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(54) A switching device

(57) The present invention is directed to a switching device comprising a rotary control handle adapted to switch between set-points and 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. The protraction defines an opening capable of receiving one or more padlocks in the locked position. There is also provided a locking member that includes a shaft and a recess, said shaft can move in response to the protraction and retraction of the sliding element and respectively displaced into and out the recess so as to cause the control handle to be correspondingly locked and unlocked. The switching device is also provided with means for enabling the protraction of the sliding element once the shaft is disposed within the recess by keeping the shaft stationary.

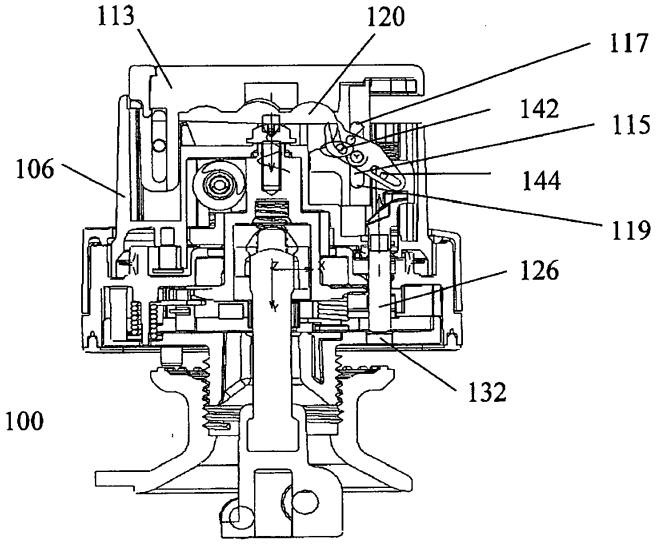

Fig. 1

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Description

Field of Invention

[0001] The present invention relates to a switching device with a sliding element adapted for protraction and thereby creating an opening capable of receiving one or more padlocks for locking the switching device. More particularly, the sliding element is capable of being snapped into a final elevated position to increase the opening for supporting bigger padlocks.

Background of Invention

[0002] In order to prevent accidental or unauthorized operation of a switch, some form of locking means is usually provided within the switch. One typical arrangement is to lock a rotary control handle of the switch in the locked position by means of one or more padlocks that are hooked though an opening formed on the rotary control handle. U.S. Patent Application No. 11/383,285 describes such a locking device.

[0003] Typically, a user would pull out a sliding element from the rotary control handle into protraction to form an opening capable of receiving one or more padlocks. However, the sliding element may only be pulled out or protracted into a limited height and typically facilitating entry by small padlocks. A switch that provides an increased protraction of the sliding element, for example, between 2.5mm to 8mm in height to support bigger padlocks would inevitably increase the overall height of the switch.

[0004] This is undesirable as the installation of tall switches on a chassis would result in high protruding parts projecting from the surface of the chassis which is space consuming and may cause obstructions and even dangers to passers-by knocking inadvertently against the switches and resulting in injuries or damages to the switches. For illustration, in the teaching of US Patent Application No. 11/279,673, there is disclosed a switch that includes a rotary control handle adapted to switch between set-points. There is provided a sliding element 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. The protraction defines an opening capable of receiving one or more padlocks in the locked position. There is also provided a locking member that includes a shaft and a recess, the shaft can move in response to the protraction and retraction of the sliding element and respectively into and out the recess so as to cause the control handle to be correspondingly locked and unlocked.

[0005] It is clear from this teaching that the sliding element will reach a protraction limit when the shaft reaches the recess and more particularly when the shaft reaches the bottom of the recess. When this occurs, the sliding element reaches its limit of protraction since any further pulling of the sliding element would result in the shaft abutting against the wall of the switch housing, thereby disabling any further protraction of the sliding element.

[0006] In order to extend the protraction of the sliding element so as to support the use of a bigger padlock, one possible solution is to increase the depth of the recess. This however would increase the overall height of the switch and is undesirable. Another possible solution is to have a recess with a through hole on the chassis door such that the shaft may protrude out of the recess and housing when extended protraction is required. However, such design is also undesirable due to safety concerns or customer inconvenience to drill another hole.

[0007] There is therefore a need for an improved switching device to address the problems mentioned above.

Summary of Invention

[0008] In accordance to one aspect of the present invention, there is provided a switching device operable between different set-points comprising a rotary control handle adapted to switch between set-points. The switching device also includes 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, said protraction defines an opening capable of receiving one or more padlocks in the locked position.

