or ring is arranged on the second rotatable holder 167. The rotatable element 165 is freely rotatable with respect to the second rotatable holder 167. The rotatable element 165 is not attached to the spring element 164. The rotatable element 165 can thus rotate freely with respect to the spring element 164. The rotatable element 165 is in the assembled condition of the screening device 12 attached to the roller tube 15. The motor 18 is connected to the rotatable element 165, which in turn is connected to the roller tube 15 and the spring element 164 such that the motor 18 in operation may rotate the spring element 164. The spring element 164, the second rotatable holder 167 and the rotatable element 165 are arranged concentrically on the rod element 163 of the end section 16 between the end piece 161 and the inner piece 162. The first rotatable holder 166 is arranged concentrically on the rod element 163 of the end section 16, optionally on a seat or bearing 168, between the end piece 161 and the inner piece 162. Also, the winding wheel 20 is arranged concentrically with respect to the rod element 163 adjacent to the end piece 161. Furthermore, the rotatable holder 166 is in the assembled condition of the screening device 12 attached to an inner surface of the roller tube 15. The rotatable holder 166 can thus rotate with the roller tube 15.

[0050] Likewise, referring to Figs. 4 and 7, the end section 17 further comprises a spring element 174 having one end attached to a first rotatable holder 176 and the opposite end attached to a second rotatable holder (not visible), which in turn is attached to the winding wheel 20. A rotatable element 175 or ring is arranged on the second rotatable holder. The rotatable element 175 is not attached to the spring element 174. The rotatable element 175 is in the assembled condition of the screening device 12 attached to the roller tube 15. The spring element 174, the first rotatable holder 176, the second

rotatable holder and the rotatable element 175 are arranged concentrically on the rod element of the end section 17 between the end piece 171 and the inner piece. Also, the winding wheel 20 is arranged concentrically on the rod element adjacent to the end piece 171. Furthermore, the rotatable holder 176 is in the assembled condition of the screening device 12 attached to an inner surface of the roller tube 15.

[0051] Thus, the respective spring element 164, 174 and the respective winding wheel 20 may rotate together. The spring elements 164 and 174 are in an embodiment a helical spring. The spring elements 164 and 174 have an inherent pretension.

[0052] One of the end sections 16 and 17, in the embodiment shown the end section 16, is furthermore connected to the motor 18. More particularly, the motor 18, in the embodiment shown (cf. Fig. 5) the printed circuit board 182 of the motor 18, is attached to the inner piece 162 of the end section 16 in a non-rotatable manner. Thereby, the inner piece 162, the printed circuit board 182 and the rod element 163 are connected in such a manner that they form one rigid element.

[0053] Generally, according to the invention, at least one, and optionally any two or three or all four, of the end piece 161 and the inner piece 162 of the first end section 16 and the end piece 171 and the inner piece 172 of the second end section is connected to the rod element 163 and 173, respectively, by means of a pin 1611, 1621, 1711, 1721, respectively, which pin is arranged extending through at least one opening in the rod element 163, 173, respectively, and attached to the at least one of the end pieces and the inner pieces.

[0054] Referring to Figs. 8 to 15, embodiments of the second end section 17 and of the connection between first and inner piece, respectively, and rod element will be described in further detail with reference to the second end section 17. Figs. 8, 14 and 15 show different views of the inner piece 172 of the second end section 17 connected to the rod element 173, while Figs. 9, 10 and 11 show different views of the end piece 171 of the second end section 17 connected to the rod element 173.

[0055] It is noted that the first end section 16 and the second end section 17 are of analogous or even identical construction. The below description therefore also applies to the first end section 16, and to the connection between and construction of the end piece 161 and the inner piece 162, respectively, and the rod element 163 of the first end section 16.

[0056] Referring to Figs. 9, 10 and 11 the end piece 171 is connected to the rod element 173 by means of a pin 1711. Generally, and referring particularly to Fig. 9, the pin 1711 is, in the assembled condition of the end piece 171, arranged extending through two opposite openings 1731 in the rod element 173 and is attached to the end piece 171 by means of a snap locking connection. Thereby, the pin 1711 is brought to extend in a first direction X perpendicular to a second direction Y in which the rod element 173 extends. Also, the pin 1711, or a

part of the pin, defines a line L extending, in the mounted condition, in the first direction X.

[0057] The rod element 173 may be hollow (Figs. 9 and 12a) or it may be massive (Fig. 12b). The cross section 1734 of the rod element 173 is circular. The openings 1731, 1732 in the rod element 173 may be one through opening 1731 (Fig. 12b) or two opposite openings 1731 (Fig. 9) provided in the wall of the rod element 173. Alternatively, the openings 1731, 1732 in the rod element 173 may be two opposite openings 1731 provided in two opposite lugs 1733 of the rod element 173 (Fig. 12a), where the lugs 1733 are provided extending from a longitudinal end of the rod element 173. The rod element is preferably made of aluminium.

[0058] The pin 1711, 1721 may be a linear pin 1711 (Fig. 13a), an L-shaped pin 1711' (Fig. 13b) or a T-shaped pin 1711" (Fig. 13c). The pin 1711, 1721 may have a circular or a rectangular cross section. Other configurations of the pin 1711, 1721 are also feasible.

[0059] Referring again to Figs. 9, 10 and 11, the snap locking connection is in the embodiment shown provided by means of a recess 1713 and a snap locking element 1712 provided in the end piece 171 in diametrically opposite positions with respect to a hole 1717 provided and adapted for receiving an end of the rod element 173. In the embodiment shown, the snap locking element 1712 comprises a flexible arm 1715. The flexible arm 1715 comprises a stop surface 1716 (Fig. 10). The snap locking element 1712 further comprises an opening 17121 (Fig. 11) for guiding the pin 1711 during assembly of the end piece 171 and for keeping the pin 1711 in position when the end piece 171 is assembled. The snap locking element 1712 further comprises an optional recess 17122 (Fig. 11) for guiding the pin 1711 during assembly of the end piece 171 and for accommodating an end of the pin 1711 such as to keep the pin 1711 in position when the end piece 171 is assembled. The recess 1713 is adapted for receiving an end of the pin 1711 such as to keep the pin 1711 in position when the end piece 171 is assembled. The recess 1713 comprises an end stop 1714.

[0060] When attaching the end piece 171 to the rod element 173, the rod element is first inserted into a hole 1717 provided in the end piece 171 in such a way that the openings 1731 are aligned with the recess 1713 and the snap locking element 1712, respectively. Then the pin 1711 is inserted into the openings 1731 from the side where the snap locking element 1712 is provided by pushing the flexible arm 1715 against its inherent spring force in the second direction Y and guiding the pin 1711 into and through the openings 1731 until an end of the pin 1711 extends into the recess 1713 and abuts the end stop 1714. To this end the end piece 171 is provided with an optional flange 1719 comprising an optional guiding opening 1718 (Figs. 9 and 11) through which the pin 1711 may be inserted. When the pin 1711 has been inserted far enough to have passed the flexible arm 1715 in its entirety, the flexible arm 1715 swings back into its neutral

position, in which the stop surface 1716 is now abutting or arranged in close proximity to an end of the pin 1711, thereby keeping the pin from falling back out. Likewise, the opposite end of the pin 1711 is now abutting or arranged in close proximity to the end stop 1714 of the recess 1713, thereby keeping the pin from falling out in the opposite direction. The end piece 171 is thus attached to the rod element 173.

