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(54) **A SWITCH**

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Description

[0001] The present invention relates to switches and, more particularly to electrical switches with a safety mechanism against inadvertent actuation.

[0002] Switches are essential for operation of many electrical devices or appliances. In many such electrical devices, for example, power tools especially power cutting tools, inadvertent actuation of the device can be dangerous. Therefore, it is desirable to provide electrical switches with safety means to mitigate risks of inadvertent actuation.

[0003] JP 57 007029 discloses a switch having a safety mechanism that requires a user to press a lever before the lever can be switched between first and second positions.

[0004] JP 2005-112163 discloses a selector switch for a motor car that allows users to select between various electrical devices in the vehicle. The selector switch includes a piston that is depressed and then turned to positions to activate different electrical devices.

[0005] US3604868 discloses a safety switch for preventing inadvertent activation of an electrical device. The lever of the switch can be locked to prevent operation and unlocked to allow operation. Locking and unlocking of the lever is achieved by pushing the lever into the device and by rotating the lever through 90 degrees. When the switch is locked the lever is locked in position and when unlocked, the lever can be freely switched between the on and off positions.

[0006] DE 10 2005 053955 discloses a switch for activating a sunroof in a motor vehicle. The switch is a rocker switch that has a locking mechanism to prevent tilting of the switch unless the switch is depressed.

[0007] According to the present invention, there is provided an electrical switch in accordance with claim 1.

[0008] A switch requiring a two-stage actuation movement alleviates the risks of inadvertent actuation.

[0009] A one-way barrier means provides a simple means to devise a switch which requires a two-stage movement to actuate the switch. In addition, its non-symmetrical barrier resistance means only a single stage movement is required to deactivate the switch.

[0010] Since the actuation member will be urged out of engagement from the guide means at the off-position, a user has to move the actuation member along a first direction to engage with the guide means, and then along a second, different, direction to move the actuation member into the on-position. This requires a clear intention of the user and mitigates the risks of inadvertent actuation.

[0011] A switch with a guide means which requires a user to perform a two-stage movement in two different directions in order to move an actuator member into the on-state would alleviate the risks of inadvertent actuation since a clear actuation intention of a user is required before a switch is actuated.

[0012] Preferred embodiments of the present invention will be explained in further detail below by way of example and with reference to the accompanying drawings, in which:-

Figure 1 shows a first side view of a switch comprising a safety mechanism of this invention,
Figure 2 is a second side view of the switch of Figure 1 from another, opposite, side of Figure 1,
Figure 3 shows an end view of the switch of Figure 1,
Figure 4 is a longitudinal cross-sectional view along the section line A-A' of Figure 3 of a first embodiment of the switch of Figure 1 with the actuation member in the off-position,
Figure 4A shows the lower portion of the switch housing of Figure 4, with the actuation member, the upper housing portion removed and the switching mechanism,
Figure 4B is a transverse cross-sectional view of the lower housing portion of Figure 4A along the line B-B',
Figure 4C shows the switch of Figure 4A, with the actuation member at the on-position;
Figure 5 shows the longitudinal cross-sectional view of a second embodiment of the switch of Figure 1 in the off-position along the section line A-A' of Figure 3,
Figure 5A shows the lower portion of the switch housing of Figure 5, with the actuation member, the upper housing portion and the switching mechanism removed,
Figure 5B is a transverse cross-sectional view of the lower housing portion of Figure 5A along the line C-C',
Figure 5C shows the switch of Figure 5A with the actuation member at the on-position;
Figures 6A and 6B show respectively a first and second side view of the actuation member of the embodiments of Figures 4 and 5;
Figure 6C is a longitudinal cross-sectional view of the actuation member of the switch of Figure 1 along the line D-D';

[0013] Referring to Figures 1 to 4C, a first exemplary embodiment of a switch **100** of this invention comprising a switching mechanism, an actuation mechanism and a safety mechanism installed on an insulated housing is shown.

[0014] The switching mechanism comprises a first contact terminal **120** and a second contact terminal **122** which are connectable by a moveable conductive member **124.** When the first and second contact terminals are connected by the conductive member, the switching mechanism will be in its "make" condition and a closed circuit is formed so that electrical power can flow from a power source to a load, corresponding to an "on" state of the switch. On the other hand, when the conduction path between the first and second contact terminals is broken, the switching mechanism will be in its "break" condition, thereby isolating a load from a power source, and correspond to the "off" state of the switch. The first

and second contact terminals are fixedly mounted on the bottom portion of the housing and are connected respectively to a first **130** and a second **132** switch terminal provided for making external connection.

[0015] The conductive member **124** comprises a bridge-like member permanently connected electrically to the first contact terminal and having a length covering at least the span between the first and second contact terminals. The conductive member may be made of steel, for example, stainless steel, a rigid copper alloy, or other rigid alloys to give good rigidity and durability for repeated operations. One end of the conductive member is moveable between a make position when it is in electrical contact with the second terminal and a break position when it is lifted clear of the second contact terminal, thereby insulated from the second contact terminal. By moving the conductive member between the contact and no-contact positions, the switching mechanism will be toggled between the make- and break-conditions respectively.

[0016] As shown more particularly in Figures 4 & 4C, the conductive member is arranged as a conductive cantilever extending from the first contact terminal as a base and supported on a conductive fulcrum **126** at a location intermediate its longitudinal ends. The conductive fulcrum is an electrical extension of the first contact terminal and comprises a transversely extending knife or sharp edge which is elevated from a base level to permit pivotal movement of the conductive member about the conductive fulcrum. The knife edge is adapted to ensure good electrical contact with the conductive member, as well as to facilitate more efficient toggling of the conductive member during switching operations. The end of the conductive member distal from the cantilever base comprises a contact head **128** which is moveable between the contact (Figure 4C) and no-contact (Figure 4) positions when driven by an actuation member as explained below. The lower side of the conductive fulcrum is permanently connected, again electrically, to the first contact terminal so that the conductive member will always be in electrical contact with the first terminal, irrespective of the position of the free end. When the switching mechanism is in its off-state, as shown in Figure 4, the contact head **128** of the conductive member will be lifted clear of the second contact terminal, leaving an air-gap sufficient to isolate the second terminal from the bridge member. Alternatively, when the switching mechanism is in its on-state, the contact head will be pushed into compressive contact to form a contact engagement with the second contact terminal to complete electrical connection between the first and second contact terminals.

