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(54) **DRIVE FOR A LOW, MEDIUM OR HIGH VOLTAGE SWITCH**

(57) The present invention relates to a drive for a low, medium or high voltage switch, comprising: a pushrod (10); a sun cogwheel (30); at least one planetary cogwheel (40); a carrier (50); a cogwheel ring (60); and a carrier locking device (200). An axis of the pushrod is coaxial with an axis of the sun cogwheel, and a rotation of the sun cogwheel is configured to move the pushrod along the axis of the pushrod. An axis of the carrier is coaxial with the axis of the sun cogwheel, and the carrier comprises at least one latching feature (52). An axis of the cogwheel ring is coaxial with the axis of the sun cogwheel. The at least one planetary cogwheel is located between the sun cogwheel and the cogwheel ring, wherein each planetary cogwheel of the at least one planetary cogwheel is connected to the carrier such that when the carrier rotates about the axis of the sun cogwheel a centre

axis of each planetary cogwheel rotates with the carrier, and wherein each planetary cogwheel is configured to rotate about its own centre axis. The carrier locking device is configured to engage with one latching feature of the at least one latching feature of the carrier to stop the carrier from rotating, and the carrier locking device is configured to disengage from the at least one latching feature of the carrier to permit the carrier to rotate. Initiation of a first switching action comprises a disengagement of the carrier locking device from a latching feature of the at least one latching feature of the carrier. In the first switching action a rotation of the carrier about the axis of the sun cogwheel in a first rotational direction is configured to rotate the sun cogwheel in the first rotational direction to move the pushrod along the axis of the pushrod in a first direction.

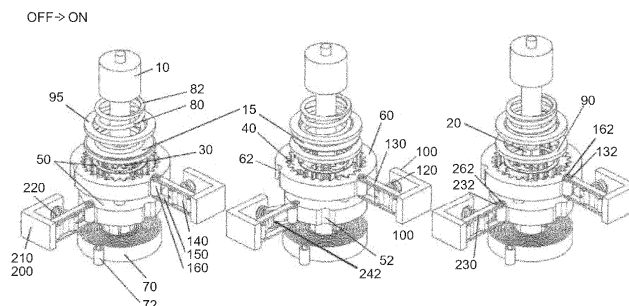


Fig. 1

Description

FIELD OF THE INVENTION

[0001] The present invention relates to a drive for a low, medium or high voltage switch, and a low, medium or high voltage vacuum circuit breaker.

BACKGROUND OF THE INVENTION

[0002] Low, medium or high voltage two-position switches such as switching poles or circuit breakers (CBs), generally use for example levers or shafts. For example, levers or shafts are used to connect several switching poles (usually 3) or other devices mechanically to one drive. The poles themselves require a translational movement (like SF6 poles or vacuum poles). With levers and shafts, it is difficult to connect several switching poles or devices unless they are arranged in one line.

[0003] For applications where an individual pole driving or a concentric device installed at the insulation part without a breaker housing is required, e.g. for synchronised switching or for having more freedom in the design of switchgears, the known mechanical CB drives are relatively large and complex. With magnetic drives, on the other hand, such solutions are possible, because these drives can be coupled relatively easily to Vacuum Interrupters (Vis) resulting in compact in-axis design for complete switching poles that already include the drive.

[0004] However, such magnetic drives are not always an optimal solution.

[0005] There is a need to address these issues.

SUMMARY OF THE INVENTION

[0006] Therefore, it would be advantageous to have an improved drive for a low, medium or high voltage switch.

[0007] The object of the present invention is solved with the subject matter of the independent claims, wherein further embodiments are incorporated in the dependent claims.

[0008] In a first aspect, there is provided a drive for a low, medium or high voltage switch, comprising:

- a pushrod;
- a sun cogwheel;
- at least one planetary cogwheel;
- a carrier;
- a cogwheel ring; and
- a carrier locking device.

[0009] An axis of the pushrod is coaxial with an axis of the sun cogwheel, and wherein a rotation of the sun cogwheel is configured to move the pushrod along the axis of the pushrod. An axis of the carrier is coaxial with the axis of the sun cogwheel, and wherein the carrier comprises at least one latching feature. An axis of the cog-

wheel ring is coaxial with the axis of the sun cogwheel. The at least one planetary cogwheel is located between the sun cogwheel and the cogwheel ring. Each planetary cogwheel of the at least one planetary cogwheel is connected to the carrier such that when the carrier rotates about the axis of the sun cogwheel a centre axis of each planetary cogwheel rotates with the carrier. Each planetary cogwheel is configured to rotate about its own centre axis. The carrier locking device is configured to engage with one latching feature of the at least one latching feature of the carrier to stop the carrier from rotating. The carrier locking device is configured to disengage from the at least one latching feature of the carrier to permit the carrier to rotate. Initiation of a first switching action comprises a disengagement of the carrier locking device from a latching feature of the at least one latching feature of the carrier. In the first switching action a rotation of the carrier about the axis of the sun cogwheel in a first rotational direction is configured to rotate the sun cogwheel in the first rotational direction to move the pushrod along the axis of the pushrod in a first direction.

[0010] In this manner, a triggered release of the carrier enables a rotational movement of the carrier and associated rotational movement of planetary cogwheels about a centre axis that leads to each planetary cogwheel also rotating about its own axis and this rotation is coupled to the sun cogwheel which then rotates and in doing so translates the pushrod along its axis as part of the switching mechanism of the vacuum circuit breaker.

[0011] In other words, the carrier can be a ring type structure to which is mounted the planetary cogwheels. Then, the carrier can be stationary and the sun cogwheel and the cogwheel ring can rotate as the individual planetary cogwheels rotate about their own axes. Also, the carrier can rotate, and with the cogwheel ring stationary the individual planetary cogwheels rotate as the carrier rotates and this rotation is coupled to the sun cogwheel which then rotates. Also, the carrier can rotate, and with the sun cogwheel stationary the individual planetary cogwheels rotate as the carrier rotates and this rotation is coupled to the cogwheel ring which then rotates.

In an example, the pushrod is rotationally connected to or engaged with the sun cogwheel.

[0012] In an example, the sun cogwheel comprises a plurality of outward facing teeth.

[0013] In an example, the cogwheel ring comprises a plurality of inward facing teeth.

[0014] In an example, the pushrod comprises a threaded portion, and the sun cogwheel comprises an inner threaded portion located about an axis of the sun cogwheel.

[0015] In an example, the at least one planetary cogwheel comprises a plurality of outward facing teeth, and wherein some teeth of the at least one planetary cogwheel are engaged with some teeth of the sun cogwheel and some other teeth of the at least one planetary cogwheel are engaged with some teeth of the cogwheel ring.

[0016] In an example, the at least one planetary cog-

wheel comprises three planetary cogwheels.

[0017] In an example, the medium voltage switch is a vacuum circuit breaker.

[0018] In an example, the carrier comprises a disc that rotates with the carrier. The at least one latching feature of the carrier comprises at least one indentation in an outer perimeter of the disc of the carrier. The carrier locking device comprises a protrusion. Engagement of the carrier locking device with a latching feature of the carrier comprises the carrier locking device being configured to hold the protrusion of the carrier locking device in an indentation of the disc to stop the carrier from rotating. Disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to enable the protrusion of the carrier locking device to move into and out of the at least one indentation of the disc.

[0019] In an example, the protrusion of the carrier locking device comprises a roller. Engagement of the carrier locking device with a latching feature of the carrier comprises the locking device being configured to hold the roller of the carrier locking device in the indentation of the disc to stop the carrier from rotating. Disengagement of the locking device from the at least one latching feature of the carrier comprises the locking device being configured to enable the roller of the carrier locking device to roll into and out of the at least one indentation of the disc.

[0020] In an example, engagement of the carrier locking device with the latching feature of the carrier comprises the carrier locking device being configured to resist a movement of the protrusion of the carrier locking device in a radial direction away from the axis of the carrier.

[0021] In an example, the carrier locking device comprises a knee lever and wherein the carrier locking device is configured to hold a first lever and a second lever of the knee-lever of the carrier locking device straight to resist the movement of the protrusion of the carrier locking device in the radial direction away from the axis of the carrier.

[0022] In an example, disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to enable a movement of the protrusion of the carrier locking device in a radial direction away from the axis of the carrier.

[0023] In an example, disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to pull the protrusion of the carrier locking device in the radial direction away from the axis of the carrier.

[0024] In an example, disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to bend the knee-lever of the carrier locking device such that the first lever is angled to the second lever.

[0025] In an example, the at least one latching feature

of the carrier comprises a plurality of latching features angularly spaced one from the other about the axis of the carrier.

[0026] In an example, in the first switching action the drive is configured such that the cogwheel ring does not rotate.

[0027] In an example, the cogwheel ring comprises at least one latching feature. The drive comprises a cogwheel ring locking device. The cogwheel ring locking device is configured to engage with one latching feature of the at least one latching feature of the cogwheel ring to stop the cogwheel ring from rotating. The cogwheel ring locking device is configured to disengage from the at least one latching feature of the cogwheel ring to permit the cogwheel ring to rotate.

[0028] In an example, the at least one latching feature of the cogwheel ring comprises at least one indentation in an outer perimeter of the cogwheel ring. The cogwheel ring locking device comprises a protrusion. Engagement of the cogwheel ring locking device with a latching feature of the cogwheel ring comprises the cogwheel ring locking device being configured to hold the protrusion of the cogwheel ring locking device in an indentation of the cogwheel ring to stop the cogwheel ring from rotating. Disengagement of the cogwheel ring locking device from the at least one latching feature of the cogwheel ring comprises the cogwheel ring locking device being configured to enable the protrusion of the cogwheel ring locking device to move into and out of the at least one indentation of the cogwheel ring.

[0029] In an example, the protrusion of the cogwheel ring locking device comprises a roller. Engagement of the cogwheel ring locking device with a latching feature of the cogwheel ring comprises the locking device being configured to hold the roller of the cogwheel ring locking device in the indentation of the cogwheel ring to stop the cogwheel ring from rotating. Disengagement of the cogwheel ring locking device from the at least one latching feature of the cogwheel ring comprises the locking device being configured to enable the roller of the cogwheel ring locking device to roll into and out of the at least one indentation of the cogwheel ring.

[0030] In an example, engagement of the cogwheel ring locking device with the latching feature of the cogwheel ring comprises the cogwheel ring locking device being configured to resist a movement of the protrusion of the cogwheel ring locking device in a radial direction away from the axis of the cogwheel ring.

[0031] In an example, the cogwheel ring locking device comprises a knee lever and wherein the cogwheel ring locking device is configured to hold a first lever and a second lever of the knee-lever of the cogwheel ring locking device straight to resist the movement of the protrusion of the cogwheel ring locking device in the radial direction away from the axis of the cogwheel ring.