[0061] The snap locking element 1712 and/or the recess 1713 may be dimensioned to hold the pin 1711 without leaving any play, i.e. to conform to the dimensions of the pin 1711. Alternatively, the snap locking element 1712 and/or the recess 1713 may be dimensioned to be slightly larger than the dimensions of the pin 1711 such as to leave an amount of play in the connection between the end piece 171 and the rod element 173.

[0062] In an alternative the recess 1713 may be adapted for receiving the pin 1711 by pressing the pin 1711 into the recess 1713 in a snap locking manner, the recess 1713 thereby forming a further snap locking element. In yet another alternative the end piece 171 may, in the place of the recess 1713, comprise a further snap locking element of the same type as the snap locking element 1712.

[0063] Likewise, and referring now to Figs. 8, 14 and 15, the inner piece 172 is connected to the rod element 173 by means of a pin 1721. Generally, the pin 1721 is, in the assembled condition of the inner piece 172, arranged extending through two opposite openings 1732 in the rod element 173 and is attached to the inner piece 172 by means of a snap locking connection. Thereby, the pin 1721 is brought to extend in a first direction X perpendicular to a second direction Y in which the rod element 173 extends. Also, the pin 1721, or a part of the pin, defines a line L extending, in the mounted condition, in the first direction X.

[0064] The snap locking connection of the inner piece 172 is in the embodiment shown provided by means of a recess 1723 and a snap locking element 1722 provided in the inner piece 172 in diametrically opposite positions with respect to a hole 1727 provided and adapted for receiving an end of the rod element 173. In the embodiment shown, the snap locking element 1722 comprises a flexible arm 1725. The flexible arm 1725 comprises a stop surface 1726 (Fig. 14). The snap locking element 1722 further comprises an opening 17221 (Fig. 15) for guiding the pin 1721 during assembly of the inner piece 172 and for keeping the pin 1721 in position when the inner piece 172 is assembled. The snap locking element 1722 further comprises an optional recess 17222 (Figs. 8 and 15) for guiding the pin 1721 during assembly of the inner piece 172 and for accommodating an end of the pin 1721 such as to keep the pin 1721 in position when the inner piece 172 is assembled. The recess 1723 is adapted for receiving an end of the pin 1721 such as to keep the pin 1721 in position when the inner piece 172 is assembled. The recess 1723 comprises an end stop 1724.

[0065] When attaching the inner piece 172 to the rod element 173, the rod element is first inserted into a hole 1727 provided in the inner piece 172 in such a way that the openings 1732 are aligned with the recess 1723 and the snap locking element 1722, respectively. Then the pin 1721 is inserted into the openings 1732 from the side where the snap locking element 1722 is provided by pushing the flexible arm 1725 against its inherent spring force in the first direction X and guiding the pin 1721 into and through the openings 1732 until an end of the pin 1721 extends into the recess 1723 and abuts the end stop 1724. When the pin 1721 has been inserted far enough to have passed the flexible arm 1725 in its entirety, the flexible arm 1725 swings back into its neutral position, in which the stop surface 1726 is now abutting or arranged in close proximity to an end of the pin 1721, thereby keeping the pin from falling back out. Likewise, the opposite end of the pin 1721 is now abutting or arranged in close proximity to the end stop 1724 of the recess 1723, thereby keeping the pin from falling out in the opposite direction. The inner piece 172 is thus attached to the rod element 173.

[0066] The snap locking element 1722 and/or the recess 1723 may be dimensioned to hold the pin 1721 without leaving any play, i.e. to conform to the dimensions of the pin 1721. Alternatively, the snap locking element 1722 and/or the recess 1723 may be dimensioned to be slightly larger than the dimensions of the pin 1721 such as to leave an amount of play in the connection between the inner piece 172 and the rod element 173.

[0067] In an alternative the recess 1723 may be adapted for receiving the pin 1721 by pressing the pin 1721 into the recess 1712 in a snap locking manner, the recess 1723 thereby forming a further snap locking element. In yet another alternative the inner piece 172 may, in the place of the recess 1723, comprise a further snap locking element of the same type as the snap locking element 1722.

[0068] The person skilled in the art realizes that the present invention by no means is limited to the preferred embodiments described above. On the contrary, many modifications and variations are possible within the scope of the appended claims.

[0069] In particular, features and elements described in relation to one of the inner pieces 161 and/or 171 or end pieces 162 and/or 172 or end sections 16 and/or 17 may likewise be employed on the other of the inner pieces 161 and/or 171, end pieces 162 and/or 172 and/or end sections 16 or 17.

Claims

1. A screening device (12) adapted for mounting on a frame structure with frame members comprising top and bottom members as well as side members and lining an opening in a building, in particular a door or a window, the screening device comprising a top

element (13), the top element comprising a roller tube (15) and two mutually opposite end sections (16, 17), at least one of the mutually opposite end sections comprising:

- an end piece (161, 171) adapted for connection to the frame structure,
- an inner piece (162, 172) adapted for being arranged inside the roller tube and being connected to the roller tube and/or to a motor adapted for driving the screening device, and
- a rod element (163, 173) extending between and connecting the end piece and the inner piece and being adapted for being arranged concentrically within the roller tube, wherein

at least one of the end piece and the inner piece (161, 171; 162, 172) of the at least one of the two mutually opposite end sections (16, 17) are connected to the rod element (163, 173) by means of a pin (1611, 1621; 1711, 1721) arranged extending through at least one opening in the rod element (163, 173) and attached to the at least one of the end piece (161, 171) and the inner piece (162, 172), and **characterised in that** the pin (1611, 1621; 1711, 1721) is attached to the at least one of the end piece (161, 171) and the inner piece (162, 172) by means of a snap locking connection.

2. A screening device (12) according to claim 1, wherein both of the two mutually opposite end sections (16, 17) comprises:

- an end piece (161, 171) adapted for connection to the frame structure,
- an inner piece (162, 172) adapted for being arranged inside the roller tube and being connected to the roller tube and/or to a motor adapted for driving the screening device, and
- a rod element (163, 173) extending between and connecting the end piece and the inner piece and being adapted for being arranged concentrically within the roller tube, and wherein

at least one of the end piece and the inner piece (161, 171; 162, 172) of at least one of the two mutually opposite end sections (16, 17) are connected to the rod element (163, 173) by means of a pin (1611, 1621; 1711, 1721) arranged extending through at least one opening in the rod element (163, 173) and attached to the at least one of the end piece (161, 171) and the inner piece (162, 172).

