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(54) A switching device

(57) A switching device operable between different set-points comprising a rotary control handle adapted to switch between set-points, a sliding element adapted for protraction from a resting position to an elevated position to lock the control handle at any set-point and retraction from the elevated position to the resting position to unlock the control handle, a locking member comprising a shaft and a recess, said shaft is movable in response to the protraction and retraction of the sliding element and respectively into and out the recess so as to correspondingly lock and unlock the control handle, and means for selectively disabling the protraction of the sliding element at a designated set-point in a normal course of operation and selectively enabling the protraction when required.

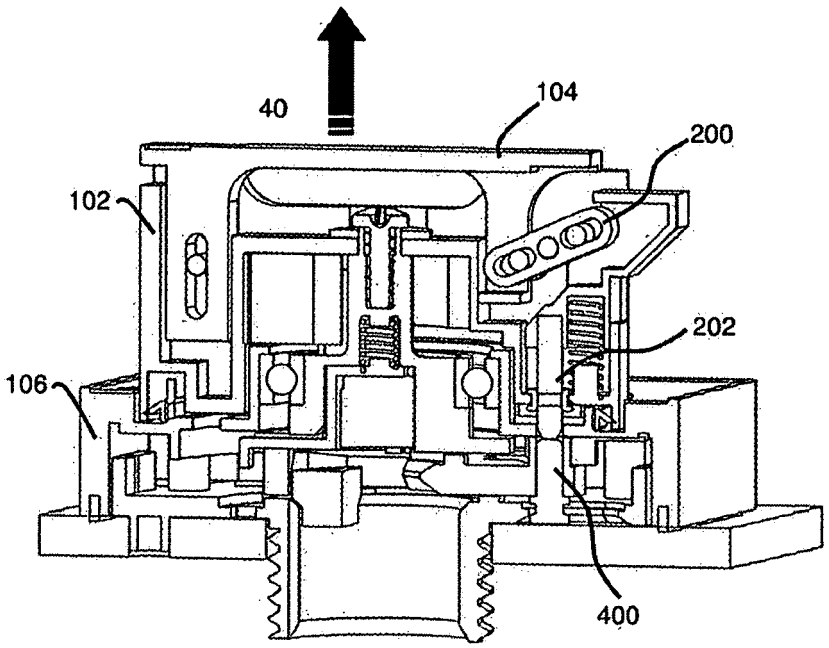

Figure 4c

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Description

FIELD OF THE INVENTION

[0001] The present invention broadly relates to a switching device, and particularly relates to a switching device used for motor controls and the like.

BACKGROUND OF INVENTION

[0002] A switch to operate an electrical device such as motor control, circuit breaker or the like is typically often mounted outside a chassis encasing the electrical device to operate the device. Some form of locking is necessary in order to prevent accidental or unauthorized operation of the switch and /or accidental or unauthorized opening of a door of the chassis.

[0003] In a prior art, Singapore Patent Application No. 200906594-7, a switch incorporated with a locking feature, wherein the switch is preferably a rotary switch is disclosed. Features to allow padlocking of the switch are also incorporated to facilitate locking at designated set-points, for example the "OFF" and "ON" positions.

[0004] For such switches similar to the one disclosed in Singapore Patent Application No. 200906594-7, padlocking at both the "OFF" and "ON" positions is normally possible as determined by the user. However, when such switches are shipped out from a factory, the padlocking function of a switch is usually disabled at the "ON" position.

[0005] Currently, a deformable or breakable piece is incorporated into the design of such a switch available in the market. The user would deform or break the piece to enable padlocking at the "ON" position. However this process is irreversible. That is to say, the padlocking at the "ON" position cannot be disabled thereafter.

[0006] Generally, the use of a deformable or breakable piece leads to an irreversible process for disabling the padlocking function. As such, a user does not have a choice as he or she desires to manipulate the padlocking function at a designated set-point depending on the requirements of operation. This often causes inconvenience and undeniably sets limitations to a user with respect to the padlocking function; thereby lacking user-friendliness.

[0007] Therefore, there is a need for an improved switching device to address any one of the problems mentioned above.

SUMMARY OF INVENTION

[0008] The present invention is a switching device operable between different set-points comprising a rotary control handle adapted to switch between set-points, a sliding element adapted for protraction from a resting position to an elevated position to lock the control handle at any set-point and retraction from the elevated position to the resting position to unlock the control handle, a locking member comprising a shaft and a recess, said shaft is movable in response to the protraction and retraction of the sliding element and respectively into and out the recess so as to correspondingly lock and unlock the control handle, and means for selectively disabling the protraction of the sliding element at a designated set-point in a normal course of operation and selectively enabling the protraction when required.

[0009] In the switching device, the means may be an adjustable member for selectively preventing entry of the shaft into the recess and selectively allowing entry of the shaft into the recess. The adjustable member may be insertable into the recess to block the entry of the recess and removable to unblock the entry. The adjustable member may include a cylindrical rod or a tubular rod.

[0010] In the switching device, the adjustable member may also be slidable into a first position to block the entry of the recess and a second position that unblocks the entry. Yet, the adjustable member may be rotatable into a first position to block the entry of the recess and a second position that unblocks the entry.

[0011] The adjustable member may further comprise a retractable protruding member adapted for releasably securing within the recess. Alternatively, the recess may further comprise a retractable protruding member and the adjustable member may further comprise a latching recess adapted for receiving the retractable protruding member.

[0012] The shaft of the switching device may comprise an aperture adapted for selectively wedging and unwedging the shaft.

[0013] The present invention is also a switching device operable between different set-points comprising a rotary control handle adapted to switch between set-points, a sliding element adapted for protraction from a resting position to an elevated position to lock the control handle at any set-point and retraction from the elevated position to the resting position to unlock the control handle, a locking member comprising a shaft and a recess, said shaft is movable in response to the protraction and retraction of the sliding element and respectively into and out the recess so as to correspondingly lock and unlock the control handle, and a channel in communication with the recess or the shaft in which an external adjustable member is insertable to disable the protraction of the sliding element at a designated set-point in a normal course of operation.

[0014] The switching device may further comprise a storage recess adapted for receiving the adjustable member.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] Embodiments of the invention will be better understood and readily apparent to one of ordinary skill in the art from the following written description, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 shows a plan view of an embodiment of the invention.

Figure 2 shows a cross-sectional perspective view of the embodiment as seen from line A-A' of Figure 1 with a sliding element (a) retracted; and (b) extended.

Figure 3a shows a cross-sectional perspective view of the embodiment as seen from line A-A' of Figure 1 with the sliding element extended and a padlock (in ghost).

Figure 3b shows a plan view of the embodiment as seen from line D-D' of Figure 3a with the padlock (in ghost).

Figure 4 shows a bottom perspective view of an embodiment as seen from line C-C' of Figure 2b: (a) without an adjustable member; and (b) with an adjustable member.

Figure 4c shows a cross-sectional perspective view of the embodiment as seen from line E-E' of Figure 4b with the adjustable member.

Figure 4d shows a perspective view of an embodiment of the adjustable member in Figure 4b.

Figure 5a shows a bottom perspective view of another embodiment of the invention as seen from line C-C' of Figure 2b with an adjustable member at a first position.

Figure 5b shows a perspective view of an embodiment of the adjustable member in Figure 5a.

Figure 5c shows an expanded cross-sectional perspective view of the embodiment of the invention as seen from line F-F' of an encircled area 51 in Figure 5a.

Figure 5d shows a bottom perspective view of the embodiment of the invention as seen from line C-C' of Figure 2b with the adjustable member at a second position.

Figure 5e shows an expanded cross-sectional perspective view of the embodiment of the invention as seen from line G-G' of an encircled area 53 in Figure 5d.

Figure 6 shows a bottom perspective view of yet another embodiment of the invention as seen from line C-C' of Figure 2b (orientated 90° clockwise) with an adjustable member (a) removable from the embodiment; and (b) at a first position.

Figure 6c shows a perspective view of an embodiment of the adjustable member in Figure 6a or 6b.

Figure 6d shows an expanded cross-sectional view of the embodiment of the invention as seen from line H-H' of an encircled area 61 in Figure 6b.

Figure 6e shows a bottom perspective view of the embodiment of the invention as seen from line C-C' of Figure 2b (orientated 90° clockwise) with the adjustable member.at a second position.

Figure 6f shows an expanded cross-sectional view of the embodiment of the invention as seen from line I-I' of an encircled area 63 in Figure 6e.