[0032] In an example, disengagement of the cogwheel ring locking device from the at least one latching feature of the cogwheel ring comprises the cogwheel ring locking

device being configured to enable a movement of the protrusion of the cogwheel ring locking device in a radial direction away from the axis of the cogwheel ring.

[0033] In an example, disengagement of the cogwheel ring locking device from the at least one latching feature of the cogwheel ring comprises the cogwheel ring locking device being configured to pull the protrusion of the cogwheel ring locking device in the radial direction away from the axis of the cogwheel ring.

[0034] In an example, disengagement of the cogwheel ring locking device from the at least one latching feature of the cogwheel ring comprises the cogwheel ring locking device being configured to bend the knee-lever of the cogwheel ring locking device such that the first lever is angled to the second lever.

[0035] In an example, the at least one latching feature of the cogwheel ring comprises a plurality of latching features angularly spaced one from the other about the axis of the cogwheel ring.

[0036] In an example, in the first switching action the rotation of the sun cogwheel in the first rotational direction is configured to move the pushrod along the axis of the pushrod in the first direction away from the sun cogwheel.

[0037] In an example, in the first switching action the drive is configured such that the pushrod does not rotate about the pushrod axis.

[0038] In this way, because the pushrod is threaded and the sun cogwheel is threaded, rotation of the sun cogwheel whilst the pushrod cannot rotate necessarily leads to translation of the pushrod.

[0039] In an example, a first end of a first spring is coupled to the carrier. In the first switching action energy release from the first spring is configured to rotate the carrier in the first rotational direction about the axis of the sun cogwheel.

[0040] In an example, in the first switching action the drive is configured such that a second end of the first spring is held in a fixed position.

[0041] In an example, in the first switching action movement of the pushrod along the axis of the pushrod is configured to store energy in a second spring.

[0042] In this way, the first switching action can store energy required for a return or second switching action bringing the switch back to its original configuration.

[0043] In an example, at the end of the first switching action, the carrier locking device is configured to engage with a latching feature of the at least one latching feature of the carrier.

[0044] In an example, a contact plate is fixedly connected to the pushrod. The drive comprises a fixed end stop. In the first switching action the drive is configured such that the contact plate is moved toward the end stop. At the end of the first switching action the drive is configured such that the contact plate has contacted the end stop.

[0045] In an example, the contact plate comprises a ring-shaped structure and the end stop comprises a ring-shaped structure.

[0046] In an example, the contact plate and/or the end stop have a defined level of flexibility.

[0047] In an example, initiation of a second switching action comprises a disengagement of the cogwheel ring locking device from a latching feature of the at least one latching feature of the cogwheel ring. In the second switching action a rotation of the cogwheel ring about the axis of the sun cogwheel in the first rotational direction is configured to rotate the sun cogwheel in a second rotational direction opposite to the first rotational direction to move the pushrod along the axis of the pushrod in a second direction opposite to the first direction.

[0048] In an example, in the second switching action energy release from the second spring is configured to rotate the cogwheel ring.

[0049] In an example, a first end of the second spring is connected to the contact plate.

[0050] In an example, a second end of the second spring is held in a fixed position.

[0051] In an example, in the second switching action the drive is configured such that the carrier does not rotate about the axis of the sun cogwheel.

[0052] In other words, the sun cogwheel rotates, but the individual planetary cogwheels are not rotating about the centre axis but are each rotating about their own axes, and this leads to the cogwheel ring rotating. Thus, in this manner the second switching movement is not constrained by storing energy in the first spring used to drive the first switching movement because the planetary cogwheels are not rotating as a whole around a centre axis but only rotating about their own axes.

[0053] In an example, in the second switching action the drive is configured such that the second end of the first spring is held in the fixed position.

[0054] In an example, prior to the first switching action the drive is configured such that a rotation of the second end of the first spring in the first rotational direction is configured to store energy in the first spring.

[0055] In this manner, a simple way of charging the drive for switching operation is enabled.

[0056] In a second aspect, there is provided a low, medium or high voltage vacuum circuit breaker comprising a drive according to the first aspect.

[0057] In a third aspect, there is provided a drive for a low, medium or high voltage switch, comprising:

- a pushrod;
- a sun cogwheel;
- at least one planetary cogwheel;
- a carrier;
- a cogwheel ring;
- a cogwheel ring locking device.

An axis of the pushrod is coaxial with an axis of the sun cogwheel. A rotation of the sun cogwheel is configured to move the pushrod along the axis of the pushrod. An axis of the carrier is coaxial with the axis of the sun cogwheel. An axis of the cogwheel ring is coaxial with the

axis of the sun cogwheel, and wherein the cogwheel ring comprises at least one latching feature. The at least one planetary cogwheel is located between the sun cogwheel and the cogwheel ring. Each planetary cogwheel of the at least one planetary cogwheel is connected to the carrier such that when the carrier rotates about the axis of the sun cogwheel a centre axis of each planetary cogwheel rotates with the carrier. Each planetary cogwheel is configured to rotate about its own centre axis. The cogwheel ring locking device is configured to engage with one latching feature of the at least one latching feature of the cogwheel ring to stop the cogwheel ring from rotating. The cogwheel ring locking device is configured to disengage from the at least one latching feature of the cogwheel ring to permit the cogwheel ring to rotate. Initiation of a first switching action comprises a disengagement of the cogwheel ring locking device from a latching feature of the at least one latching feature of the cogwheel ring. In a first switching action a rotation of the cogwheel ring about the axis of the sun cogwheel in a first rotational direction is configured to rotate the sun cogwheel in a second rotational direction opposite to the first rotational direction to move the pushrod along the axis of the pushrod in a first direction.

[0058] In this manner, a triggered release of the cogwheel ring enables a rotational movement of the cogwheel ring about a centre axis that leads to each planetary cogwheel also rotating about its own axis and this rotation is coupled to the sun cogwheel which then rotates and in doing so translates the pushrod along its axis as part of the switching mechanism of the vacuum circuit breaker.

[0059] In other words, the carrier can be a ring type structure to which is mounted the planetary cogwheels. Then, the carrier can be stationary and the sun cogwheel and the cogwheel ring can rotate as the individual planetary cogwheels rotate about their own axes. Also, the carrier can rotate, and with the cogwheel ring stationary the individual planetary cogwheels rotate as the carrier rotates in this rotation is coupled to the sun cogwheel which then rotates. Also, the carrier can rotate, and with the sun cogwheel stationary the individual planetary cogwheels rotate as the carrier rotates in this rotation is coupled to the cogwheel ring which then rotates.

[0060] In an example, the pushrod is rotationally connected to or engaged with the sun cogwheel.

[0061] In an example, the pushrod comprises a threaded portion.

[0062] In an example, the sun cogwheel comprises an inner threaded portion located about an axis of the sun cogwheel.

[0063] In an example, the sun cogwheel comprises a plurality of outward facing teeth.

[0064] In an example, the cogwheel ring comprises a plurality of inward facing teeth.

[0065] In an example, the at least one planetary cogwheel comprises a plurality of outward facing teeth, and wherein some teeth of the at least one planetary cog-

wheel are engaged with some teeth of the sun cogwheel and some other teeth of the at least one planetary cogwheel are engaged with some teeth of the cogwheel ring.

[0066] In an example, the at least one planetary cogwheel comprises three planetary cogwheels.

[0067] In an example, the medium voltage switch is a vacuum circuit breaker.

[0068] In an example, the at least one latching feature of the cogwheel ring comprises at least one indentation in an outer perimeter of the cogwheel ring. The cogwheel ring locking device comprises a protrusion. Engagement of the cogwheel ring locking device with a latching feature of the cogwheel ring comprises the cogwheel ring locking device being configured to hold the protrusion of the cogwheel ring locking device in an indentation of the cogwheel ring to stop the cogwheel ring from rotating. Disengagement of the cogwheel ring locking device from the at least one latching feature of the cogwheel ring comprises the cogwheel ring locking device being configured to enable the protrusion of the cogwheel ring locking device to move into and out of the at least one indentation of the cogwheel ring.

[0069] In an example, the protrusion of the cogwheel ring locking device comprises a roller. Engagement of the cogwheel ring locking device with a latching feature of the cogwheel ring comprises the locking device being configured to hold the roller of the cogwheel ring locking device in the indentation of the cogwheel ring to stop the cogwheel ring from rotating. Disengagement of the cogwheel ring locking device from the at least one latching feature of the cogwheel ring comprises the locking device being configured to enable the roller of the cogwheel ring locking device to roll into and out of the at least one indentation of the cogwheel ring.

[0070] In an example, engagement of the cogwheel ring locking device with the latching feature of the cogwheel ring comprises the cogwheel ring locking device being configured to resist a movement of the protrusion of the cogwheel ring locking device in a radial direction away from the axis of the cogwheel ring.

[0071] In an example, the cogwheel ring locking device comprises a knee lever and wherein the cogwheel ring locking device is configured to hold a first lever and a second lever of the knee-lever of the cogwheel ring locking device straight to resist the movement of the protrusion of the cogwheel ring locking device in the radial direction away from the axis of the cogwheel ring.

[0072] In an example, disengagement of the cogwheel ring locking device from the at least one latching feature of the cogwheel ring comprises the cogwheel ring locking device being configured to enable a movement of the protrusion of the cogwheel ring locking device in a radial direction away from the axis of the cogwheel ring.

[0073] In an example, disengagement of the cogwheel ring locking device from the at least one latching feature of the cogwheel ring comprises the cogwheel ring locking device being configured to pull the protrusion of the cogwheel ring locking device in the radial direction away from

the axis of the cogwheel ring.

[0074] In an example, disengagement of the cogwheel ring locking device from the at least one latching feature of the cogwheel ring comprises the cogwheel ring locking device being configured to bend the knee-lever of the cogwheel ring locking device such that the first lever is angled to the second lever.

[0075] In an example, the at least one latching feature of the cogwheel ring comprises a plurality of latching features angularly spaced one from the other about the axis of the cogwheel ring.

[0076] In an example, in the first switching action the drive is configured such that the carrier does not rotate about the pushrod axis.

[0077] In an example, the carrier comprises at least one latching feature. The drive comprises a carrier locking device. The carrier locking device is configured to engage with one latching feature of the at least one latching feature of the carrier to stop the carrier from rotating. The carrier locking device is configured to disengage from the at least one latching feature of the carrier to permit the carrier to rotate.

[0078] In an example, the carrier comprises a disc that rotates with the carrier. The at least one latching feature of the carrier comprises at least one indentation in an outer perimeter of the disc of the carrier. The carrier locking device comprises a protrusion. Engagement of the carrier locking device with a latching feature of the carrier comprises the carrier locking device being configured to hold the protrusion of the carrier locking device in an indentation of the disc to stop the carrier from rotating. Disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to enable the protrusion of the carrier locking device to move into and out of the at least one indentation of the disc.