3. A screening device according to claim 1 or 2, wherein both of the end piece and the inner piece of at least one of the two mutually opposite end sections are connected to the rod element by means of a pin ar-

ranged extending through at least one opening in the rod element and attached to the at least one of the end piece and the inner piece, or wherein at least one of the end piece and the inner piece of both of the two mutually opposite end sections are connected to the rod element by means of a pin arranged extending through at least one opening in the rod element and attached to the at least one of the end piece and the inner piece, or wherein both of the end piece and the inner piece of both of the two mutually opposite end sections are connected to the rod element by means of a pin arranged extending through at least one opening in the rod element and attached to the at least one of the end piece and the inner piece.

4. A screening device according to any one of the above claims, wherein the snap locking connection is provided by at least one snap locking element provided in the at least one of the end piece and the inner piece and being adapted for receiving the pin.

5. A screening device according to claim 4, wherein the at least one snap locking element comprises any one or more of:

- a flexible arm or a recess adapted for receiving the pin in a snap locking manner,
- an opening adapted for keeping the pin in position, and
- a recess adapted for accommodating an end section of the pin.

6. A screening device according to claim 4 or 5, wherein the snap locking element and/or the recess is dimensioned to hold the pin without leaving any play, and/or wherein the snap locking element and/or the recess is dimensioned to conform to the dimensions of the pin.

7. A screening device according to claim 4 or 5, wherein the snap locking element and/or the recess is dimensioned to be slightly larger than the dimensions of the pin such as to leave an amount of play in the connection between the end piece and the rod element.

8. A screening device according to claim 4, wherein the at least one snap locking element comprises a flexible arm adapted for receiving the pin in a snap locking manner, and wherein the flexible arm is any one of straight or curved.

9. A screening device according to any one of the above claims, wherein the pin is any one of linear, L-shaped and T-shaped, and/or wherein the pin comprises a cross section being any one of circular and rectangular.

10. A screening device according to any one of the above claims, wherein the rod element is any one of hollow and massive, and/or wherein the at least one opening provided in the rod element is any one of:
- an opening provided in the wall of the rod element, and
 - an opening provided in a lug of the rod element, the lug being provided extending from a longitudinal end surface of the rod element.
11. A screening device according to any one of the above claims, wherein the end piece of at least one of the two mutually opposite end sections comprises an opening adapted for guiding the pin during assembly of the end section.
12. A screening device according to any one of the above claims, wherein the at least one of the end piece and the inner piece comprises:
- a recess adapted for receiving an end of the pin,
 - at least one end stop arranged to and adapted for preventing movement of the pin in a direction out of the at least one opening in the rod element, or
 - at least one stop surface adapted for preventing movement of the pin in a direction out of the at least one opening in the rod element.
13. A screening device according to claim 12, wherein the at least one end stop or the at least one stop surface is arranged:
- on a line defined by the part of the pin extending through the rod element in the assembled condition of the end section, or
 - offset from a line defined by the part of the pin extending through the rod element in the assembled condition of the end section.
14. A screening device according to any one of the above claims, wherein at least one of the end piece and the inner piece of at least one of the two mutually opposite end sections are connected to the rod element by means of the pin in such a way as to allow for play between the end piece and the pin and/or the inner piece and the pin.
15. A window, such as a roof window, or a door comprising a screening device according to any one of the above claims.

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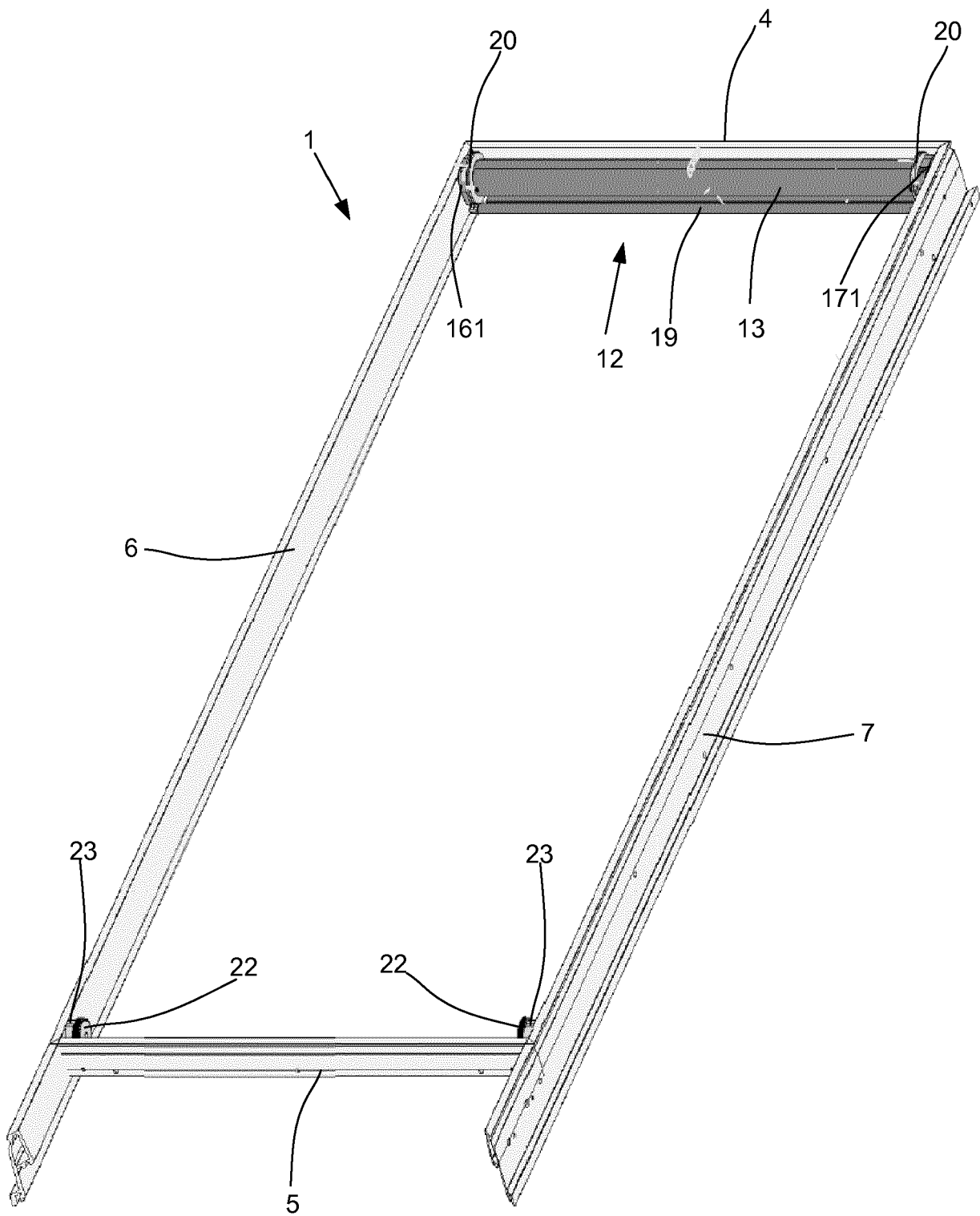