[0017] The switching mechanism can be switched or toggled between the on- and off- states by operation of an actuation mechanism, which comprises an actuation member **140** moveably mounted on the housing. More specifically, the operation state of the switching mechanism is toggled in response to actuation and de-actuation movements of the actuation member **140** relative to the housing.

[0018] The housing is made of hard plastics and comprises an upper housing portion **160** and a lower housing portion **162,** which are snap fitted together by means of a snap-fit arrangement. As shown in Figure 4B, the snap-fit arrangement comprises a pair of tapered protruding wings **156** formed on opposite external walls of the lower housing. The pair of wings is adapted for detachable engagement with a pair of corresponding windows **158** formed on the upper housing. The switching mechanism is mounted on the bottom of the lower housing portion with the switch terminals **130**, **132** protruding downwardly from the floor of the lower housing portion.

[0019] The actuation member **140** is arranged to drive the switching mechanism to operate between on- and off-states. As such, the actuation member is required to drive the conductive bridge to move or toggle between make- and break-positions. As shown more particularly in Figures 6A to 6C, the actuation member **140** comprises an actuation lever **142** having an elongate body which defines at its lower end an axially extending bore **144** for receiving the actuation tongue **146.** The dimension of the bore is adapted to permit slidable movement of the actuation tongue axially along the bore and relative to the elongate body so as to vary the length or extent of the actuation tongue protruding from the elongate body under spring urge. For this purpose, the length of the bore is shorter than that of the actuation tongue while its cross-sectional dimension is slightly larger that of the actuation tongue. A helical spring which is substantially coaxial with the bore is disposed intermediate the actuation tongue and the top end of the bore to provide spring urge to urge the actuation tongue to protrude away from the elongate body. To provide a better and guided mechanical coupling between the helical spring and the actuation tongue, the actuation tongue further comprises a thinner neck portion which protrudes inside the helical spring. The upper end of the elongate body distal from the bore is adapted and dimensioned to provide an operation interface for a user.

[0020] A partially spherical portion **150** is formed on the actuation lever immediate the upper and lower portions of the elongate body. This partially spherical portion 150 is adapted to be received within a neck portion **164** of the housing formed on the top part of the upper housing. Upon coupling with a sealing ring **170** or a sealing collar disposed on the inner periphery of the neck portion, this partially spherical portion enhances the water-tightness of the switch while permitting pivotal movement of the actuation lever **142** relative to the switch housing.

[0021] To facilitate guided pivotal movements of the actuation member **140** relative to the switch housing, a pair of transversal protrusions **152** is formed diametrically on the partial spherical portion, as depicted more particularly in Figure 6B. This pair of transversal protrusions **152** is arranged to cooperate with a pair of axially extending channels formed inside the neck portion **(no shown)** so as to restrict the transversal protrusions **152** to be slidable axially along the pair of channels while making

pivotal or swivel movements to move between the on- and off positions. Another pair of diametrically extending guide protrusions **154** is formed on the lower portion of the actuation lever. This pair of guide protrusions is adapted to engage with a guide means to facilitate guided sliding movements of the actuation member along a guide means formed on the housing as explained below. The axes of the two pairs of protrusions **152 154** formed on the actuation lever are parallel to each other and both are orthogonal to the longitudinal axis x-x' of the actuation lever. The guide channels are parallel to the longitudinal axis x-x'.

[0022] A guide track **166** is formed on the housing as a form of guide means to facilitate guided pivotal movement of the actuation member along a guided movement path to operate the switch. The guide track comprises a pair of arcuate recesses formed, for example, by moulding on opposite walls on the upper portion of the housing (as shown more clearly in Figures 4A and 4B) for cooperative engagement with the pair of guide protrusions **154** formed on the lower portion of the actuation lever. The guide track, defined by an upper flange and a lower flange on a side wall of the housing, defines a movement path along which the actuation lever is guided to move between a first position when the switching mechanism is actuated, as depicted in Figure 4C, and a second position when the switching mechanism is de-actuated, as depicted in Figure 4.

[0023] To provide safety measures to mitigate the risks of inadvertent actuation of the switch, a two-stage actuation movement is required to actuate the switch. An exemplary implementation of such safety measures thorough cooperative operation of the actuation member and the guide track is described below with reference to Figures 4-4C.

[0024] When the switch is at its on-state as depicted in Figure 4C, the actuation member will be pivoted with the actuation tongue proximal the contact head **128.** At this switching state, the pair of transversal protrusions on the upper part of the actuation lever is received by the pair of channels formed on the neck portion of the switch housing, the pair of guide protrusions **154** is in coupling engagement with the guide track, and the contact head **128** is firmly pressed into electrical contact engagement with the second contact terminal by the actuation tongue. To ensure a good electrical contact, the spring bias is devised so that it is sufficiently strong to bring about a firm compressive contact between the contact head **128** and the second contact terminal **122.** It will be appreciated that when the when the actuation member is at this state, the spring urge due to the helical spring will tend to push the elongate body axially upwards. However, due to coupling engagement between the pair of transversal protrusions **154** and the guide track **166,** the upper portion of the guide track, or more specifically the upper flange, prevents upward movement of the elongate body. As a result, the spring urge operates to urge the actuation tongue to press downwards to close the contact head and the second terminal.

[0025] On the other hand, when the switch is at its off-state as depicted in Figure 4, the actuation tongue is moved away from the contact head **128** and is now adjacent the first contact terminal **120.** At this state, the pair of transversal protrusions on the upper part of the actuation lever is still received by the pair of channels formed on the neck portion, but the pair of guide protrusions **154** is now out of engagement with the guide track as shown in Figure 4A. Due to the spring urge on the actuation tongue 146, the actuation tongue will gradually sweep across the conductive member when it moves from the on-state to the off-state and will maintain contact with the conductive member throughout the sweeping. When at this off-state, the actuation tongue acts on the end of the conductive member, which is distal from the contact head **128,** thereby lifting the contact head **128** out of contact with the second terminal **122.** Furthermore, since the transversal protrusions **154** are no longer in engagement with the guide track, the spring urge due to the helical spring will now push the elongate body axially upwards. The end of the axial channels on the next portion of the housing will then limit the maximum upward displacement of the elongate body.

[0026] The guide track **166** is devised to provide a guided movement path for the actuation member to pivotally movable between the on- and off states. When moving between the on- and off-states, the actuation tongue will gradually retract axially when it approaches the conductive fulcrum, and then extend to depress the contact head 128 or the distal end of the conductive member 124 after it has passed the knife edge of the fulcrum. More particularly, the actuation tongue is fully extended when it is at the stable on- or off states.