[0079] In an example, the protrusion of the carrier locking device comprises a roller. Engagement of the carrier locking device with a latching feature of the carrier comprises the locking device being configured to hold the roller of the carrier locking device in the indentation of the disc to stop the carrier from rotating. Disengagement of the locking device from the at least one latching feature of the carrier comprises the locking device being configured to enable the roller of the carrier locking device to roll into and out of the at least one indentation of the disc.

[0080] In an example, engagement of the carrier locking device with the latching feature of the carrier comprises the carrier locking device being configured to resist a movement of the protrusion of the carrier locking device in a radial direction away from the axis of the carrier.

[0081] In an example, the carrier locking device comprises a knee lever and wherein the carrier locking device is configured to hold a first lever and a second lever of the knee-lever of the carrier locking device straight to resist the movement of the protrusion of the carrier locking device in the radial direction away from the axis of the carrier.

[0082] In an example, disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to enable a movement of the protrusion of the carrier locking device in a radial direction away from the axis of the carrier.

[0083] In an example, disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to pull the protrusion of the carrier locking device in the radial direction away from the axis of the carrier.

[0084] In an example, disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to bend the knee-lever of the carrier locking device such that the first lever is angled to the second lever.

[0085] In an example, the at least one latching feature of the carrier comprises a plurality of latching features angularly spaced one from the other about the axis of the carrier.

[0086] In an example, in the first switching action the rotation of the sun cogwheel in the second rotational direction is configured to move the pushrod along the axis of the pushrod in the first direction away from the sun cogwheel.

[0087] In an example, in the first switching action the drive is configured such that the pushrod does not rotate about the pushrod axis.

[0088] In this way, because the pushrod is threaded and the sun cogwheel is threaded, rotation of the sun cogwheel whilst the pushrod cannot rotate necessarily leads to translation of the pushrod.

[0089] In an example, a first end of a first spring is coupled to the cogwheel ring, and wherein in the first switching action energy release from the first spring is configured to rotate the cogwheel ring in the first rotational direction about the axis of the sun cogwheel.

[0090] In an example, in the first switching action the drive is configured such that a second end of the first spring is held in a fixed position.

[0091] In an example, in the first switching action movement of the pushrod along the axis of the pushrod is configured to store energy in a second spring.

[0092] In this way, the first switching action can store energy required for a return or second switching action bringing the switch back to its original configuration.

[0093] In an example, at the end of the first switching action, the cogwheel ring locking device is configured to engage with a latching feature of the at least one latching feature of the cogwheel ring.

[0094] In an example, a contact plate is fixedly connected to the pushrod. The drive comprises a fixed end stop. In the first switching action the drive is configured such that the contact plate is moved toward the end stop. At the end of the first switching action the drive is configured such that the contact plate has contacted the end

stop.

[0095] In an example, the contact plate comprises a ring-shaped structure and the end stop comprises a ring-shaped structure.

[0096] In an example, the contact plate and/or the end stop have a defined level of flexibility.

[0097] In an example, initiation of a second switching action comprises a disengagement of the carrier locking device from a latching feature of the at least one latching feature of the carrier. In the second switching action a rotation of the carrier about the axis of the sun cogwheel is configured to rotate the sun cogwheel in a first rotational direction opposite to the second rotational direction to move the pushrod along the axis of the pushrod in a second direction opposite to the first direction.

[0098] In an example, in the second switching action energy release from the second spring is configured to rotate the carrier.

[0099] In an example, a first end of the second spring is connected to the contact plate.

[0100] In an example, a second end of the second spring is held in a fixed position.

[0101] In an example, in the second switching action the drive is configured such that the cogwheel ring does not rotate about the axis of the sun cogwheel.

[0102] In other words, the sun cogwheel rotates, and the planetary cogwheels rotate about the centre axis and each planetary cogwheel are each rotating about their own axes, and this with the cogwheel ring not rotating. Thus, in this manner the second switching movement is not constrained by storing energy in the first spring used to drive the first switching movement because the cogwheel ring is not rotating.

[0103] In an example, in the second switching action the drive is configured such that the second end of the first spring is held in the fixed position.

[0104] In an example, prior to the first switching action the drive is configured such that a rotation of the second end of the first spring in the first rotational direction is configured to store energy in the first spring.

[0105] In this manner, a simple way of charging the drive for switching operation is enabled.

[0106] In a fourth aspect, there is provided a low, medium or high voltage vacuum circuit breaker comprising a drive according to the third aspect.

[0107] In a fifth aspect, there is provided a drive for a medium voltage switch, comprising:

- a pushrod;
- a sun cogwheel;
- at least one planetary cogwheel;
- a carrier;
- a cogwheel ring;
- a carrier locking device.

An axis of the pushrod is coaxial with the axis of the cogwheel ring. A rotation of the cogwheel ring is configured to move the pushrod along the axis of the pushrod. An

axis of the carrier is coaxial with the axis of the sun cogwheel. The carrier comprises at least one latching feature. The axis of the cogwheel ring is coaxial with an axis of the sun cogwheel. The at least one planetary cogwheel is located between the sun cogwheel and the cogwheel ring. Each planetary cogwheel of the at least one planetary cogwheel is connected to the carrier such that when the carrier rotates about the axis of the sun cogwheel a centre axis of each planetary cogwheel rotates with the carrier. Each planetary cogwheel is configured to rotate about its own centre axis. The carrier locking device is configured to engage with one latching feature of the at least one latching feature of the carrier to stop the carrier from rotating. The carrier locking device is configured to disengage from the at least one latching feature of the carrier to permit the carrier to rotate. Initiation of a first switching action comprises a disengagement of the carrier locking device from a latching feature of the at least one latching feature of the carrier. In the first switching action a rotation of the carrier about the axis of the sun cogwheel in a first rotational direction is configured to rotate the cogwheel ring in a first rotational direction to move the pushrod along the axis of the pushrod in a first direction.

[0108] In this manner, a triggered release of the carrier enables a rotational movement of the carrier and associated rotational movement of planetary cogwheels about a centre axis leads to each planetary cogwheel also rotating about its own axis and this rotation is coupled to the cogwheel ring which then rotates and in doing so translates the pushrod along its axis as part of the switching mechanism of the vacuum circuit breaker.

[0109] In other words, the carrier can be a ring type structure to which is mounted the planetary cogwheels. Then, the carrier can be stationary and the sun cogwheel and the cogwheel ring can rotate as the individual planetary cogwheels rotate about their own axes. Also, the carrier can rotate, and with the cogwheel ring stationary the individual planetary cogwheels rotate as the carrier rotates in this rotation is coupled to the sun cogwheel which then rotates. Also, the carrier can rotate, and with the sun cogwheel stationary the individual planetary cogwheels rotate as the carrier rotates in this rotation is coupled to the cogwheel ring which then rotates.

[0110] In an example, the pushrod comprises a threaded portion.

[0111] In an example, the cogwheel ring comprises an inner threaded portion located about an axis of the cogwheel ring.

[0112] In an example, the sun cogwheel comprises a plurality of outward facing teeth.

[0113] In an example, the cogwheel ring comprises a plurality of inward facing teeth.

[0114] In an example, the at least one planetary cogwheel comprises a plurality of outward facing teeth, and wherein some teeth of the at least one planetary cogwheel are engaged with some teeth of the sun cogwheel and some other teeth of the at least one planetary cog-

wheel are engaged with some teeth of the cogwheel ring

[0115] In an example, the at least one planetary cogwheel comprises three planetary cogwheels.

[0116] In an example, the medium voltage switch is a vacuum circuit breaker.

[0117] In an example, the carrier comprises a disc that rotates with the carrier. The at least one latching feature of the carrier comprises at least one indentation in an outer perimeter of the disc of the carrier. The carrier locking device comprises a protrusion. Engagement of the carrier locking device with a latching feature of the carrier comprises the carrier locking device being configured to hold the protrusion of the carrier locking device in an indentation of the disc to stop the carrier from rotating. Disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to enable the protrusion of the carrier locking device to move into and out of the at least one indentation of the disc.

[0118] In an example, the protrusion of the carrier locking device comprises a roller. Engagement of the carrier locking device with a latching feature of the carrier comprises the locking device being configured to hold the roller of the carrier locking device in the indentation of the disc to stop the carrier from rotating. Disengagement of the locking device from the at least one latching feature of the carrier comprises the locking device being configured to enable the roller of the carrier locking device to roll into and out of the at least one indentation of the disc.

[0119] In an example, engagement of the carrier locking device with the latching feature of the carrier comprises the carrier locking device being configured to resist a movement of the protrusion of the carrier locking device in a radial direction away from the axis of the carrier.

[0120] In an example, the carrier locking device comprises a knee lever. The carrier locking device is configured to hold a first lever and a second lever of the knee lever of the carrier locking device straight to resist the movement of the protrusion of the carrier locking device in the radial direction away from the axis of the carrier.

[0121] In an example, disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to enable a movement of the protrusion of the carrier locking device in a radial direction away from the axis of the carrier.

[0122] In an example, disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to pull the protrusion of the carrier locking device in the radial direction away from the axis of the carrier.

[0123] In an example, disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to bend the knee-lever of the carrier locking device such that the first lever is angled to the second lever.

[0124] In an example, the at least one latching feature of the carrier comprises a plurality of latching features angularly spaced one from the other about the axis of the carrier.

5 **[0125]** In an example, in the first switching action the drive is configured such that the sun cogwheel does not rotate.

[0126] In an example, the sun cogwheel comprises at least one latching feature. The drive comprises a sun cogwheel locking device. The sun cogwheel locking device is configured to engage with one latching feature of the at least one latching feature of the sun cogwheel to stop the sun cogwheel from rotating. The sun cogwheel locking device is configured to disengage from the at least one latching feature of the sun cogwheel to permit the cogwheel ring to rotate.

[0127] In an example, the sun cogwheel comprises a disc that rotates with the sun cogwheel. The at least one latching feature of the sun cogwheel comprises at least one indentation in an outer perimeter of the disc of the sun cogwheel. The sun cogwheel locking device comprises a protrusion. Engagement of the sun cogwheel locking device with a latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to hold the protrusion of the sun cogwheel locking device in an indentation of the disc of the sun cogwheel to stop the sun cogwheel from rotating. Disengagement of the sun cogwheel locking device from the at least one latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to enable the protrusion of the sun cogwheel locking device to move into and out of the at least one indentation of the disc of the sun cogwheel.

[0128] In an example, the protrusion of the sun cogwheel locking device comprises a roller. Engagement of the sun cogwheel locking device with a latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to hold the roller of the sun cogwheel locking device in the indentation of the disc of the sun cogwheel to stop the sun cogwheel from rotating. Disengagement of the sun cogwheel locking device from the at least one latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to enable the roller of the sun cogwheel locking device to roll into and out of the at least one indentation of the disc of the sun cogwheel.

