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(54) **An energy accumulator for actuating a switching device, a tap changer and a transformer**

(57) The invention relates to an energy accumulator for actuating a switching device. The energy accumulator includes a chargeable mechanical spring means (5), tensioning means (3) for charging the spring means (5), actuating means (4, 61, 62) for actuating the at least one switch and release means (73) for discharging the spring means (5).

According to the invention the tensioning means (3) includes a first linearly movable body (3) having drive means (31) connectable to a driving source (1) for applying a tensioning stroke to the first movable body (3), and having first spring support means (32). The actuating means includes a second linearly movable body (4) having cam profile means (61) and having second spring support means, and further includes cam follower means (62) which cam follower means (62) has connection means (23) to the switching device. The release means includes a latching mechanism (73) arranged to lock the second movable body (4) and to be brought to an unlocking position upon influence from the first movable body (3). The energy accumulator further includes guiding means (71, 72) arranged to guide the bodies in parallel. The spring means (5) is arranged between said first (32) and second spring support means.

The invention also relates to a tap changer and to a transformer.

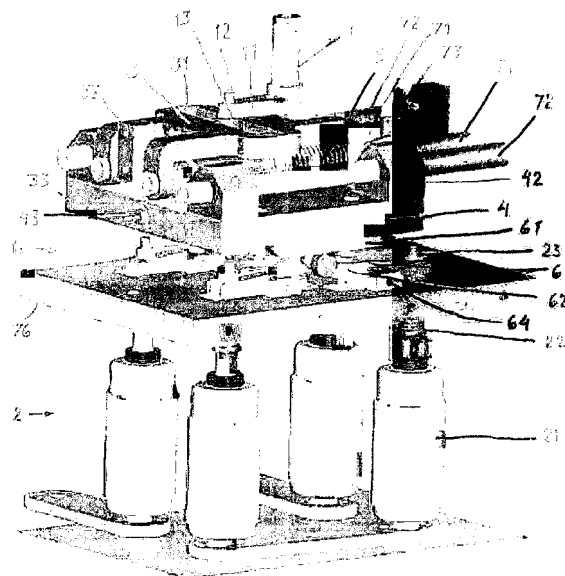


Fig. 2

Description

Field of invention

[0001] The present invention relates to an energy accumulator for actuating a switching device, which energy accumulator includes a chargeable mechanical spring means, tensioning means for charging the spring means, actuating means for actuating the switching device and release means for discharging the spring means.

[0002] The invention also relates to a tap changer and to a transformer.

Background of invention

[0003] A tap changer is commonly used in connection with a transformer in order to vary the transformation rate thereof. In a transformer with a tap changer one of the windings in the transformer has a fixed amount of turns connected to the circuit. The other winding has one fixed connection point, whereas the other connection point can be selected among a number of points to attain a required voltage. The selectable points may be located after each other along a portion of the winding corresponding to 70% to 100% of its full extension.

[0004] Upon a change in the load connected to the transformer or due to other influences it might be required to change the connection point. The need of changing the tap point is often triggered automatically in response to sensed parameters. Tap changing includes a plurality of manoeuvres including the opening and closing of switches e.g. via a spring loaded energy accumulator and moving a selector arm to a new connection point. The present invention is related to the energy accumulator for the actuation of the switches.

[0005] Closing and opening of the switches have to be performed very rapidly with a considerable force. Typically the time duration is in the order of 10 ms. It is therefore common that the actuation movement is driven by the release of a spring that has been charged with mechanical energy, whereby the spring can provide the necessary force and act rapidly. The supply of the energy, i.e. the charging of the spring can be made during a much longer period and thus at a much lower power. The advantages gained by using a spring loaded energy accumulator are thus evident, and this kind of actuation of the switches in an on load tap changer therefore is commonly used. Illustrative examples of the construction of such an energy accumulator are disclosed in EP 1138052, EP 1891652 US 3811022, US 6838629, WO 200175919, WO 2006133767, JP 11054342, JP 2008258259 and CN 2891237.

[0006] The energy accumulators according to prior art are generally complicated and includes a large part of components that are to move and to cooperate for receiving the energy at a low speed, store the energy and deliver the energy at high speed.

Summary of invention

[0007] The object of the present invention is to improve an energy accumulator of the kind in question, in particular to attain an energy accumulator that is simple and reliable and overcomes the drawbacks entailing known energy accumulators of this kind.

[0008] The invention is primarily intended for the actuation of switches in a diverter switch of an on load tap changer, but is not exclusively related to such an application.

[0009] The object of the invention is achieved in that an energy accumulator of the kind specified in the introduction of this application includes the specific features that the tensioning means includes a first linearly movable body having drive means connectable to a driving source for applying a tensioning stroke to the first movable body, and having first spring support means, the actuating means includes a second linearly movable body having cam profile means and having second spring support means, and further includes cam follower means arranged to cooperate with the cam profile means and which cam follower means has connection means to the switching device, the release means includes a latching mechanism arranged to lock the second movable body and to be brought to an unlocking position upon influence from the first movable body, and which energy accumulator further includes guiding means arranged to guide the first and second movable body in a respective linear movement, which linear movements are in parallel to each other, and in that the spring means is arranged between said first and second spring support means.

[0010] This general construction of the energy accumulator requires very few moving parts, results in a short mechanical transmission path for transferring the actuation power from its input to its output, and thereby can be made relatively compact. The low number of active components, the linear movement both for charging and discharging the spring means and the short transmission path makes the device very simple. This reduces the manufacturing and assembly costs, and leads to reduced need for maintenance and to a safe functionality at operation.

[0011] According to a preferred embodiment, the cam profile means includes a plurality of cam profiles arranged in parallel to each other and, the cam follower means includes a corresponding plurality of cam followers cooperating with a respective cam profile and being connectable to a respective switch of the switching device.