Figure 7 shows a bottom view of yet another embodiment of the invention as seen from line C-C' of Figure 2b (orientated 90° clockwise) with an adjustable member rotated (a) to a first position; and (b) to a second position.

Figure 7c shows a perspective view of an embodiment of the adjustable member in Figure 7a or 7b.

Figure 7d shows an expanded cross-sectional side view of the embodiment of the invention as seen from line J-J' of an encircled area 71 in Figure 7a.

Figure 7e shows an expanded cross-sectional side view of the embodiment of the invention as seen from line K-K' of an encircled area 73 in Figure 7b.

Figure 7f shows a flow diagram containing the bottom view of the embodiment of the invention as seen from line C-C' of Figure 2b (orientated 90° clockwise) with the adjustable member (i) rotated to the second position at a first location; (ii) rotated to the first position at the first location; (iii) rotated to the first position at a second location; and (iv) rotated to the second position at the second location.

Figure 8 shows an expanded cross-sectional side view of yet another embodiment of the invention as seen from line B-B' of an encircled area 11 in Figure 1 with a shaft (a) wedged; and (b) unwedged.

Figure 9 shows an expanded cross-sectional side view of yet another embodiment of the invention as seen from line B-B' of an encircled area 11 in Figure 1 with a shaft (a) wedged; and (b) unwedged.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0016] An embodiment of the invention is a switching device with a locking feature and a reversible operation of a padlocking feature at a designated set-point, wherein the switching device is preferably a rotary switch. With reference to the drawings,

[0017] Figure 1 shows a switching device 100 comprising a rotary control handle 102, a sliding element 104 and a housing 106. This switching device 100 may be mounted on the external surface of a chassis of an electric device such as a motor control or a circuit breaker (not shown in the drawings) and adapted to connect to the electric device.

[0018] In the preferred embodiment, the rotary control handle 102 is rotatable between a first set-point (as shown in Figure 1) and a second set-point, wherein the handle is orientated at 90° clockwise with respect to that shown in Figure 1. The first and second set-points correspond to an "ON" position and an "OFF" position of the switching device 100. In this embodiment, Figure 1 shows the control handle 102 positioned to a designated set-point of the "ON" position.

[0019] In a preferred embodiment of Figure 2a, the cross-sectional perspective view of the switching device 100 with the control handle 102 positioned to the designated "ON" position shows an arrangement of the sliding element 104 coupled to an actuator 200 which is in turn

coupled to a shaft 202. Upon pushing the sliding element 104 in a downward direction as indicated by a directional arrow 20, the shaft 202 is retracted out of a recess 204 via the actuation of the actuator 200. In this embodiment, the recess 204 is formed in the housing 106.

[0020] When the sliding element 104 is lifted in an upward direction as indicated by a directional arrow 22, the shaft 202 is protracted into the recess 204 as seen in Figure 2b. In this configuration, the control handle 102 is locked at the designation "ON" position; thereby disabling switching to a different set-point. A padlock 300 (as shown in ghost in Figure 3a) may be used to maintain the protraction of the shaft 202 into the recess 204 and correspondingly keep the control handle 102 in the locked position. Figure 3b shows a top view of the switching device 100 with the sliding element 104 locked by the padlock 300 (in ghost).

[0021] The present invention of a switching device allows a user to have a choice to hinder or disallow the ability to lock a sliding element of the switching device with a padlock by disabling the protraction of a shaft, which is in communication with sliding element, into a recess. The user can also choose to allow this ability to lock a sliding element of the switching device with a padlock again using the same switching device by enabling the protraction of the shaft into the recess. The disabling-enabling of the protraction of the shaft depends on the user's requirements and is reversible, that is to say, the user can toggle between disabling and enabling, and vice versa. Such a switching device provides a convenient, user-selectable and reversible way of choosing the function of padlocking at a designated set-point, more specifically at the "ON" position.

[0022] Figures 4a-4d show an embodiment of the invention to reversibly disable and enable the protraction of the shaft 202 (not shown in Figure 4a). In Figure 4a, the bottom view of the embodiment shows the housing 106 comprising the recess 204, which runs through to the back of the housing 106. In Figure 4b, a means to disable the protraction of the shaft 202 (not shown in Figure 4b) which includes an adjustable member 400 is insertable into and removable from the recess 204 (not shown in Figure 4b), accessing from the back of the housing 106.

[0023] As illustrated in Figure 4c, with the adjustable member 400 inserted into the recess 204 (not shown in Figure 4c), the shaft 202 is blocked from entering into the recess 204 by the adjustable member 400. This, in turn, prevents the sliding element 104 from being lifted in an upward direction as indicated by a directional arrow 40. Failure to lift the sliding element 104 away from the control handle 102 would result in having insufficient space to accommodate the padlock 300 (not shown in Figure 4c).

[0024] An embodiment of the adjustable member 400 is preferably a cylindrical rod as shown in Figure 4d. The adjustable member 400 of the cylindrical rod comprises a body 402 with a ring 404 positioned axially along the body 402 and a head 406 which is located at one end of the body 402. The head 406 and the ring 404, each has a circumference larger than the circumference of the body 402. Together with reference to Figure 4c, the body 402 is insertable into the recess 204 (not shown in Figure 4c). Upon full insertion, the body 402 comes into contact with the shaft 202; thereby blocking the shaft 202 and disabling the protraction of the shaft 202.

[0025] The ring 404 is used to wedge the adjustable member 400 against the housing 106. The head 406 facilitates easy insertion and extraction of the adjustable member 400 into and out the recess 204 (not shown in Figure 4c). The body 402 of the adjustable member 400 has an overall height that is comparable the total length of the recess 204. Upon full insertion into the recess 204, the head 406 of the adjustable member 400 is flushed with the back surface of the housing 106.

[0026] The recess 204 may also be in communication with a channel or may form part of a channel (not shown). The channel allows the adjustable member 400 to be inserted to disable the protraction of the sliding element 104 at the designated set-point in a normal course of operation. The adjustable member 400 may be an external adjustable member.

[0027] Another embodiment of the adjustable member 400 may preferably be a tubular rod (not shown in the drawings).

[0028] Figures 5a-5e show another embodiment of the invention to reversibly disable and enable the protraction of the shaft 202 (not shown in Figure 5a). In Figure 5a, the bottom view of the embodiment shows the housing 106 comprising a means to disable and enable the protraction of the shaft 202 (not shown in Figure 5a) which is an adjustable member 500.

[0029] An embodiment of the adjustable member 500 is a U-shaped element as shown in Figure 5b. The adjustable member 500 of the U-shaped element comprises a top blocking plate 504 and a bottom blocking plate 506. A plate recess 502 is disposed on the bottom blocking plate 506.

[0030] With reference to Figure 5c, the adjustable member 500 is slidable in an outward direction as indicated by a directional arrow 50 to a first position where the top blocking plate 504 is not placed along the path of the shaft 202 and the recess 204. As such, the protraction of the shaft 202 is enabled with the lifting of the sliding element 104; thereby allowing padlocking of the switching device 100 (not shown in Figure 5c).

[0031] In Figures 5d and 5e, the adjustable member 500 is slidable in an inward direction as indicated by a directional arrow 52 to a second position where the top blocking plate 504 is placed along the path of the shaft 202 and the recess 204. As such, the protraction of the shaft 202 is disabled as the top blocking plate 504 is in contact with the shaft 202 and therefore blocks the shaft 202 from entering into the recess 204; thereby disallowing the sliding element 104 to be lifted and correspondingly hindering the padlocking of the switching device

100 (not shown in Figure 5e).

[0032] The plate recess 502 is to facilitate easy handling of the adjustable member 500, more specifically, to allow the user to slide the adjustable member 500 without much difficulty, for example by using a flat screw driver to push on the plate recess 502. The plate recess 502 may also be used to wedge against the housing 106.

[0033] Based on a similar concept, instead of the slidable adjustable member, another embodiment of the present invention (not shown in the drawings) may comprise a rotatable adjustable member having a top blocking plate. In this embodiment, the adjustable member may be rotatable axially to bring its top blocking plate into a first position to block the entry of the recess and a second position that unblocks the entry.

[0034] Figures 6a-6f show yet another embodiment of the invention to reversibly disable and enable the protraction of the shaft 202 (not shown in Figure 6a). In Figure 6a, the bottom view of the embodiment shows the housing 106 comprising a recess 204, and a storage 602 which includes a storage recess 604. The housing 106 further accommodates a means to disable and enable the protraction of the shaft 202 (not shown in Figure 6a) which is an adjustable member 600.