[0129] In an example, engagement of the sun cogwheel locking device with the latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to resist a movement of the protrusion of the sun cogwheel locking device in a radial direction away from the axis of the sun cogwheel.

[0130] In an example, the sun cogwheel locking device comprises a knee lever. The sun cogwheel locking device is configured to hold a first lever and a second lever of the knee-lever of the sun cogwheel locking device straight to resist the movement of the protrusion of the sun cogwheel locking device in the radial direction away

from the axis of the sun cogwheel.

[0131] In an example, disengagement of the sun cogwheel locking device from the at least one latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to enable a movement of the protrusion of the sun cogwheel locking device in a radial direction away from the axis of the sun cogwheel.

[0132] In an example, disengagement of the sun cogwheel locking device from the at least one latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to pull the protrusion of the sun cogwheel locking device in the radial direction away from the axis of the sun cogwheel.

[0133] In an example, disengagement of the sun cogwheel locking device from the at least one latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to bend the knee-lever of the sun cogwheel locking device such that the first lever is angled to the second lever.

[0134] In an example, the at least one latching feature of the sun cogwheel comprises a plurality of latching features angularly spaced one from the other about the axis of the sun cogwheel.

[0135] In an example, in the first switching action the rotation of the cogwheel ring in the first rotational direction is configured to move the pushrod along the axis of the pushrod in the first direction away from the sun cogwheel.

[0136] In an example, in the first switching action the drive is configured such that the pushrod does not rotate about the pushrod axis.

[0137] In this way, because the pushrod is threaded and the cogwheel ring has a threaded section that mates with the threaded pushrod, rotation of the cogwheel ring whilst the pushrod cannot rotate necessarily leads to translation of the pushrod.

[0138] In other words, the carrier can be a ring type structure to which is mounted the planetary cogwheels. Then, the carrier can be stationary and the sun cogwheel and the cogwheel ring can rotate as the individual planetary cogwheels rotate about their own axes. Also, the carrier can rotate, and with the cogwheel ring stationary the individual planetary cogwheels rotate as the carrier rotates in this rotation is coupled to the sun cogwheel which then rotates. Also, the carrier can rotate, and with the sun cogwheel stationary the individual planetary cogwheels rotate as the carrier rotates and this rotation is coupled to the cogwheel ring which then rotates.

[0139] In an example, a first end of a first spring is coupled to the carrier. In the first switching action energy release from a first spring is configured to rotate the carrier in the first rotational direction about the axis of the sun cogwheel.

[0140] In an example, in the first switching action the drive is configured such that a second end of the first spring is held in a fixed position.

[0141] In an example, in the first switching action movement of the pushrod along the axis of the pushrod is configured to store energy in a second spring.

[0142] In this way, the first switching action can store energy required for a return or second switching action bringing the switch back to its original configuration.

[0143] In an example, at the end of the first switching action, the carrier locking device is configured to engage with a latching feature of the at least one latching feature of the carrier.

[0144] In an example, a contact plate is fixedly connected to the pushrod. The drive comprises a fixed end stop. In the first switching action the drive is configured such that the contact plate is moved toward the end stop. At the end of the first switching action the drive is configured such that the contact plate has contacted the end stop.

[0145] In an example, the contact plate comprises a ring-shaped structure and the end stop comprises a ring-shaped structure.

[0146] In an example, the contact plate and/or the end stop have a defined level of flexibility.

[0147] In an example, initiation of a second switching action comprises a disengagement of the sun cogwheel locking device from a latching feature of the at least one latching feature of the sun cogwheel. In the second switching action a rotation of the sun cogwheel about the axis of the sun cogwheel in a first rotational direction is configured to rotate the cogwheel ring in a second rotational direction opposite to the first rotational direction to move the pushrod along the axis of the pushrod in a second direction opposite to the first direction.

[0148] In an example, in the second switching action energy release from the second spring is configured to rotate the sun cogwheel.

[0149] In an example, a first end of the second spring is connected to the contact plate.

[0150] In an example, a second end of the second spring is held in a fixed position.

[0151] In an example, in the second switching action the drive is configured such that the carrier does not rotate about the axis of the sun cogwheel.

[0152] In other words, the cogwheel ring rotates, but the individual planetary cogwheels are not rotating about the centre axis but are each rotating about their own axes, and this leads to the sun cogwheel rotating. Thus, in this manner the second switching movement is not constrained by storing energy in the first spring used to drive the first switching movement because the planetary cogwheels are not rotating as a whole around a centre axis but only rotating about their own axes.

[0153] In an example, in the second switching action the drive is configured such that the second end of the first spring is held in the fixed position.

[0154] In an example, prior to the first switching action the drive is configured such that a rotation of the second end of the first spring in the first rotational direction is configured to store energy in the first spring.

[0155] In this manner, a simple way of charging the drive for switching operation is enabled.

[0156] In a sixth aspect, there is provided a low, me-

dium or high voltage vacuum circuit breaker comprising a drive according to the fifth aspect.

[0157] In a seventh aspect, there is provided a drive for a low, medium and high voltage switch, comprising:

- a pushrod;
- a sun cogwheel;
- at least one planetary cogwheel;
- a carrier;
- a cogwheel ring; and
- a sun cogwheel locking device.

An axis of the pushrod is coaxial with the axis of the cogwheel ring. A rotation of the cogwheel ring is configured to move the pushrod along the axis of the pushrod. An axis of the carrier is coaxial with the axis of the sun cogwheel. The sun cogwheel comprises at least one latching feature. The axis of the cogwheel ring is coaxial with an axis of the sun cogwheel. The at least one planetary cogwheel is located between the sun cogwheel and the cogwheel ring. Each planetary cogwheel of the at least one planetary cogwheel is connected to the carrier such that when the carrier rotates about the axis of the sun cogwheel a centre axis of each planetary cogwheel rotates with the carrier. Each planetary cogwheel is configured to rotate about its own centre axis. The sun cogwheel locking device is configured to engage with one latching feature of the at least one latching feature of the sun cogwheel to stop the sun cogwheel from rotating. The sun cogwheel locking device is configured to disengage from the at least one latching feature of the sun cogwheel to permit the sun cogwheel to rotate. Initiation of a first switching action comprises a disengagement of the sun cogwheel locking device from a latching feature of the at least one latching feature of the sun cogwheel. In the first switching action a rotation of the sun cogwheel in a first rotational direction is configured to rotate the cogwheel ring in a second rotational direction counter to the first rotational direction to move the pushrod along the axis of the pushrod in a first direction.

[0158] In an example, the pushrod comprises a threaded portion.

[0159] In an example, the cogwheel ring comprises an inner threaded portion located about an axis of the cogwheel ring.

[0160] In an example, the sun cogwheel comprises a plurality of outward facing teeth.

[0161] In an example, the cogwheel ring comprises a plurality of inward facing teeth.

[0162] In an example, the at least one planetary cogwheel comprises a plurality of outward facing teeth, and wherein some teeth of the at least one planetary cogwheel are engaged with some teeth of the sun cogwheel and some other teeth of the at least one planetary cogwheel are engaged with some teeth of the cogwheel ring

[0163] In an example, the at least one planetary cogwheel comprises three planetary cogwheels.

[0164] In an example, the medium voltage switch is a

vacuum circuit breaker.

[0165] In an example, the sun cogwheel comprises a disc that rotates with the sun cogwheel. wherein the at least one latching feature of the sun cogwheel comprises at least one indentation in an outer perimeter of the disc of the sun cogwheel wherein the sun cogwheel locking device comprises a protrusion, wherein engagement of the sun cogwheel locking device with a latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to hold the protrusion of the sun cogwheel locking device in an indentation of the disc of the sun cogwheel to stop the sun cogwheel from rotating, and wherein disengagement of the sun cogwheel locking device from the at least one latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to enable the protrusion of the sun cogwheel locking device to move into and out of the at least one indentation of the disc of the sun cogwheel.

[0166] In an example, the protrusion of the sun cogwheel locking device comprises a roller. Engagement of the sun cogwheel locking device with a latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to hold the roller of the sun cogwheel locking device in the indentation of the disc of the sun cogwheel to stop the sun cogwheel from rotating. Disengagement of the sun cogwheel locking device from the at least one latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to enable the roller of the sun cogwheel locking device to roll into and out of the at least one indentation of the disc of the sun cogwheel.

[0167] In an example, engagement of the sun cogwheel locking device with the latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to resist a movement of the protrusion of the sun cogwheel locking device in a radial direction away from the axis of the sun cogwheel.

[0168] In an example, the sun cogwheel locking device comprises a knee lever and wherein the sun cogwheel locking device is configured to hold a first lever and a second lever of the knee-lever of the sun cogwheel locking device straight to resist the movement of the protrusion of the sun cogwheel locking device in the radial direction away from the axis of the sun cogwheel.

[0169] In an example, disengagement of the sun cogwheel locking device from the at least one latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to enable a movement of the protrusion of the sun cogwheel locking device in a radial direction away from the axis of the sun cogwheel.

[0170] In an example, disengagement of the sun cogwheel locking device from the at least one latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to pull the protrusion of the sun cogwheel locking device in the radial direction away from the axis of the sun cogwheel.

[0171] In an example, disengagement of the sun cogwheel locking device from the at least one latching feature

of the sun cogwheel comprises the sun cogwheel locking device being configured to bend the knee-lever of the sun cogwheel locking device such that the first lever is angled to the second lever.

[0172] In an example, the at least one latching feature of the sun cogwheel comprises a plurality of latching features angularly spaced one from the other about the axis of the sun cogwheel.

[0173] In an example, in the first switching action the drive is configured such that the carrier does not rotate about the axis of the sun cogwheel.

[0174] In an example, the drive comprises a carrier locking device. The carrier comprises at least one latching feature. The carrier locking device is configured to engage with one latching feature of the at least one latching feature of the carrier to stop the carrier from rotating. The carrier locking device is configured to disengage from the at least one latching feature of the carrier to permit the carrier to rotate.

[0175] In an example, the carrier comprises a disc that rotates with the carrier. The at least one latching feature of the carrier comprises at least one indentation in an outer perimeter of the disc of the carrier. The carrier locking device comprises a protrusion. Engagement of the carrier locking device with a latching feature of the carrier comprises the carrier locking device being configured to hold the protrusion of the carrier locking device in an indentation of the disc to stop the carrier from rotating. Disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to enable the protrusion of the carrier locking device to move into and out of the at least one indentation of the disc.