[0027] As shown more particularly in Figure 4A, the guide track is discontinued at one end corresponding to the end at which the actuation member has completed its journey to lift the contact head **128** clear of the second contact terminal. At this location of discontinuity, the pair of guide protrusions **154** on the actuation member is no longer engaged by the guide track, but is released and is slidably movable along its longitudinal axis and along a pair of longitudinal recesses formed on the neck portion of the upper housing. Since the actuation tongue is now resting on the conductive member, spring bias on the actuation tongue will operate to push the actuation member axially upwards and abruptly away from the locus of the guide track. Once the actuation member has reached this state, it will be prevented from moving back to the on-state by a simple pivotal movement in reversal, since the pair of guide protrusions is now blocked by a portion of the housing which defines the guide track, in particular the entry to the guide track.

[0028] To turn off the switch, a user only needs to move the actuation member pivotally, in order to drive the actuation member from the state of Figure 4C into the state of Figure 4. Upon reaching the state of Figure 4, the actuation member will be out of engagement with the guide

track.

[0029] To move the actuation member from the off-position to the on- position, it will be necessary to first move the actuation member axially downwards towards the entry of the guide track, or the location of discontinuity of the guide track, by depressing the actuation lever relative to the actuation tongue so that the pair of transversal protrusions is aligned with the guide track entry. After the pair of guide protrusions has been aligned with the guide track entry, the next step will be to pivotally move the actuation member along the guide track and then into the on-position to actuate the switching mechanism as described above.

[0030] Stated simply, when moving the actuation member from the off- state to the on- state, a user will have to move the actuation member firstly in a first, axial, direction towards the location of discontinuity in order to gain entry into engagement with a guide means, and then a second movement along the guide means to bring the actuation member fully into the on-state. On the other hand, a single step action is required to turn the switch off. Thus, by devising the guide track so that a discontinuity, especially an abrupt discontinuity, is formed at a location corresponding to the off-location of the switching mechanism, so that the actuation member is driven out of engagement from a guiding means, safety measures are provided.

[0031] In the second embodiment as shown in Figures 5 to 5C, the components of the switch **200** are substantially identical to that of the first embodiment shown above except with a modified guide track on the housing. Parts of the first embodiment are incorporated herein by reference, and parts which are common or equivalent to the parts of the first embodiment are designated by the same numerals increased by **100.**

[0032] In this embodiment, the guide track **266** is also discontinued at a location corresponding to the position at which the actuation lever is in the off- position. Differing from the first embodiment, the guide tracks **266** is joined by an extension guide track, which extends axially upwards and joins the guide track **266** with an abrupt junction at the discontinuity as an upward extension of the guide track. As a result of the extension track, a user will have to depress the actuation member in an axial direction to bring the guide protrusions **254** into alignment with the guide track **266** and gain entry into the guide track **266,** and then abruptly change the direction of movement to move along the guide track in order to bring the actuation member into the on- state.

Claims

1. An electrical switch comprising an actuation member (140, 240), wherein said actuation member (140,240) comprises an actuating lever (142, 242) and an urging means (148), wherein said actuating lever (142, 242) is mounted on a switch housing (160, 260) and pivotally movable relative to a switch housing (160) to move between said on- and off- positions, the electrical switch further comprising a switching mechanism, wherein said actuation member (140) is movable between a first position and a second position corresponding respectively to on- and off- positions of said switching mechanism; wherein said actuation member (140) is arranged such that a two-stage movement is required to move said actuation member (140) from said second position to said first position to operate said switching mechanism,

wherein said switch comprises a guide means, which comprises a guide track (166, 266), defining a path along which said actuation member (140) is moveable between said on- and off- positions, and one-way barrier means formed on said guide means (166); and wherein said one-way barrier means is configured such that said actuation member (140) is moveable from said on- position to off- position unobstructed by barrier resistance of said barrier means, and said actuation member (140) is moveable into engagement with said guide means (166) and then from said off-position to said on-position after overcoming barrier resistance of said barrier means,

wherein the two-stage movement comprises a first-stage movement in a first direction to move said actuation member (140) from said off- position into said guide track (166), said first-stage movement comprising an axial movement of said actuator member (140) along its longitudinal axis to move said actuation member (140), against spring (148) urge towards said housing and said guide track (166) and a second-stage movement in a second direction different from the first direction, to move said actuation member (140) along said guide (166) track to said on- position and second-stage movement comprising a pivotal movement to move said actuation member (140) towards said first position,

wherein said guide (166) track discontinues at an entry end at which said actuation member (140) transits between said off- position and said guide track (166), said discontinuity forming a one-way barrier against movement of said actuation member (140) from said off- position towards said guide track (166), and being a non-barrier to a said actuation member (140) with respect to movement of said actuation member (140) from said guide track (166) towards said off- position,

wherein said guide means (166) is arranged such that, when said an actuation member (140) is at said on- position, a said actuation member (140) is in engagement with said guide means and is urged by said guide means (166) to close said a switching mechanism (128), and a said actuation member (140) is released from engagement with said guide means (166) when at said off- position, wherein the

urging means (148) is arranged to urge a said actuation member (140) out of engagement with said guide means (166) when at said off- position,
characterised in that
said guide means (166) are formed on housing (160, 162), the guide track (166) being moulded on said housing (160, 162),
said actuating lever (142) comprises a pair of transversal protrusions (154) arranged to engage with said guide means (166), said pair of transversal protrusions (154) being in engagement with said guide means (166) when moving between said on- and off-positions, and said pair of transversal protrusions (154) being released from engagement with said guide means (166) at said second position, said actuator member (140) further comprises an actuating tongue (146), said actuating tongue (146) being moveably mounted to said actuating lever (142) and protruding axially there-from, and wherein said actuating lever (142) and said actuating tongue (146) are arranged such that the extent of axial protrusion of said actuating tongue (146) from said actuating lever (142) changes as said actuating lever (142) moves from said off- position to said on- position,
the urging means (128) is a helical spring which is substantially coaxial with a bore (144) of the actuation lever (142) and disposed intermediate said actuation tongue (146) and the top end of the bore,
said actuating tongue (146) is coupled to said actuating lever (142) against the axial urge of the urging means (128) which urges said actuating tongue (146) to move away from said actuation lever (142) along the axis of said actuation lever (142), and said actuation member (140) is arranged such that action of said actuation tongue (146) on said switching mechanism urges said actuation lever (142) against said guide means (166) to engage therewith,
said switching mechanism comprises a conductive bridge (124, 224) which is arranged to toggle between said one and off positions in response to sweeping movement of said actuation member (140) between said on- and off- positions, and
said conductive bridge (124) is in sliding contact with said actuation member (140) and in compressive contact with said actuation tongue (146) due to the spring urging means (148) when said actuation member (140) moves between said on- and off- positions, so that the urging means (148) is arranged to urge said actuation member (140) to close said switching mechanism (128) when at said on position.