[0035] Figure 6b shows the adjustable member 600 disposed within the storage recess 604 in a stored-away configuration. The adjustable member 600, being relatively small in size and removable from the switching device 100 may be easily misplaced during use. In the stored-away configuration, the adjustable member 600 may be stored safely within the switching device 100 for future use. This would advantageously reduce the risk of losing the adjustable member 600.

[0036] An embodiment of the adjustable member 600 is shown in Figure 6c. The adjustable member 600 comprises a body 606, a head 608 at one end of body 606 and a plurality of protruding members 610. The head 608 have a circumference larger than the circumference of the body 606 to facilitate easy insertion and extraction of the adjustable member 600 into and out the recess 204 (not shown in Figure 6c). In the stored-away configuration of Figure 6b, the protruding members 610 (not shown in Figure 6b) allow the adjustable member 600 to be wedged to the housing 106 in the storage recess 604 (not shown in Figure 6b). Preferably, the protruding members 610 are spring-biased or are made of a resilient material.

[0037] Figure 6d illustrates that in the stored-away configuration, upon lifting the sliding element 104, the shaft 202 is protracted into the recess 204 (not shown in Figure 6d) as indicated by a directional arrow 60.

[0038] Figures 6e and 6f show the adjustable member 600 disposed within the recess 204 (not shown in Figures 6e and 6f). The body 606 is insertable into the recess 204. Upon full insertion, the body 606 (not shown in Figures 6e and 6f) of the adjustable member 600 comes into contact with the shaft 202; thereby blocking the shaft 202 and disabling the protraction of the shaft 202 in a direction as indicated by a directional arrow 62 when attempting to lift the sliding element 104. The protruding members 610 (not shown in Figures 6e and 6f) allow the adjustable member 600 to be wedged within the recess 204.

[0039] Figures 7a-7f show another embodiment of the invention to reversibly disable and enable the protraction of the shaft 202 (not shown in Figure 7a). In Figure 7a, the bottom view of the embodiment shows the housing 106 comprising a storage 702 which includes a storage recess 704. The housing 106 further accommodates a means to disable and enable the protraction of the shaft 202 (not shown in Figure 6a), the means being an adjustable member 700. In Figure 7a, the adjustable member 700 is disposed within the recess 204 (not shown in Figure 7a) in a first position and rotatable along a direction as indicated by a directional arrow 70. Figure 7b shows the adjustable member 700 being rotated to a second position. The adjustable member 700 may be removed from the recess 204 and disposed within the storage recess 704 in a stored-away configuration (not shown).

[0040] An embodiment of the adjustable member 700 is shown in Figure 7c. The adjustable member 700 comprises a body 706, a head 708 at one end of body 706 and a retractable protruding element 710. The head 708 have a circumference larger than the circumference of the body 706 to facilitate easy insertion and extraction of the adjustable member 700 into and out the recess 204 (not shown in Figure 7c). The head 708 further comprises a slit 712 which allows the insertion of an external tool (not shown) such as a flat-head screwdriver to facilitate easy rotational action to the adjustable member 700.

[0041] For example, in a factory where the switching device 100 (not shown) is prepared for delivery purposes, the adjustable member 700 is inserted into the recess 204 in the orientation as shown in Figure 7a. Figure 7d shows the cross-sectional side view of the inserted adjustable member 700. The adjustable member 700 is then rotated to the orientation as shown in Figure 7b. Figure 7e shows the cross-sectional side view of the rotated adjustable member 700 wherein the retractable protruding element 710 is positioned aligned with a latching edge 714 of the housing 106 (not shown in Figure 7e). Such an arrangement of the latching edge 714 and the retractable protruding element 710 prevents the adjustable member 700 from accidental dropping off during delivery of the switching device 100 or when a person handling the switching device 100 starts pulling the sliding element 104 before installing the switching device 100 onto a door of the chassis encasing an electrical device (not shown in Figure 7). The switching device is usually delivered with the adjustable member 700 inserted into the recess 204; thereby disabling the protraction of the shaft 202 and preventing entry into the recess 204.

[0042] For use, a user may choose to disable the protraction of the shaft 202 (not shown) as illustrated in Figure 7b or enable the protraction of the shaft 202 (not shown) by performing the steps as illustrated in Figure 7f. The adjustable member 700 is rotated in a direction

as indicated by a directional arrow 72 to an orientation as shown in Figure 7f(ii). At this orientation, the adjustable member 700 is removable from the recess 204 (not shown) and placeable into the storage recess 704 as seen in Figure 7f(iii). By rotating the adjustable member 700 in a direction as indicated by a directional arrow 74, the adjustable member 700 is secured within the storage recess 704 as seen in Figure 7f(iv), whereby the retractable protruding element 710 (not shown in figure 7f) is latched within the storage recess 704. The switching device 100 is now in the stored-away configuration, wherein the protraction of the shaft 202 is enabled with the lifting of the sliding element 104 (not shown).

[0043] The arrangement of the latching edge 714 and the retractable protruding element 710 to prevent the adjustable member 700 from accidental dropping off or unintentional removal as described in Figure 7, may be realized in another embodiment (not shown in the drawings), wherein a latching edge or latching recess may be located on an adjustable member while a retractable protruding element may be located on a recess receiving the adjustable member instead. In this embodiment, the adjustable member may be releasably securable within the recess by performing similar steps as described in Figure 7f.

[0044] Figures 8a-8b show yet another embodiment of the invention to reversibly disable and enable the protraction of the shaft 202. In Figure 8a, the shaft 202 comprises two apertures 804, 806. Adjustable members such as wedging pins 800, 802 encased within the switching device 100 (not shown in Figures 8a and 8b) are inserted into the corresponding apertures 804, 806 in directions as indicated by respective directional arrows 80, 82. In this case, the shaft 202 is prevented from entry into the recess 204; thereby hindering the lifting of the sliding element 104 (not shown in Figures 8a and 8b).

[0045] In Figure 8b, the wedging pins 800, 802 are moved away from the shaft 202 in directions as indicated by respective directional arrows 84, 86. The shaft is now no longer being prevented from entering the recess 204.

[0046] Figures 9a-9b show another embodiment of the invention to reversibly disable and enable the protraction of the shaft 202, based on the similar working principle of the embodiment of Figures 8a-8b. In Figure 9a, the shaft 202 comprises a through-hole aperture 902. An adjustable member such as a wedging pin 900 is inserted through the through-hole aperture 902 in a direction as indicated by a directional arrow 90. The wedging pin 900 prevents the shaft 202 from entry into the recess 204. Figure 9b shows the wedging pin 900 removed from the through-hole aperture 902 in a direction as indicated by a directional arrow 92. In this case, the shaft is now allowed to enter the recess 204 upon lifting the sliding element 104 (not shown).

[0047] The embodiments described in Figures 8 and 9 may further comprise a channel in communication with the shaft 202. The aperture may form part of the channel. The channel allows the adjustable member to be inserted to disable the protraction of the sliding element 104 at the designated set-point in a normal course of operation. The adjustable member may be an external adjustable member.

[0048] It will be appreciated by a person skilled in the art that numerous variations and/or modifications may be made to the present invention as shown in the specific embodiments without departing from the spirit or scope of the invention as broadly described. The present embodiments are, therefore, to be considered in all respects to be illustrative and not restrictive.

Claims

1. A switching device operable between different set-points comprising:

   a rotary control handle adapted to switch between set-points;
   a sliding element adapted for protraction from a resting position to an elevated position to lock the control handle at any set-point and retraction from the elevated position to the resting position to unlock the control handle;
   a locking member comprising a shaft and a recess, said shaft is movable in response to the protraction and retraction of the sliding element and respectively into and out the recess so as to correspondingly lock and unlock the control handle; and
   means for selectively disabling the protraction of the sliding element at a designated set-point in a normal course of operation and selectively enabling the protraction when required.

2. The switching device as claimed in claim 1, wherein the means is an adjustable member for selectively preventing entry of the shaft into the recess and selectively allowing entry of the shaft into the recess.

3. The switching device as claimed in claim 2, wherein the adjustable member is insertable into the recess to block the entry of the recess and removable to unblock the entry.

4. The switching device as claimed in claim 3, wherein the adjustable member includes a cylindrical rod.

5. The switching device as claimed in claim 3, wherein the adjustable member includes a tubular rod.

6. The switching device as claimed in claim 2, wherein the adjustable member is slidable into a first position to block the entry of the recess and a second position that unblocks the entry.

7. The switching device as claimed in claim 2, wherein

the adjustable member is rotatable into a first position to block the entry of the recess and a second position that unblocks the entry.