[0012] Applying a number of cam profiles and cam followers in a simple way adapts the energy accumulator to the actuation of a plurality of switches in a diverter switch. One actuating stroke of the energy accumulator thereby serves to actuate the plurality of switches. The required sequence and timing of the breaking/closing of the switches thereby can be easily obtained simply by designing the cam profiles and their relative positions

accordingly.

[0013] According to a further preferred embodiment, the second movable body has a first side on which said cam profile means is located and an opposite side on which said second spring support means is located, and in that the second movable body is made of an insulating material.

[0014] This very important embodiment of the invention provides an effective electricity barrier between separate parts of the energy accumulator.

[0015] According to a further preferred embodiment, the first side of the second movable body is facing toward the switching device and the opposite side is facing toward the spring means, the first movable body and said drive means.

[0016] The components connected to the drive source and related to the charging of the spring means may be at ground potential. According to this embodiment these components by the barrier formed by the second movable body will be electrically insulated from the switches and those components that are directly engaged in the actuation of these. The result is that the components on both sides of this barrier can be arranged at a relatively short distance from each other, which further contributes to a compact construction.

[0017] According to a further preferred embodiment, the spring means includes at least one spring device having a plurality of springs arranged in series to each other, and which springs have different spring characteristics.

[0018] Thereby the force/time relation of the spring means can be tailored to be optimized in accordance with the required pattern. Normally two springs arranged in series in a spring device will be appropriate.

[0019] According to a further preferred embodiment, the spring means includes a plurality of spring devices arranged in parallel to each other.

[0020] Thereby the movements at charging and discharging of the springs will be more stable and precise. It is preferred that the number of spring devices is two.

[0021] According to a further preferred embodiment, the guiding means includes a plurality of first guide bars for the first movable body and a plurality of second guide bars for the second movable body, which rods all are arranged in parallel to each other.

[0022] Separating the guiding means for the first movable body from the second movable body in this way simplifies to eliminate interference between the movements of these bodies. The use of a plurality of guiding rods contributes to a well defined movement of the respective body and eliminates the risk of tilting of any of them in a simple way. Two guide bars for each body is sufficient for attaining this.

[0023] According to a further preferred embodiment, each spring device includes at least one helical spring arranged coaxially around a respective bar of the first guide bars.

[0024] This type of springs is particularly adapted for the linear movement pattern of the invented energy ac-

cumulator. By arranging the springs around the guide bars, the springs will be directionally stabilized in alignment with the moving of the bodies.

[0025] According to a further preferred embodiment, the latching mechanism includes a pawl arranged to contact the second movable body and thereby prevent linear movement thereof, and whereby the first movable body during an end phase of its tensioning stroke is arranged to contact the pawl for actuating the pawl to release its contact with the second movable body.

[0026] The cooperation between the first and second movable bodies for discharging the spring means is thereby achieved in a simple and reliable way.

[0027] According to a further preferred embodiment, the drive connection means includes a groove on the first movable body, which groove is arranged to cooperate with a roller of a crank arm from the drive source such that a 180° rotation of the crank arm provides one tensioning stroke of the first movable body.

[0028] By this construction of the drive connection means an effective and simple conversion of a half turn rotational input can be performed. This is an adaption to an advantageous way of transferring the drive source movement via a gearbox to the energy accumulator, where the output of the gearbox has this 180° stroke.

[0029] According to a further preferred embodiment, each cam follower includes a cam roller arranged to be in contact with a respective cam profile and a rocking lever having a first end on which the cam roller is mounted and a second end connectable to an actuating rod of a switch, which lever has a first portion and a second portion forming an obtuse angle with the first portion, and which lever is provided with a spring pressing the cam roller into contact with the cam profile.

[0030] The rolling contact reduce losses and wear due to friction, and by the angled lever the transmission of the movement to an actuating rod of the switch that is perpendicular to the movement of the cam profile. Preferably the obtuse angle is within the range of 145° to 165°.

[0031] The invented tap changer includes an energy accumulator according to the present invention, in particular according to any of the preferred embodiments thereof.

[0032] The invented transformer includes a tap changer according to the present invention.

[0033] The invented tap changer and the invented transformer gain from the advantages of the invented energy accumulator and the preferred embodiments thereof, and which advantages have been described above.

[0034] The above described preferred embodiments of the invention are specified in the dependent claims. It is to be understood that further preferred embodiments of course can be constituted by any possible combination of the preferred embodiments above and by any possible combination of these and features mentioned in the description of examples below.

[0035] The invention will be further explained through

the following detailed description of examples thereof and with reference to the accompanying drawings.

Short description of the drawings

[0036]

Fig. 1 is an illustration of a tap changer of a kind for which the energy accumulator according to the present invention is suitable.

Fig. 2 is a perspective view of an energy accumulator according to the present invention.

Fig. 3 is a side view of parts of the energy accumulator of fig. 2.

Fig. 4 in a side view perpendicular to that of fig. 3 of parts of the energy accumulator of fig. 2.

Fig. 5 in a graph illustrates the movements of some components in the energy accumulator of fig. 2.

Description of example

[0037] Fig. 1 schematically illustrates an on load tap changer 100 of a kind for which the energy accumulator according to the present invention is intended. The tap changer 100 is connected to a regulating winding 105 of a transformer and has a set of different taps 110. The tap changer of Fig. 1 is of diverter switch type, and comprises a diverter switch 115 and a tap selector 120.

[0038] The tap selector 120 of Fig. 1 comprises two current collectors 125, two selector arms forming two moveable contacts 130 and further comprises a set of fixed contacts 135, where, each fixed contact 135 is arranged to be connected to one of the taps 110 of the regulating winding. The tap changer 100 of Fig. 1 has fifteen different fixed contacts 135, and the regulating winding 105 has fifteen taps 110. The tap changer 100 of Fig. 1 is mechanically linear in the sense that the current collectors 125 are implemented as linear rods, and the fixed contacts 135 are arranged in a linear fashion. The two current collectors 125 together form a current collector part.