[0176] In an example, the protrusion of the carrier locking device comprises a roller. Engagement of the carrier locking device with a latching feature of the carrier comprises the locking device being configured to hold the roller of the carrier locking device in the indentation of the disc to stop the carrier from rotating. Disengagement of the locking device from the at least one latching feature of the carrier comprises the locking device being configured to enable the roller of the carrier locking device to roll into and out of the at least one indentation of the disc.

[0177] In an example, engagement of the carrier locking device with the latching feature of the carrier comprises the carrier locking device being configured to resist a movement of the protrusion of the carrier locking device in a radial direction away from the axis of the carrier.

[0178] In an example, the carrier locking device comprises a knee lever. The carrier locking device is configured to hold a first lever and a second lever of the knee-lever of the carrier locking device straight to resist the movement of the protrusion of the carrier locking device in the radial direction away from the axis of the carrier.

[0179] In an example, disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to enable a movement of the protrusion of the

carrier locking device in a radial direction away from the axis of the carrier.

[0180] In an example, disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to pull the protrusion of the carrier locking device in the radial direction away from the axis of the carrier.

[0181] In an example, disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to bend the knee-lever of the carrier locking device such that the first lever is angled to the second lever.

[0182] In an example, the at least one latching feature of the carrier comprises a plurality of latching features angularly spaced one from the other about the axis of the carrier

[0183] In an example, in the first switching action the rotation of the cogwheel ring in the second rotational direction is configured to move the pushrod along the axis of the pushrod in the first direction away from the sun cogwheel.

[0184] In an example, in the first switching action the drive is configured such that the pushrod does not rotate about the pushrod axis.

[0185] In an example, a first end of a first spring is coupled to the sun cogwheel. In the first switching action energy release from the first spring is configured to rotate the sun cogwheel in the first rotational direction about the axis of the sun cogwheel.

[0186] In an example, in the first switching action the drive is configured such that a second end of the first spring is held in a fixed position.

[0187] In an example, in the first switching action movement of the pushrod along the axis of the pushrod is configured to store energy in a second spring.

[0188] In an example, at the end of the first switching action, the sun cogwheel locking device is configured to engage with a latching feature of the at least one latching feature of the sun cogwheel.

[0189] In an example, a contact plate is fixedly connected to the pushrod. The drive comprises a fixed end stop. In the first switching action the drive is configured such that the contact plate is moved toward the end stop. At the end of the first switching action the drive is configured such that the contact plate has contacted the end stop.

[0190] In an example, the contact plate comprises a ring-shaped structure and the end stop comprises a ring-shaped structure.

[0191] In an example, the contact plate and/or the end stop have a defined level of flexibility.

[0192] In an example, initiation of a second switching action comprises a disengagement of the carrier locking device from a latching feature of the at least one latching feature of the carrier. In the second switching action a rotation of the carrier about the axis of the sun cogwheel

in the first rotational direction is configured to rotate the cogwheel ring in a first rotational direction opposite to the second rotational direction to move the pushrod along the axis of the pushrod in a second direction opposite to the first direction.

[0193] In an example, in the second switching action energy release from the second spring is configured to rotate the carrier.

[0194] In an example, a first end of the second spring is connected to the contact plate.

[0195] In an example, a second end of the second spring is held in a fixed position.

[0196] In an example, in the second switching action the drive is configured such that the sun cogwheel does not rotate about the axis of the sun cogwheel.

[0197] In an example, in the second switching action the drive is configured such that the second end of the first spring is held in the fixed position.

[0198] In an example, prior to the first switching action the drive is configured such that a rotation of the second end of the first spring in the first rotational direction is configured to store energy in the first spring.

[0199] In an eighth aspect, there is provided a low, medium and high voltage switch comprising a drive according to the seventh aspect.

[0200] The above aspects and examples will become apparent from and be elucidated with reference to the embodiments described hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

[0201] Exemplary embodiments will be described in the following with reference to the following drawings:

Fig. 1 shows a schematic view of three instances of a first switching action in the form of a closing operation of an exemplar drive for a low, medium or high voltage switch; and

Fig. 2 shows a schematic view of three instances of a second switching action in the form of an operation of the exemplar drive for a low, medium or high voltage switch of Fig. 1.

DETAILED DESCRIPTION OF EMBODIMENTS

[0202] Figs. 1-2 relate to examples of a drive for a low, medium or high voltage switches. Not every embodiment described below is actually shown in the figures.

Embodiment 1

[0203] In an example a drive for a low, medium or high voltage switch comprising a pushrod 10, a sun cogwheel 30, at least one planetary cogwheel 40, a carrier 50, a cogwheel ring 6, and a carrier locking device 200. An axis of the pushrod is coaxial with an axis of the sun cogwheel, and wherein a rotation of the sun cogwheel is

configured to move the pushrod along the axis of the pushrod. An axis of the carrier is coaxial with the axis of the sun cogwheel, and wherein the carrier comprises at least one latching feature (52). An axis of the cogwheel ring is coaxial with the axis of the sun cogwheel. The at least one planetary cogwheel is located between the sun cogwheel and the cogwheel ring. Each planetary cogwheel of the at least one planetary cogwheel is connected to the carrier such that when the carrier rotates about the axis of the sun cogwheel a centre axis of each planetary cogwheel rotates with the carrier. Each planetary cogwheel is configured to rotate about its own centre axis. The carrier locking device is configured to engage with one latching feature of the at least one latching feature of the carrier to stop the carrier from rotating. The carrier locking device is configured to disengage from the at least one latching feature of the carrier to permit the carrier to rotate. Initiation of a first switching action comprises a disengagement of the carrier locking device from a latching feature of the at least one latching feature of the carrier. In the first switching action a rotation of the carrier about the axis of the sun cogwheel in a first rotational direction is configured to rotate the sun cogwheel in the first rotational direction to move the pushrod along the axis of the pushrod in a first direction.

[0204] In an example, the sun cogwheel comprises a plurality of outward facing teeth.

[0205] In an example, the cogwheel ring comprises a plurality of inward facing teeth.

[0206] In an example, the pushrod comprises a threaded portion 20, and the sun cogwheel comprises an inner threaded portion located about an axis of the sun cogwheel.

[0207] In an example, the at least one planetary cogwheel comprises a plurality of outward facing teeth, and wherein some teeth of the at least one planetary cogwheel are engaged with some teeth of the sun cogwheel and some other teeth of the at least one planetary cogwheel are engaged with some teeth of the cogwheel ring

[0208] In an example, the at least one planetary cogwheel comprises three planetary cogwheels.

[0209] In an example, the medium voltage switch is a vacuum circuit breaker.

[0210] In an example, the carrier comprises a disc that rotates with the carrier. The at least one latching feature of the carrier comprises at least one indentation in an outer perimeter of the disc of the carrier. The carrier locking device comprises a protrusion. Engagement of the carrier locking device with a latching feature of the carrier comprises the carrier locking device being configured to hold the protrusion of the carrier locking device in an indentation of the disc to stop the carrier from rotating. Disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to enable the protrusion of the carrier locking device to move into and out of the at least one indentation of the disc.

[0211] In an example, the protrusion of the carrier lock-

ing device comprises a roller. Engagement of the carrier locking device with a latching feature of the carrier comprises the locking device being configured to hold the roller of the carrier locking device in the indentation of the disc to stop the carrier from rotating. Disengagement of the locking device from the at least one latching feature of the carrier comprises the locking device being configured to enable the roller of the carrier locking device to roll into and out of the at least one indentation of the disc.

[0212] In an example, engagement of the carrier locking device with the latching feature of the carrier comprises the carrier locking device being configured to resist a movement of the protrusion of the carrier locking device in a radial direction away from the axis of the carrier.

[0213] In an example, the carrier locking device comprises a knee lever and wherein the carrier locking device is configured to hold a first lever and a second lever of the knee-lever of the carrier locking device straight to resist the movement of the protrusion of the carrier locking device in the radial direction away from the axis of the carrier.

[0214] In an example, disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to enable a movement of the protrusion of the carrier locking device in a radial direction away from the axis of the carrier.

[0215] In an example, disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to pull the protrusion of the carrier locking device in the radial direction away from the axis of the carrier.

[0216] In an example, disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to bend the knee-lever of the carrier locking device such that the first lever is angled to the second lever.

[0217] In an example, the at least one latching feature of the carrier comprises a plurality of latching features angularly spaced one from the other about the axis of the carrier.

[0218] In an example, in the first switching action the drive is configured such that the cogwheel ring does not rotate.

[0219] In an example, the cogwheel ring comprises at least one latching feature 62. The drive comprises a cogwheel ring locking device 100. The cogwheel ring locking device is configured to engage with one latching feature of the at least one latching feature of the cogwheel ring to stop the cogwheel ring from rotating. The cogwheel ring locking device is configured to disengage from the at least one latching feature of the cogwheel ring to permit the cogwheel ring to rotate.

[0220] In an example, the at least one latching feature of the cogwheel ring comprises at least one indentation in an outer perimeter of the cogwheel ring. The cogwheel

ring locking device comprises a protrusion. Engagement of the cogwheel ring locking device with a latching feature of the cogwheel ring comprises the cogwheel ring locking device being configured to hold the protrusion of the cogwheel ring locking device in an indentation of the cogwheel ring to stop the cogwheel ring from rotating. Disengagement of the cogwheel ring locking device from the at least one latching feature of the cogwheel ring comprises the cogwheel ring locking device being configured to enable the protrusion of the cogwheel ring locking device to move into and out of the at least one indentation of the cogwheel ring.

[0221] In an example, the protrusion of the cogwheel ring locking device comprises a roller. Engagement of the cogwheel ring locking device with a latching feature of the cogwheel ring comprises the locking device being configured to hold the roller of the cogwheel ring locking device in the indentation of the cogwheel ring to stop the cogwheel ring from rotating. Disengagement of the cogwheel ring locking device from the at least one latching feature of the cogwheel ring comprises the locking device being configured to enable the roller of the cogwheel ring locking device to roll into and out of the at least one indentation of the cogwheel ring.

[0222] In an example, engagement of the cogwheel ring locking device with the latching feature of the cogwheel ring comprises the cogwheel ring locking device being configured to resist a movement of the protrusion of the cogwheel ring locking device in a radial direction away from the axis of the cogwheel ring.

[0223] In an example, the cogwheel ring locking device comprises a knee lever and wherein the cogwheel ring locking device is configured to hold a first lever and a second lever of the knee-lever of the cogwheel ring locking device straight to resist the movement of the protrusion of the cogwheel ring locking device in the radial direction away from the axis of the cogwheel ring.

[0224] In an example, disengagement of the cogwheel ring locking device from the at least one latching feature of the cogwheel ring comprises the cogwheel ring locking device being configured to enable a movement of the protrusion of the cogwheel ring locking device in a radial direction away from the axis of the cogwheel ring.