8. The switching device as claimed in any one of claims 2-7, wherein the adjustable member further comprises a retractable protruding member adapted for releasably securing within the recess.

9. The switching device as claimed in any one of claims 2-7,
wherein the recess further comprises a retractable protruding member; and
wherein the adjustable member further comprises a latching recess adapted for receiving the retractable protruding member.

10. The switching device as claimed in any one of the preceding claims, wherein the shaft comprises an aperture adapted for selectively wedging and unwedging the shaft.

11. A switching device operable between different set-points comprising:

a rotary control handle adapted to switch between set-points;
a sliding element adapted for protraction from a resting position to an elevated position to lock the control handle at any set-point and retraction from the elevated position to the resting position to unlock the control handle;
a locking member comprising a shaft and a recess, said shaft is movable in response to the protraction and retraction of the sliding element and respectively into and out the recess so as to correspondingly lock and unlock the control handle; and
a channel in communication with the recess or the shaft in which an external adjustable member is insertable to disable the protraction of the sliding element at a designated set-point in a normal course of operation.

12. The switching device as claimed in any one of claims 2-11, further comprising a storage recess adapted for receiving the adjustable member.

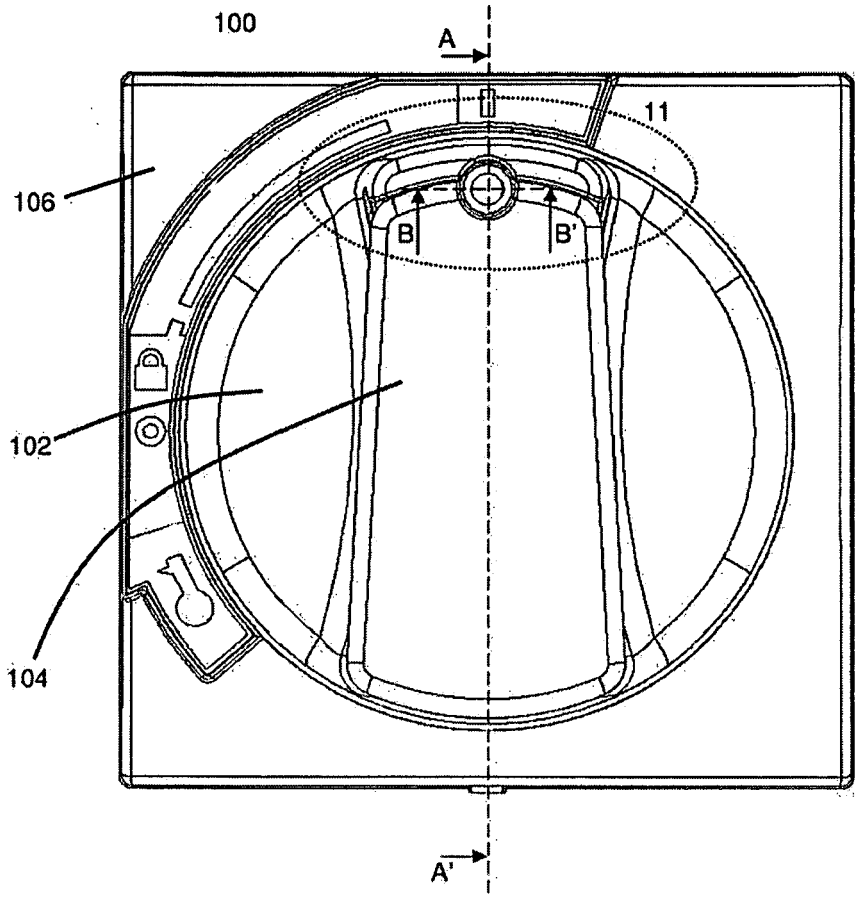


Figure 1

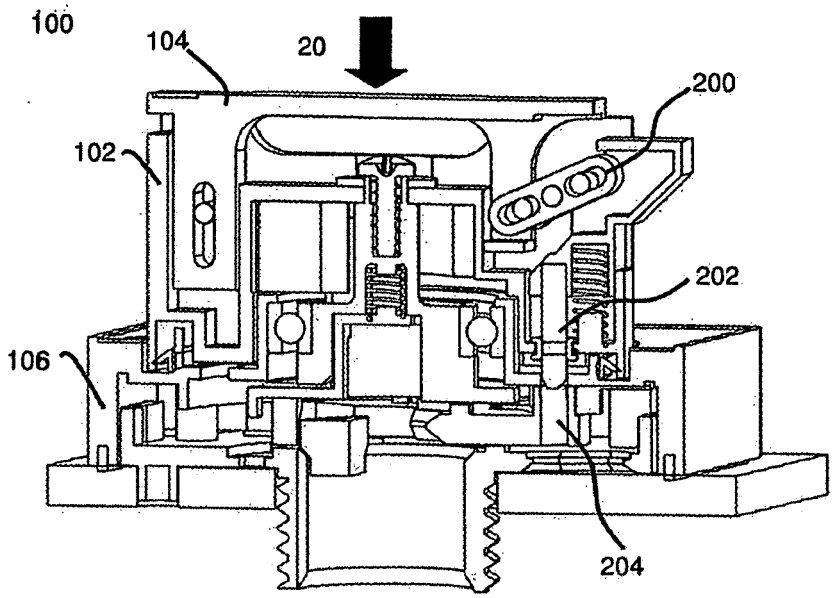


Figure 2a

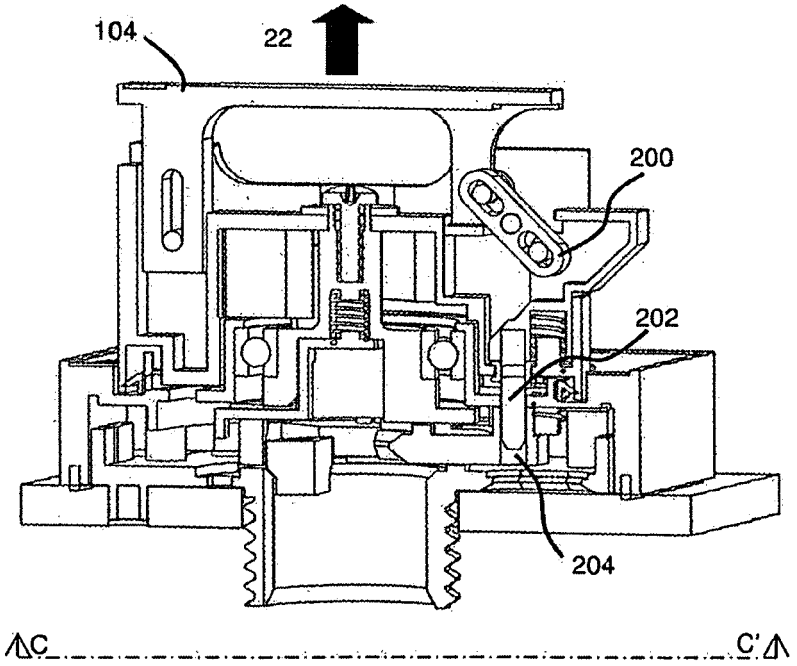


Figure 2b

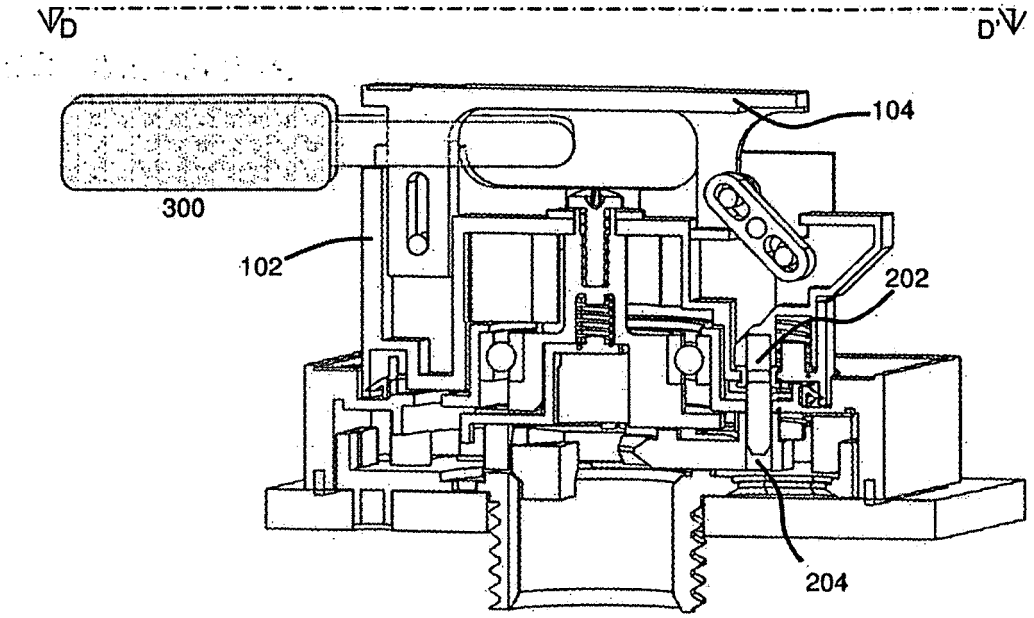


Figure 3a

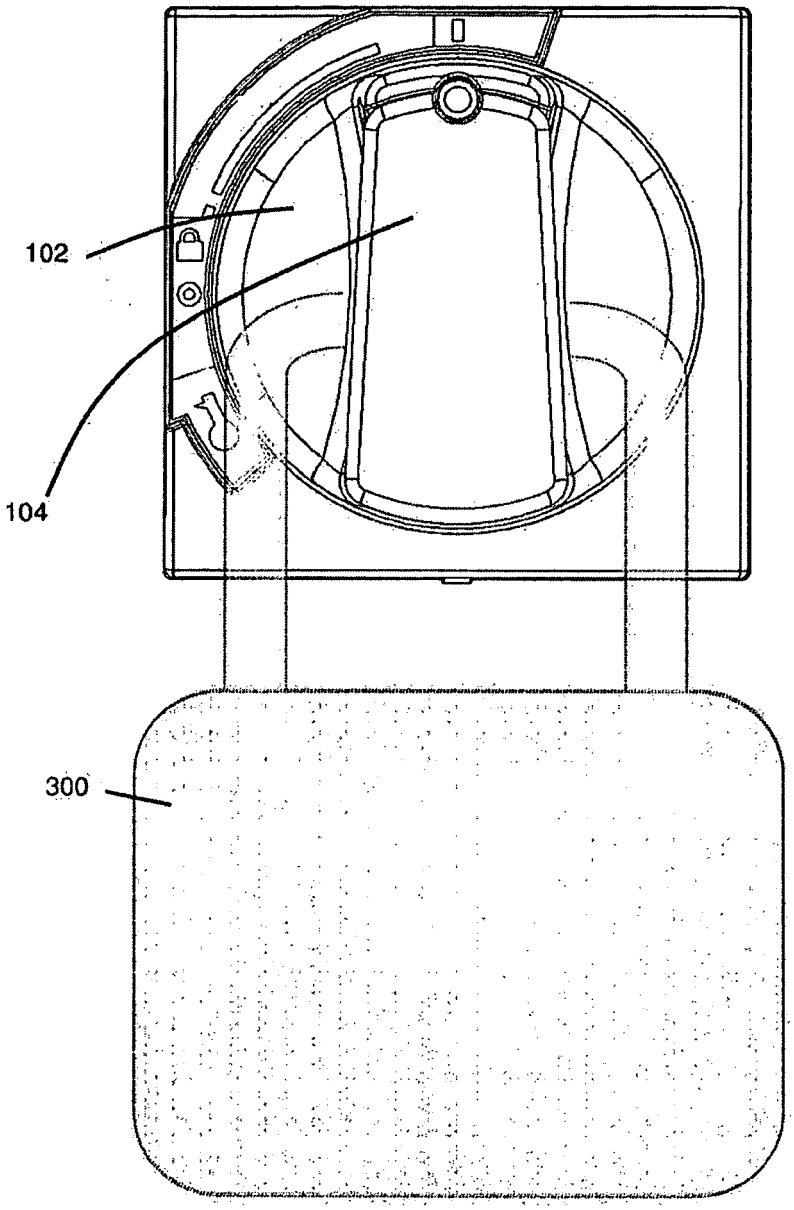


Figure 3b

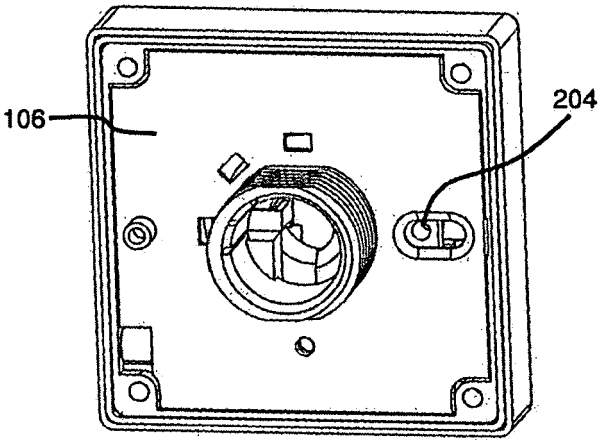


Figure 4a

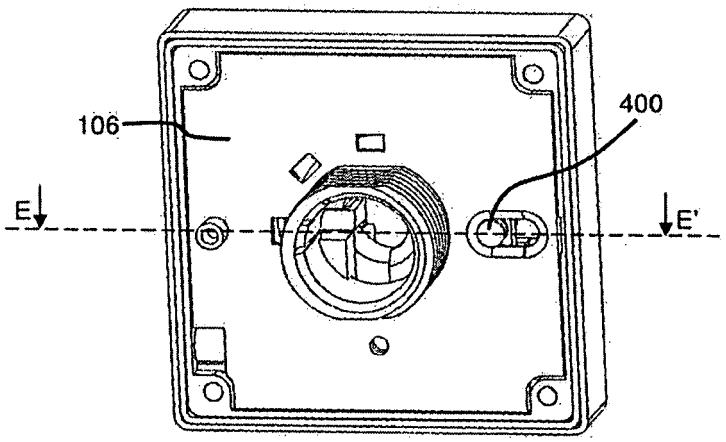


Figure 4b

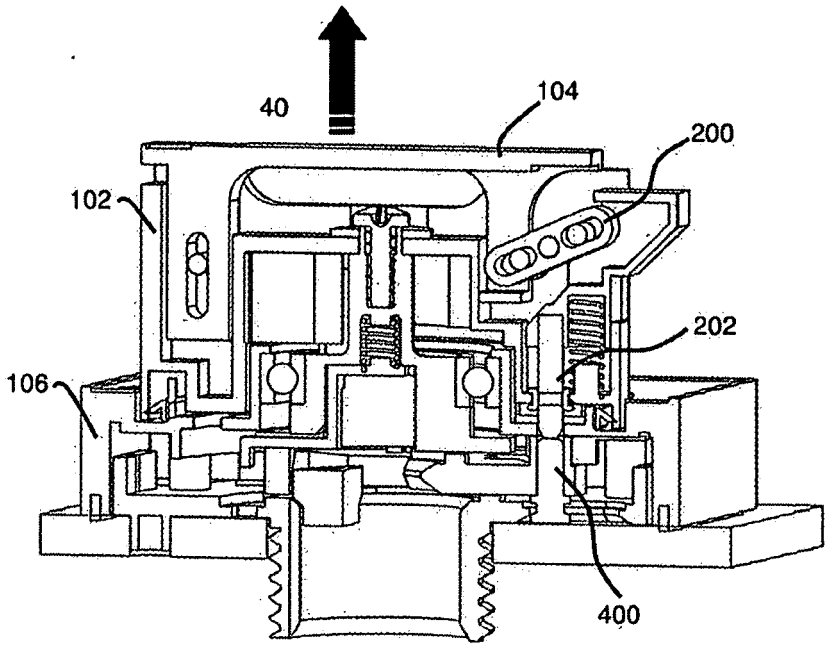
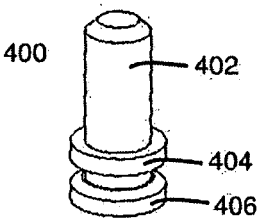