Patentansprüche

1. Elektrischer Schalter, der ein Betätigungsglied (140, 240) umfasst, wobei das Betätigungsglied (140, 240) einen Betätigungshebel (142, 242) und ein Drängmittel (148) umfasst, wobei der Betätigungshebel (142, 242) an einem Schaltergehäuse (160, 260) angebracht und schwenkbar bezüglich eines Schaltergehäuses (160) zur Bewegung zwischen der Ein- und Aus-Position beweglich ist, wobei der elektrische Schalter ferner einen Schaltmechanismus umfasst, wobei das Betätigungsglied (140) zwischen einer ersten Position und einer zweiten Position, die jeweils Ein- und Aus-Positionen des Schaltmechanismus entsprechen, beweglich ist; wobei das Betätigungsglied (140) derart angeordnet ist, dass eine Zweistufenbewegung zum Bewegen des Betätigungsglieds (140) aus der ersten Position in die zweite Position zum Betreiben des Schaltmechanismus erforderlich ist,
wobei der Schalter ein Führungsmittel umfasst, das eine Führungsspur (166, 266), die einen Weg definiert, den entlang das Betätigungsglied (140) zwischen der Ein- und Aus-Position beweglich ist, und Einwegsperrmittel umfasst, die auf dem Führungsmittel (166) ausgebildet sind; und wobei das Einwegsperrmittel derart konfiguriert ist, dass das Betätigungsglied (140) aus der Ein-Position in die Aus-Position ungehindert durch Sperrwiderstand des Sperrmittels beweglich ist und das Betätigungsglied (140) in Eingriff mit dem Führungsmittel (166) und dann aus der Aus-Position in die Ein-Position nach dem Überwinden von Sperrwiderstand des Sperrmittels beweglich ist,
wobei die Zweistufenbewegung eine Bewegung der ersten Stufe in eine erste Richtung zum Bewegen des Betätigungsglieds (140) aus der Aus-Position in die Führungsspur (166) umfasst, wobei die Bewegung der ersten Stufe eine axiale Bewegung des Betätigungsglieds (140) entlang seiner Längsachse zum Bewegen des Betätigungsglieds (140) gegen die Kraft einer Feder (148) zum Gehäuse und zur Führungsspur (166) hin umfasst, und eine Bewegung der zweiten Stufe in eine zweite, von der ersten Richtung abweichende Richtung zum Bewegen des Betätigungsglieds (140) die Führungsspur (166) entlang zur Ein-Position umfasst, und wobei die Bewegung der zweiten Stufe eine Schwenkbewegung zum Bewegen des Betätigungsglieds (140) zur ersten Position hin umfasst,
wobei die Führungsspur (166) an einem Eintrittsende unterbrochen ist, an dem das Betätigungsglied (140) zwischen der Aus-Position und der Führungsspur (166) übergeht, wobei die Unterbrechung eine Einwegsperre gegen Bewegung des Betätigungsglieds (140) aus der Aus-Position zur Führungsspur (166) ausbildet und eine Nicht-Sperre für das Betätigungsglied (140) bezüglich Bewegung des Betätigungsglieds (140) von der Führungsspur (166) zur Aus-Position hin ist,
wobei das Führungsmittel (166) derart angeordnet ist, dass, wenn das Betätigungsglied (140) in der Ein-Position ist, das Betätigungsglied (140) in Eingriff mit dem Führungsmittel steht und durch das Führungs-

mittel (166) zum Schließen des Schaltmechanismus (128) gedrängt ist, und das Betätigungsglied (140) aus dem Eingriff mit dem Führungsmittel (166) freigegeben ist, wenn es in der Aus-Position ist, wobei das Drängmittel (148) zum Drängen des Betätigungsglieds (140) außer Eingriff mit dem Führungsmittel (166) angeordnet ist, wenn es in der Aus-Position ist,

dadurch gekennzeichnet, dass

die Führungsmittel (166) am Gehäuse (160, 162) ausgebildet sind, wobei die Führungsspur (166) an das Gehäuse (160, 162) angeformt ist,

der Betätigungshebel (142) ein Paar quer verlaufende Vorsprünge (154) umfasst, das zum Eingreifen in die Führungsmittel (166) angeordnet ist, wobei das Paar quer verlaufender Vorsprünge (154) bei der Bewegung zwischen den Ein- und Aus-Positionen in Eingriff mit den Führungsmitteln (166) steht, und das Paar quer verlaufender Vorsprünge (154) aus dem Eingriff mit den Führungsmitteln (166) an der zweiten Position freigegeben ist, wobei das Betätigungsglied (140) ferner eine Betätigungszunge (146) umfasst, wobei die Betätigungszunge (146) beweglich am Betätigungshebel (142) angebracht ist und davon vorsteht, und wobei der Betätigungshebel (142) und die Betätigungszunge (146) derart angeordnet sind, dass sich die Ausdehnung axialen Vorstands der Betätigungszunge (146) vom Betätigungshebel (142) ändert, wenn sich der Betätigungshebel (142) aus der Aus-Position in die Ein-Position bewegt,

das Drängmittel (128) eine Schraubenfeder ist, die im Wesentlichen koaxial mit einer Bohrung (144) des Betätigungshebels (142) ist und zwischen der Betätigungszunge (146) und dem oberen Ende der Bohrung angeordnet ist,

die Betätigungszunge (146) an den Betätigungshebel (142) gegen das axiale Drängen des Drängmittels (128) gekuppelt ist, welches die Betätigungszunge (146) zum Wegbewegen vom Betätigungshebel (142) entlang der Achse des Betätigungshebels (142) drängt, und das Betätigungsglied (140) derart angeordnet ist, dass Einwirkung der Betätigungszunge (146) auf den Schaltmechanismus den Betätigungshebel (142) gegen das Führungsmittel (166) zur Ineingriffnahme damit drängt,

der Schaltmechanismus eine leitfähige Brücke (124, 224) umfasst, die zum Hin- und Herschalten zwischen der Ein- und Aus-Position in Reaktion auf die Kippbewegung des Betätigungsglieds (140) zwischen der Ein- und Aus-Position angeordnet ist, und die leitfähige Brücke (124) in Gleitkontakt mit dem Betätigungsglied (140) und in Druckkontakt mit der Betätigungszunge (146) aufgrund des Federdrängmittels (148) ist, wenn sich das Betätigungsglied (140) zwischen der Ein- und Aus-Position bewegt, sodass das Drängmittel (148) zum Drängen des Betätigungsglieds (140) zum Schließen des Schaltmechanismus (128) angeordnet ist, wenn es in der Ein-Position ist.