[0009] The switching device further comprises a locking member that includes a shaft and a recess, said shaft can move in response to the protraction and retraction of the sliding element and respectively displaced into and out the recess so as to cause the control handle to be correspondingly locked and unlocked. The switching device is also provided with means for enabling the protraction of the sliding element once the shaft is disposed within the recess by keeping the shaft stationary.

[0010] In a preferred embodiment, the means for protracting the sliding element once the shaft is disposed within the recess comprises an operating mechanism interacting, at one side, with the shaft and, at the other side, with the sliding element to provide a dual state of motion conversion and dwelling.

[0011] In a preferred embodiment, the operating mechanism comprises a member that includes an oblong opening at one side and a bent opening at the opposite side, said member is mounted so as to rotate about the control handle, wherein the shaft and the sliding element are each mounted so as to slide respectively along the oblong opening and the bent opening of the member.

[0012] In a preferred embodiment, the sliding element is protracted from the resting position to reach the elevated position in a snap-in manner.

[0013] In a preferred embodiment, the means for protracting the sliding element to reach a final elevated position is effected in a snap-in manner.

[0014] In a preferred embodiment, a biasing means in

the form of a spring is mounted on the shaft to bias the shaft to the unlocked position.

Brief Description of Drawings

[0015]

Fig. 1 shows a cross sectional view of a switch in accordance to a preferred embodiment of the invention;
Fig. 2a shows a front view of an operating mechanism coupled to a locking member;
Fig. 2b and 2c show a front view of variations of the operating mechanism; and
Fig. 3 - 6 show cross-sectional views of the preferred embodiment with a sliding element of the switch being pulled-up for locking.

Preferred Embodiments of Invention

[0016] The present invention, in accordance to one embodiment, comprises a switch 100 that includes a rotary control handle 106 adapted to switch between set-points. The rotary control handle 106 may be turned between 2 or more set-points that correspond to 2 or more states of an electrical system. For example, the rotary control handle 106 may be turned between 2 set-points that correspond to an "ON" state and an "OFF" state.

[0017] The switch 100 also includes a sliding element 113, formed within the rotary control handle 106 for protraction from a resting position to an elevated position to lock the control handle 106 at any set-point and retraction from the elevated position to the resting position to unlock the control handle 106. Once the rotary control handle 106 is locked, turning of the switch is disabled.

[0018] The protraction defines an opening 120 capable of receiving one or more padlocks in the locked position. The switch 100 further includes a locking member that comprises a shaft 126 and a recess 132, the shaft 126 can move in response to the protraction and retraction of the sliding element 113 and respectively into and out the recess 132 so as to cause the control handle 106 to be correspondingly locked and unlocked. The recess 132 may be formed on a non-moving body of the switch 100.

[0019] When the sliding element 113 is protracted, the shaft 126 is triggered such that it moves into the recess 132 and consequently, the movement or rotation of the rotary control handle 106 is disabled at this set-point. In order to lock the switch at the set-point and to prevent unauthorized turning of the switch, a padlock may be inserted into the opening 120. Conversely, when the sliding element 113 is retracted, the shaft 126 is triggered such that it moves out from the recess 132 and as a result, the rotation of the rotary control handle 106 is enabled. This allows the rotary control handle 106 to be switched to a different set-point. At each set-point, a recess may be provided to allow selective locking and unlocking of the rotary control handle 106.

[0020] The switch 100 is provided with means for protracting the sliding element 113 once the shaft 126 is displaced within the recess 132 without moving the shaft 126. This allows the sliding element 113 to be protracted while the shaft 126 remains stationary. At this stage, the protraction of the sliding element 113 results in no corresponding displacement on the shaft 126 and advantageously preventing the overshooting of the shaft 126 beyond the remit of the recess 132.

[0021] In a preferred embodiment of the invention, the means for protracting the sliding element 113 once the shaft 126 is disposed within the recess 132 comprises an operating mechanism that interacts, at one side, with the shaft 126 and, at the other side, with the sliding element 113. More preferably, the operating mechanism comprises a member 205 that includes an oblong opening 212 at one side and a bent opening 217 at the opposite side as shown in Fig. 2a. The member 205 may be mounted so as to rotate about the control handle 106, through for example, an axle 135. The shaft 126 and the sliding element 113 may each be mounted to the member 205 so as to slide respectively along the oblong opening 212 and the bent opening 217. Preferably, a coupling means such as for example, a pin 142 may be used for coupling the member 205 to the sliding element 113 through the bent opening 217 and another coupling means such as for example, a pin 144 may be used for coupling the member 205 to the shaft 126 through the oblong opening 212. The bent opening 217 is preferably formed of 2 oblong openings interposed at an angle to create a curve 223 as shown in Fig. 2b and 2c.