[0225] In an example, disengagement of the cogwheel ring locking device from the at least one latching feature of the cogwheel ring comprises the cogwheel ring locking device being configured to pull the protrusion of the cogwheel ring locking device in the radial direction away from the axis of the cogwheel ring.

[0226] In an example, disengagement of the cogwheel ring locking device from the at least one latching feature of the cogwheel ring comprises the cogwheel ring locking device being configured to bend the knee-lever of the cogwheel ring locking device such that the first lever is angled to the second lever.

[0227] In an example, the at least one latching feature of the cogwheel ring comprises a plurality of latching features angularly spaced one from the other about the axis

of the cogwheel ring.

[0228] In an example, in the first switching action the rotation of the sun cogwheel in the first rotational direction is configured to move the pushrod along the axis of the pushrod in the first direction away from the sun cogwheel.

[0229] In an example, in the first switching action the drive is configured such that the pushrod does not rotate about the pushrod axis.

[0230] In this way, because the pushrod is threaded and the sun cogwheel is threaded, rotation of the sun cogwheel whilst the pushrod cannot rotate necessarily leads to translation of the pushrod.

[0231] In an example, a first end 74 of a first spring 70 is coupled to the carrier. In the first switching action energy release from the first spring 70 is configured to rotate the carrier in the first rotational direction about the axis of the sun cogwheel.

[0232] In an example, in the first switching action the drive is configured such that a second end 72 of the first spring is held in a fixed position.

[0233] In an example, in the first switching action movement of the pushrod along the axis of the pushrod is configured to store energy in a second spring 80.

[0234] In this way, the first switching action can store energy required for a return or second switching action bringing the switch back to its original configuration.

[0235] In an example, at the end of the first switching action, the carrier locking device is configured to engage with a latching feature of the at least one latching feature of the carrier.

[0236] In an example, a contact plate 15 is fixedly connected to the pushrod. The drive comprises a fixed end stop 90. In the first switching action the drive is configured such that the contact plate is moved toward the end stop. At the end of the first switching action the drive is configured such that the contact plate has contacted the end stop.

[0237] In an example, the contact plate comprises a ring-shaped structure and the end stop comprises a ring-shaped structure.

[0238] In an example, the contact plate and/or the end stop have a defined level of flexibility.

[0239] In an example, initiation of a second switching action comprises a disengagement of the cogwheel ring locking device from a latching feature of the at least one latching feature of the cogwheel ring. In the second switching action a rotation of the cogwheel ring about the axis of the sun cogwheel in the first rotational direction is configured to rotate the sun cogwheel in a second rotational direction opposite to the first rotational direction to move the pushrod along the axis of the pushrod in a second direction opposite to the first direction.

[0240] In an example, in the second switching action energy release from the second spring is configured to rotate the cogwheel ring.

[0241] In an example, a first end 84 of the second spring is connected to the contact plate.

[0242] In an example, a second end 82 of the second

spring is held in a fixed position.

[0243] In an example, in the second switching action the drive is configured such that the carrier does not rotate about the axis of the sun cogwheel.

[0244] In other words, the sun cogwheel rotates, but the individual planetary cogwheels are not rotating about the centre axis but are each rotating about their own axes, and this leads to the cogwheel ring rotating. Thus, in this manner the second switching movement is not constrained by storing energy in the first spring used to drive the first switching movement because the planetary cogwheels are not rotating as a whole around a centre axis but only rotating about their own axes.

[0245] In an example, in the second switching action the drive is configured such that the second end of the first spring is held in the fixed position.

[0246] In an example, prior to the first switching action the drive is configured such that a rotation of the second end of the first spring in the first rotational direction is configured to store energy in the first spring.

[0247] In this manner, a simple way of charging the drive for switching operation is enabled.

[0248] The above described switch of embodiment 1 can form part of a low, medium or high voltage vacuum circuit breaker.

Embodiment 2

[0249] In an example a drive for a low, medium or high voltage switch comprises a pushrod 10, a sun cogwheel 30, at least one planetary cogwheel 40, a carrier 50, a cogwheel ring 60, and a cogwheel ring locking device 100. An axis of the pushrod is coaxial with an axis of the sun cogwheel. A rotation of the sun cogwheel is configured to move the pushrod along the axis of the pushrod. An axis of the carrier is coaxial with the axis of the sun cogwheel. An axis of the cogwheel ring is coaxial with the axis of the sun cogwheel, and wherein the cogwheel ring comprises at least one latching feature 62. The at least one planetary cogwheel is located between the sun cogwheel and the cogwheel ring. Each planetary cogwheel of the at least one planetary cogwheel is connected to the carrier such that when the carrier rotates about the axis of the sun cogwheel a centre axis of each planetary cogwheel rotates with the carrier. Each planetary cogwheel is configured to rotate about its own centre axis. The cogwheel ring locking device is configured to engage with one latching feature of the at least one latching feature of the cogwheel ring to stop the cogwheel ring from rotating. The cogwheel ring locking device is configured to disengage from the at least one latching feature of the cogwheel ring to permit the cogwheel ring to rotate. Initiation of a first switching action comprises a disengagement of the cogwheel ring locking device from a latching feature of the at least one latching feature of the cogwheel ring. In a first switching action a rotation of the cogwheel ring about the axis of the sun cogwheel in a first rotational direction is configured to rotate the sun cogwheel in a

second rotational direction opposite to the first rotational direction to move the pushrod along the axis of the pushrod in a first direction.

[0250] In an example, the pushrod is rotationally connected to or engaged with the sun cogwheel.

[0251] In an example, the pushrod comprises a threaded portion 20.

[0252] In an example, the sun cogwheel comprises an inner threaded portion located about an axis of the sun cogwheel.

[0253] In an example, the sun cogwheel comprises a plurality of outward facing teeth.

[0254] In an example, the cogwheel ring comprises a plurality of inward facing teeth.

[0255] In an example, the at least one planetary cogwheel comprises a plurality of outward facing teeth, and wherein some teeth of the at least one planetary cogwheel are engaged with some teeth of the sun cogwheel and some other teeth of the at least one planetary cogwheel are engaged with some teeth of the cogwheel ring.

[0256] In an example, the at least one planetary cogwheel comprises three planetary cogwheels.

[0257] In an example, the medium voltage switch is a vacuum circuit breaker.

[0258] In an example, the at least one latching feature of the cogwheel ring comprises at least one indentation in an outer perimeter of the cogwheel ring. The cogwheel ring locking device comprises a protrusion. Engagement of the cogwheel ring locking device with a latching feature of the cogwheel ring comprises the cogwheel ring locking device being configured to hold the protrusion of the cogwheel ring locking device in an indentation of the cogwheel ring to stop the cogwheel ring from rotating. Disengagement of the cogwheel ring locking device from the at least one latching feature of the cogwheel ring comprises the cogwheel ring locking device being configured to enable the protrusion of the cogwheel ring locking device to move into and out of the at least one indentation of the cogwheel ring.

[0259] In an example, the protrusion of the cogwheel ring locking device comprises a roller. Engagement of the cogwheel ring locking device with a latching feature of the cogwheel ring comprises the locking device being configured to hold the roller of the cogwheel ring locking device in the indentation of the cogwheel ring to stop the cogwheel ring from rotating. Disengagement of the cogwheel ring locking device from the at least one latching feature of the cogwheel ring comprises the locking device being configured to enable the roller of the cogwheel ring locking device to roll into and out of the at least one indentation of the cogwheel ring.

[0260] In an example, engagement of the cogwheel ring locking device with the latching feature of the cogwheel ring comprises the cogwheel ring locking device being configured to resist a movement of the protrusion of the cogwheel ring locking device in a radial direction away from the axis of the cogwheel ring.

[0261] In an example, the cogwheel ring locking device

comprises a knee lever and wherein the cogwheel ring locking device is configured to hold a first lever and a second lever of the knee-lever of the cogwheel ring locking device straight to resist the movement of the protrusion of the cogwheel ring locking device in the radial direction away from the axis of the cogwheel ring.

[0262] In an example, disengagement of the cogwheel ring locking device from the at least one latching feature of the cogwheel ring comprises the cogwheel ring locking device being configured to enable a movement of the protrusion of the cogwheel ring locking device in a radial direction away from the axis of the cogwheel ring.

[0263] In an example, disengagement of the cogwheel ring locking device from the at least one latching feature of the cogwheel ring comprises the cogwheel ring locking device being configured to pull the protrusion of the cogwheel ring locking device in the radial direction away from the axis of the cogwheel ring.

[0264] In an example, disengagement of the cogwheel ring locking device from the at least one latching feature of the cogwheel ring comprises the cogwheel ring locking device being configured to bend the knee-lever of the cogwheel ring locking device such that the first lever is angled to the second lever.

[0265] In an example, the at least one latching feature of the cogwheel ring comprises a plurality of latching features angularly spaced one from the other about the axis of the cogwheel ring.

[0266] In an example, in the first switching action the drive is configured such that the carrier does not rotate about the pushrod axis.

[0267] In an example, the carrier comprises at least one latching feature 52. The drive comprises a carrier locking device 200. The carrier locking device is configured to engage with one latching feature of the at least one latching feature of the carrier to stop the carrier from rotating. The carrier locking device is configured to disengage from the at least one latching feature of the carrier to permit the carrier to rotate.

[0268] In an example, the carrier comprises a disc that rotates with the carrier. The at least one latching feature of the carrier comprises at least one indentation in an outer perimeter of the disc of the carrier. The carrier locking device comprises a protrusion. Engagement of the carrier locking device with a latching feature of the carrier comprises the carrier locking device being configured to hold the protrusion of the carrier locking device in an indentation of the disc to stop the carrier from rotating. Disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to enable the protrusion of the carrier locking device to move into and out of the at least one indentation of the disc.

[0269] In an example, the protrusion of the carrier locking device comprises a roller. Engagement of the carrier locking device with a latching feature of the carrier comprises the locking device being configured to hold the roller of the carrier locking device in the indentation of

the disc to stop the carrier from rotating. Disengagement of the locking device from the at least one latching feature of the carrier comprises the locking device being configured to enable the roller of the carrier locking device to roll into and out of the at least one indentation of the disc.

[0270] In an example, engagement of the carrier locking device with the latching feature of the carrier comprises the carrier locking device being configured to resist a movement of the protrusion of the carrier locking device in a radial direction away from the axis of the carrier.

[0271] In an example, the carrier locking device comprises a knee lever and wherein the carrier locking device is configured to hold a first lever and a second lever of the knee-lever of the carrier locking device straight to resist the movement of the protrusion of the carrier locking device in the radial direction away from the axis of the carrier.

[0272] In an example, disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to enable a movement of the protrusion of the carrier locking device in a radial direction away from the axis of the carrier.

[0273] In an example, disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to pull the protrusion of the carrier locking device in the radial direction away from the axis of the carrier.