[0039] The diverter switch 115 comprises two series connections of a main contact 140 and a transition contact 145, with transition resistor 150 connected in parallel with transition contact 145. It is common that the contacts are vacuum interrupters. Each of the series connections are, at one end, connected to a respective one of the two current collectors 125, and, at the other end, connected to an external contact 155 of the tap changer 100.

[0040] The moveable contacts 130 are, at one end, in electrical contact with a respective one of the current collectors 125. A selector arm 130 can move along the current collector 125 to which it is connected, in order to reach different positions, at which the other end of the moveable contact 130 is in electrical contact with one of the fixed contacts 135. The moveable contacts 130 could for example be sliding contacts arranged to slide along the current collectors 125, to allow for electrical connec-

tion between the current collectors 125 and the different fixed contacts 135. The driving of the moveable contacts 130 of Fig. 1 is arranged so that if one of the moveable contacts 130 is in contact with a fixed contact 135, connected to a first tap, the other moveable contact 130 is in contact with a fixed contact 135, connected to a tap 110 which is adjacent to the first tap 110.

[0041] By switching the main contacts 140 and transition contacts 145 in a conventional manner, one or the other of the moveable contacts 130 will be in electrical contact with the external contact 155, and thus provide an electrical path through the tap changer 100. Similarly, the two current collectors 125 will take turns at being part of the electrical path of the tap changer 100. The electrical path through the tap changer 100 ends at the external contact 155 at one end, and at the fixed contact 135 that is currently connected at the other end. An example of a diverter switch 115 is described in EP0116748. The diverter switch 115 of Fig. 1 is an example only, and any suitable type of diverter switch 115 can be used.

[0042] As mentioned above, the regulating winding 105 has a set of taps 110, which are shown to be connected to the fixed contacts 135 of the tap changer 100 via cables 160. The other end of the regulating winding 105 is provided with an external contact 165. Depending on which tap 110 is currently connected to a fixed contact 135, the electrical path between the external contacts 155 and 165 will include a different number of the regulating winding turns. The regulating winding 105 is often not seen as part of the tap changer 100, and has therefore been surrounded by a solid line in Fig. 1.

[0043] When it is required to change from one tap to another, the vacuum interrupters of the contacts 140 and 145 and those on the other current collector are to be closed and opened, respectively in a and certain sequence. This allows the selector arms with the movable contacts 130 to move to come into contact with the adjacent one of the fixed contacts 135. Closing and opening of the vacuum interrupters in the diverter switch 115 and movement of the movable contacts in the tap selector 170 has to be made in a certain time relation to each other. The actuation of the vacuum interrupters requires a rapid and strong actuation force, that normally is obtained by an energy accumulator having a spring that can be charged and discharged.

[0044] The energy accumulator according to the present invention has the function to provide actuation of the switches in the diverter switch. The aspects of a tap changer described above are generally known and are mainly for the purpose of explaining the context in which the invented energy accumulator operates.

[0045] The energy accumulator operating on vacuum interrupters in a diverter switch is illustrated in a perspective view in fig. 2. A drive shaft 1 is connected to a drive source via a gearbox (not shown) and provides the driving power to the energy accumulator. At the bottom of the figure is the diverter switch 2 with four vacuum interrupters 21 that are actuated by the energy accumulator. The

drive shaft 1 has a crank arm 11 with a pin 12 at its outer end. On the pin 12 a roller 13 is mounted and cooperates with a groove 31 in a first linearly movable body 3, which acts as a tensioning slide 3 for the energy accumulator. The tensioning slide 3 is arranged to move along a first pair of guide bars 71.

[0046] A second linearly moveable body 4 is arranged to move along a second pair of guide bars 72, which second body is a cam slide 4 provided with four cam profiles 61 on its side facing downwards in the figure. Spring means 5 is arranged between the tensioning slide 3 and the cam slide 4. The spring means 5 in this example has two parallel spring devices 5 (of which only one is visible in the figure). Each spring device 5 is composed by two helical springs 51, 52 arranged coaxially around one of the guide bars 71 of the tensioning slide 3, of which one is as strong spring 51, and the other a weak spring 52. The springs 51, 52 of one spring device 5 thus have different spring characteristic.

[0047] Each spring device 5 at one end is supported by a first spring support means 32 connected to the tensioning slide 3 and by second support means (not visible in the figure) connected to the cam slide 4. A pawl 73 forming a latching mechanism 73 is arranged to abut the second support means and to be released from contact thereto at a certain stage. For each spring device 5 there is such a first support means at each end of the tensioning slide 3 and such second support means with a pawl 73 at each end of the cam slide 4 for the purpose of actuation in either direction.

[0048] On a plate 76 separating the vacuum interrupters 21 from the energy accumulator there are mounted cam follower means 62 arranged to cooperate with the cam profiles 61 and to actuate the vacuum interrupters via manoeuvring rods 23 and contact springs 22. The cam follower means consists of four cam followers, each having a rocking lever 62 with a roller 63 at its first end for cooperation with a respective cam profile 61. On the second end the cam follower is connected to a respective actuating rod 23. The cam follower has two lever legs 621, 622 forming an angle between each other and is pivotable around a pivot pin 64 where the two lever legs meet each other.

[0049] In fig. 3 parts of the energy accumulator is illustrated in a side view. The guide bars 71 (of which only one is visible in the figure) for the tensioning slide 3 are rigidly connected to a frame 7 and the tensioning slide 3 at each end has a linear bearing surrounding each guide bar 71. The two guide bars 72 for the cam slide 4 are also rigidly connected to the frame 7, but are in the figure hidden behind the guide bar 71.