[0022] In a preferred embodiment of the invention, the sliding element 113 comprises an opening. Preferably, the opening 115 is oblong in shape. The member 205 is mounted to the rotary control handle 106 by a coupling mean, for example the axle 135, through the oblong opening 115 of the sliding element 113. When the sliding element 113 is in the resting position, the axle 135 is at one end 117 of the oblong opening 115.

[0023] The operating mechanism interacts with the sliding element 113 and the shaft 126 to provide a dual state of motion conversion and dwelling. In the state of motion conversion, the displacement of the sliding element 113 in one direction is converted into a displacement of the shaft 126 in an opposite direction. In the dwelling state, there is no displacement of the shaft 126 during movement of the sliding element 113. The curve 223 of the bent opening 217 provides a threshold point where the motion conversion state transits to the dwelling state and vice-versa.

[0024] In operation, the sliding element 113 is protracted from its resting position in direction A as shown in Fig. 3. The displacement of the sliding element 113 results in the member 205 rotating clockwise (relative to the figures used in the specification) on the axle 135 formed at the rotary control handle 106 and thus effecting a motion conversion wherein the displacement of the sliding element 113 in direction A is converted to a displacement

of the shaft 126 in an opposite direction B.

[0025] As the sliding element 113 is displaced in direction A, the oblong opening 115 of the sliding element 113 is displaced in the same direction and the end 117 of the oblong opening 115 is displaced from the axle 135.

[0026] In the motion conversion state, the pin 142 that is coupled to the sliding element 113 through the bent opening 217 travels along the bent opening to reach the threshold curve 223 of the bent as shown in Fig. 4. As the member 205 rotates beyond the threshold curve 223, the motion conversion state changes to the dwelling state as shown in Fig. 5. The transition also produces a snap-in effect in relation to the sliding element 113 as the pin 142 is guided by the opening 217 to move axially toward the end 225 of opening 217. As the pin 142 reaches the end 225 of the member 205, another end 119 of the oblong opening 115 of the sliding element 113 may simultaneously reach the axle 135. The sliding element 113 is thereby protracted from the resting position to reach its final elevated position in a snap-in manner.

[0027] In the dwelling state, the shaft 126 is disposed within the recess 132 and remains stationary relative to the moving sliding element 113 snapping into its final position. This allows the sliding element to be extended without causing the shaft 126 to overshoot beyond the remit of the recess 132. The fully extended sliding element 113 is as shown in Fig. 6.

[0028] When the sliding element 113 is retracted from its elevated position back to its resting position, the member 205 rotates counter-clockwise (relative to the figures used in the specifications) so that the pin 142 that is coupled to the sliding element 113 through the bent opening 217 travels along the bent opening to reach the threshold curve 223. As the member 205 rotates beyond the threshold curve 223 and moving toward the end 230 of opening 217, the dwelling state changes back to the motion conversion state. In this state, the shaft 126 is moved out of the recess 132 and back to its original position following the retraction of the sliding element 113.

[0029] In a preferred embodiment, biasing means such as for example, a spring may be coupled to the shaft to interact with the shaft such that during protraction of the sliding element 113, the spring is biased. Upon retraction of the sliding element 113, the spring provides a biasing that snaps the sliding element 113 back to its resting position.

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, said protraction defines an opening capable of receiving one or more padlocks in the locked position;
   a locking member that includes a shaft and a recess, said shaft can move in response to the protraction and retraction of the sliding element and respectively displaced into and out of the recess so as to cause the control handle to be correspondingly locked and unlocked; and
   means for enabling the protraction of the sliding element once the shaft is disposed within the recess by keeping the shaft stationary.

2. The switching device of claim 1, wherein the means for enabling the protraction of the sliding element once the shaft is disposed within the recess comprises:

   an operating mechanism interacting, at one side, with the shaft and, at the other side, with the sliding element to provide a dual state of motion conversion and dwelling.