Figure 4c



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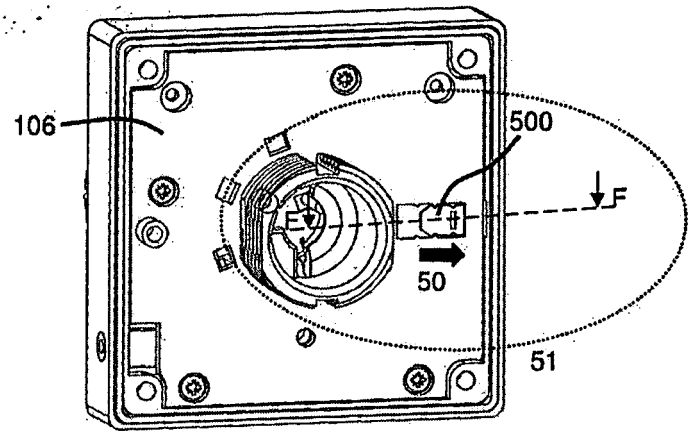
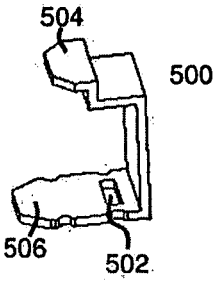


Figure 5a



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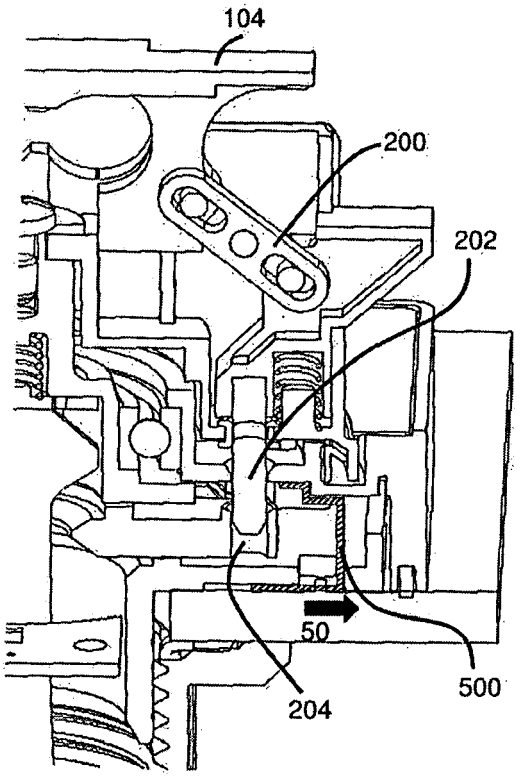

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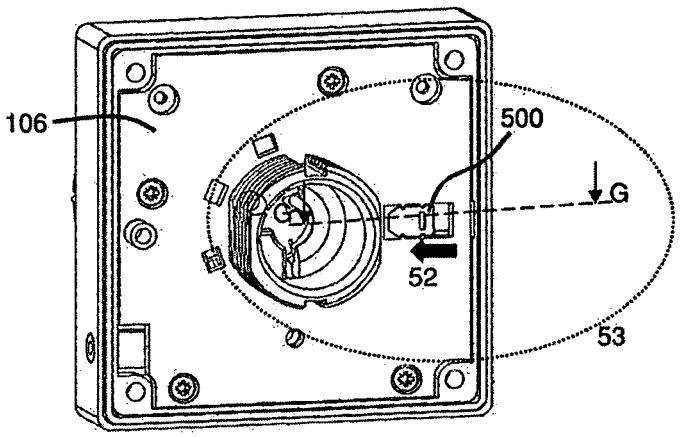


Figure 5d

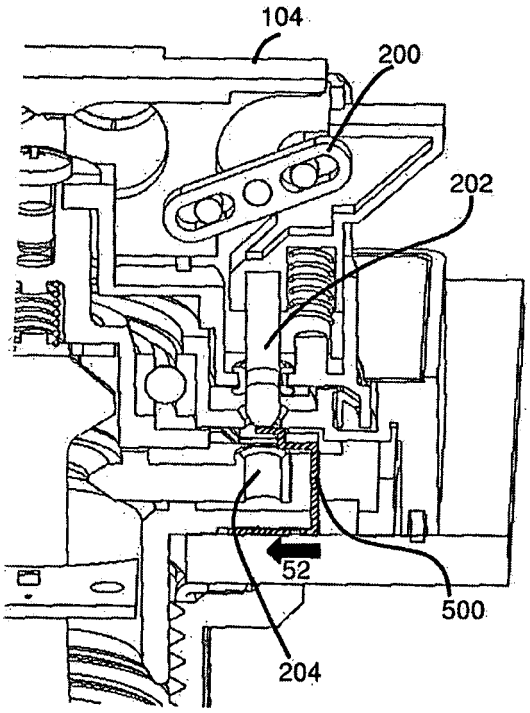


Figure 5e

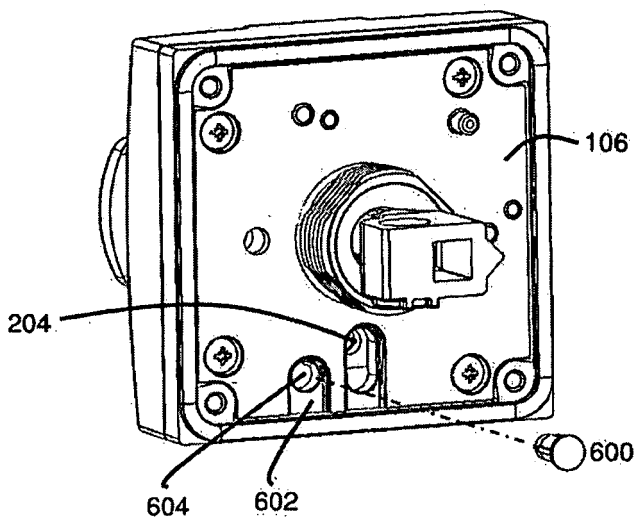
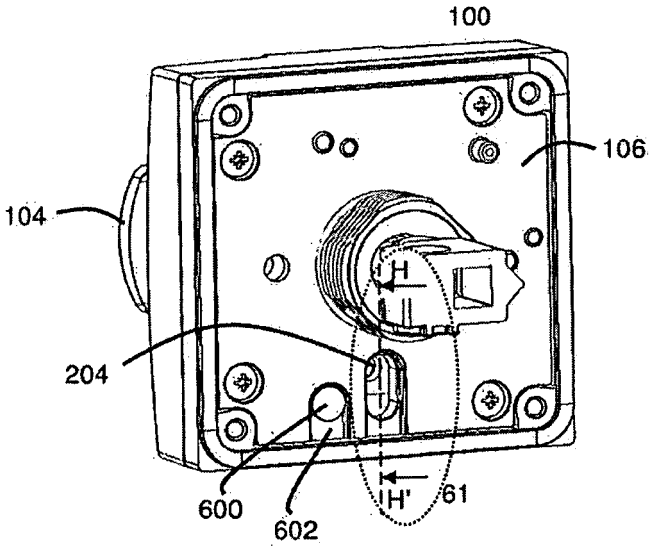


Figure 6a



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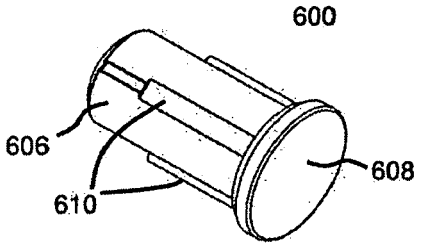

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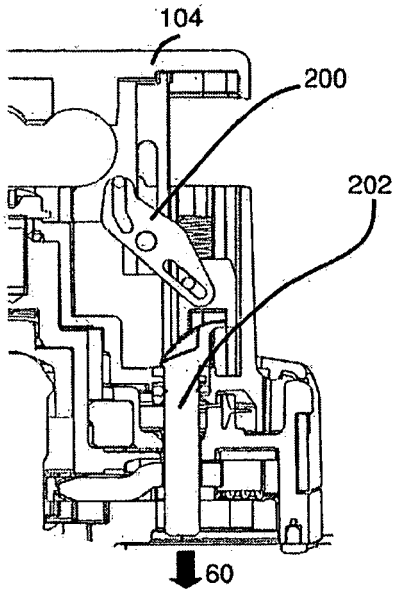
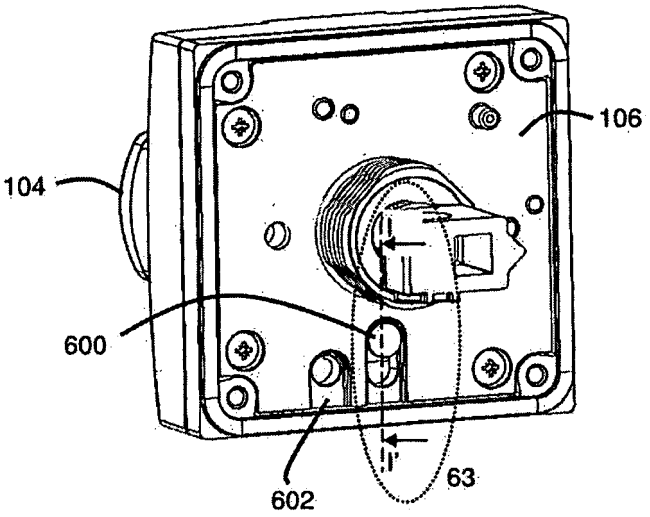