[0050] The cam slide 4 also has a pair of linear bearing 42 (see fig. 2) at each end through which it slides on its guiding bars 72. The cam slide 4 also has a pair of support means 41 at each end for the respective spring device 5. The pawl 73 arranged at each end for releasing the cam slide 4 is pivotable around a pin 74 attached on a console (not shown) connected to the frame 7. The pawl

has two legs 731, 732 forming an angle of a little more than 90° to each other. One leg 731 holds the cam slide 4. The other leg 732 is arranged to come into contact with an abutment portion (not shown) of the tensioning slide 3 close to the end position thereof and is urged by a compression spring 75 in the counter clockwise direction.

[0051] At each end of the cam slide 4 there is a hydraulic damper 42. A rubber stop 77 is arranged on the frame 7 at each side of the cam slide 4.

[0052] On the bottom side of the cam slide 4 one of its four cam profiles 61 can be seen. Each cam profile 61 cooperates with a respective cam follower 62 consisting of two lever legs 621, 622, which form an angle of 158° between each other. The lever leg 621 on which the cam roller 63 is mounted is pressed against its cam profile by a spring 65.

[0053] Fig. 4 in a simplified view depicts parts of the energy accumulator from a direction perpendicular to the one of fig. 3. In this view the two guiding bars 71 for the tensioning slide 3 and the two guiding bars 72 for the cam slide 4 are visible. The spring devices arranged around each of the guiding bars 71 of the tensioning slide 3 are left out for better clarity. Also the four cam profiles 61 are visible in this view.

[0054] In the following the function of the energy accumulator shown in figures 2 to 4 will be explained. Upon actuation of the vacuum interrupters 21, the procedure occurs in two steps, a tensioning step and an actuation step. The tensioning step lasts for some seconds while the actuation step occurs almost instantly.

[0055] In fig. 2 the energy accumulator is shown in the start position before loading of the spring has started. During the tensioning step the drive shaft 1 from the gearbox rotates 180° for a full stroke and therewith the crank arm 11. As the roller 13 of the crank arm 11 thereby describes a circular motion it moves along the groove 31 in the tensioning slide 3 and thereby also forces the tensioning slide 3 to move to the right from the start position shown in fig. 2.

[0056] When the tensioning slide 3 moves to the right in fig. 2 each spring device 5 will be compressed between the respective moving spring support 32 forming a part of the tensioning slide 3 and the respective stationary support 41 of the cam slide 4.

[0057] In fig. 3 the energy accumulator is illustrated in a position when compression of the springs 51, 52 has begun. Upon further movement of the tensioning slide towards the right, its spring support 32 at the left end acts on the spring guide 53 to further compress the spring device 5. The other end of the spring is maintained stationary by the right spring support 41 of the cam slide 4, which support acts against the spring guide 54 on the right side. Movement of the cam slide is prevented by the pawl 73 on the right side.

[0058] After further rotation of the drive shaft 1 and the accompanying further movement of the tensioning slide 3, the abutment portion thereof will come into contact

with the lever leg 732 and press it in the clockwise direction against the action of the compression spring 75. Thereby the pawl will rotate around the pivot pin 74 in the clockwise direction such that the lever leg 731 comes out of contact with the cam slide 4. This allows the spring devices 5 to be discharged by pushing the cam slide 4 rapidly in the right direction, with the consequence that the cam profiles 61 move the cam followers to actuate the vacuum interrupters 21. Release of the pawl is arranged to occur after 150° rotation of the drive shaft 1, which corresponds to a little more than 90% of the linear stroke length of the tensioning slide 3. The next operation will then follow in the opposite direction.

[0059] The cam slide 4 is made of an insulating material such as porcelain or an appropriate plastic.

[0060] In a typical application the drive shaft will make a 180° stroke in 5 seconds and the distance between the axis of the drive shaft 1 and the axis of the roller 13 on its crank arm 11 is 60 mm giving a stroke length of 120 mm.

[0061] Fig. 5 in a diagram illustrates the movements of the tensioning slide 3 and the cam slide 4 in an example with the above mentioned input data. The x-axis is the driving shaft angular position in degrees and the y-axis is the linear position of the respective slide in mm from the middle position. Graph 3 represents the movement of the tensioning slide 3 and graph 4 the movement of the cam slide 4.

[0062] The tensioning slide will make a pure sinusoidal movement from its starting position at - 60 mm to its end position at + 60 mm, which is a direct consequence of the geometrical configuration of the drive input.

[0063] The stroke length of the cam slide 4 is somewhat shorter, from - 55 mm to + 55 mm. As can be seen the cam slide is stationary during the major part of the operation cycle. At the beginning I the cam slide stands still against the rubber stop 77. After about 20° rotation of the drive shaft 1 the cam slide 4 is allowed to move uniformly with the tensioning slide for a short period, during which period the hydraulic damper 43 releases. At a little less than 50° rotation of the drive shaft 1 the pawl 73 comes into contact with the cam slide 4 and prevents further movement thereof for the active tensioning period, during which the cam slide 4 is maintained in its -40 mm position.

[0064] At a rotation of 150° of the drive shaft the tensioning slide 3 has almost completed its movement and in that position it comes into contact with the pawl 73 that locks the cam slide 4. The pawl is released from its locking position and allows the cam slide 4 to move by action of the spring devices 5. The steep extension of the cam slide graph 3 thereafter illustrates how the cam slide 3 moves up to its end position at + 55 mm during a 5° drive shaft rotation corresponding to a duration of about 0,1 sec. At the end of this movement there is retardation due to the hydraulic damper 43. During this rapid movement the operation of the vacuum interrupters via the cam profiles 61 occur sequentially as indicated in the diagram. The actuation time for a vacuum interrupter is about 10

ms.