Revendications

1. Un commutateur électrique comprenant un élément d'actionnement (140, 240), dans lequel ledit élément d'actionnement (140, 240) comprend un levier d'actionnement (142, 242) et un moyen de poussée (148), dans lequel ledit levier d'actionnement (142, 242)
est monté sur un boîtier d'interrupteur (160, 260) et peut être déplacé par pivotement relativement à un boitier d'interrupteur (160) afin de le déplacer entre lesdites positions Allumé et Éteint, l'interrupteur électrique comprenant en outre un mécanisme de commutation, dans lequel ledit élément d'actionnement (140) peut être déplacé entre une première position et une deuxième position correspondant respectivement aux positions Allumé et Éteint dudit mécanisme de commutation ; dans lequel ledit élément d'actionnement (140) est agencé de telle sorte qu'un mouvement en deux étapes soit nécessaire pour déplacer ledit élément d'actionnement (140) depuis ladite deuxième position
jusqu'à ladite première position afin d'actionner ledit mécanisme de commutation,
dans lequel ledit interrupteur comprend un moyen de guidage qui comprend un rail de guidage (166, 266),
définissant un chemin le long duquel ledit élément d'actionnement (140) peut être déplacé entre lesdites positions Allumé et Éteint, et un moyen de blocage à sens unique est formé sur ledit moyen de guidage (166) ; et dans lequel ledit moyen de blocage à sens unique est configuré de telle sorte que ledit élément d'actionnement (140) puisse être déplacé depuis ladite position Allumé jusqu'à la position Éteint sans être entravé par la résistance de blocage dudit moyen de blocage, et que ledit élément d'actionnement (140) puisse être déplacé en coopération avec ledit moyen de guidage (166) puis depuis ladite position Éteint jusqu'à ladite position Allumé après avoir surmonté la résistance de blocage dudit moyen de blocage,
dans lequel le mouvement en deux étapes comprend un mouvement de première étape dans une première direction afin de déplacer ledit élément d'actionnement (140) depuis ladite position Éteint jusqu'à l'intérieur dudit rail de guidage (166), ledit mouvement de première étape comprenant un mouvement axial dudit élément d'actionnement (140) le long de son axe longitudinal afin de déplacer ledit élément d'actionnement (140), contre la poussée du ressort (148) en direction dudit boîtier et dudit rail de guidage (166) et un mouvement de deuxième étape dans une

deuxième direction différente de la première direction, afin de déplacer ledit élément d'actionnement (140) le long dudit rail de guidage (166) jusqu'à ladite position Allumé,
et le mouvement de deuxième étape comprenant un mouvement de pivotement afin de déplacer ledit élément d'actionnement (140) vers ladite première position, dans laquelle ledit rail de guidage (166) s'interrompt à une extrémité d'entrée sur laquelle ledit élément d'actionnement (140) transite entre ladite position Éteint et ledit rail de guidage (166), ladite discontinuité formant un blocage à sens unique opposé au mouvement dudit élément d'actionnement (140) depuis ladite position Éteint jusqu'audit rail de guidage (166), et étant non-bloquant pour un dit élément d'actionnement (140) par rapport au mouvement dudit élément d'actionnement (140) depuis ledit rail de guidage (166) vers ladite position Éteint,
dans laquelle le moyen de guidage (166) est agencé de manière à ce que lorsque ledit un élément d'actionnement (140) est dans ladite position Allumé, un dit élément d'actionnement (140) est en prise avec ledit moyen de guidage et est poussé par ledit moyen de guidage (166) afin de fermer ledit un mécanisme de commutation (128), et un dit élément d'actionnement (140) est libéré de sa prise avec ledit moyen de guidage (166) lorsqu'il est à ladite position Éteint,
dans laquelle le moyen de poussée (148) est agencé de manière à pousser un dit élément d'actionnement (140) hors de sa prise avec ledit moyen de guidage (166) lorsqu'il est à ladite position Éteint,
caractérisée en ce que
ledit moyen de guidage (166) est formé sur un boîtier (160, 162), le rail de guidage (166) étant moulé sur ledit boîtier (160, 162)
ledit levier d'actionnement (142) comprend une paire de saillies transversales (154) agencées de manière à entrer en coopération avec ledit moyen de guidage (166), ladite paire de saillies transversales (154) étant en prise avec ledit moyen de guidage (166) lors du mouvement entre lesdites positions Allumé et Éteint, et ladite paire de saillies transversales (154) étant libérée de sa coopération avec ledit moyen de guidage (166) dans ladite deuxième position, ledit élément d'actionnement (140) comprenant en outre une languette d'actionnement (146), ladite languette d'actionnement (146) étant montée de manière amovible sur ledit levier d'actionnement (142) et faisant saillie axialement depuis cet élément (142) et où le levier d'actionnement (142) et ladite languette de d'actionnement (146) sont agencés de telle sorte que l'étendue de la saillie axiale de ladite languette d'actionnement (146) hors dudit levier d'actionnement (142) change à mesure que ledit levier d'actionnement (142) se déplace depuis ladite position Éteint jusqu'à ladite position Allumé,
le moyen de poussée (128) est un ressort hélicoïdal qui est substantiellement coaxial à un alésage (144) du levier d'actionnement (142) et disposé de façon intermédiaire entre ladite languette d'actionnement (146) et l'extrémité supérieure de l'alésage,
ladite languette d'actionnement (146) est couplée audit levier d'actionnement (142) contre la poussée axiale du moyen de poussée (128) qui pousse ladite languette d'actionnement (146) à s'éloigner dudit levier d'actionnement (142) suivant l'axe dudit levier d'actionnement (142), et ledit élément d'actionnement (140) est agencé de telle sorte que l'action de ladite languette d'actionnement (146) sur ledit mécanisme de commutation pousse ledit levier d'actionnement (142) contre ledit moyen de guidage (166) afin d'entrer en coopération avec celui-ci,
ledit mécanisme de commutation comprenant un pont conducteur (124, 224) qui est agencé de manière à passer entre lesdites positions Allumé et Éteint en réponse à un mouvement de balayage dudit élément d'actionnement (140) entre lesdites positions Allumé et Éteint, et
ledit pont conducteur (124) est en contact de glissement avec ledit élément d'actionnement (140) et en contact de compression avec ladite languette d'actionnement (146) sous l'action du moyen de poussée (148)
lorsque ledit élément d'actionnement (140) se déplace entre lesdites positions Allumé et Éteint, de telle sorte que les moyens de poussée (148) sont agencés de manière à pousser ledit élément d'actionnement (140) à fermer ledit mécanisme de commutation (128) lorsqu'il est sur ladite position Allumé.