Fig. 1

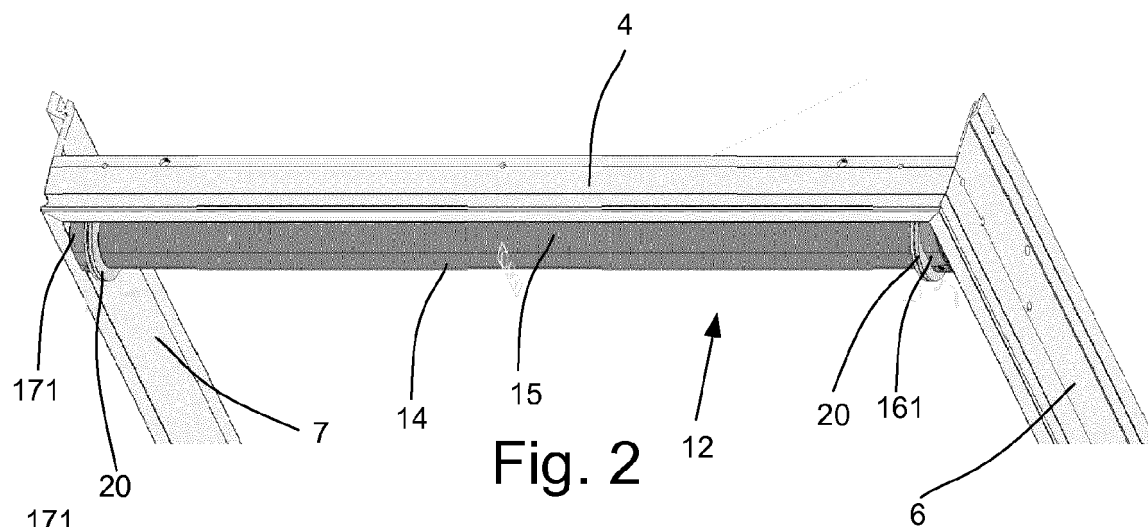


Fig. 2

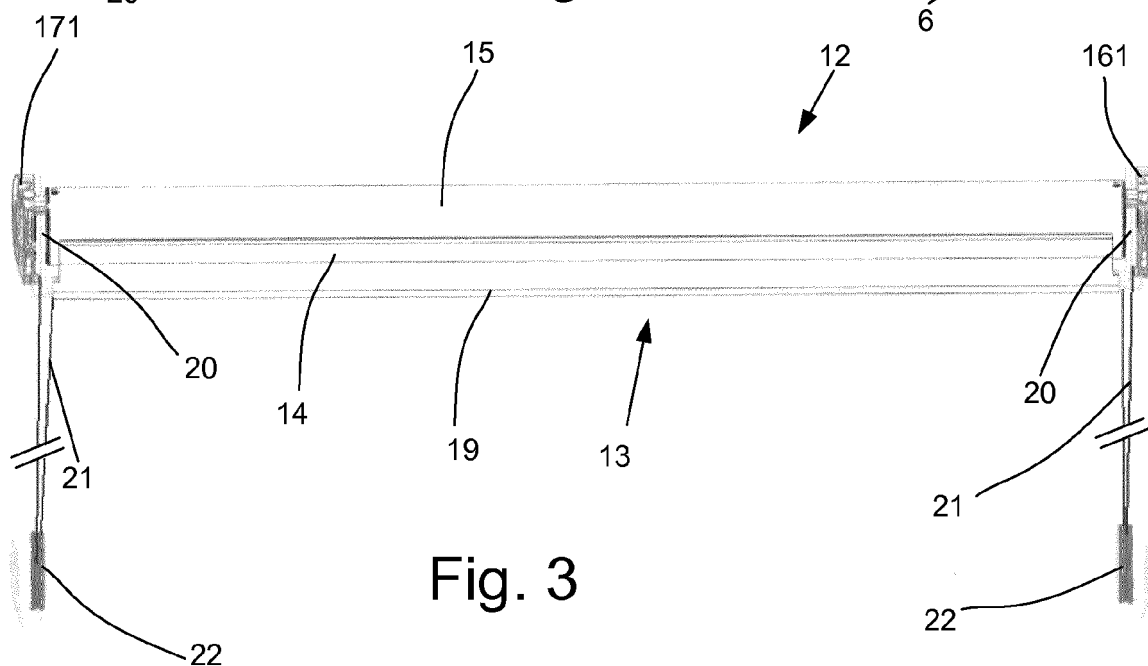


Fig. 3

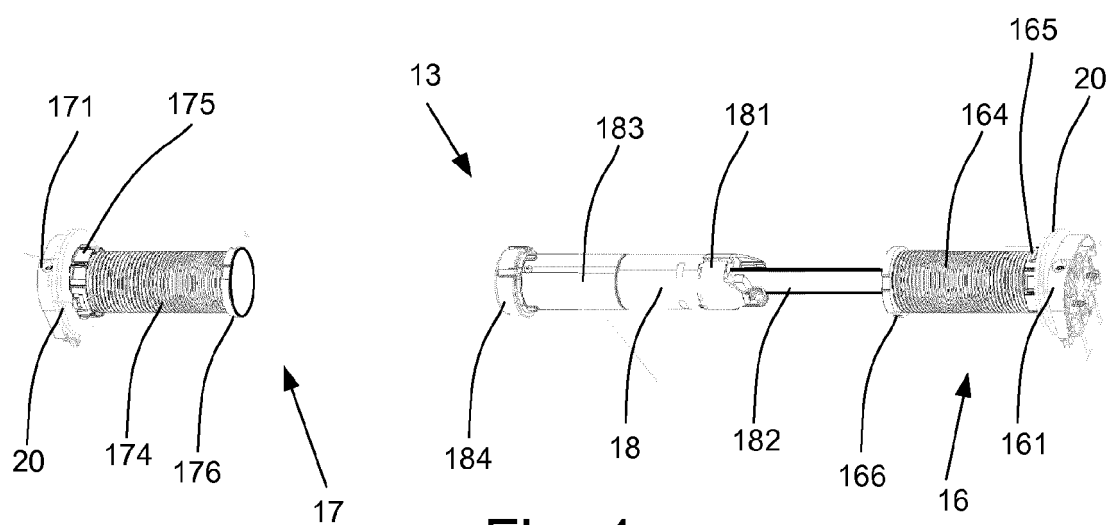


Fig. 4

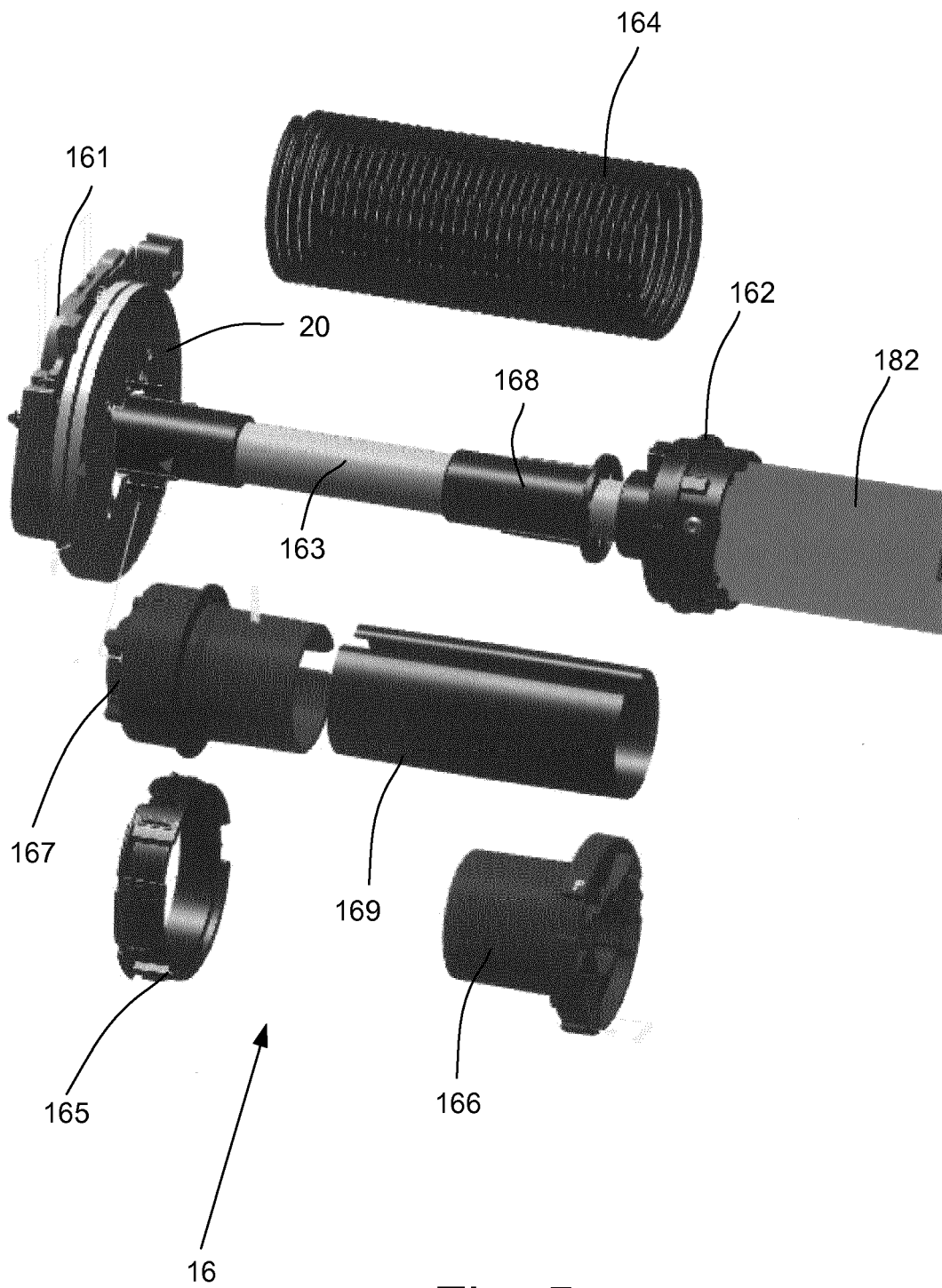


Fig. 5