Figure 6d



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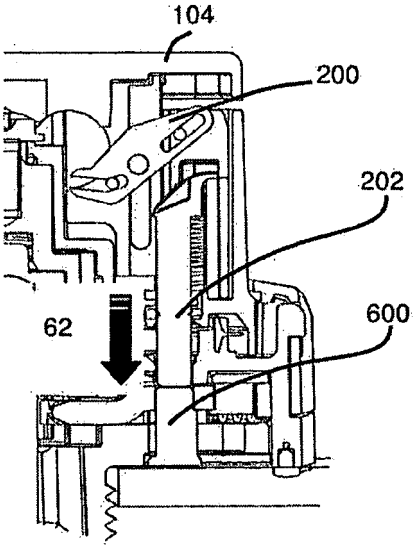

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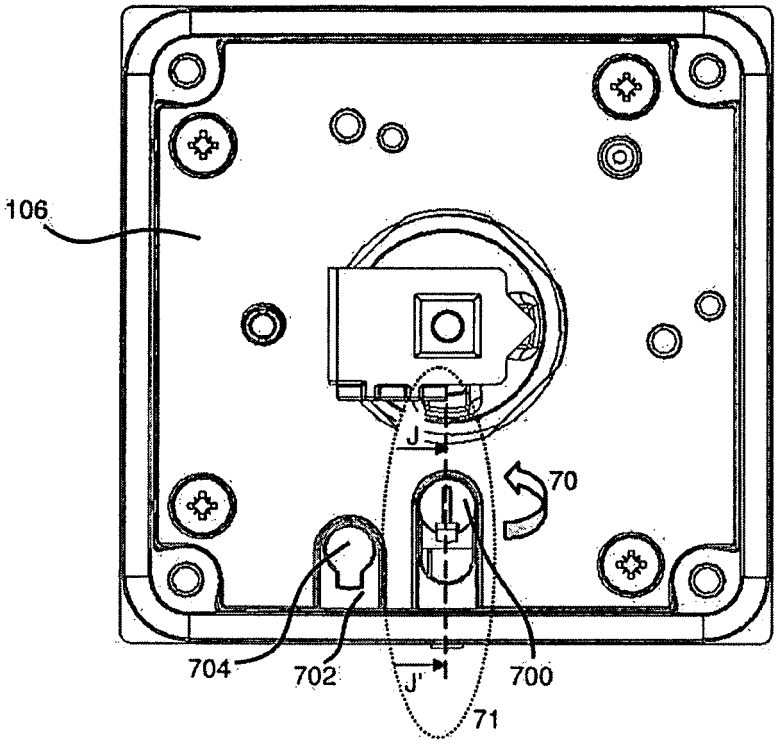


Figure 7a

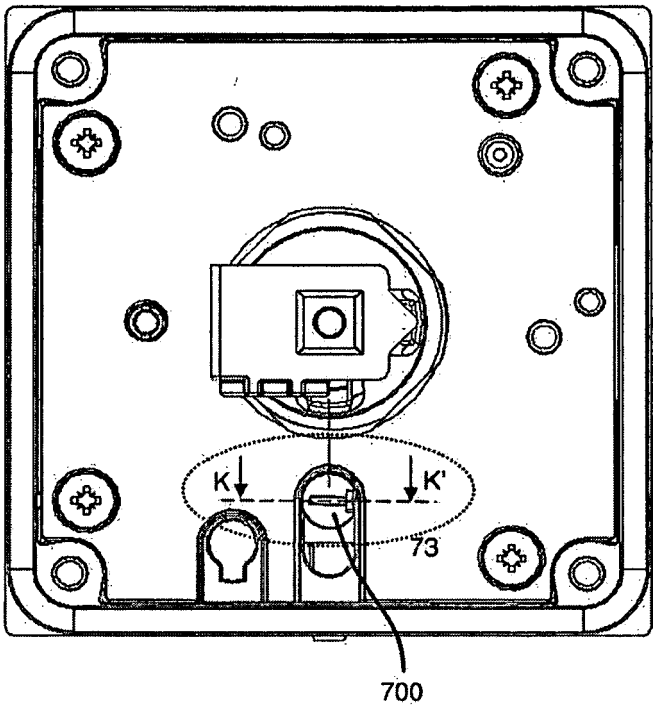
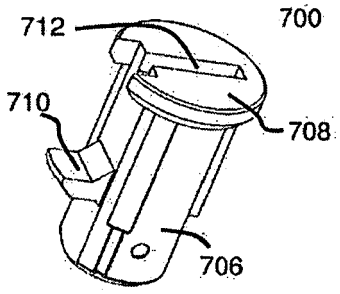


Figure 7b



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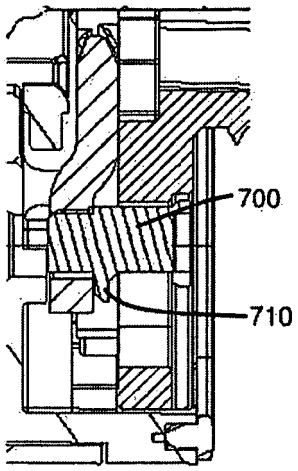

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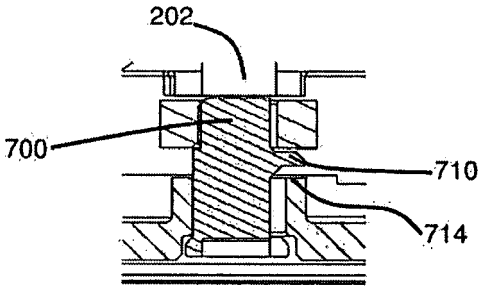

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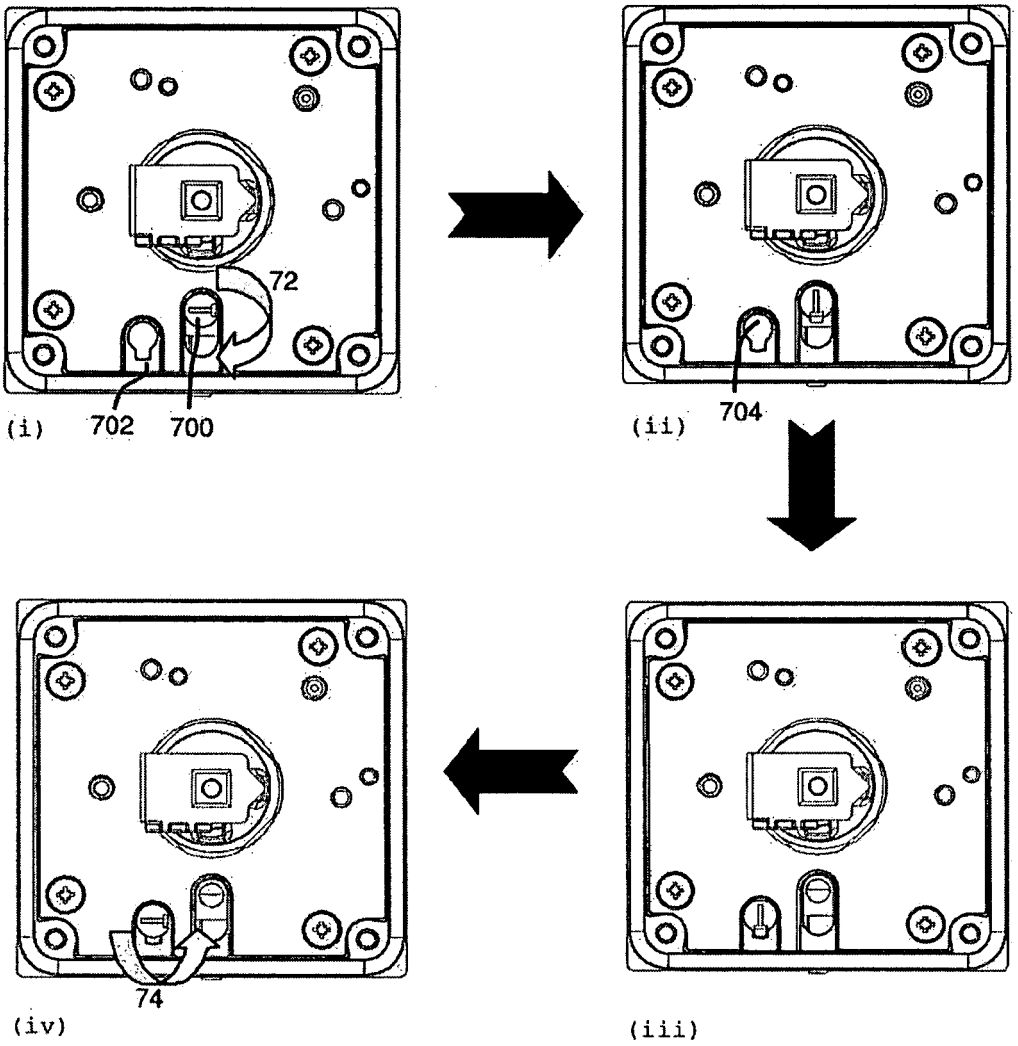