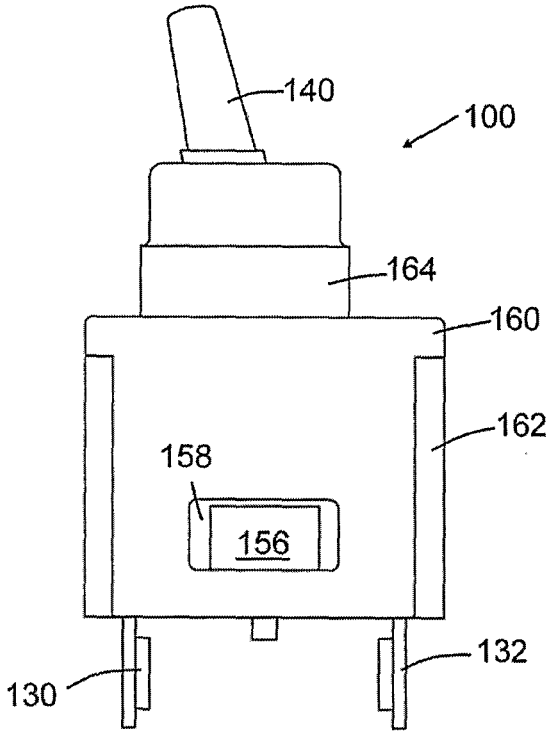


Figure 1

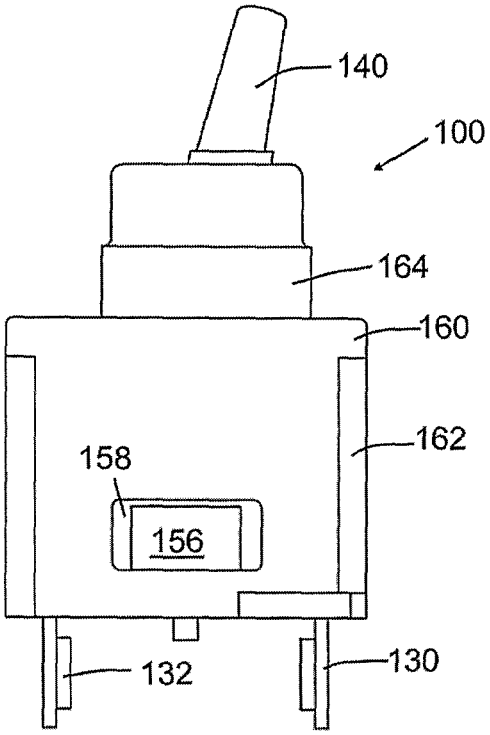


Figure 2

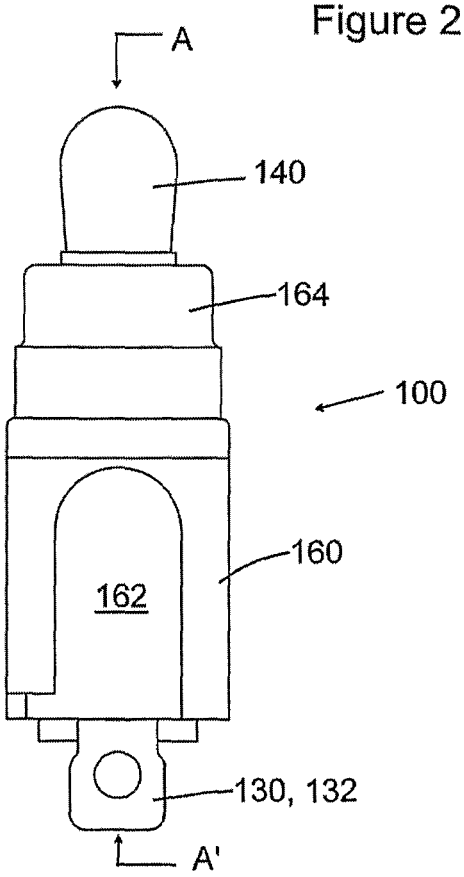


Figure 3

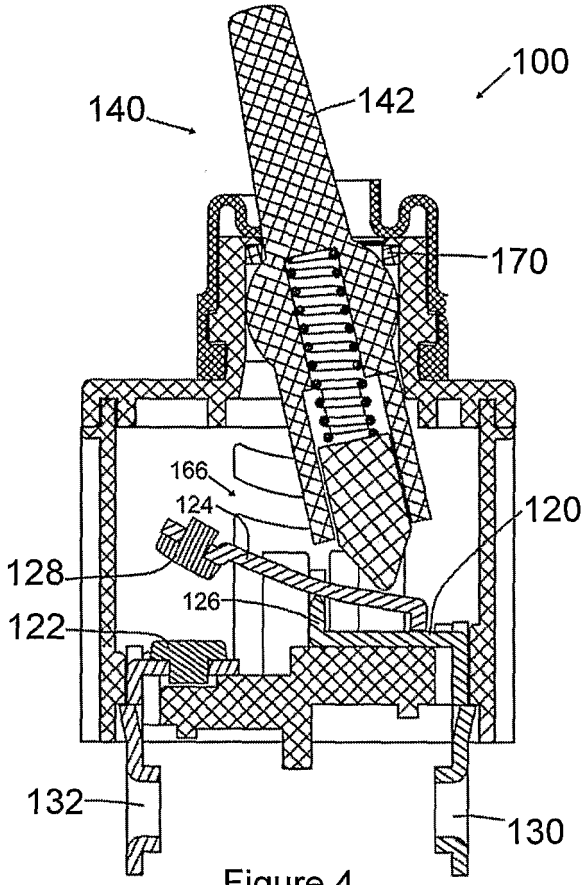


Figure 4

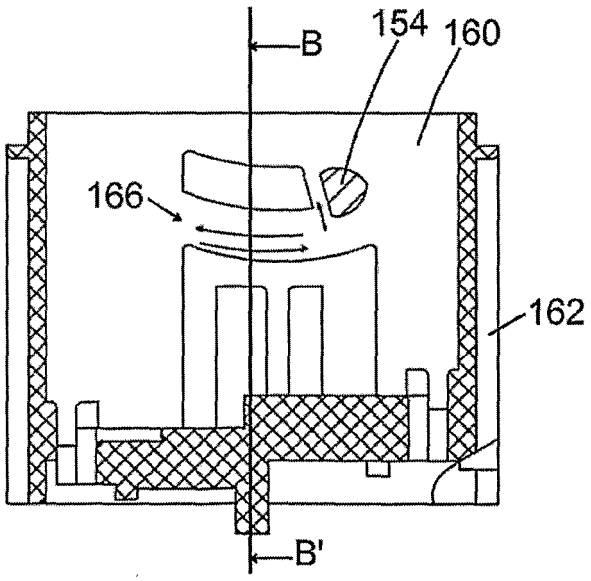


Figure 4A

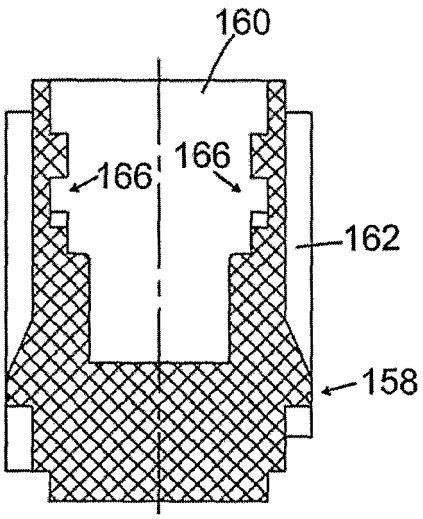