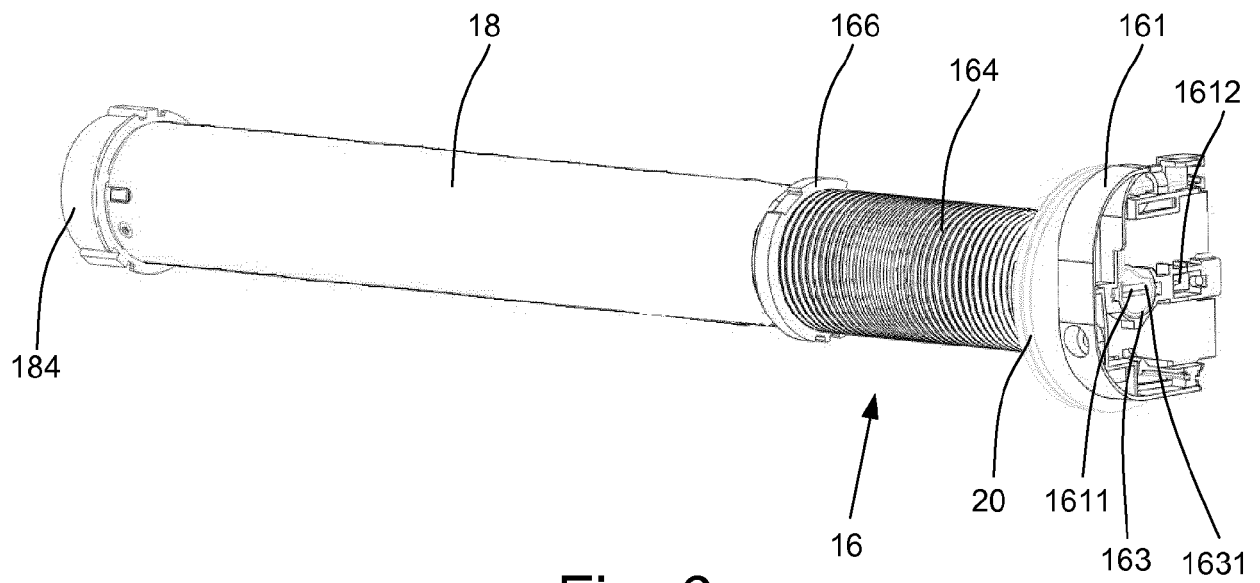


Fig. 6

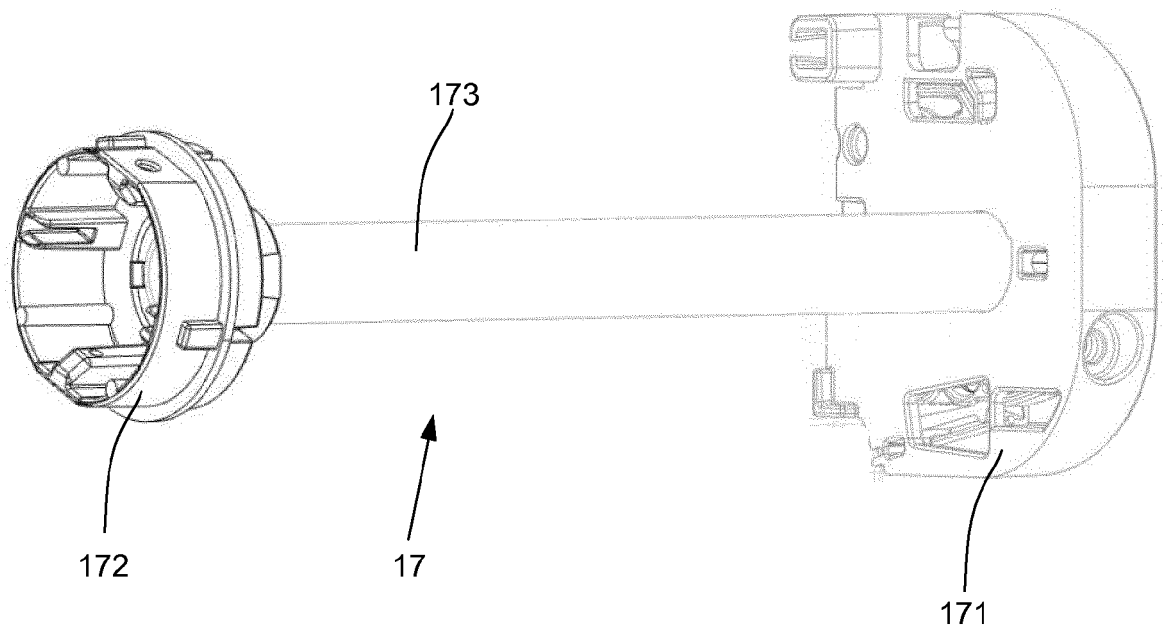


Fig. 7

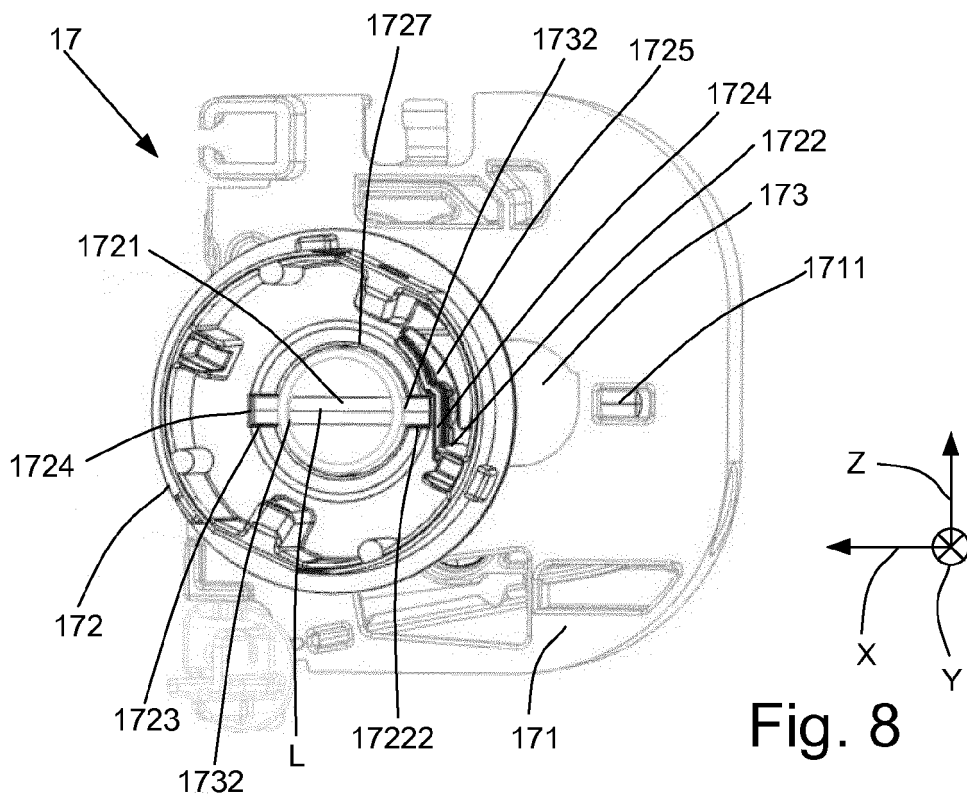


Fig. 8

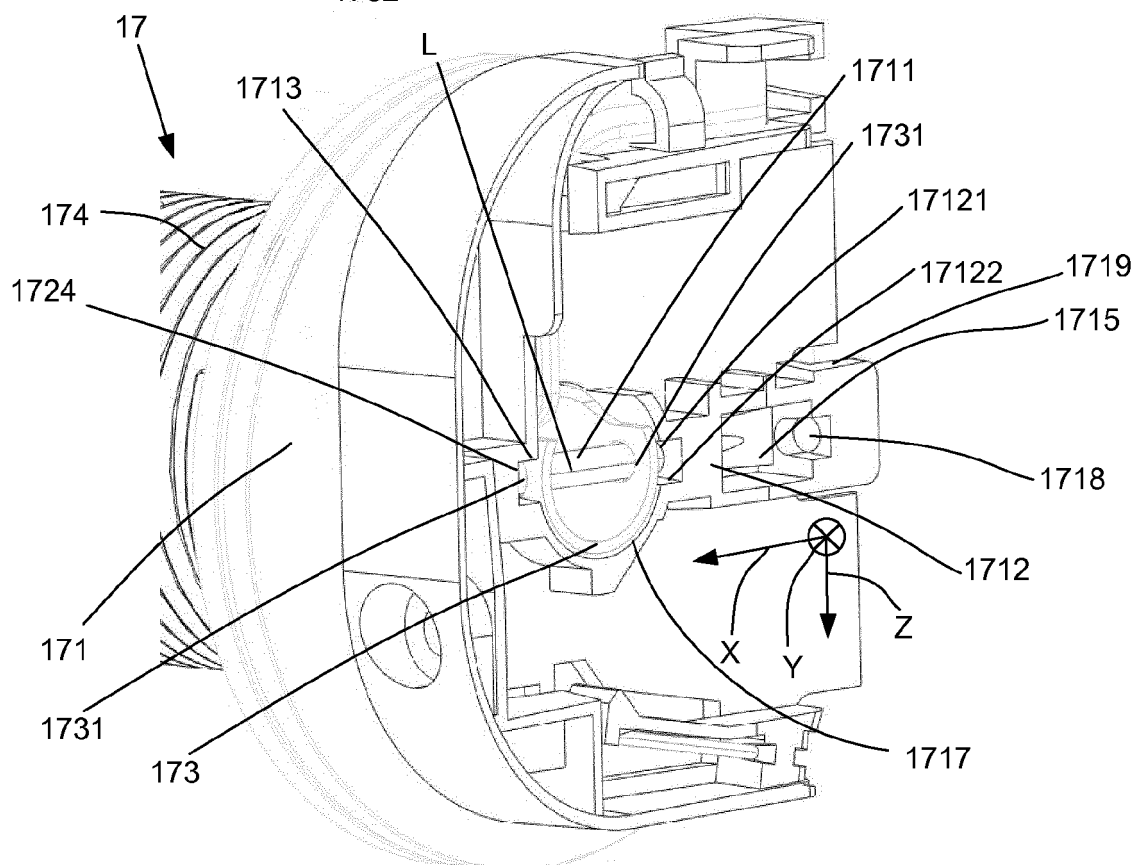


Fig. 9

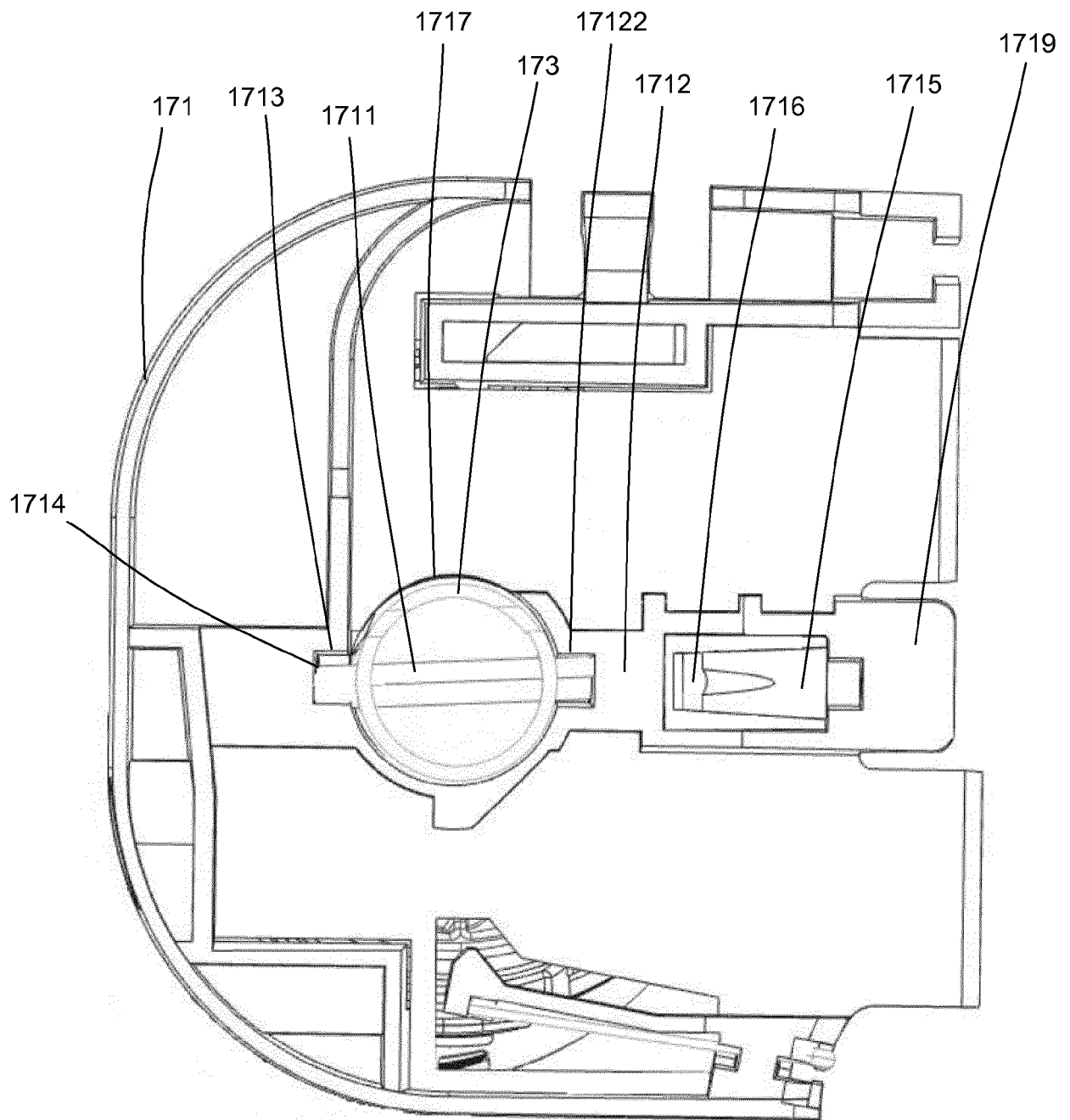