Claims

1. An energy accumulator for actuating a switching device, which energy accumulator includes a chargeable mechanical spring means (5), tensioning means (3) for charging the spring means (5), actuating means (4, 61, 62) for actuating the at least one switch and release means (73) for discharging the spring means (5) **characterized in that**

- the tensioning means (3) includes a first linearly movable body (3) having drive means (31) connectable to a driving source (1) for applying a tensioning stroke to the first movable body (3), and having first spring support means (32),

- the actuating means includes a second linearly movable body (4) having cam profile means (61) and having second spring support means (41), and further includes cam follower means (62) arranged to cooperate with the cam profile means (61) and which cam follower means (62) has connection means (23) to the switching device,

- the release means includes a latching mechanism (73) arranged to lock the second movable body (4) and to be brought to an unlocking position upon influence from the first movable body (3),

- the energy accumulator further includes guiding means (71, 72) arranged to guide the first (3) and second (4) movable body in a respective linear movement, which linear movements are in parallel to each other,

- and **in that** the spring means (5) is arranged between said first (32) and second (41) spring support means.

2. An energy accumulator according to claim 1, **characterized in that** the cam profile means (61) includes a plurality of cam profiles (61) arranged in parallel to each other and **in that** the cam follower means (62) includes a corresponding plurality of cam followers (62) cooperating with a respective cam profile (61) and being connectable to a respective switch of the switching device.

3. An energy accumulator according to claim 1 or 2, **characterized in that** the second movable body (4) has a first side on which said cam profile means (61) is located and an opposite side on which said second spring support means (41) is located, and **in that** the second movable body (4) is made of an insulating material.

4. An energy accumulator according to claim 3, **char-**

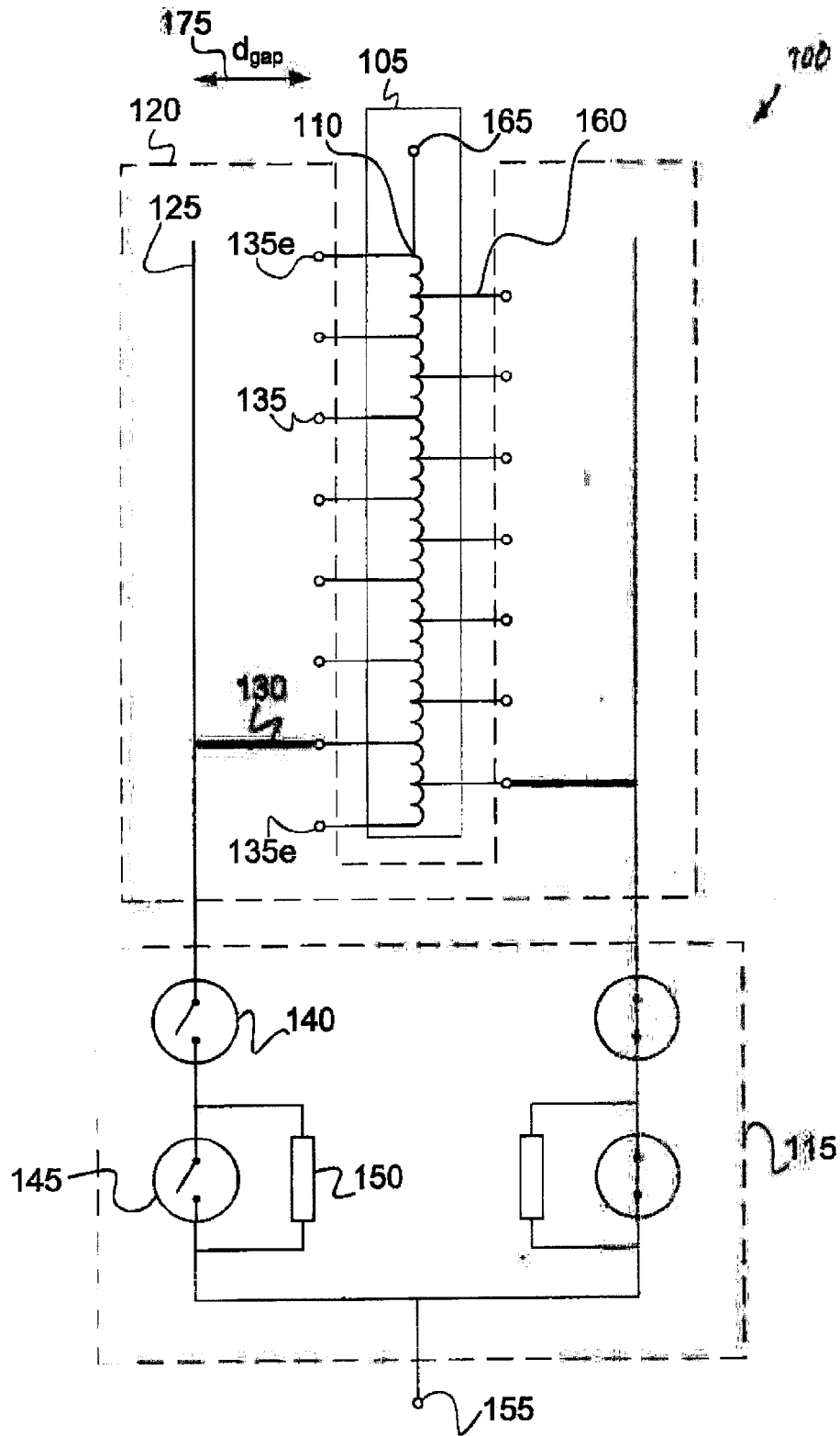
acterized in that the first side of the second movable body (4) is facing toward the switching device and the opposite side is facing toward the spring means (5), the first movable body (3) and said drive means (1).