[0274] In an example, disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to bend the knee-lever of the carrier locking device such that the first lever is angled to the second lever.

[0275] In an example, the at least one latching feature of the carrier comprises a plurality of latching features angularly spaced one from the other about the axis of the carrier.

[0276] In an example, in the first switching action the rotation of the sun cogwheel in the second rotational direction is configured to move the pushrod along the axis of the pushrod in the first direction away from the sun cogwheel.

[0277] In an example, in the first switching action the drive is configured such that the pushrod does not rotate about the pushrod axis.

[0278] In this way, because the pushrod is threaded and the sun cogwheel is threaded, rotation of the sun cogwheel whilst the pushrod cannot rotate necessarily leads to translation of the pushrod.

[0279] In an example, a first end 74 of a first spring 70 is coupled to the cogwheel ring, and wherein in the first switching action energy release from the first spring 70 is configured to rotate the cogwheel ring in the first rotational direction about the axis of the sun cogwheel.

[0280] In an example, in the first switching action the drive is configured such that a second end 72 of the first

spring is held in a fixed position.

[0281] In an example, in the first switching action movement of the pushrod along the axis of the pushrod is configured to store energy in a second spring 80.

5 **[0282]** In this way, the first switching action can store energy required for a return or second switching action bringing the switch back to its original configuration.

10 **[0283]** In an example, at the end of the first switching action, the cogwheel ring locking device is configured to engage with a latching feature of the at least one latching feature of the cogwheel ring.

15 **[0284]** In an example, a contact plate 15 is fixedly connected to the pushrod. The drive comprises a fixed end stop 90. In the first switching action the drive is configured such that the contact plate is moved toward the end stop. At the end of the first switching action the drive is configured such that the contact plate has contacted the end stop.

20 **[0285]** In an example, the contact plate comprises a ring-shaped structure and the end stop comprises a ring-shaped structure.

[0286] In an example, the contact plate and/or the end stop have a defined level of flexibility.

25 **[0287]** In an example, initiation of a second switching action comprises a disengagement of the carrier locking device from a latching feature of the at least one latching feature of the carrier. In the second switching action a rotation of the carrier about the axis of the sun cogwheel in the first rotational direction is configured to rotate the sun cogwheel in a first rotational direction opposite to the second rotational direction to move the pushrod along the axis of the pushrod in a second direction opposite to the first direction.

30 **[0288]** In an example, in the second switching action energy release from the second spring is configured to rotate the carrier.

35 **[0289]** In an example, a first end 84 of the second spring is connected to the contact plate.

40 **[0290]** In an example, a second end 82 of the second spring is held in a fixed position.

[0291] In an example, in the second switching action the drive is configured such that the cogwheel ring does not rotate about the axis of the sun cogwheel.

45 **[0292]** In other words, the sun cogwheel rotates, and the planetary cogwheels rotate about the centre axis and each planetary cogwheel are each rotating about their own axes, and this with the cogwheel ring not rotating. Thus, in this manner the second switching movement is not constrained by storing energy in the first spring used to drive the first switching movement because the cogwheel ring is not rotating.

[0293] In an example, in the second switching action the drive is configured such that the second end of the first spring is held in the fixed position.

55 **[0294]** In an example, prior to the first switching action the drive is configured such that a rotation of the second end of the first spring in the first rotational direction is configured to store energy in the first spring.

[0295] In this manner, a simple way of charging the drive for switching operation is enabled.

[0296] The above described switch of embodiment 2 can form part of a low, medium or high voltage vacuum circuit breaker.

Embodiment 3

[0297] In an example a drive for a medium voltage switch comprises a pushrod 10, a sun cogwheel 30, at least one planetary cogwheel 40, a carrier 50, a cogwheel ring 60, and a carrier locking device 200. An axis of the pushrod is coaxial with the axis of the cogwheel ring. A rotation of the cogwheel ring is configured to move the pushrod along the axis of the pushrod. An axis of the carrier is coaxial with the axis of the sun cogwheel. The carrier comprises at least one latching feature. The axis of the cogwheel ring is coaxial with an axis of the sun cogwheel. The at least one planetary cogwheel is located between the sun cogwheel and the cogwheel ring. Each planetary cogwheel of the at least one planetary cogwheel is connected to the carrier such that when the carrier rotates about the axis of the sun cogwheel a centre axis of each planetary cogwheel rotates with the carrier. Each planetary cogwheel is configured to rotate about its own centre axis. The carrier locking device is configured to engage with one latching feature of the at least one latching feature of the carrier to stop the carrier from rotating. The carrier locking device is configured to disengage from the at least one latching feature of the carrier to permit the carrier to rotate. Initiation of a first switching action comprises a disengagement of the carrier locking device from a latching feature of the at least one latching feature of the carrier. In the first switching action a rotation of the carrier about the axis of the sun cogwheel in a first rotational direction is configured to rotate the cogwheel ring in a first rotational direction to move the pushrod along the axis of the pushrod in a first direction.

[0298] In an example, the pushrod comprises a threaded portion 20.

[0299] In an example, the cogwheel ring comprises an inner threaded portion located about an axis of the cogwheel ring.

[0300] In an example, the sun cogwheel comprises a plurality of outward facing teeth.

[0301] In an example, the cogwheel ring comprises a plurality of inward facing teeth.

[0302] In an example, the at least one planetary cogwheel comprises a plurality of outward facing teeth, and wherein some teeth of the at least one planetary cogwheel are engaged with some teeth of the sun cogwheel and some other teeth of the at least one planetary cogwheel are engaged with some teeth of the cogwheel ring.

[0303] In an example, the at least one planetary cogwheel comprises three planetary cogwheels.

[0304] In an example, the medium voltage switch is a vacuum circuit breaker.

[0305] In an example, the carrier comprises a disc that

rotates with the carrier. The at least one latching feature of the carrier comprises at least one indentation in an outer perimeter of the disc of the carrier. The carrier locking device comprises a protrusion.

5 **[0306]** Engagement of the carrier locking device with a latching feature of the carrier comprises the carrier locking device being configured to hold the protrusion of the carrier locking device in an indentation of the disc to stop the carrier from rotating. Disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to enable the protrusion of the carrier locking device to move into and out of the at least one indentation of the disc.

10 **[0307]** In an example, the protrusion of the carrier locking device comprises a roller. Engagement of the carrier locking device with a latching feature of the carrier comprises the locking device being configured to hold the roller of the carrier locking device in the indentation of the disc to stop the carrier from rotating. Disengagement of the locking device from the at least one latching feature of the carrier comprises the locking device being configured to enable the roller of the carrier locking device to roll into and out of the at least one indentation of the disc.

15 **[0308]** In an example, engagement of the carrier locking device with the latching feature of the carrier comprises the carrier locking device being configured to resist a movement of the protrusion of the carrier locking device in a radial direction away from the axis of the carrier.

20 **[0309]** In an example, the carrier locking device comprises a knee lever. The carrier locking device is configured to hold a first lever and a second lever of the knee-lever of the carrier locking device straight to resist the movement of the protrusion of the carrier locking device in the radial direction away from the axis of the carrier.

25 **[0310]** In an example, disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to enable a movement of the protrusion of the carrier locking device in a radial direction away from the axis of the carrier.

30 **[0311]** In an example, disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to pull the protrusion of the carrier locking device in the radial direction away from the axis of the carrier.

35 **[0312]** In an example, disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to bend the knee-lever of the carrier locking device such that the first lever is angled to the second lever.

40 **[0313]** In an example, the at least one latching feature of the carrier comprises a plurality of latching features angularly spaced one from the other about the axis of the carrier.

45 **[0314]** In an example, in the first switching action the

drive is configured such that the sun cogwheel does not rotate.

[0315] In an example, the sun cogwheel comprises at least one latching feature. The drive comprises a sun cogwheel locking device. The sun cogwheel locking device is configured to engage with one latching feature of the at least one latching feature of the sun cogwheel to stop the sun cogwheel from rotating. The sun cogwheel locking device is configured to disengage from the at least one latching feature of the sun cogwheel to permit the sun cogwheel to rotate.

[0316] In an example, the sun cogwheel comprises a disc that rotates with the sun cogwheel. The at least one latching feature of the sun cogwheel comprises at least one indentation in an outer perimeter of the disc of the sun cogwheel. The sun cogwheel locking device comprises a protrusion. Engagement of the sun cogwheel locking device with a latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to hold the protrusion of the sun cogwheel locking device in an indentation of the disc of the sun cogwheel to stop the sun cogwheel from rotating. Disengagement of the sun cogwheel locking device from the at least one latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to enable the protrusion of the sun cogwheel locking device to move into and out of the at least one indentation of the disc of the sun cogwheel.

[0317] In an example, the protrusion of the sun cogwheel locking device comprises a roller. Engagement of the sun cogwheel locking device with a latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to hold the roller of the sun cogwheel locking device in the indentation of the disc of the sun cogwheel to stop the sun cogwheel from rotating. Disengagement of the sun cogwheel locking device from the at least one latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to enable the roller of the sun cogwheel locking device to roll into and out of the at least one indentation of the disc of the sun cogwheel.

[0318] In an example, engagement of the sun cogwheel locking device with the latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to resist a movement of the protrusion of the sun cogwheel locking device in a radial direction away from the axis of the sun cogwheel.

[0319] In an example, the sun cogwheel locking device comprises a knee lever. The sun cogwheel locking device is configured to hold a first lever and a second lever of the knee-lever of the sun cogwheel locking device straight to resist the movement of the protrusion of the sun cogwheel locking device in the radial direction away from the axis of the sun cogwheel.

[0320] In an example, disengagement of the sun cogwheel locking device from the at least one latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to enable a movement of the

protrusion of the sun cogwheel locking device in a radial direction away from the axis of the sun cogwheel.

[0321] In an example, disengagement of the sun cogwheel locking device from the at least one latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to pull the protrusion of the sun cogwheel locking device in the radial direction away from the axis of the sun cogwheel.

[0322] In an example, disengagement of the sun cogwheel locking device from the at least one latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to bend the knee-lever of the sun cogwheel locking device such that the first lever is angled to the second lever.

[0323] In an example, the at least one latching feature of the sun cogwheel comprises a plurality of latching features angularly spaced one from the other about the axis of the sun cogwheel.

[0324] In an example, in the first switching action the rotation of the cogwheel ring in the first rotational direction is configured to move the pushrod along the axis of the pushrod in the first direction away from the sun cogwheel.

[0325] In an example, in the first switching action the drive is configured such that the pushrod does not rotate about the pushrod axis.

[0326] In an example, a first end 74 of a first spring 70 is coupled to the carrier. In the first switching action energy release from a first spring 70 is configured to rotate the carrier in the first rotational direction about the axis of the sun cogwheel.

