(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 249 361 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
11.07.2012 Bulletin 2012/28

(51) Int Cl.:
H01H 3/30 *(2006.01)*

(21) Application number: **09159345.9**

(22) Date of filing: **04.05.2009**

(54) **Drive mechanism for medium voltage fuse switches.**

Ansteuerungsmechanismus für Mittelspannungslasttrenner

Mécanisme de commande pour fusibles-interrupteurs de moyenne tension

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK TR

(43) Date of publication of application:
10.11.2010 Bulletin 2010/45

(73) Proprietor: **ABB Technology AG**
8050 Zürich (CH)

(72) Inventor: **Belloni, Francesco**
I-24124, Bergamo (IT)

(74) Representative: **Giavarini, Francesco et al**
Zanoli & Giavarini S.r.l.
Via Melchiorre Gioia, 64
20125 Milano (IT)

(56) References cited:
US-A- 4 578 551 **US-A- 4 683 357**

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 2 249 361 B1

Printed by Jouve, 75001 PARIS (FR)

Description

[0001] The present invention relates to a drive mechanism for a Medium Voltage switch, in particular a drive mechanism for a Medium Voltage fuse switch, having improved features. For the purposes of the present application the term Medium Voltage is referred to applications in the range of between 1 and 52 kV.

[0002] Medium Voltage switches, in particular Medium Voltage fuse switches, are well known in the art and usually comprises a drive mechanism which is operatively connected to the kinematic chain of the switch and actuates it for opening and closing the contacts of the switch. Due to the speed needed for carrying out opening/closing operation, mechanical means are normally used to actuate the kinematic chain of the switch. In most cases, the drive mechanisms are based on springs which are loaded before carrying out the opening/closing operation; when the spring is released, the drive mechanism transmits the energy and the motion generated by the spring to the kinematic chain of the switch, thereby actuating the opening/closing operation with the required speed. In the mechanism of the known type the operation is usually carried out by an operator acting on an operating handle which is used to load the spring and actuate the release operation of the spring itself, thereby completing the opening/closing operation.

[0003] Document US 4683357 discloses a device according to the preamble of claim 1.

[0004] Even if the currently known drive mechanisms are certainly suitable to operate the opening/closing operation of a Medium Voltage switch, they are not totally satisfactory in terms of performances and/or manufacturing costs.

[0005] In particular, in the case of drive mechanism for Medium Voltage fuse switches, it would be desirable to have a simpler alternative to the existing system.

[0006] A further problem derives from the speed requirements of the opening/closing operation of the switch which involves an accurate dimensioning of the spring, as well as an accurate testing thereof.

[0007] Also, the characteristics of the spring may change during the operation life, thereby reducing also the speed characteristics of the associated switch under values that may no longer be acceptable.

[0008] It is therefore an object of the present invention to provide a drive mechanism for a Medium Voltage switch, in particular a drive mechanism for a Medium Voltage fuse switch, in which the above-mentioned drawbacks are avoided or at least reduced.

[0009] A further object of the present invention is to provide a drive mechanism for a Medium Voltage switch which does not require an excessively accurate dimensioning and pre-testing of the spring.

[0010] Another object of the present invention is to provide a drive mechanism for a Medium Voltage switch which allows to tune the characteristics of the spring and adapt it to the application in an easy way.

[0011] A further object of the present invention is to provide a drive mechanism for a Medium Voltage switch which is easily adaptable to different applications.

[0012] Still another object of the present invention is to provide a drive mechanism for a Medium Voltage switch with reduced manufacturing, installation and maintenance costs.

[0013] Thus, the present invention relates to a drive mechanism for a Medium Voltage fuse switch according to claim 1.

[0014] Thanks to the presence of the latching and release means, the drive mechanism for a Medium Voltage switch according to the invention allows to carry out the opening and closing operation very easily and effectively, as better explained in the following detailed description of preferred embodiments of the invention.

[0015] A Medium Voltage switch comprising a drive mechanism as described above is also part of the present invention.

[0016] Further characteristics and advantages of the invention will emerge from the description of preferred, but not exclusive embodiments of a drive mechanism for a Medium Voltage fuse switch according to the invention, non-limiting examples of which are provided in the attached drawings, wherein:

Figure 1 is a perspective front view of a possible embodiment of a drive mechanism according to the invention;

Figure 2 is a perspective rear view of a possible embodiment of a drive mechanism according to the invention;

Figure 3 is a plan view of an embodiment of the operating shaft, power shaft and spring assemblies used in a drive mechanism according to the invention;

Figure 4 is an exploded view of the assemblies of figure 3;

Figure 5 is rear view of a drive mechanism according to the invention, with the latching and release means in a first operating position;

Figure 6 is rear view of a drive mechanism of figure 5, with the latching and release means in a second operating position;

Figure 7 is rear view of a drive mechanism of figure 5, with the latching and release means in a third operating position;

Figure 8 is rear view of a drive mechanism of figure 5, with the latching and release means in a fourth operating position.

[0017] With reference to the attached figures, a drive mechanism for a Medium Voltage fuse switch according to the invention, globally designated with the reference numeral 1, generally comprises a base plate 10 and a front plate 11 that define an internal space. Additional plates, e.g. plate 13, can also be present between the front 11 and base 10 plate. The drive mechanism also

comprises a number of components for its connection to a Medium Voltage switch that can be of conventional type and that will not described in details.

[0018] An operating shaft 2 and a power shaft are housed in said internal space and are coaxially mounted along a first longitudinal axis, the power shaft being operatively connectable to a kinematic chain of a Medium Voltage fuse switch through conventional linking system to actuate the opening/closing operation of said switch. The operating shaft 2 has a head 20 connectable to an operating handle for manual actuation of said operating shaft, through a hole positioned on the front plate 11 of the drive mechanism 1.

[0019] The drive mechanism 1 of the invention further comprises a spring assembly 4 which comprises a first 41 and a second 42 spiral springs, also positioned in the internal space between the base plate 10 and the front plate 11.

[0020] The first and second spiral springs 41 and 42, respectively have a first end 411 and 421 which are operatively coupled to said operating shaft 2 and a second end 412 operatively couplable to said power shaft. The first and second spiral springs 41, 42 are loaded by rotation of said operating shaft 2 and actuates said power shaft when released, the first spiral spring 41 determining a rotation of said power shaft in an opposite direction with respect to the rotation determined by said second spiral spring 42.

[0021] One of the characterizing features of the drive mechanism 1 according to the invention resides in that it is provided with latching means 5 for latching said power shaft, said latching means comprising a first 51 and a second 52 latching arm which are positioned on said power shaft .

[0022] A further characteristics of the drive mechanism 1 according to the invention resides in that it is also provided with first 61 and second 62 release means for unlatching said power shaft and allowing rotation thereof; in particular, as better explained hereinafter, the first release means 61 allows a rotation of said power shaft in a direction which is opposite with respect to the rotation allowed by said second release means 62.

[0023] In practice, the closing operation is carried out by loading one of said first or second spiral springs 41 and 42, e.g. the spiral spring 41; once the spring is loaded the power shaft is latched by said latching means 5. In these conditions, the closing spring is loaded, while the power shaft 2 is latched in a position corresponding to the open position of the contacts of the associated fuse switch. The closing operation is actuated by acting on one of said release means, e.g. the release means 61, thereby unlatching the power shaft and allowing a rotation of said power arm in a first direction, e.g. clockwise with respect to a front view of the drive mechanism 1.

[0024] Correspondingly, the opening operation is carried out by loading the other one of said first or second spiral springs 41 and 42, e.g. the spiral spring 42; once the spring is loaded the power shaft is latched by said latching means 5. In these conditions, the opening spring is loaded, while the power shaft 2 is latched in a position corresponding to the closed position of the contacts of the associated fuse switch. The opening operation is actuated by acting on one of said release means, e.g. the release means 62, thereby unlatching the power shaft and allowing a rotation of said power arm in a second direction which is opposite with respect to the rotation allowed by said second first means 61, e.g., in this case, counterclockwise with respect to a front view of the drive mechanism 1.

[0025] Loading of the spiral springs 41 and 42 is conveniently carried out simultaneously; closing operation is then carried out by acting, e.g., on the release means 61, while opening operation is correspondingly carried out by acting on the release means 62.