5. An energy accumulator according to any of claims 1-4, **characterized in that** the spring means (5) includes at least one spring device (5) having a plurality of springs (51, 52) arranged in series to each other, and which springs (51, 52) have different spring characteristics.
6. An energy accumulator according to any of claims 1-5, **characterized in that** the spring means (5) includes a plurality of spring devices (5) arranged in parallel to each other.
7. An energy accumulator according to any of claims 1-6, **characterized in that** the guiding means (71, 72) includes a plurality of first guide bars (71) for the first movable body (3) and a plurality of second guide bars (72) for the second movable body (4), which rods (71, 72) all are arranged in parallel to each other.
8. An energy accumulator according to claim 7, when depending from claim 5 or 7, **characterized in that** each spring device (5) includes at least one helical spring (51, 52) arranged coaxially around a respective bar (71) of said first guide bars (71).
9. An energy accumulator according to any of claims 1-8, **characterized in that** said latching mechanism (73) includes a pawl (73) arranged to contact the second movable body (4) and thereby prevent linear movement thereof, and whereby the first movable body (3) during an end phase of its tensioning stroke is arranged to contact the pawl (73) for actuating the pawl (73) to release its contact with the second movable body (4).
10. An energy accumulator according to any of claims 1-9, **characterized in that** the drive connection means includes (31) a groove (31) on the first movable body (3), which groove (31) is arranged to cooperate with a roller (13) of a crank arm (11) from the drive source such that a 180° rotation of the crank arm (11) provides one tensioning stroke of the first movable body (4).
11. An energy accumulator according to any of claims 1-10, **characterized in that** each cam follower (62) includes a cam roller (63) arranged to be in contact with a respective cam profile (61) and a rocking lever having a first end on which the cam roller (63) is mounted and a second end connectable to an actuating rod (23) of a switch, which lever has a first portion (621) and a second portion (622) forming an

obtuse angle with the first portion (621), and which level is provided with a spring (65) pressing the cam roller (63) into contact with the cam profile (61).

- 5 12. A tap changer including a diverter switch with a plurality of switches, **characterized in that** the tap changer includes an energy accumulator according to any of claims 1-11.
- 10 13. A transformer, **characterized in that** the transformer includes a tap changer according to claim 12.