3. The switching device of claim 2, wherein the operating mechanism comprises:

   a member that includes an oblong opening at one side and a bent opening at the opposite side, said blade is mounted so as to rotate about an axle formed at the control handle,
   wherein the shaft and the sliding element are each mounted to the blade so as to slide respectively along the oblong opening and the bent opening of the blade.

4. The switching device of claim 2 or 3, wherein:

   in the motion conversion state, the displacement of the sliding element in a determined direction is converted into a displacement of the shaft in an opposite direction; and
   in the dwelling state, no displacement occurs at the shaft during displacement of the sliding element.

5. The switching device of claim 3 wherein the bent opening comprises two oblong openings interposed to form a curve.

6. The switching device of claim 1, wherein the means for enabling the protraction of the sliding element to reach a final elevated position is effected in a snap-in manner.

7. The switching device of claim 6, wherein the sliding element further comprises an opening (115), and the snap-in manner is effected by an axle (135) coupling

the rotary control handle and an operating mechanism through the opening (115) of the sliding element, wherein an end (119) of the opening (115) reaches the axle upon the sliding element reaching its final elevated position.

8. The switching device of any of the precedent claims, wherein a biasing means is mounted on the shaft to bias the shaft to the unlocked position.

9. The switching device of claim 8, wherein the biasing means includes a spring.

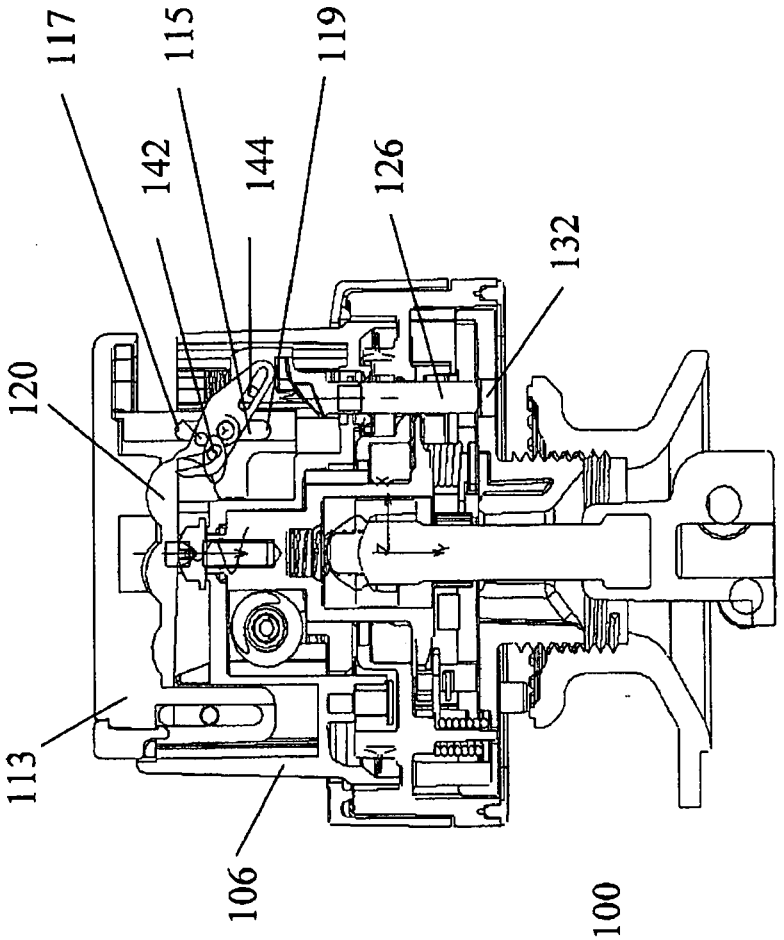

Fig. 1

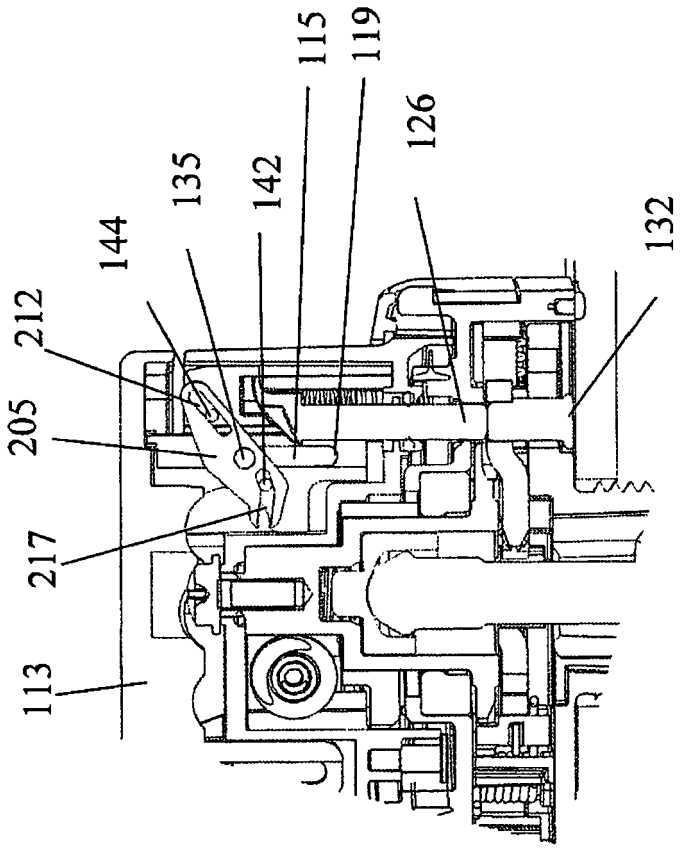

Fig. 2a

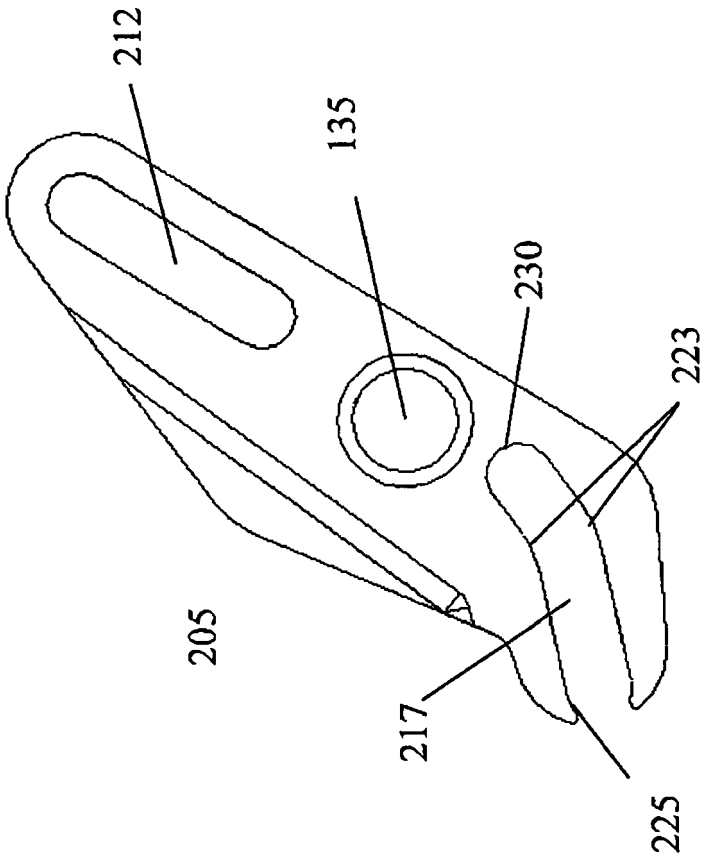

Fig. 2b

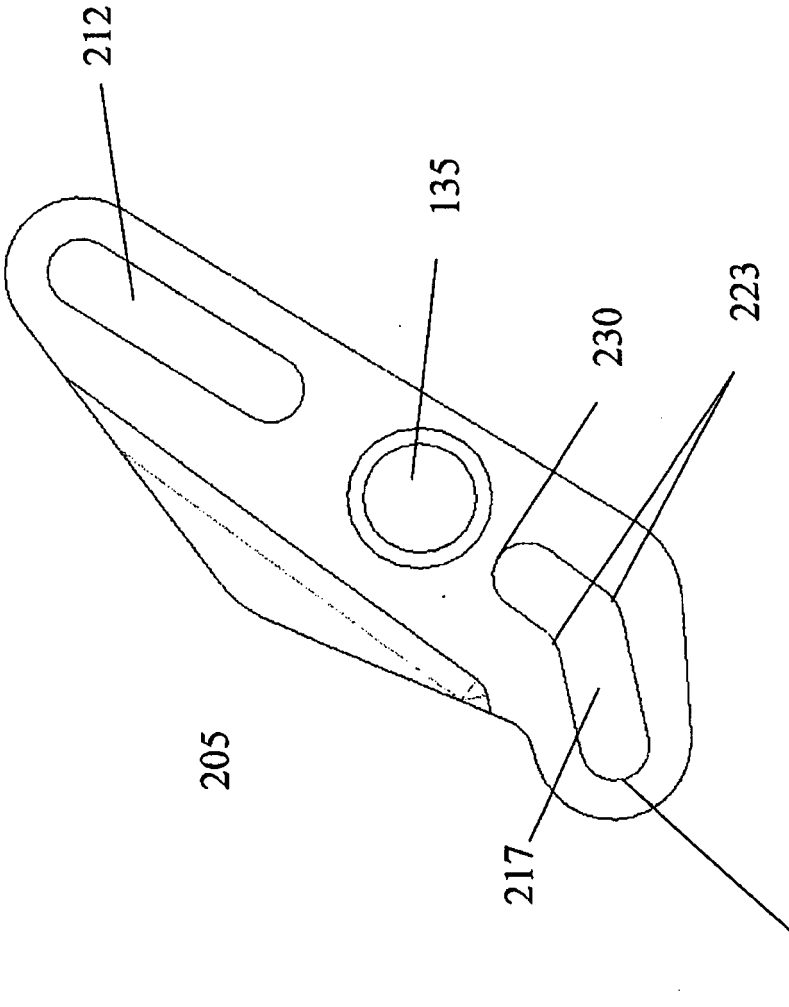

Fig. 2c

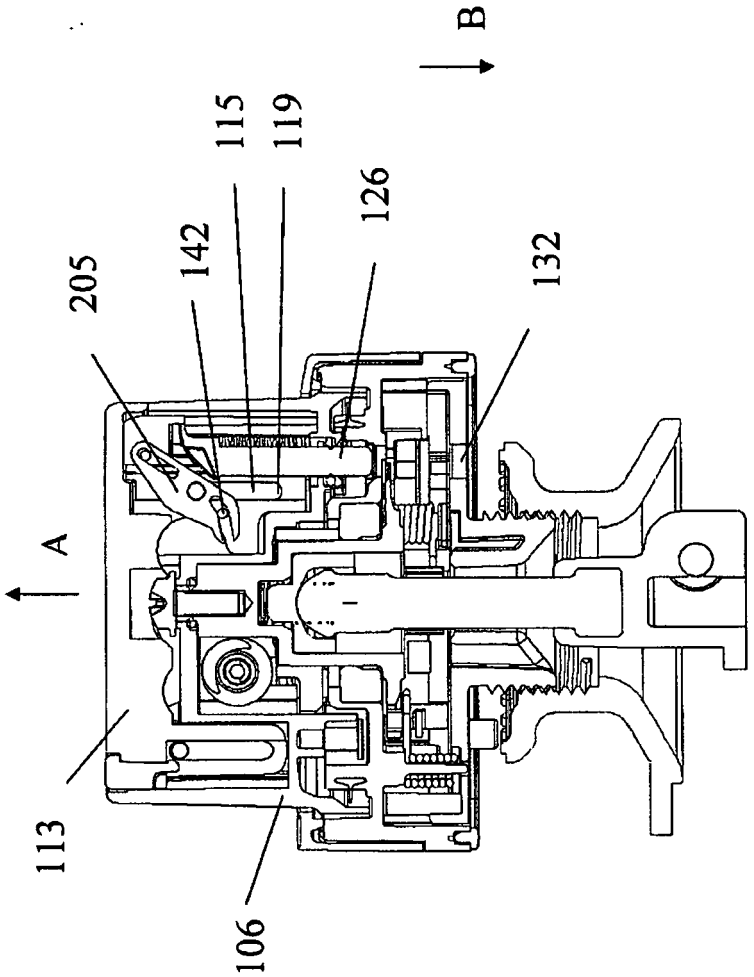

Fig. 3

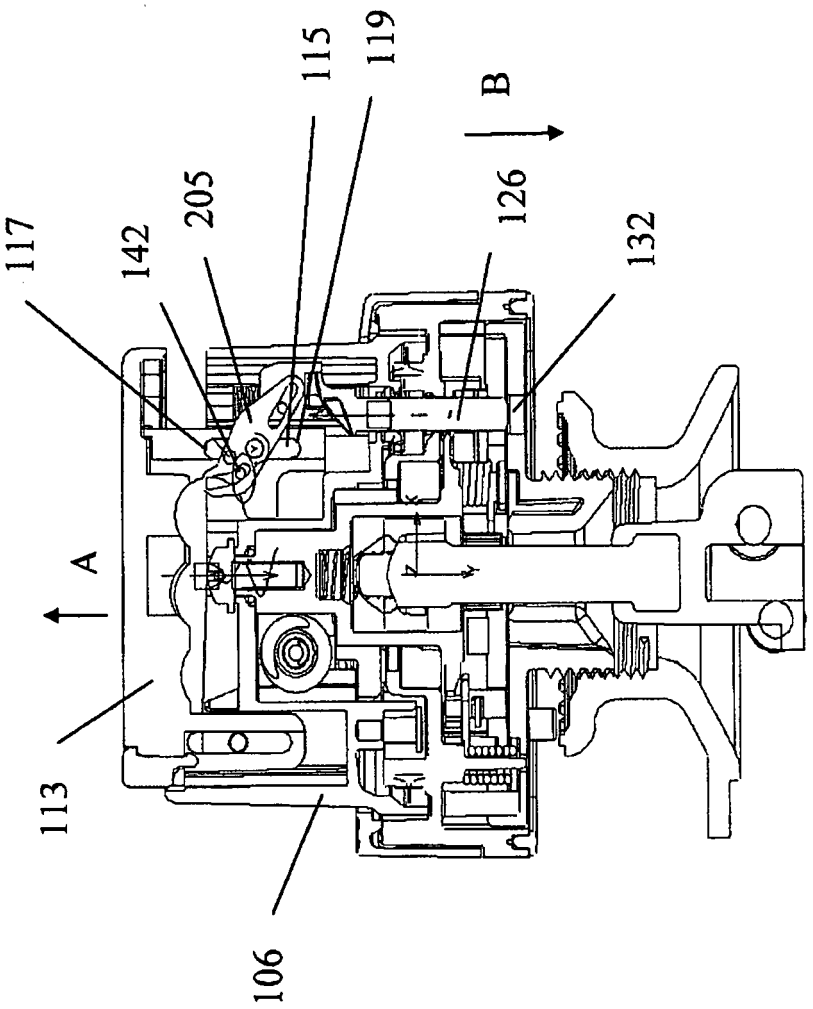

Fig. 4

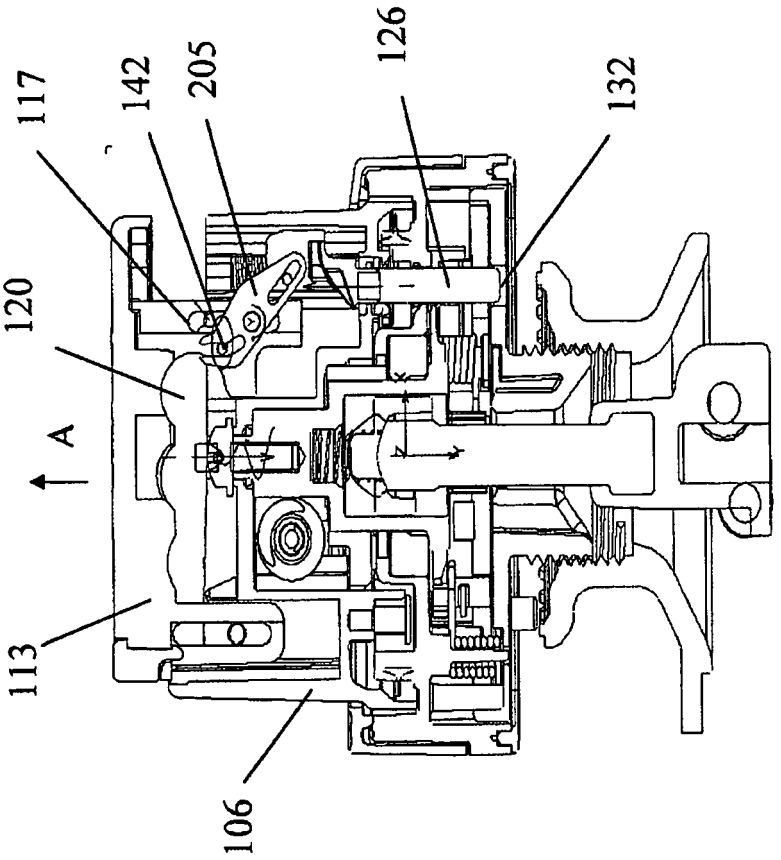

Fig. 5

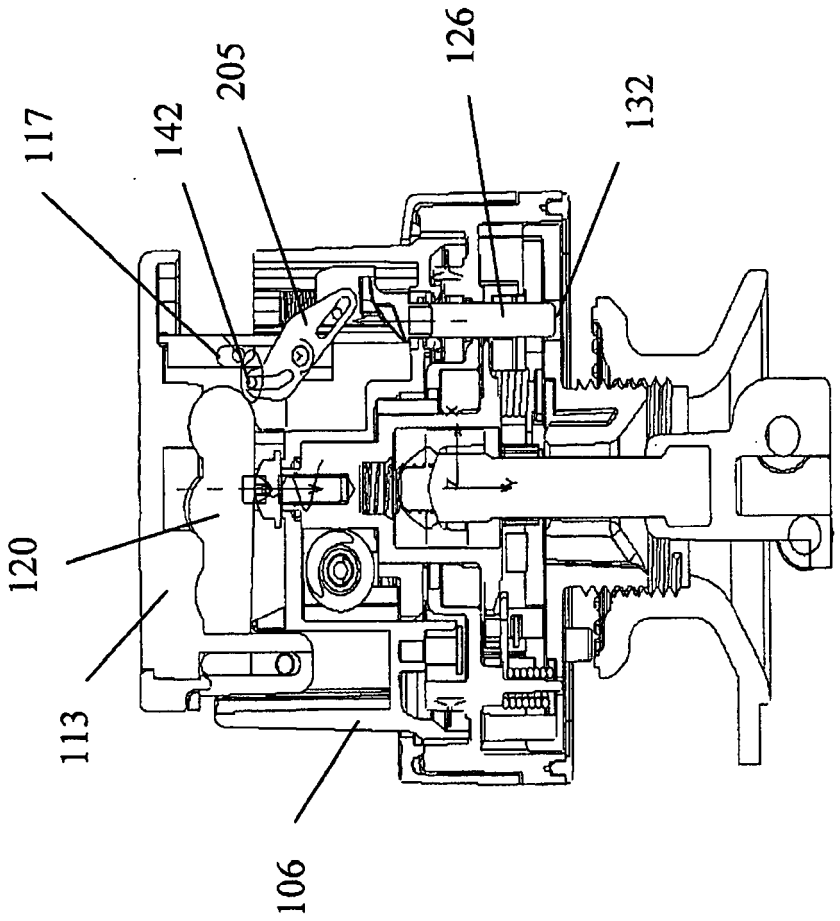

Fig. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 11 35 4028