[0026] With reference to figure 3 and 4, in the drive mechanism 1 according to the invention, the operating shaft 2 preferably comprises a first subassembly 21 which in turns comprises a disk 22 of substantially circular shape which is mounted perpendicularly with respect to said first longitudinal axis and further comprises a first plate element 23 which protrudes perpendicularly from the edge of said disk 22 in the direction of the head 20 of said operating shaft 2. The first plate element 23 is operatively couplable to the second ends 412 and 422 of said first 41 and second 42 spiral springs.

[0027] According to a preferred embodiment of the invention, the spring assembly 4 preferably comprises a first lever 43 which has a base element 44 coaxially mounted on the first subassembly 21 of said operating shaft 2 in correspondence of the disk 22. The base element 44 of the first lever 43 is conveniently provided with fixing means 441 for the first ends 411, 421 of said first and second spiral springs 41, 42. As an example, said fixing means can be constituted by a groove into which said first ends, 411 and 412, of said first and second spiral springs, 41 and 42, are secured.

[0028] A distal end 45 of said first lever 43 protrudes form the edge of said disk 22 and is operatively coupled with said first plate element 23 of said first subassembly 21.

[0029] According to a particularly preferred embodiment of the drive mechanism 1 of the invention, said first lever 43 comprises adjusting means 46 which are operatively coupled to said first plate element 23 for adjusting the preload of said first 41 and second 42 spiral springs. In this way the speed characteristics of the first and second springs, 41 and 42, can be changed, or at least fine-tuned, according to needs, thereby allowing accurate calibration of the speed characteristics of the drive mechanism and/or compensating variations due to, e.g., aging of the spring itself or other mechanical components of the drive mechanism and/or of the switch. In particular, the adjusting means 46 are preferably positioned so as to cooperate with said first plate element 23 of said operating shaft 2. In practice, according to this embodiment, the adjusting means 46 allow to rotate the first lever 40

(onto which the first ends, 411 and 412, of the first and second spiral springs, 41 and 42, are fixed) with respect to the disk 22 of the operating shaft 2, thereby changing the pre-load of the spiral springs 41,42 and consequently also their speed characteristics.

[0030] As an example, said adjusting means 40 can comprise a hole, preferably a threaded hole, positioned on the distal end portion 45 of said first lever 43 and screw means 48 inserted in said hole and abutting against the first plate element 23 of said operating shaft 2. Thus, by rotating the screw 48, the second lever 42 can be rotated to a more or less great extent with respect to the operating shaft 2, consequently changing the pre-load applied to the spiral springs 41 and 42.

[0031] Preferably, the power shaft comprises a second subassembly 31 comprising a second, L shaped, lever 32 having a flat base 33 rotationally mounted along said first longitudinal axis perpendicularly thereto; a second plate element 34 protrudes perpendicularly from said flat base 33 in the direction of the head 20 of said operating shaft 2.

[0032] In practice, the first 23 and second 34 plate elements protrudes respectively from the disk 22 and the flat base 33 along parallel directions. Also, said second plate element 34 is positioned at a distance from said first longitudinal axis which is greater than the distance of said first plate element 23 from said first longitudinal axis; in other words, the length of the flat base 33 is greater than the diameter of the disk 22. Preferably, as shown in figure 4, the length of the second plate element 34 is greater than the length of said first plate element 23.

[0033] As shown in the attached figures, the preferably the second plate element 34 is operatively couplable with the second ends, 412 and 422, of said first and second spiral springs, 41 and 42.

[0034] Preferably, the second subassembly 31 of the power shaft further comprises a main body 35 having a first side 36 which is fixed to the flat base 33 of said second, L shaped, lever 32. Said main body 35 has a second side, e.g. parallel and opposite to said first side 36, onto which said first 51 and second 52 latching arm are positioned.

[0035] With reference to figure 2 and 5-8, according to a preferred embodiment of the drive mechanism 1 of the invention, said latching means 5 comprises a first 53 and a second 54 latching pawls slidingly mounted on a third plate 13; the first 53 and second 54 sliding latching pawls are movable between a latching position and a released position and are operatively associable respectively with said first 51 and second 52 latching arm.

[0036] Also, according to a particularly preferred embodiment of the drive mechanism 1 of the invention, said first 61 and second 62 release means comprise a first 610 and a second 620 release buttons positioned on the front of said drive mechanism 1.

[0037] In details, the functioning will be explained with reference to figures 5-8, showing a preferred embodiment of the invention..

[0038] With reference to figure said figures, said first 53 and second 54 latching sliding pawl are slidingly mounted in a corresponding groove, 530 and 540, in a third plate 13, positioned in between said base 10 and front 11 plates.

[0039] Figure 5 shows an operating situation in which the first and second spiral springs, 41 and 42, are loaded and the power shaft 3 is kept by the latching means 5 in a position corresponding to the open position of the contacts of an associated switch.

[0040] According to this embodiment, in such a situation, the first sliding pawl 53 is kept in a first latching position by a first latching lever 55, in which first latching position the first latching sliding pawl 53 abuts against said first latching arm 51.

[0041] With reference to figure 6, when said first latching lever 55 is released, the first latching sliding pawl 53 slides in the groove 530 and is moved in a first releasing position, in which first releasing position the power shaft is free to rotate in a first direction, in the present case counterclockwise with respect to a rear view of the drive mechanism 1.

[0042] The power arm rotates transmitting motion and energy to the contact system of the associated switch till the position of figure 7 is reached. In such a position, the power shaft is kept by the latching means 5 in a position corresponding to a situation of closed contacts in the associated switch, one of the two spiral springs is release while the other one is still loaded.

[0043] In the position of figure 7, the second latching sliding pawl 54 is kept in a second latching position by a second latching lever, which is not shown since hidden by the third plate 13, but which is similar to the first latching lever 55. As shown in figure 7, in said second latching position, the second latching sliding pawl 54 abuts against said second latching arm 52 mounted on the power shaft.

[0044] As shown in figure 8, when said second latching lever is released, the second latching sliding pawl 54 slides in the groove 540 and is moved in a second releasing position, in which second releasing position the power shaft is free to rotate in a second direction which is opposite to said first direction, in the present case clockwise with respect to a rear view of the drive mechanism 1.

[0045] The power arm thus rotates, transmitting motion and energy to the contact system of the associated switch till it reaches a position corresponding to the its position of figure 7. In such a position, the power shaft is in a position corresponding to a situation of open contacts in the associated switch, both spiral springs 41 and 42 being released.

[0046] Preferably, the latching means 5 comprises a first 57 and a second locking means for respectively locking said first 55 and second latching levers. The second locking means are not shown since hidden by the third plate 13, but they are similar to the first locking means 57.

[0047] The first locking means 57 can be for example

consist of a rotating pin having a first position (fig. 5) in which it interferes with the first latching lever 55 blocking it, and a second position (fig. 6) in which first latching lever 55 is released. Similar set-up is possible also for the second locking means and the second latching lever.

[0048] The first 57 and second locking means are conveniently actuated by said first 610 and a second 620 release buttons. A lever system, comprises, levers 630, 640, and 650 can be foreseen for connecting the release button 620 with the associated second locking means . Also, return springs 550 and 540 can also be foreseen to help the return into position of the first 55 and second latching levers.

[0049] In a particularly preferred embodiment of the drive mechanism 1 according to the invention, a second operating shaft 9 is also present. The second operating shaft 9 is preferably mounted on a second longitudinal axis parallel to said first longitudinal axis and can be advantageously used to carry out the earthing operation of the switch acting on a shaft which is independent from the first (main) operating shaft 2 which is used for the opening and closing operation.

[0050] As it can be seen from the above description, the drive mechanism 1 for a Medium Voltage switch, in particular for a Medium Voltage fuse switch, of the present invention has a number of advantages with respect to the Medium Voltage switches equipped with conventional drive mechanisms.

[0051] In particular, the opening/closing operation can be easily actuated by acting on the release buttons 610 and 620.

[0052] Also, the presence of the adjusting means 46 does not require an excessively accurate dimensioning and pre-testing of the spiral springs 41 and 42, since the speed characteristics of the springs can be calibrated and fine-tuned after assembling. Moreover, the adjusting means 46 allow adjusting the speed characteristics of the spiral springs 41 and 42, in case of variation over the time of the characteristics of the spring itself and/or of the associated mechanical components.