Fig. 1



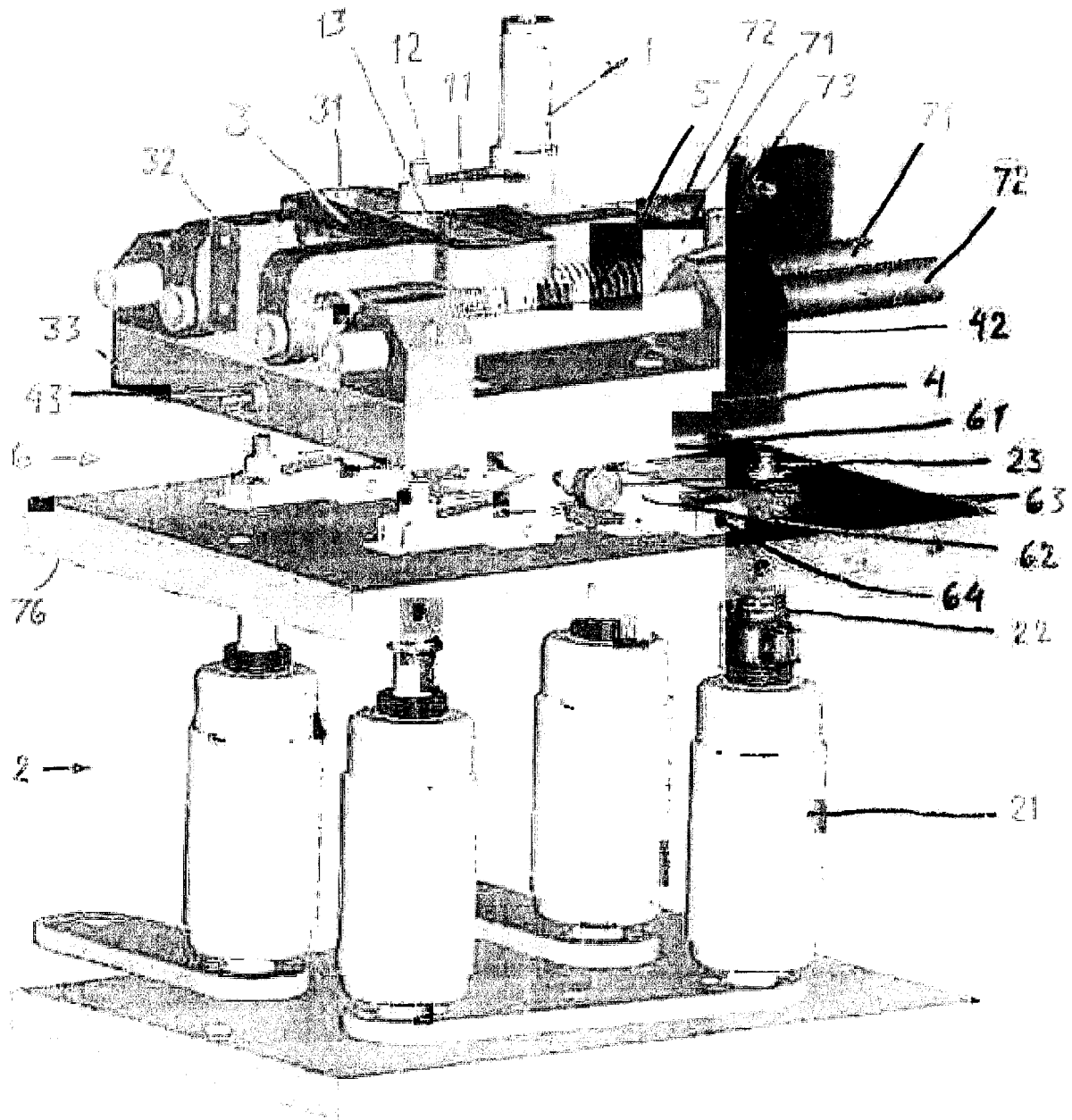


Fig. 2

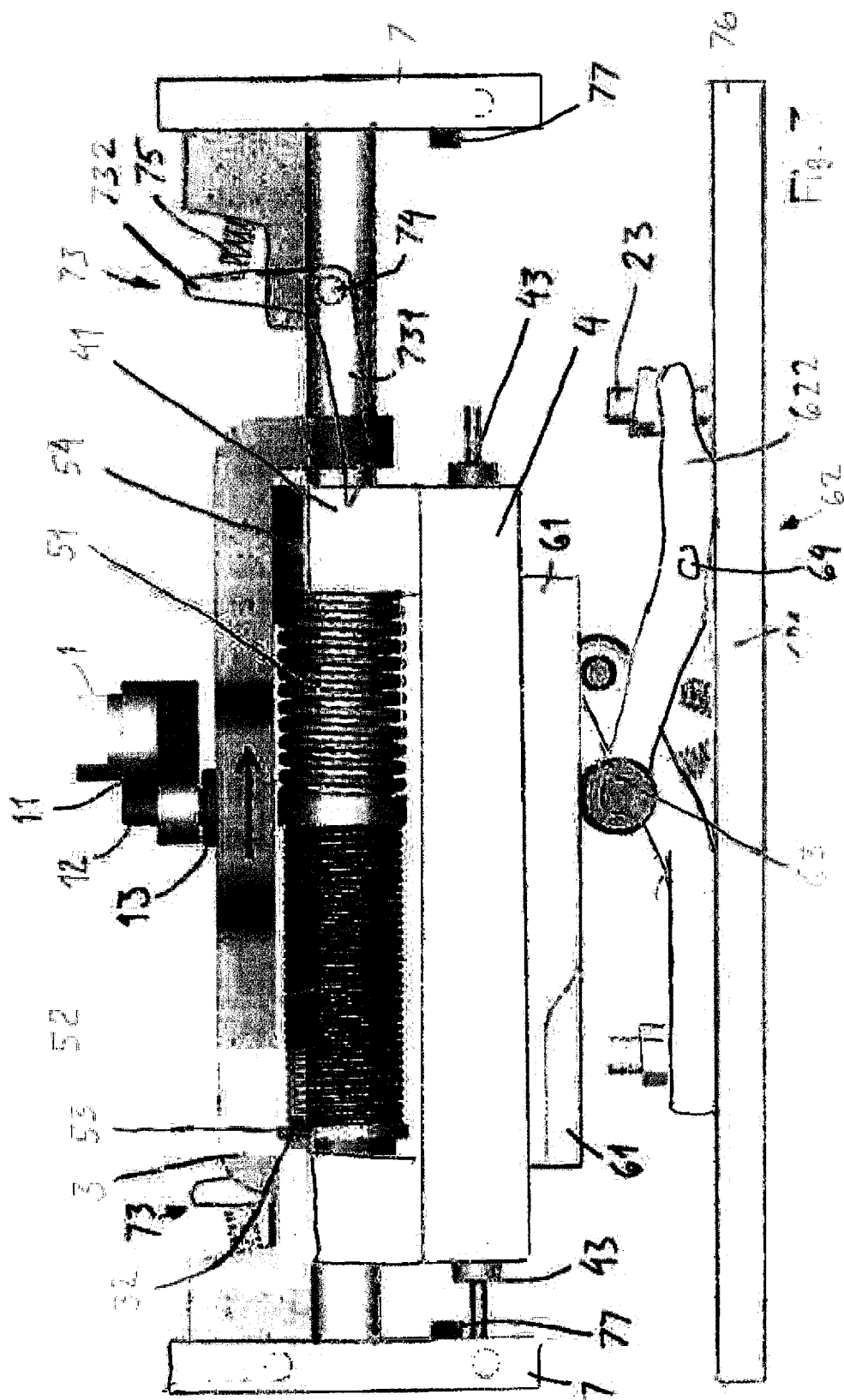
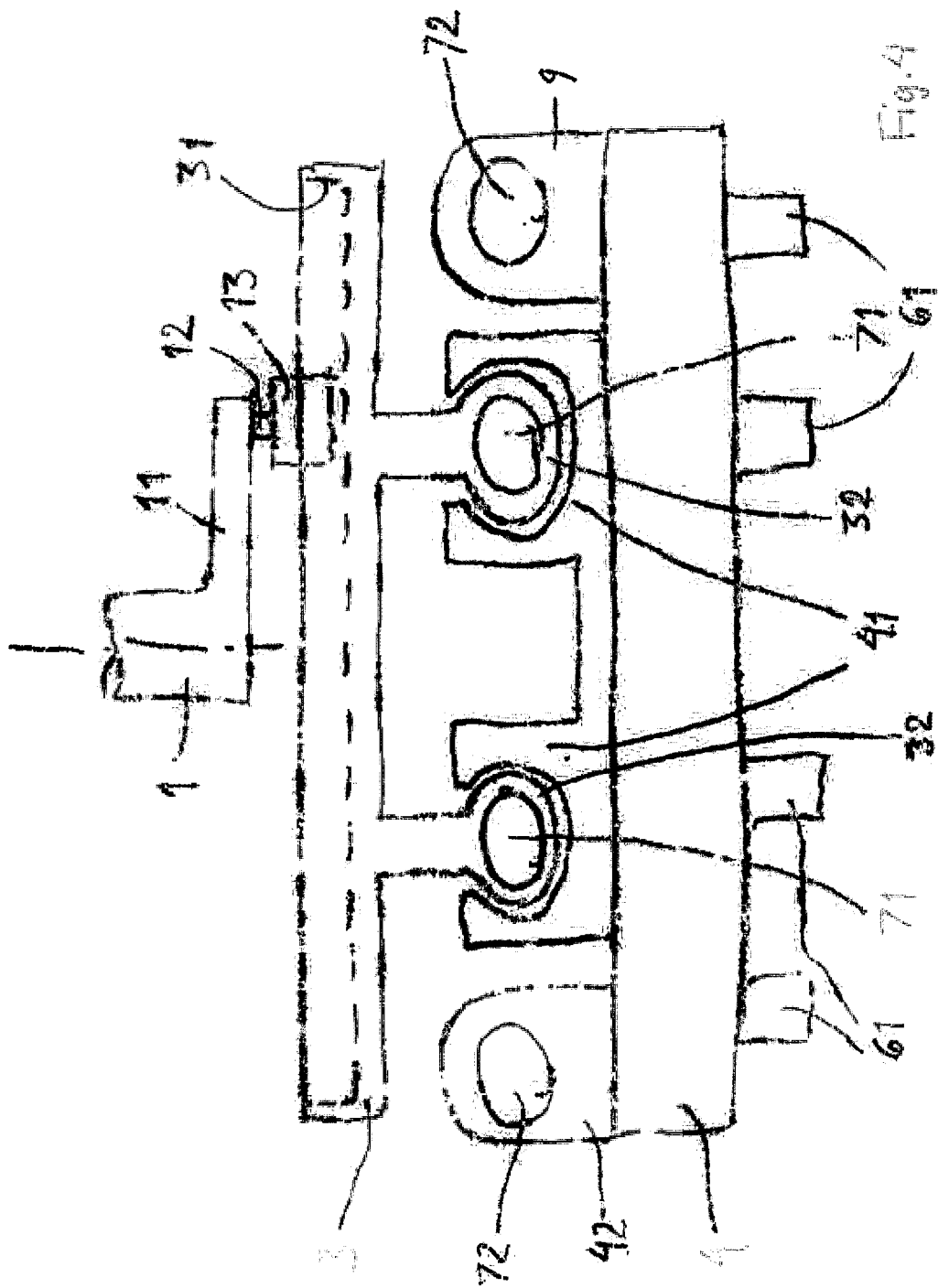
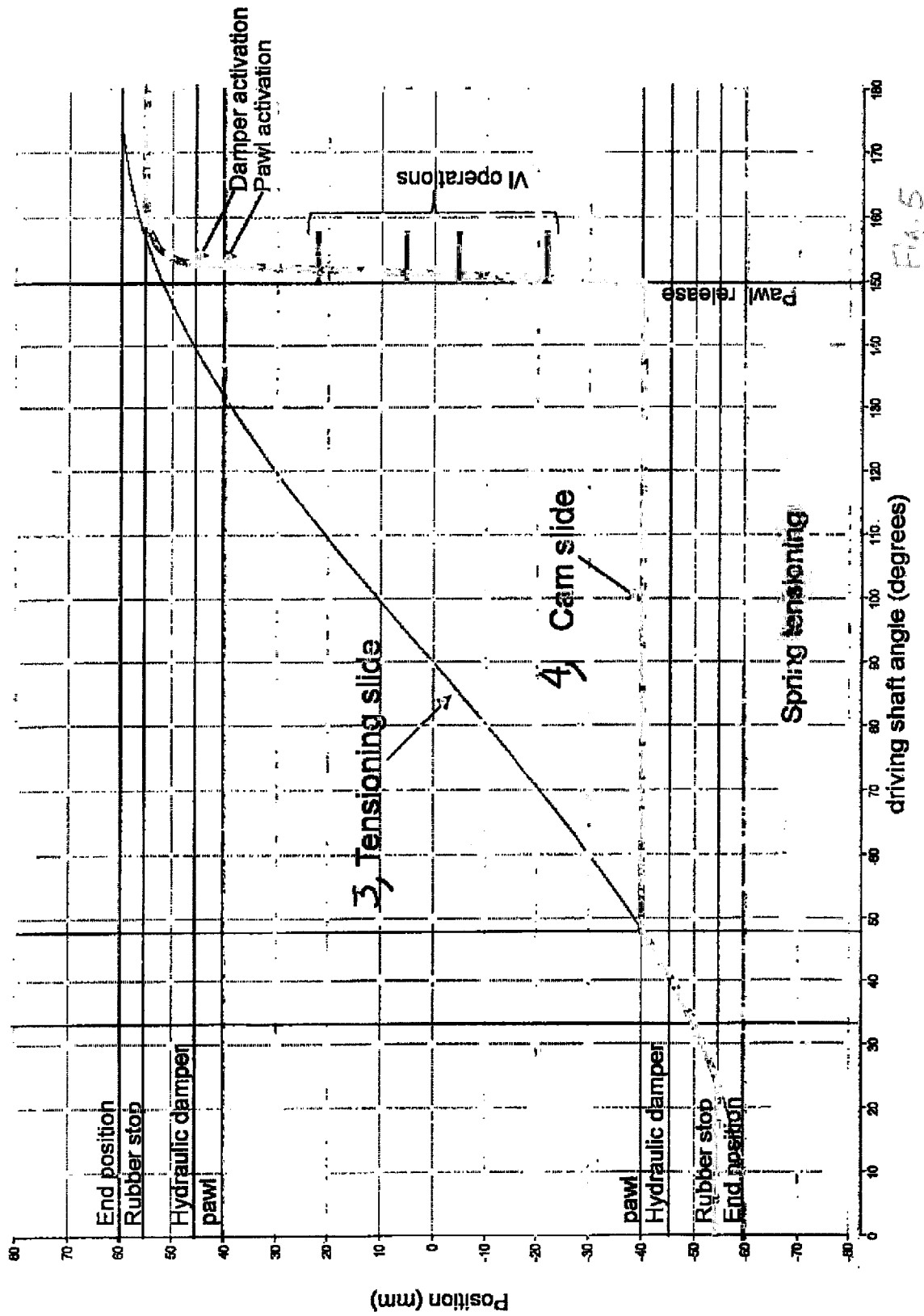


Fig. 7







EUROPEAN SEARCH REPORT

Application Number
EP 11 16 9938

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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