Fig. 10

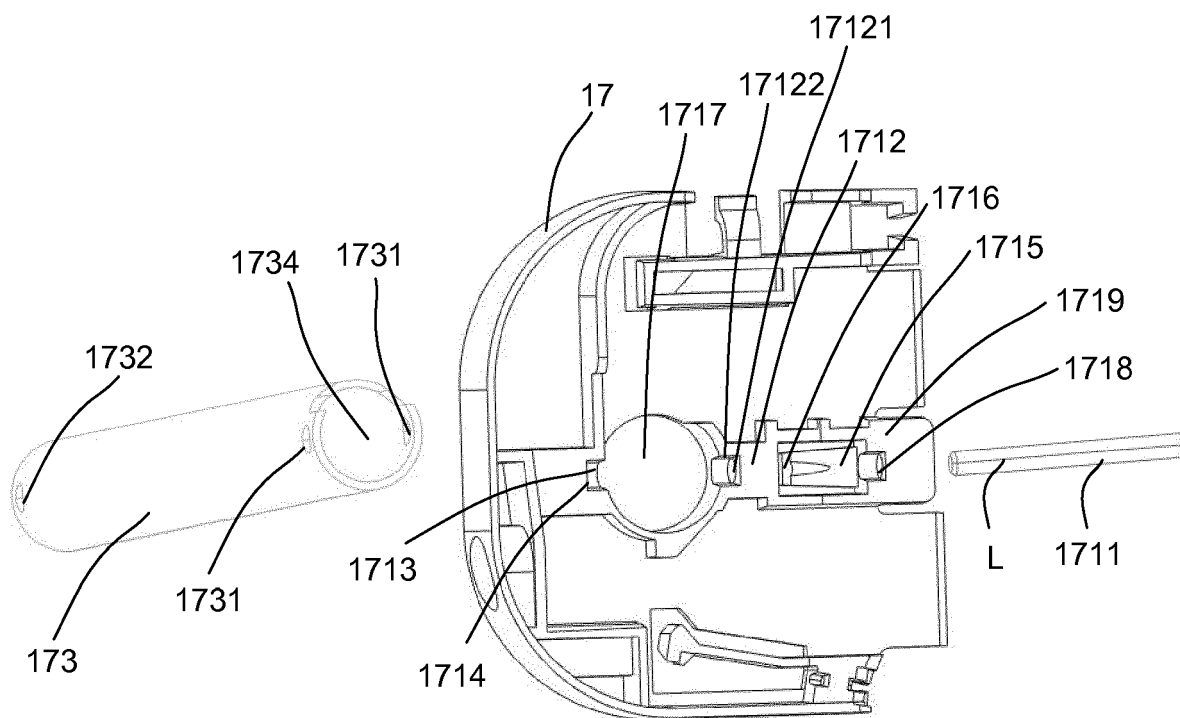


Fig. 11

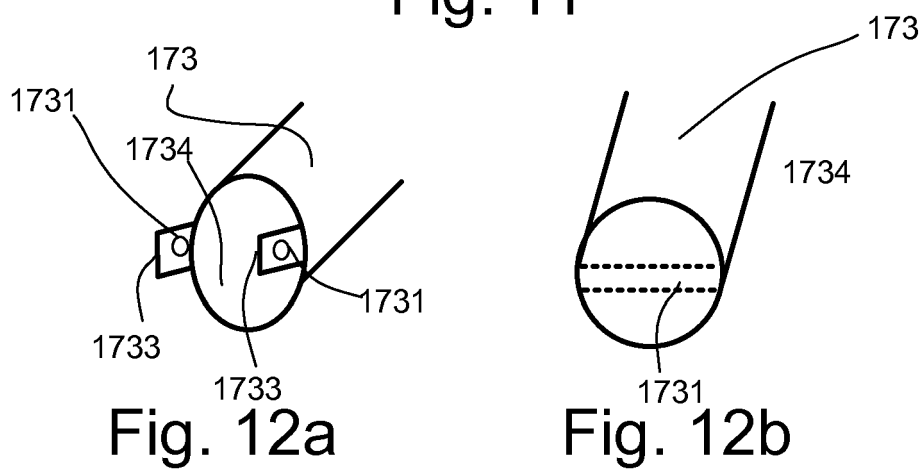


Fig. 12a

Fig. 12b

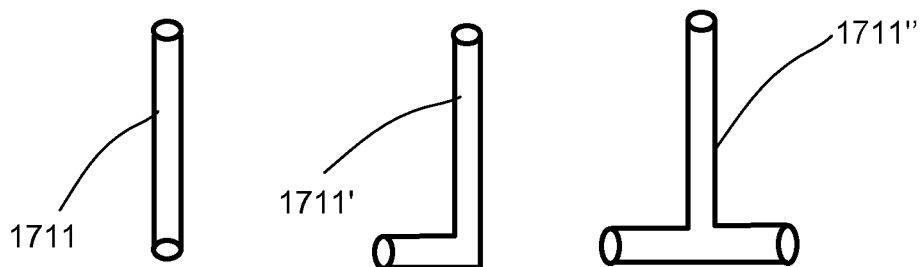
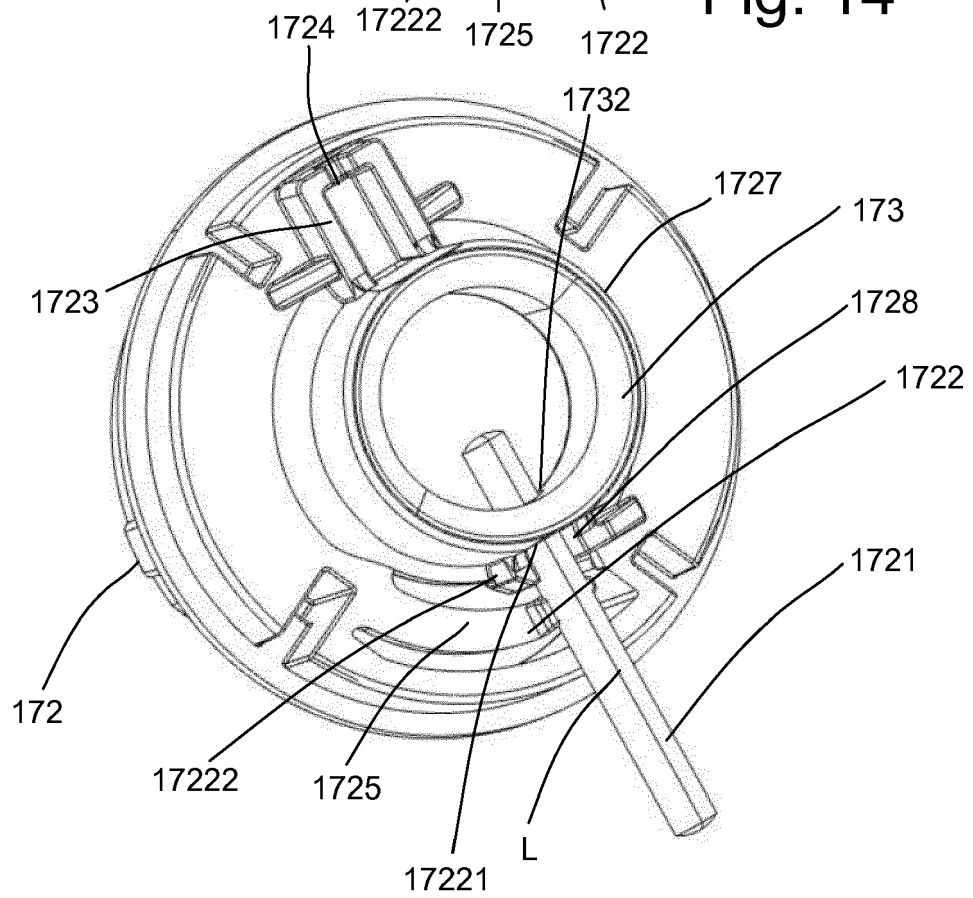