[0053] It is worth noting that the above mentioned functionalities (i.e., releasing means and adjusting means) can be implemented in a relatively easy manner, with a reduced number of components of relatively simple structure. Thus, the drive mechanism of the invention is also effective from an economical standpoint.

[0054] In general, the structure of the drive mechanism of the invention is very compact and can be adapted, with only a few modification, to a number of different Medium Voltage applications.

[0055] The drive mechanism for a Medium Voltage fuse switch of the invention can also comprise further components and functionalities that have not been described in details as they can be of conventional kind, as defined in the claims.

Claims

1. A drive mechanism (1) for a Medium Voltage fuse switch **characterized in that** it comprises:

   - a base plate (10) and a front plate (11) defining an internal space housing an operating shaft (2) and a power shaft coaxially mounted along a first longitudinal axis, the power shaft being operatively connectable to a kinematic chain of a Medium Voltage fuse switch for opening/closing operation of said switch, the operating shaft (2) having a head (20) connectable to an operating handle for manual actuation of said operating shaft (2);
   - a spring assembly (4) which comprises a first (41) and a second (42) spiral springs having a first end (411, 421) operatively coupled to said operating shaft (2) said spiral springs (41, 42) being loaded by rotation of said operating shaft (2) and actuating said power shaft when released, the first spiral spring (41) determining a rotation of said power shaft in an opposite direction with respect to the rotation determined by said second spiral spring (42);
   - latching means (5) for latching said power shaft comprising a first (51) and a second (52) latching arm positioned on said power shaft ;
   - first (61) and second (62) release means for unlatching said power shaft and allowing rotation thereof, the first release means (61) allowing a rotation of said power shaft in an opposite direction with respect to said second release means (62); **characterised by**
   - said operating shaft (2) comprising a first subassembly (21) comprising a disk (22) perpendicularly mounted with respect to said first longitudinal axis and further comprising a first plate element (23) protruding perpendicularly from the edge of said disk (22) in the direction of the head (20) of said operating shaft (2).

2. The drive mechanism (1) according to claim 1, **characterized in that** said spring assembly (4) comprises a first lever (43) having a base element (44) coaxially mounted on the first subassembly (21) of said operating shaft (2) and a distal end (45) protruding form the edge of said disk (22), said base element (44) being provided with fixing means (441) for the first ends (411, 421) of said first and second spiral springs (41, 42), said distal end (45) being operatively coupled with said first plate element (23) of said first subassembly (21).

3. The drive mechanism (1) according to claim 2, **characterized in that** said fixing means (441) comprises a groove in which said first ends (411, 412) of said first and second spiral springs (41, 42) are secured,

and further **characterized in that** said distal end (45) of said first lever (43) comprises adjusting means (46) operatively coupled to said first plate element (23) for adjusting the preload of said first (41) and second (42) spiral springs.

4. The drive mechanism (1) according to one or more of the preceding claims, **characterized in that** said power shaft comprises a second subassembly (31) comprising a second, L shaped, lever (32) having a flat base (33) rotationally mounted along said first longitudinal axis perpendicularly thereto, and a second plate element (34) perpendicularly protruding from said flat base (33) in the direction of the head (20) of said operating shaft (2), the second subassembly (31) further comprising a main body (35) having a first side (36) fixed to the flat base (33) of said second, L shaped, lever (32) and a second side onto which said first (51) and second (52) latching arm are positioned.

5. The drive mechanism (1) according to claim 4, **characterized in that** said second plate element (34) is operatively couplable with the second ends (412, 422) of said first and second spiral springs (41, 42).

6. The drive mechanism (1) according to one or more of the preceding claims, **characterized in that** said latching means (5) comprises a first (53) and a second (54) latching sliding pawl slidingly mounted on a third plate (13) and movable between a latching position and a released position and operatively associable with said first (51) and second (52) latching arm.

7. The drive mechanism (1) according to claim 6, **characterized in that** said first (53) and second (54) latching sliding pawl are slidingly mounted in a corresponding groove (530, 540) in said third plate (13), the first sliding pawl (53) being kept in a first latching position by a first latching lever (55), in which first latching position said first latching sliding pawl (53) abuts against said first latching arm (51), said first latching sliding pawl (53) being moved in a first releasing position when said first latching lever (55) is released, in which first releasing position the power shaft is free to rotate in a first direction, the second latching sliding pawl (54) being kept in a second latching position by a second latching lever, in which second latching position said second latching sliding pawl (54) abuts against said second latching arm (52), said second latching sliding pawl (54) being moved in a second releasing position when said second latching lever is released, in which second releasing position the power shaft (3) is free to rotate in a second direction opposite to said first direction.

8. The drive mechanism (1) according to claim 7, **characterized in that** said latching means (5) comprises a first (57) and a second locking means for respectively locking said first (55) and second (56) latching levers.

9. The drive mechanism (1) according to one or more of the preceding claims, **characterized in that** said first (61) and second (62) release means comprise a first (610) and a second (620) release buttons positioned on the front of said drive mechanism (1).

10. The drive mechanism (1) according to claims 8 and 9, **characterized in that** said first (610) and a second (620) release buttons respectively act on said first (57) and second locking means.

11. A Medium Voltage fuse switch **characterized in that** it comprises a drive mechanism (1) according to one or more of the preceding claims.

Patentansprüche

1. Antriebsmechanismus (1) für einen Mittelspannungs-Sicherungsschalter, **dadurch gekennzeichnet, dass** er aufweist:

- eine Basisplatte (10) und eine Frontplatte (11), die einen Innenraum definieren, in dem eine Arbeitswelle (2) und eine Leistungswelle aufgenommen sind, die koaxial entlang einer ersten Längsachse befestigt sind, wobei die Leistungswelle mit einer kinematischen Kette eines Mittelspannungs-Sicherungsschalters für einen Öffnungs/Schließvorgang des Schalters operativ verbindbar ist, wobei die Arbeitswelle (2) einen Kopf (20) aufweist, der mit einem Bediengriff für eine manuelle Betätigung der Arbeitswelle (2) verbindbar ist;
- eine Federbaugruppe (4), die eine erste (41) und eine zweite (42) Spiralfeder mit einem ersten Ende (411, 421) aufweist, die mit der Arbeitswelle (2) operativ gekoppelt sind, wobei die Spiralfedern (41, 42) durch eine Drehung der Arbeitswelle (2) vorgespannt werden und bei Freigabe die Leistungswelle betätigen, wobei die erste Spiralfeder (41) eine Drehung der Leistungswelle in eine in Bezug auf die durch die zweite Spiralfeder (42) bestimmte Drehung entgegengesetzte Richtung bestimmt;
- eine Sperreinrichtung (5) zum Sperren der Leistungswelle, die einen auf der Leistungswelle positionierten ersten (51) und zweiten (52) Sperrschenkel aufweist;
- eine erste (61) und eine zweite (62) Freigabeeinrichtung zum Entsperren der Leistungswelle und Ermöglichen einer Drehung derselben, wobei die erste Freigabeeinrichtung (61) eine Dre-

hung der Leistungswelle in eine in Bezug auf die zweite Freigabeeinrichtung (62) entgegengesetzte Richtung ermöglicht; **dadurch gekennzeichnet, dass**

- die Arbeitswelle (2) eine erste Unterbaugruppe (21) aufweist, die eine Scheibe (22) aufweist, die in Bezug auf die erste Längsachse im rechten Winkel montiert ist, und ferner ein erstes Plattenelement (23) aufweist, das von dem Rand der Scheibe (22) in Richtung des Kopfes (20) der Arbeitswelle (2) im rechten Winkel vorsteht.

2. Antriebsmechanismus (1) nach Anspruch 1, **dadurch gekennzeichnet, dass** die Federbaugruppe (4) einen ersten Hebel (43) mit einem auf der ersten Unterbaugruppe (21) der Arbeitswelle (2) koaxial befestigten Basiselement (44) und einem von dem Rand der Scheibe (22) vorstehenden distalen Ende (45) aufweist, wobei das Basiselement (44) mit einer Fixiereinrichtung (441) für die ersten Enden (411, 421) der ersten und der zweiten Spiralfeder (41, 42) versehen ist, wobei das distale Ende (45) mit dem ersten Plattenelement (23) der ersten Unterbaugruppe (21) operativ gekoppelt ist.