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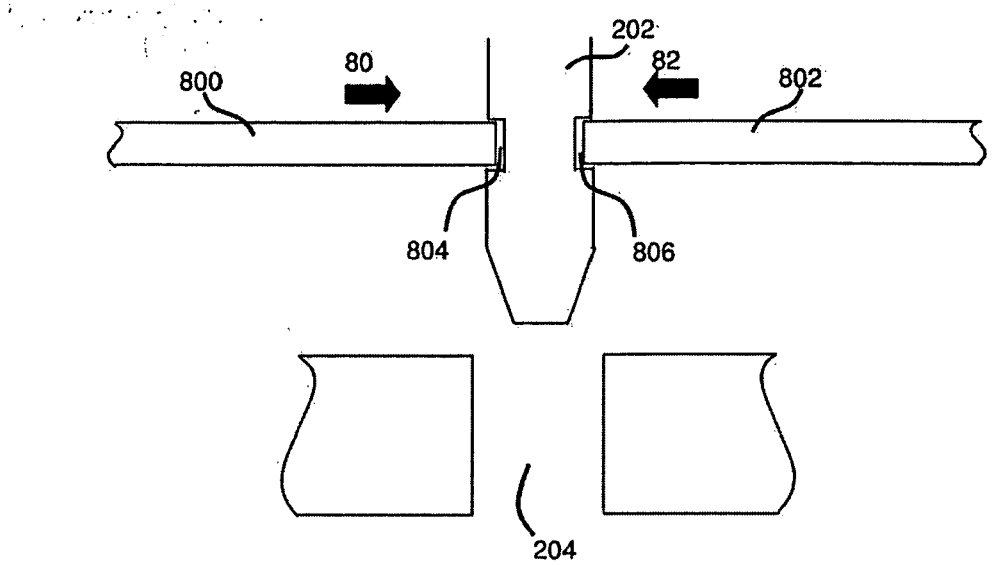

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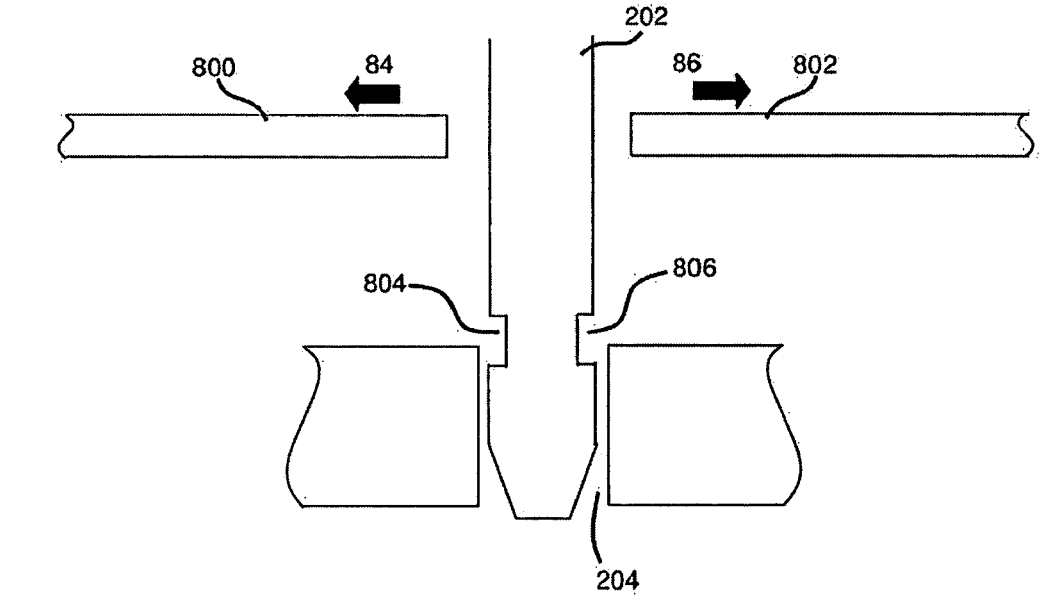

Figure 8b

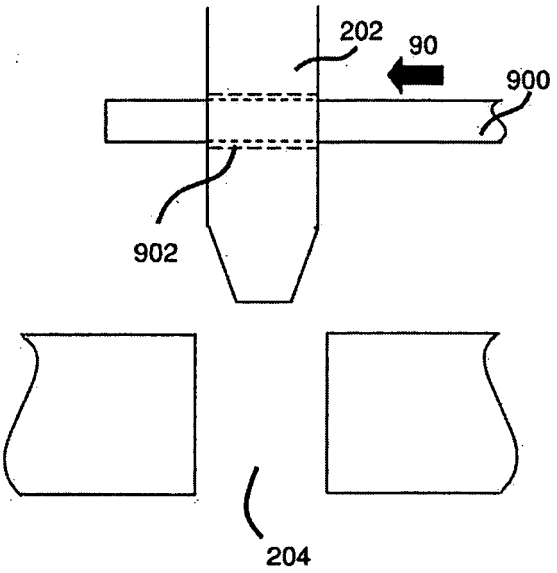

Figure 9a

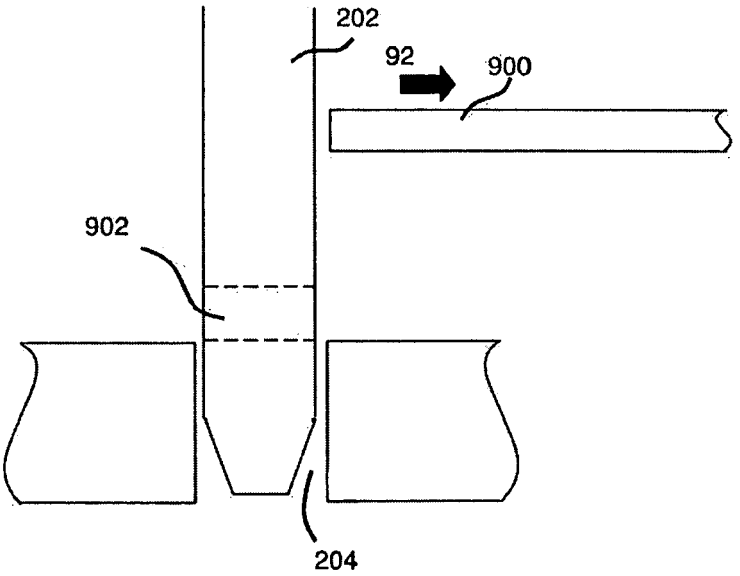

Figure 9b

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EUROPEAN SEARCH REPORT

Application Number
EP 11 35 4029

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	EP 1 729 313 A1 (SCHNEIDER ELECTRIC IND SAS [FR]) 6 December 2006 (2006-12-06) * paragraph [0032]; figures *	1,2,5-7, 11,12 3,4,8-10	INV. H01H9/28
Y	EP 1 271 585 A1 (LEGRAND SA [FR]; LEGRAND SNC [FR] LEGRAND FRANCE [FR]; LEGRAND SNC [FR) 2 January 2003 (2003-01-02) * paragraph [0060] - paragraph [0069]; figures *	3,4,8,9	
Y	DE 199 39 717 A1 (MOELLER GMBH [DE]) 22 February 2001 (2001-02-22) * column 5, line 27 - line 42; figures *	3,4	
Y A	JP 10 134693 A (FUJI ELECTRIC CO LTD) 22 May 1998 (1998-05-22) * the whole document *	10 7	

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H01H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	8 September 2011	Ramírez Fueyo, M

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