Figure 4B

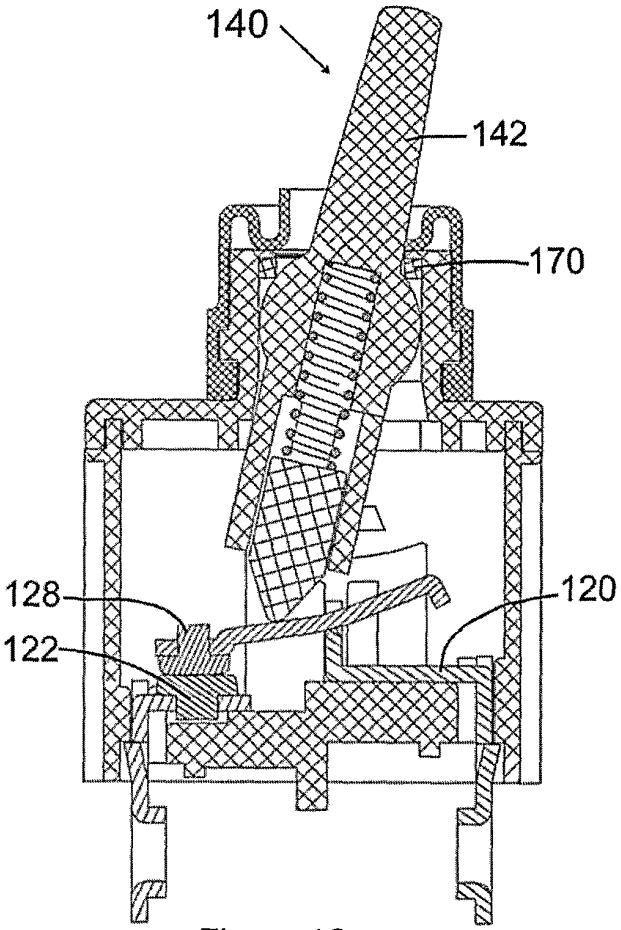


Figure 4C

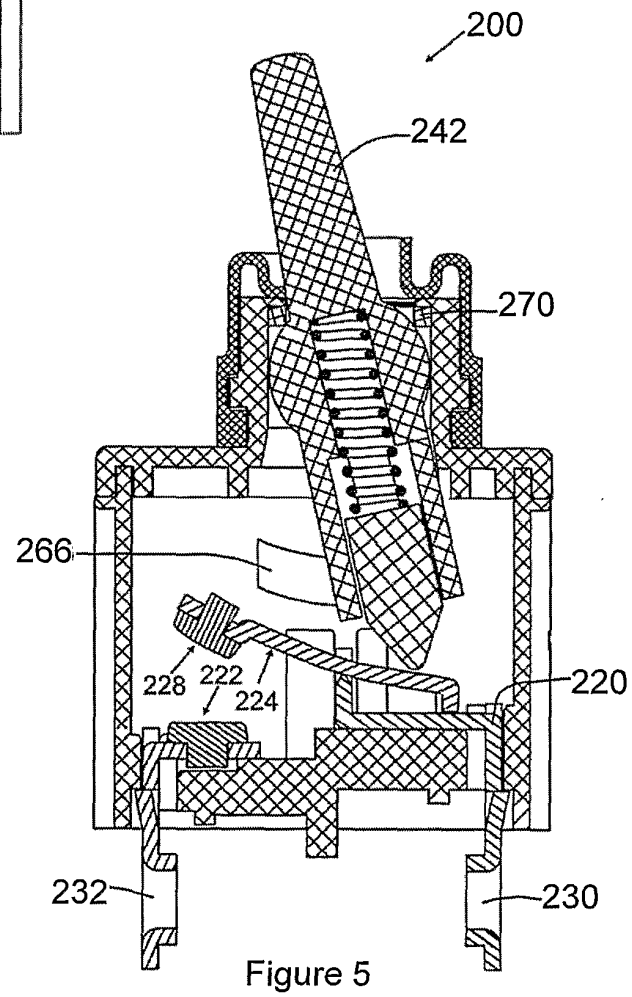


Figure 5

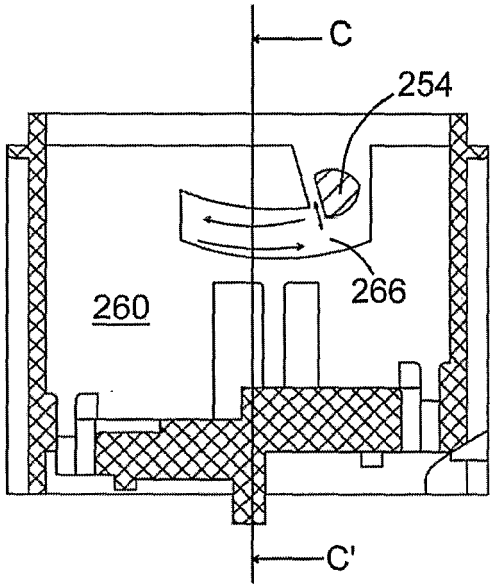


Figure 5A

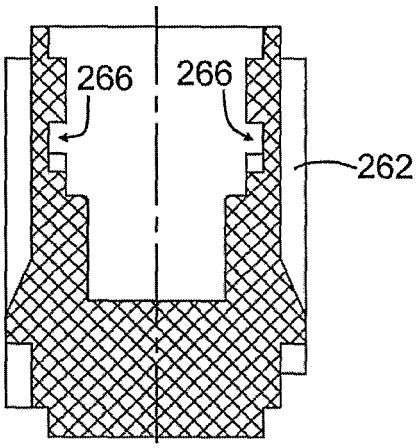


Figure 5B

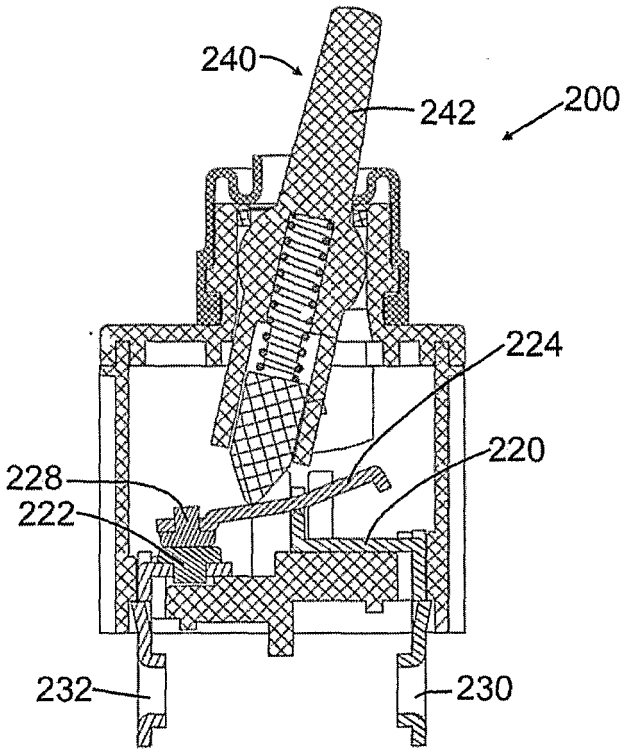


Figure 5C