3. Antriebsmechanismus (1) nach Anspruch 2, **dadurch gekennzeichnet, dass** die Fixiereinrichtung (441) eine Aussparung aufweist, in der die ersten Enden (411, 412) der ersten und der zweiten Spiralfeder (41, 42) gesichert sind, und ferner **dadurch gekennzeichnet, dass** das distale Ende (45) des ersten Hebels (43) eine Einstelleinrichtung (46) aufweist, die mit dem ersten Plattenelement (23) zum Einstellen der Vorspannung der ersten (42) und der zweiten (42) Spiralfeder operativ gekoppelt ist.

4. Antriebsmechanismus (1) nach einem oder mehreren der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Leistungswelle eine zweite Unterbaugruppe (31) aufweist, die einen zweiten L-förmigen Hebel (32) mit einer ebenen Basis (33), die entlang der ersten Längsachse im rechten Winkel zu derselben drehbar montiert ist, und ein zweites Plattenelement (34), das im rechten Winkel von der ebenen Basis (33) in Richtung des Kopfes (20) der Arbeitswelle (2) vorsteht, aufweist, wobei die zweite Unterbaugruppe (31) ferner einen Hauptkörper (35) mit einer an der ebenen Basis (33) des zweiten L-förmigen Hebels (32) fixierten ersten Seite (36) und einer zweiten Seite aufweist, auf der der erste (51) und der zweite (52) Sperrschenkel positioniert sind.

5. Antriebsmechanismus (1) nach Anspruch 4, **dadurch gekennzeichnet, dass** das zweite Plattenelement (34) mit den zweiten Enden (412, 422) der ersten und der zweiten Spiralfeder (41, 42) operativ koppelbar ist.

6. Antriebsmechanismus (1) nach einem oder mehreren der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Sperreinrichtung (5) eine erste (53) und eine zweite (54) Sperrgleitklaue aufweist, die auf einer dritten Platte (13) gleitend befestigt und zwischen einer Sperrposition und eine Freigabeposition beweglich ist und dem ersten (51) und dem zweiten (52) Sperrschenkel operativ zuordenbar ist.

7. Antriebsmechanismus (1) nach Anspruch 6, **dadurch gekennzeichnet, dass** die erste (53) und die zweite (54) Sperrgleitklaue in einer entsprechenden Aussparung (530, 540) in der dritten Platte (13) gleitend befestigt sind, wobei die erste Gleitklaue (53) in einer ersten Sperrposition durch einen ersten Sperrhebel (55) gehalten wird, wobei in der ersten Sperrposition die erste Sperrgleitklaue (53) an dem ersten Sperrschenkel (51) anliegt, wobei die erste Sperrgleitklaue (53) in eine erste Freigabeposition bewegt wird, wenn der erste Sperrhebel (55) freigegeben wird, wobei in der ersten Freigabeposition die Leistungswelle in einer ersten Richtung frei drehen kann, wobei die zweite Sperrgleitklaue (54) durch einen zweiten Sperrhebel in einer zweiten Sperrposition gehalten wird, wobei in der zweiten Sperrposition die zweite Sperrgleitklaue (54) an dem zweiten Sperrschenkel (52) anliegt, wobei die zweite Sperrgleitklaue (54) in eine zweite Freigabeposition bewegt wird, wenn der zweite Sperrhebel freigegeben wird, wobei in der zweiten Freigabeposition die Leistungswelle (3) in einer zu der ersten Richtung entgegengesetzten zweiten Richtung frei drehen kann.

8. Antriebsmechanismus (1) nach Anspruch 7, **dadurch gekennzeichnet, dass** die Sperreinrichtung (5) eine erste (57) und eine zweite Sperreinrichtung zum jeweiligen Sperren des ersten (55) und des zweiten (56) Sperrhebels aufweist.

9. Antriebsmechanismus (1) nach einem oder mehreren der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die erste (61) und die zweite (62) Freigabeeinrichtung eine erste (610) und eine zweite (620) Freigabetaste aufweisen, die auf der Vorderseite des Antriebsmechanismus (1) positioniert sind.

10. Antriebsmechanismus (1) nach Anspruch 8 und 9, **dadurch gekennzeichnet, dass** die erste (610) und die zweite (620) Freigabetaste jeweils auf die erste (57) und die zweite Sperreinrichtung einwirken.

11. Mittelspannungs-Sicherungsschalter, **dadurch gekennzeichnet, dass** er einen Antriebsmechanismus (1) nach einem oder mehreren der vorhergehenden Ansprüche aufweist.

Revendications

1. Mécanisme de commande (1) pour un fusible-interrupteur de Moyenne Tension, **caractérisé en ce qu'**il comprend :

   - une plaque de base (10) et une plaque avant (11), définissant un espace interne logeant un arbre d'actionnement (2) et un arbre de puissance (3), montés coaxialement le long d'un premier axe longitudinal, l'arbre de puissance étant susceptible d'être connecté fonctionnellement à une chaîne cinématique d'un fusible-interrupteur de Moyenne Tension, pour une opération d'ouverture/fermeture dudit interrupteur, l'arbre d'actionnement (2) comprenant une tête (20), susceptible d'être connectée à une poignée d'actionnement, pour un actionnement manuel dudit arbre d'actionnement (2) ;
   - un ensemble à ressort (4), comprenant un premier (41) et un deuxième (42) ressort en spirale, ayant une première extrémité (411, 421), couplée fonctionnellement audit arbre d'actionnement (2), lesdits ressorts en spirale (41, 42) étant chargés par la rotation dudit arbre d'actionnement (2) et actionnant ledit arbre de puissance une fois relâchés, le premier ressort en spirale (41) déterminant une rotation dudit arbre de puissance, dans un sens opposé à la rotation déterminée par ledit deuxième ressort en spirale (42) ;
   - des moyens de verrouillage (5), pour verrouiller ledit arbre de puissance, comprenant un premier (51) et un deuxième (52) bras de verrouillage, positionnés sur ledit arbre de puissance ;
   - des premier (61) et deuxième (62) moyens de libération, pour déverrouiller ledit arbre de puissance et permettre la rotation de celui-ci, les premiers moyens de libération (61) permettant une rotation dudit arbre de puissance dans un sens opposé par rapport auxdits deuxièmes moyens de libération (62) ; **caractérisé par le fait que**
   - ledit arbre d'actionnement (2) comprend un premier sous-ensemble (21), comprenant un disque (22), monté perpendiculairement audit premier axe longitudinal et comprenant en outre un premier élément en plaque (23) faisant saillie perpendiculairement du bord dudit disque (22), dans la direction de la tête (20) dudit arbre d'actionnement (2).

2. Mécanisme de commande (1) selon la revendication 1, **caractérisé en ce que** ledit ensemble à ressort (4) comprend un premier levier (43), ayant un élément de base (44) montés coaxialement sur le premier sous-ensemble (21) dudit arbre d'actionnement (2), et une extrémité distale (45), faisant saillie du bord dudit disque (22), ledit élément de base (44) étant prévu avec des moyens de fixation (441) pour les premières extrémités (411, 421) desdits premier et deuxième ressorts en spirale (41, 42), ladite extrémité distale (45) étant couplée fonctionnellement audit premier élément en plaque (23) dudit premier sous-ensemble (21).

3. Mécanisme de commande (1) selon la revendication 2, **caractérisé en ce que** lesdits moyens de fixation (441) comprennent une gorge dans laquelle lesdites premières extrémités (411, 412) desdits premier et deuxième ressorts en spirale (41, 42) sont fixées, et en outre **caractérisé en ce que** ladite extrémité distale (45) dudit premier levier (43) comprend des moyens d'ajustement (46), couplés fonctionnellement audit premier élément en plaque (23), pour ajuster la pré-charge desdits premier (41) et deuxième (42) ressorts en spirale.