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	DE 23 04 645 A1 (SIEMENS AG) 8 August 1974 (1974-08-08) * page 3, paragraph 2 - page 4, paragraph 1; figures 1,3,4 *	1,2,4,8, 9 3,5-7	INV. H01H9/28
X A	DE 196 03 238 C1 (KLOECKNER MOELLER GMBH [DE]) 10 April 1997 (1997-04-10) * column 3, line 31 - column 5, line 17; figures 1-3 *	1,2,6,8, 9 3-5,7	
Y A	EP 1 729 313 A1 (SCHNEIDER ELECTRIC IND SAS [FR]) 6 December 2006 (2006-12-06) * column 3, line 7 - column 5, line 9; figures 1A,1B *	3,5-7 1,2,4,8, 9	

TECHNICAL FIELDS SEARCHED (IPC)

H01H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	21 September 2011	Pavlov, Valeri

CATEGORY OF CITED DOCUMENTS

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21-09-2011

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 2304645 A1	08-08-1974	NONE	
DE 19603238 C1	10-04-1997	AT 188065 T	15-01-2000
		CA 2246544 A1	07-08-1997
		CN 1209901 A	03-03-1999
		WO 9728551 A1	07-08-1997
		EP 0878017 A1	18-11-1998
		HK 1018537 A1	30-11-2001
		JP 3176635 B2	18-06-2001
		JP 11505063 T	11-05-1999
		US 5998743 A	07-12-1999
EP 1729313 A1	06-12-2006	AT 381768 T	15-01-2008
		CN 1881496 A	20-12-2006
		DE 602006000338 T2	04-12-2008
		ES 2297806 T3	01-05-2008
		FR 2886756 A1	08-12-2006
		US 2006278505 A1	14-12-2006

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Patent documents cited in the description

- US 383285 A **[0002]**
- US 11279673 B **[0004]**