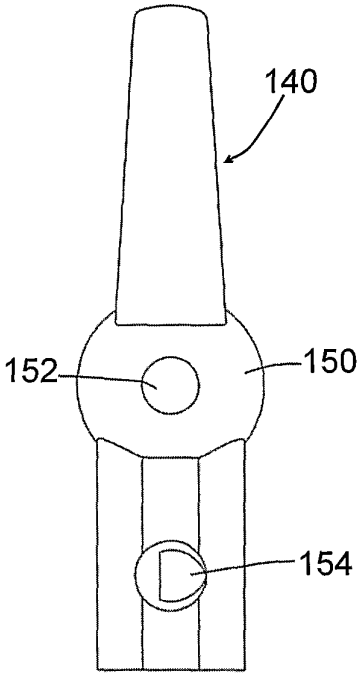


Figure 6A

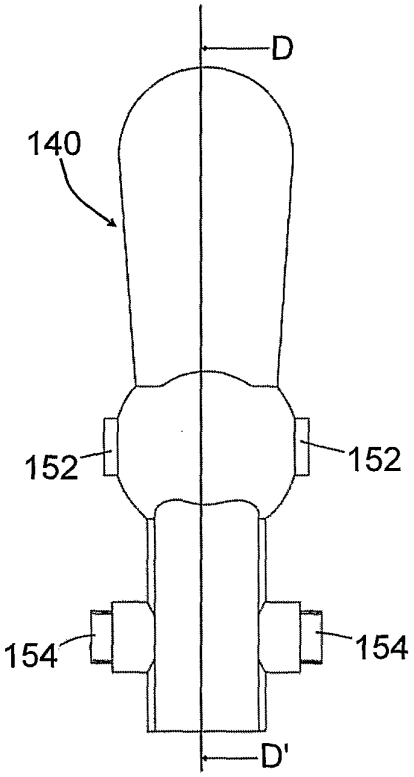


Figure 6B

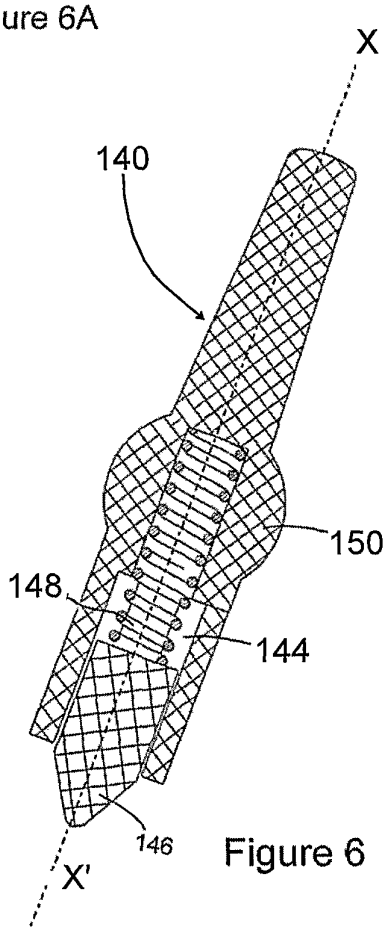


Figure 6

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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- DE 102005053955 **[0006]**