4. Mécanisme de commande (1) selon l'une ou plusieurs des revendications précédentes, **caractérisé en ce que** ledit arbre de puissance comprend un deuxième sous-ensemble (31), comprenant un deuxième levier (32), en forme de L, ayant une base (33) plate, montée à rotation le long dudit premier axe longitudinal de celui-ci, et un deuxième élément en plaque (34), faisant saillie perpendiculairement de ladite base (33), dans la direction de la tête (20) dudit arbre d'actionnement (2), le deuxième sous-ensemble (31) comprenant en outre un corps principal (35) ayant un premier côté(36), fixé à la base plate (33) dudit deuxième levier (32), en forme de L, et un deuxième côté, sur lequel lesdits premier (51) et deuxième (52) bras de verrouillage sont positionnés.

5. Mécanisme de commande (1) selon la revendication 4, **caractérisé en ce que** ledit deuxième élément en plaque (34) est susceptible d'être couplé fonctionnellement aux deuxièmes extrémités (412, 422) desdits premier et deuxième ressorts en spirale (41, 42).

6. Mécanisme de commande (1) selon l'une ou plusieurs des revendications précédentes, **caractérisé en ce que** lesdits premier moyens de verrouillage (5) comprennent un premier (53) et un deuxième (54) cliquet coulissant de verrouillage, montés à coulissement sur une troisième plaque (13) et déplaçable entre une position de verrouillage et une position libérée, et susceptible d'être associé fonctionnellement auxdits premier (51) et deuxième (52) bras de verrouillage.

7. Mécanisme de commande (1) selon la revendication 6, **caractérisé en ce que** lesdits premier (53) et deuxième (54) cliquets coulissants de verrouillage sont montés à coulissement dans une gorge (530,

540) correspondante ménagée dans ladite troisième plaque (13), le premier (53) cliquet coulissant étant maintenu, par un premier levier de verrouillage (55), dans une première position de verrouillage, première position de verrouillage dans laquelle le premier (53) cliquet coulissant de verrouillage vient buter contre ledit premier bras de verrouillage (51), ledit premier (53) cliquet coulissant de verrouillage étant déplacé en une première position de libération, lorsque ledit premier levier de verrouillage (55) est libéré, première position de libération dans laquelle l'arbre de puissance est libre de tourner dans un premier sens, le deuxième (54) cliquet coulissant de verrouillage étant maintenu, par un deuxième levier de verrouillage, en une deuxième position de verrouillage, deuxième position de verrouillage dans laquelle ledit deuxième (54) cliquet coulissant de verrouillage vient buter contre ledit deuxième bras de verrouillage (52), ledit deuxième (54) cliquet coulissant de verrouillage étant déplacé en une deuxième position de libération lorsque ledit deuxième levier de verrouillage est libéré, deuxième position de libération dans laquelle l'arbre de puissance (3) est libre de tourner dans un deuxième sens, opposé audit premier sens.

8. Mécanisme de commande (1) selon la revendication 7, **caractérisé en ce que** lesdits moyens de verrouillage (5) comprennent des premiers (57) et des deuxièmes moyens de verrouillage, pour respectivement verrouiller lesdits premier (55) et deuxième (56) leviers de verrouillage.

9. Mécanisme de commande (1) selon l'une ou plusieurs des revendications précédentes, **caractérisé en ce que** lesdits premier (61) et deuxièmes (62) moyens de libération comprennent un premier (610) et un deuxième (620) boutons de libération, positionnés sur l'avant dudit mécanisme de commande (1).

10. Mécanisme de commande (1) selon les revendications 8 et 9, **caractérisé en ce que** lesdits premier (610) et deuxième (620) boutons de libération agissent respectivement sur lesdits premier (57) et deuxième moyens de verrouillage.

11. Fusible-interrupteur de Moyenne Tension, **caractérisé en ce qu'**il comprend un mécanisme de commande (1) selon l'une ou plusieurs des revendications précédentes.