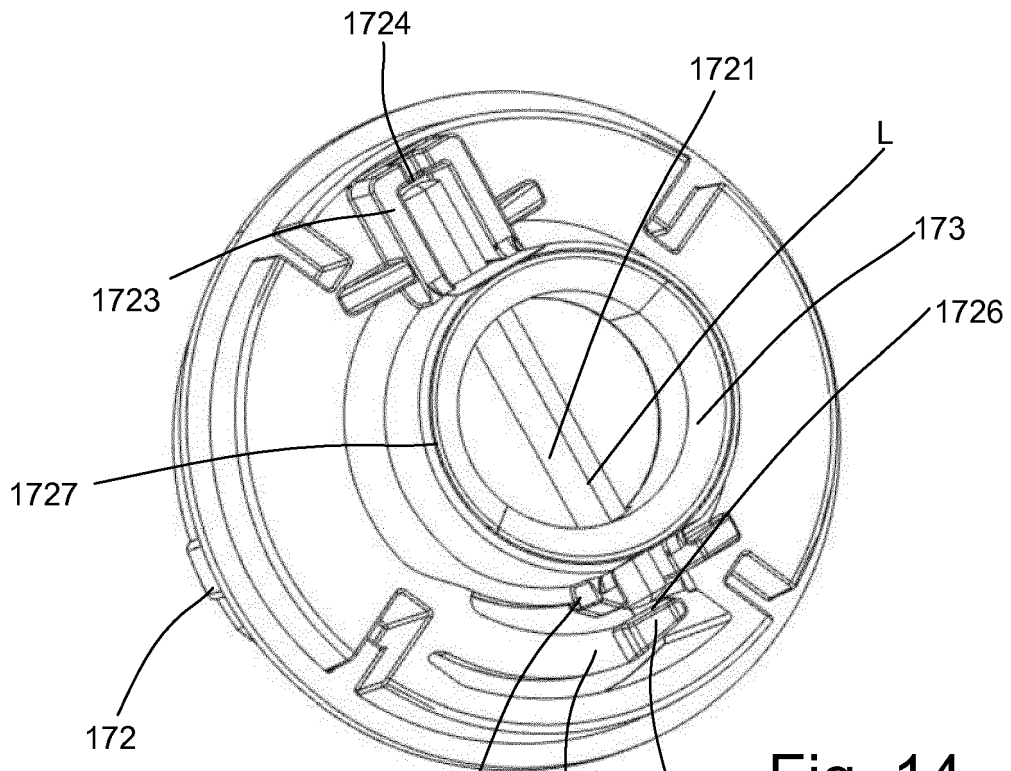


Fig. 13a

Fig. 13b

Fig. 13c





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X	US 6 263 942 B1 (MILLER JAMES V [US]) 24 July 2001 (2001-07-24) * figure 9 *	1-15	
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Place of search Munich		Date of completion of the search 20 March 2019	Examiner Ott, Stéphane
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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