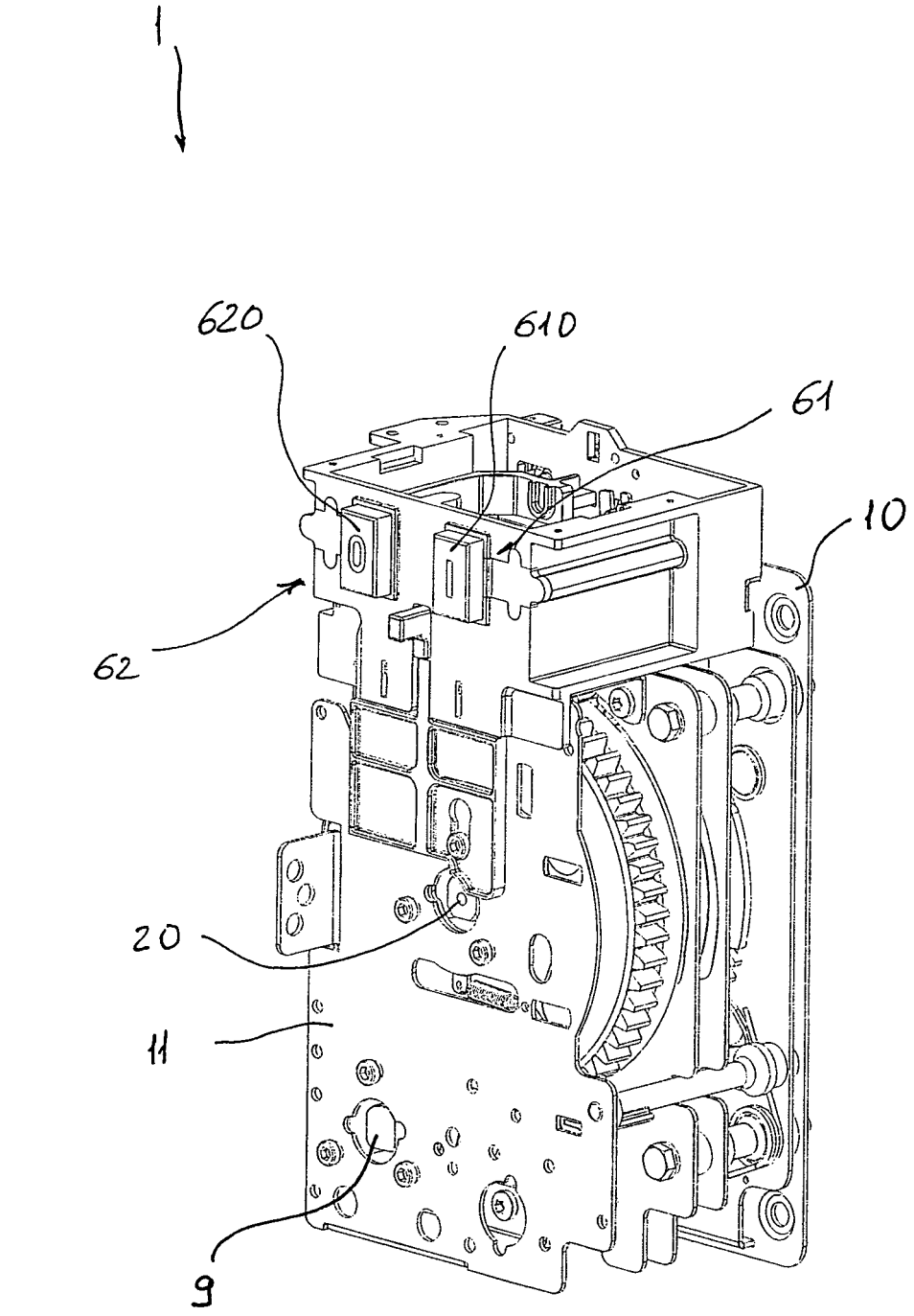


Fig.1

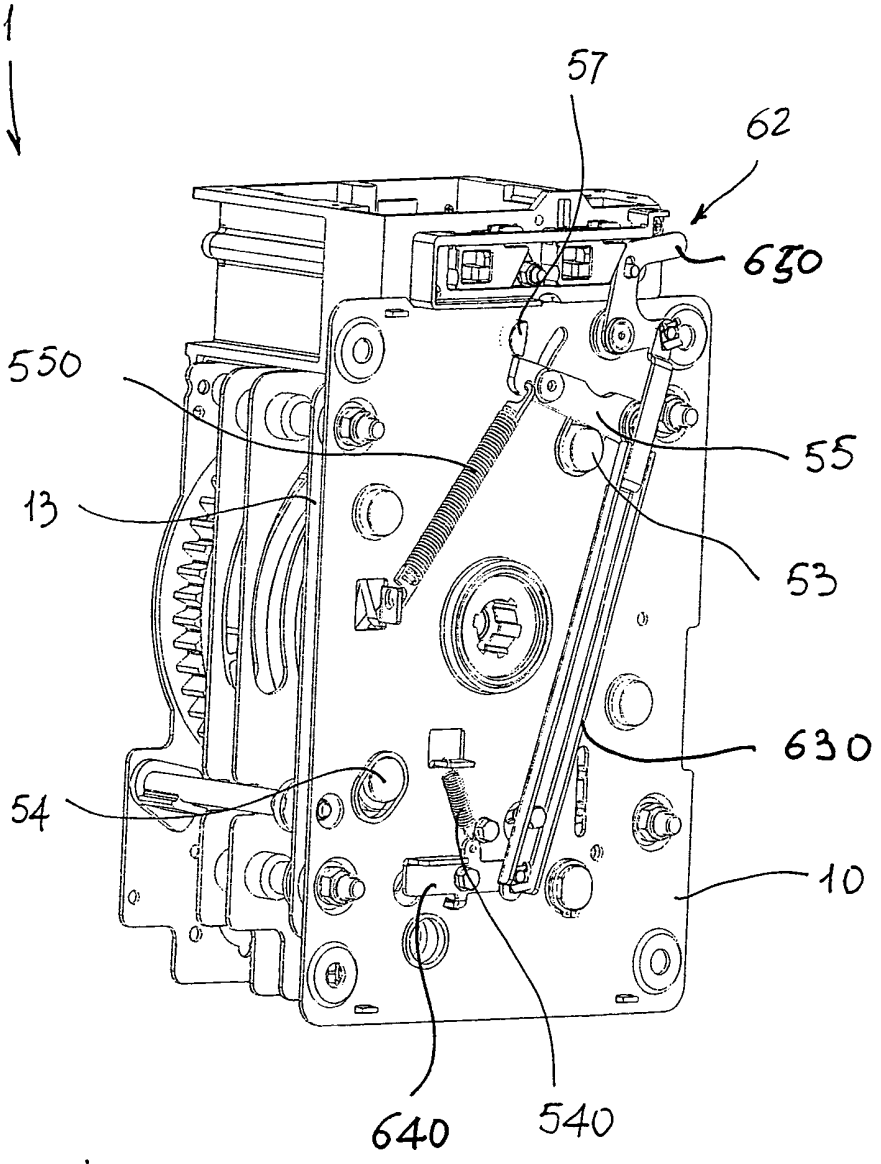


Fig.2

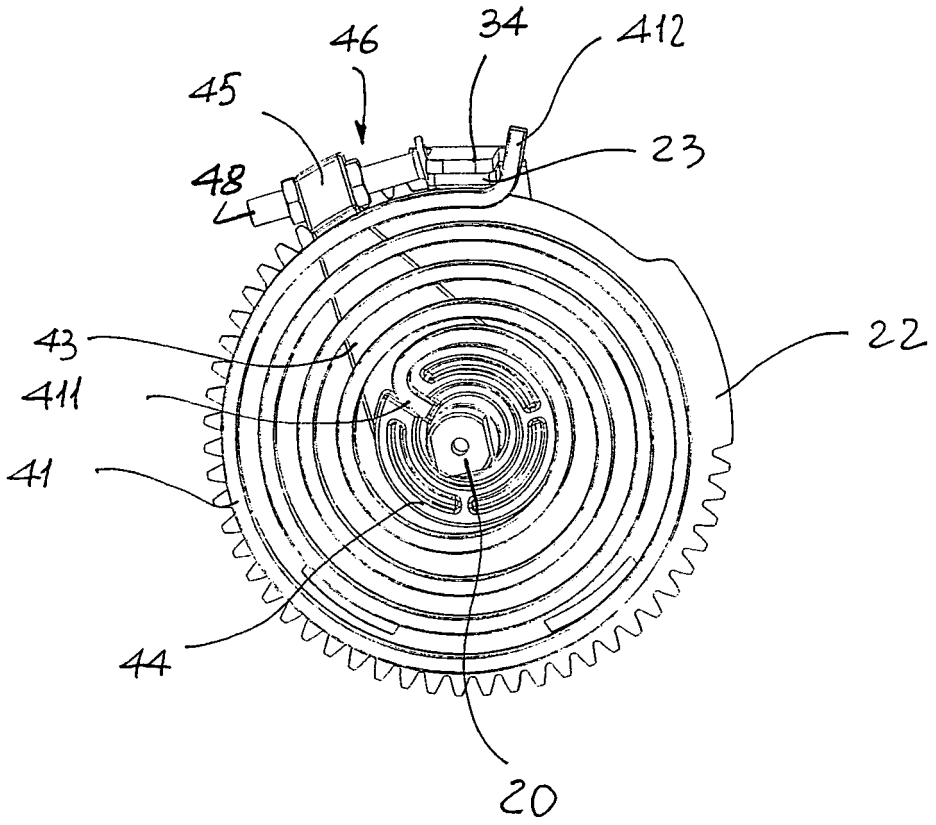


Fig. 3

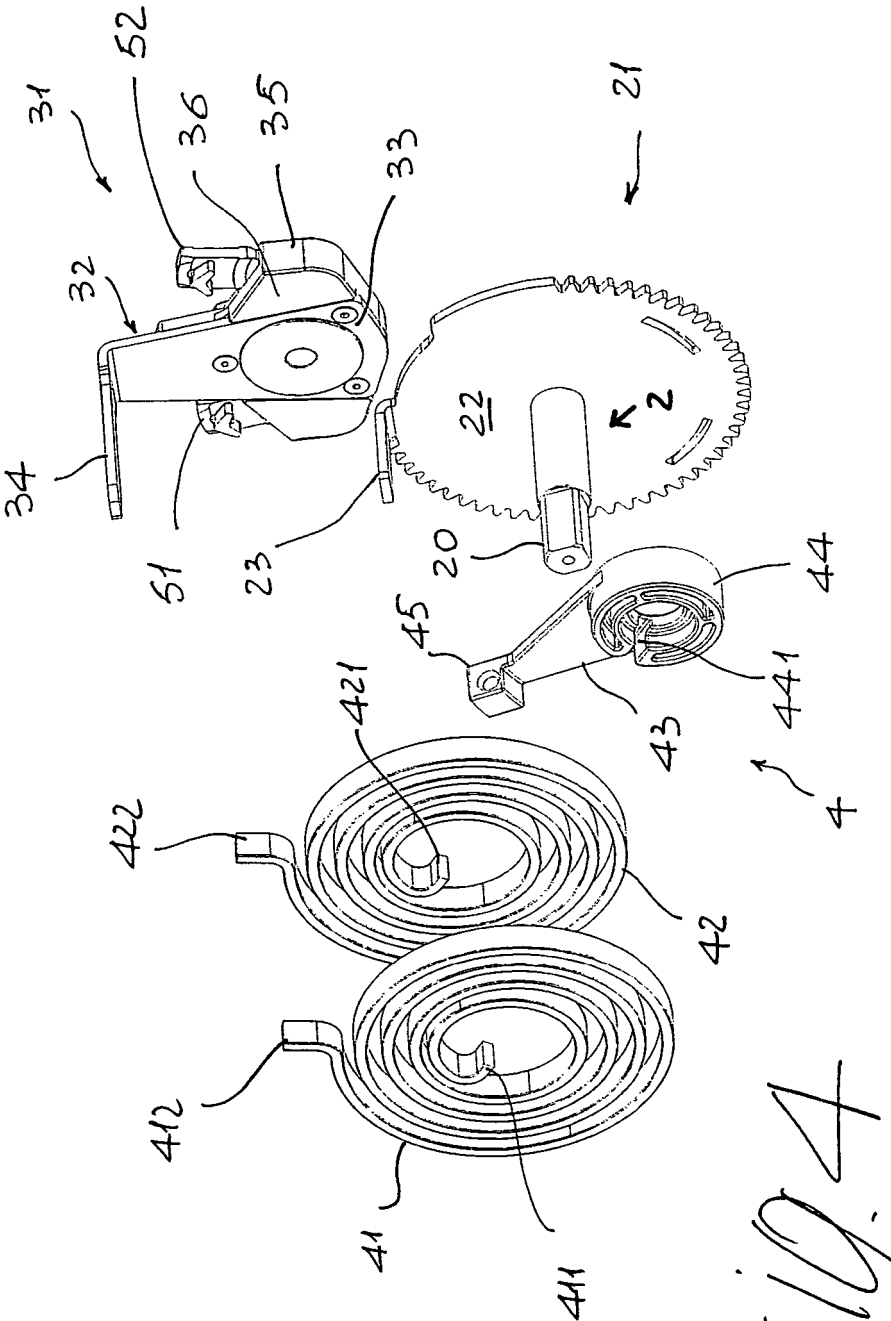

31
52
36
35
33
21
32
22
2
34
51
23
20
44
45
441
43
421
4
422
42
412
41
411

Fig. 4

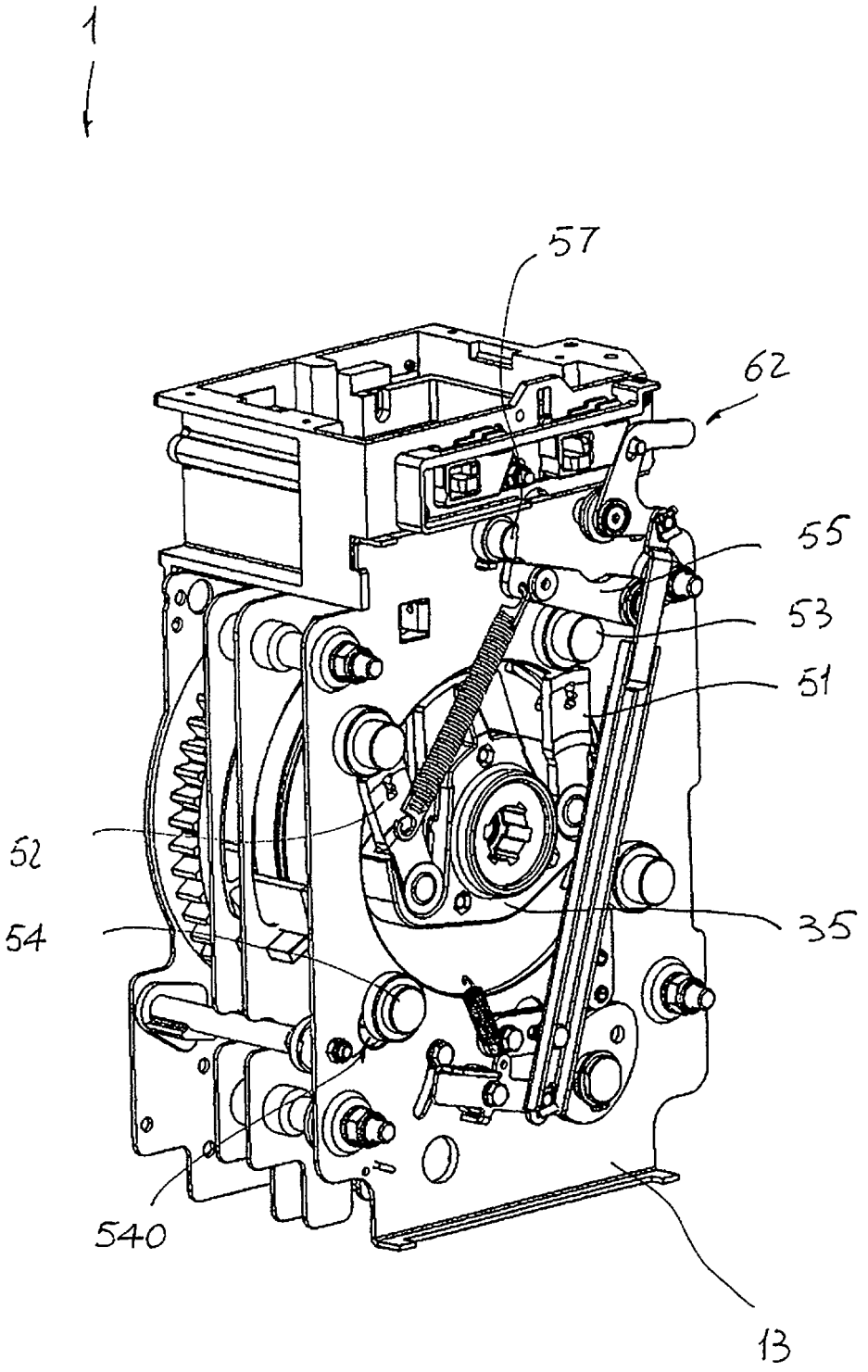


Fig. 5

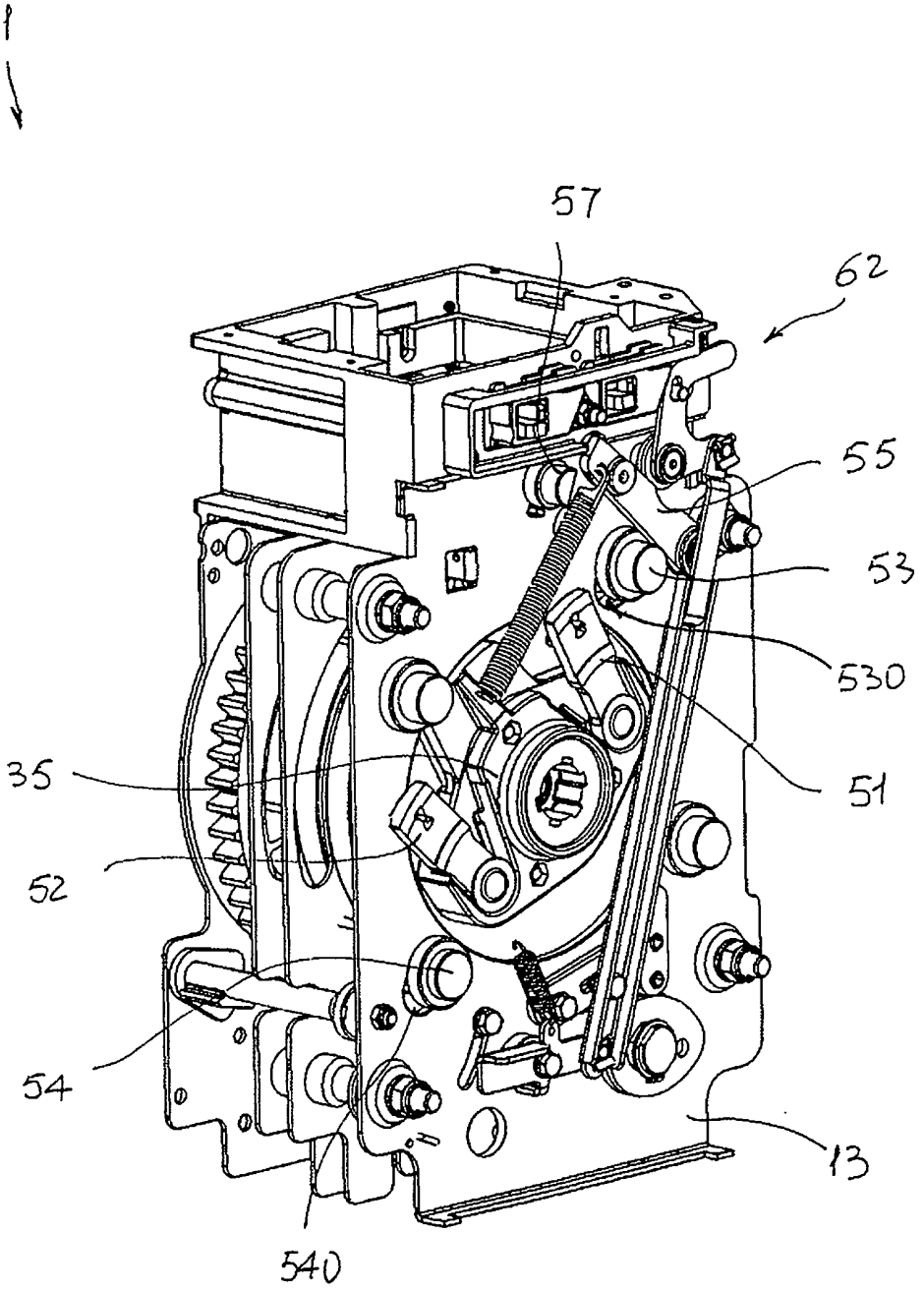


Fig 6

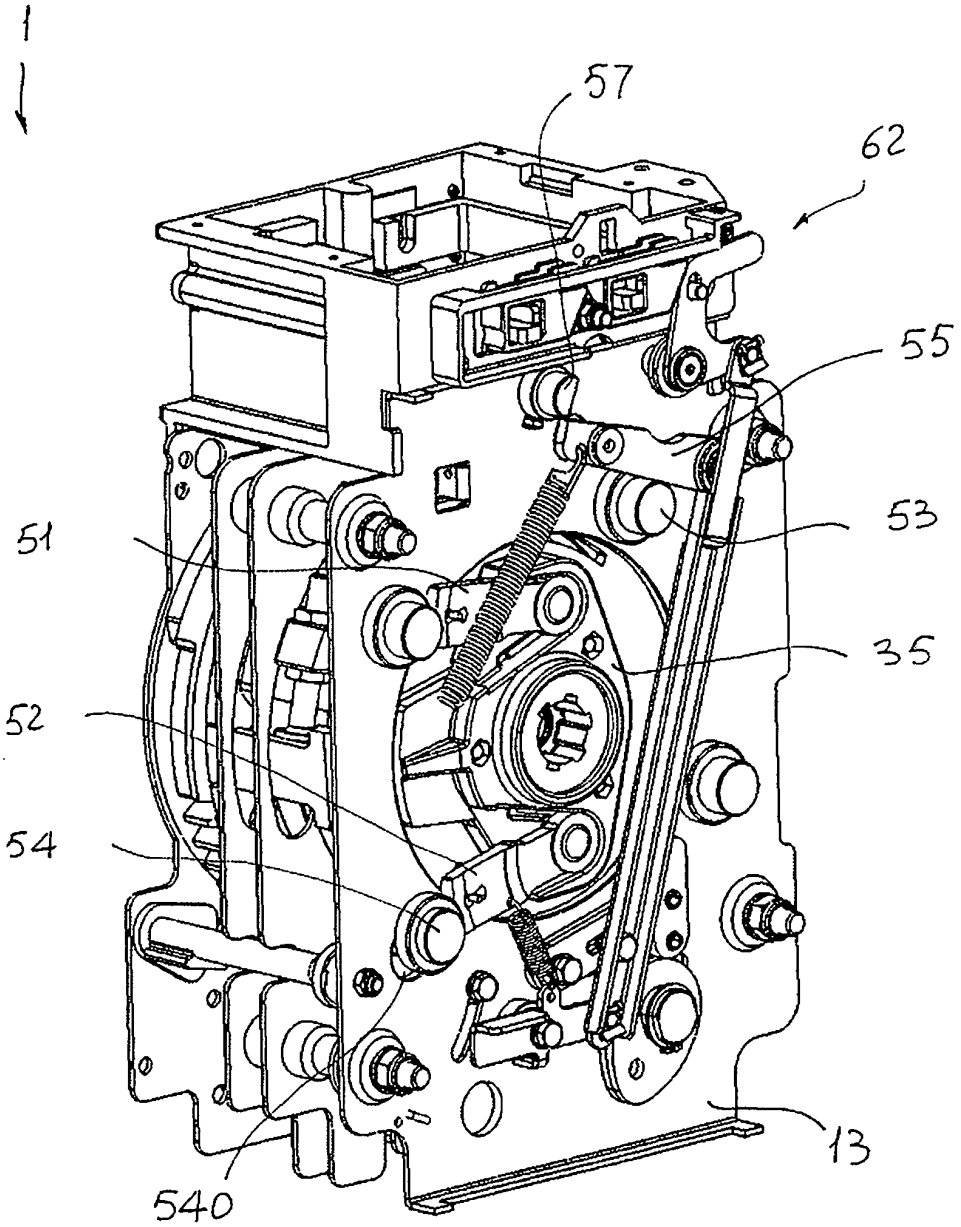


Fig 7

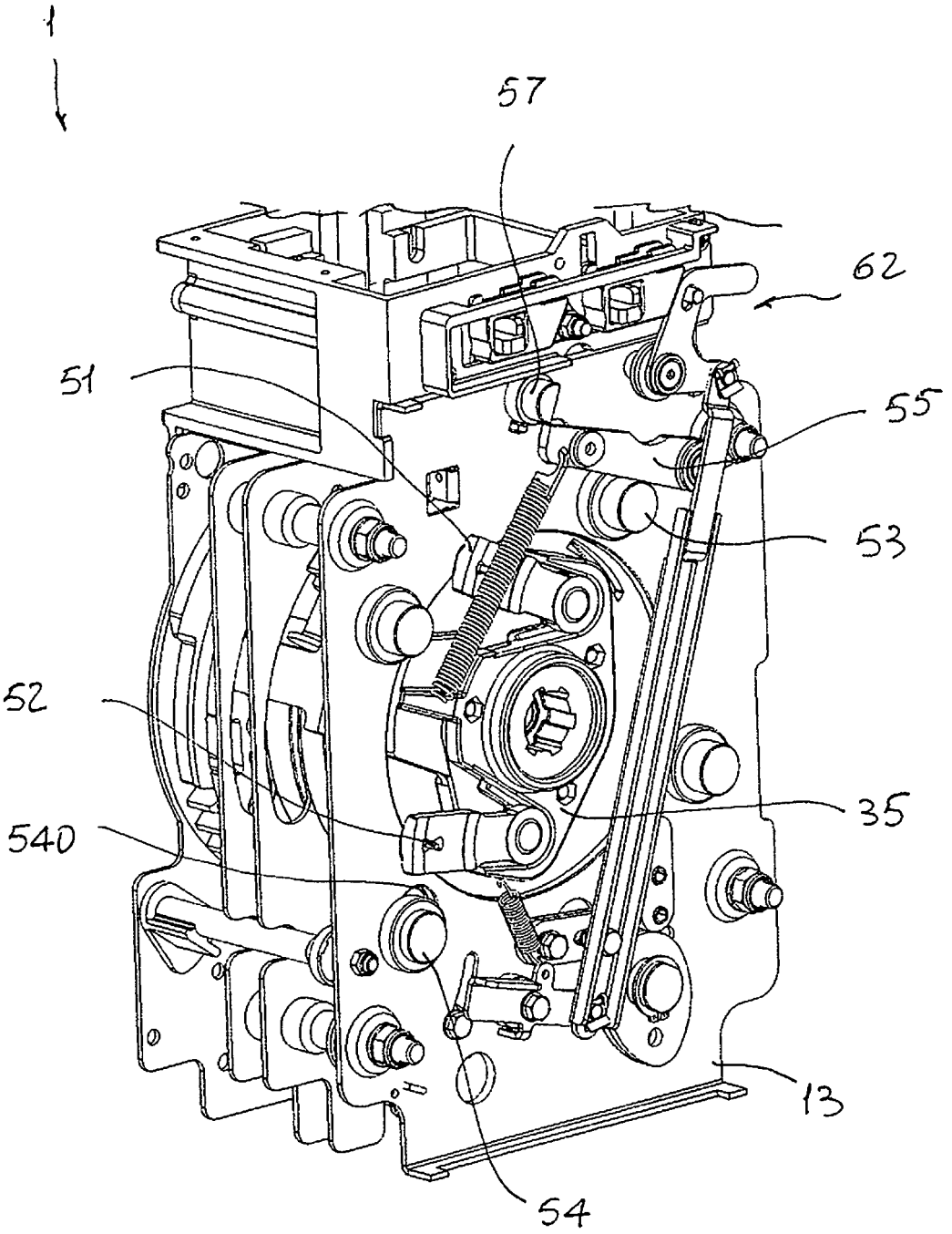


Fig. 8

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 4683357 A **[0003]**