[0327] In an example, in the first switching action the drive is configured such that a second end 72 of the first spring is held in a fixed position.

[0328] In an example, in the first switching action movement of the pushrod along the axis of the pushrod is configured to store energy in a second spring 80.

[0329] In an example, at the end of the first switching action, the carrier locking device is configured to engage with a latching feature of the at least one latching feature of the carrier.

[0330] In an example, a contact plate 15 is fixedly connected to the pushrod. The drive comprises a fixed end stop 90. In the first switching action the drive is configured such that the contact plate is moved toward the end stop. At the end of the first switching action the drive is configured such that the contact plate has contacted the end stop.

[0331] In an example, the contact plate comprises a ring-shaped structure and the end stop comprises a ring-shaped structure.

[0332] In an example, the contact plate and/or the end stop have a defined level of flexibility.

[0333] In an example, initiation of a second switching action comprises a disengagement of the sun cogwheel locking device from a latching feature of the at least one latching feature of the sun cogwheel. In the second switching action a rotation of the sun cogwheel about the axis of the sun cogwheel in a first rotational direction is

configured to rotate the cogwheel ring in a second rotational direction opposite to the first rotational direction to move the pushrod along the axis of the pushrod in a second direction opposite to the first direction.

[0334] In an example, in the second switching action energy release from the second spring is configured to rotate the sun cogwheel.

[0335] In an example, a first end (84) of the second spring is connected to the contact plate.

[0336] In an example, a second end (82) of the second spring is held in a fixed position.

[0337] In an example, in the second switching action the drive is configured such that the carrier does not rotate about the axis of the sun cogwheel.

[0338] In an example, in the second switching action the drive is configured such that the second end of the first spring is held in the fixed position.

[0339] In an example, prior to the first switching action the drive is configured such that a rotation of the second end of the first spring in the first rotational direction is configured to store energy in the first spring.

[0340] The above described switch of embodiment 3 can form part of a low, medium or high voltage vacuum circuit breaker.

Embodiment 4

[0341] In an example a drive for a low, medium and high voltage switch comprises a pushrod 10, a sun cogwheel 30, at least one planetary cogwheel 40, a carrier 50, a cogwheel ring 60, and a sun cogwheel locking device. An axis of the pushrod is coaxial with the axis of the cogwheel ring. A rotation of the cogwheel ring is configured to move the pushrod along the axis of the pushrod. An axis of the carrier is coaxial with the axis of the sun cogwheel. The sun cogwheel comprises at least one latching feature. The axis of the cogwheel ring is coaxial with an axis of the sun cogwheel. The at least one planetary cogwheel is located between the sun cogwheel and the cogwheel ring. Each planetary cogwheel of the at least one planetary cogwheel is connected to the carrier such that when the carrier rotates about the axis of the sun cogwheel a centre axis of each planetary cogwheel rotates with the carrier. Each planetary cogwheel is configured to rotate about its own centre axis. The sun cogwheel locking device is configured to engage with one latching feature of the at least one latching feature of the sun cogwheel to stop the sun cogwheel from rotating. The sun cogwheel locking device is configured to disengage from the at least one latching feature of the sun cogwheel to permit the sun cogwheel to rotate. Initiation of a first switching action comprises a disengagement of the sun cogwheel locking device from a latching feature of the at least one latching feature of the sun cogwheel. In the first switching action a rotation of the sun cogwheel in a first rotational direction is configured to rotate the cogwheel ring in a second rotational direction counter to the first rotational direction to move the pushrod along

the axis of the pushrod in a first direction.

[0342] In an example, the pushrod comprises a threaded portion 20.

[0343] In an example, the cogwheel ring comprises an inner threaded portion located about an axis of the cogwheel ring.

[0344] In an example, the sun cogwheel comprises a plurality of outward facing teeth.

[0345] In an example, the cogwheel ring comprises a plurality of inward facing teeth.

[0346] In an example, the at least one planetary cogwheel comprises a plurality of outward facing teeth, and wherein some teeth of the at least one planetary cogwheel are engaged with some teeth of the sun cogwheel and some other teeth of the at least one planetary cogwheel are engaged with some teeth of the cogwheel ring

[0347] In an example, the at least one planetary cogwheel comprises three planetary cogwheels.

[0348] In an example, the medium voltage switch is a vacuum circuit breaker.

[0349] In an example, the sun cogwheel comprises a disc that rotates with the sun cogwheel. wherein the at least one latching feature of the sun cogwheel comprises at least one indentation in an outer perimeter of the disc of the sun cogwheel wherein the sun cogwheel locking device comprises a protrusion, wherein engagement of the sun cogwheel locking device with a latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to hold the protrusion of the sun cogwheel locking device in an indentation of the disc of the sun cogwheel to stop the sun cogwheel from rotating, and wherein disengagement of the sun cogwheel locking device from the at least one latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to enable the protrusion of the sun cogwheel locking device to move into and out of the at least one indentation of the disc of the sun cogwheel.

[0350] In an example, the protrusion of the sun cogwheel locking device comprises a roller. Engagement of the sun cogwheel locking device with a latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to hold the roller of the sun cogwheel locking device in the indentation of the disc of the sun cogwheel to stop the sun cogwheel from rotating. Disengagement of the sun cogwheel locking device from the at least one latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to enable the roller of the sun cogwheel locking device to roll into and out of the at least one indentation of the disc of the sun cogwheel.

[0351] In an example, engagement of the sun cogwheel locking device with the latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to resist a movement of the protrusion of the sun cogwheel locking device in a radial direction away from the axis of the sun cogwheel.

[0352] In an example, the sun cogwheel locking device comprises a knee lever and wherein the sun cogwheel

locking device is configured to hold a first lever and a second lever of the knee-lever of the sun cogwheel locking device straight to resist the movement of the protrusion of the sun cogwheel locking device in the radial direction away from the axis of the sun cogwheel.

[0353] In an example, disengagement of the sun cogwheel locking device from the at least one latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to enable a movement of the protrusion of the sun cogwheel locking device in a radial direction away from the axis of the sun cogwheel.

[0354] In an example, disengagement of the sun cogwheel locking device from the at least one latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to pull the protrusion of the sun cogwheel locking device in the radial direction away from the axis of the sun cogwheel.

[0355] In an example, disengagement of the sun cogwheel locking device from the at least one latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to bend the knee-lever of the sun cogwheel locking device such that the first lever is angled to the second lever.

[0356] In an example, the at least one latching feature of the sun cogwheel comprises a plurality of latching features angularly spaced one from the other about the axis of the sun cogwheel.

[0357] In an example, in the first switching action the drive is configured such that the carrier does not rotate about the axis of the sun cogwheel.

[0358] In an example, the drive comprises a carrier locking device 200. The carrier comprises at least one latching feature 52. The carrier locking device is configured to engage with one latching feature of the at least one latching feature of the carrier to stop the carrier from rotating. The carrier locking device is configured to disengage from the at least one latching feature of the carrier to permit the carrier to rotate.

[0359] In an example, the carrier comprises a disc that rotates with the carrier. The at least one latching feature of the carrier comprises at least one indentation in an outer perimeter of the disc of the carrier. The carrier locking device comprises a protrusion. Engagement of the carrier locking device with a latching feature of the carrier comprises the carrier locking device being configured to hold the protrusion of the carrier locking device in an indentation of the disc to stop the carrier from rotating. Disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to enable the protrusion of the carrier locking device to move into and out of the at least one indentation of the disc.

[0360] In an example, the protrusion of the carrier locking device comprises a roller. Engagement of the carrier locking device with a latching feature of the carrier comprises the locking device being configured to hold the roller of the carrier locking device in the indentation of the disc to stop the carrier from rotating. Disengagement

of the locking device from the at least one latching feature of the carrier comprises the locking device being configured to enable the roller of the carrier locking device to roll into and out of the at least one indentation of the disc.

[0361] In an example, engagement of the carrier locking device with the latching feature of the carrier comprises the carrier locking device being configured to resist a movement of the protrusion of the carrier locking device in a radial direction away from the axis of the carrier.

[0362] In an example, the carrier locking device comprises a knee lever. The carrier locking device is configured to hold a first lever and a second lever of the knee-lever of the carrier locking device straight to resist the movement of the protrusion of the carrier locking device in the radial direction away from the axis of the carrier.

[0363] In an example, disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to enable a movement of the protrusion of the carrier locking device in a radial direction away from the axis of the carrier.

[0364] In an example, disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to pull the protrusion of the carrier locking device in the radial direction away from the axis of the carrier.

[0365] In an example, disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to bend the knee-lever of the carrier locking device such that the first lever is angled to the second lever.

[0366] In an example, the at least one latching feature of the carrier comprises a plurality of latching features angularly spaced one from the other about the axis of the carrier.

[0367] In an example, in the first switching action the rotation of the cogwheel ring in the second rotational direction is configured to move the pushrod along the axis of the pushrod in the first direction away from the sun cogwheel.

[0368] In an example, in the first switching action the drive is configured such that the pushrod does not rotate about the pushrod axis.

[0369] In an example, a first end 74 of a first spring 70 is coupled to the sun cogwheel. In the first switching action energy release from the first spring 70 is configured to rotate the sun cogwheel in the first rotational direction about the axis of the sun cogwheel.

[0370] In an example, in the first switching action the drive is configured such that a second end 72 of the first spring is held in a fixed position.

[0371] In an example, in the first switching action movement of the pushrod along the axis of the pushrod is configured to store energy in a second spring 80.

[0372] In an example, at the end of the first switching action, the sun cogwheel locking device is configured to

engage with a latching feature of the at least one latching feature of the sun cogwheel.

[0373] In an example, a contact plate 15 is fixedly connected to the pushrod. The drive comprises a fixed end stop 90. In the first switching action the drive is configured such that the contact plate is moved toward the end stop. At the end of the first switching action the drive is configured such that the contact plate has contacted the end stop.

[0374] In an example, the contact plate comprises a ring-shaped structure and the end stop comprises a ring-shaped structure.

[0375] In an example, the contact plate and/or the end stop have a defined level of flexibility.

[0376] In an example, initiation of a second switching action comprises a disengagement of the carrier locking device from a latching feature of the at least one latching feature of the carrier. In the second switching action a rotation of the carrier about the axis of the sun cogwheel in the first rotational direction is configured to rotate the cogwheel ring in a first rotational direction opposite to the second rotational direction to move the pushrod along the axis of the pushrod in a second direction opposite to the first direction.

[0377] In an example, in the second switching action energy release from the second spring is configured to rotate the carrier.

[0378] In an example, a first end 84 of the second spring is connected to the contact plate.

[0379] In an example, a second end 82 of the second spring is held in a fixed position.

[0380] In an example, in the second switching action the drive is configured such that the sun cogwheel does not rotate about the axis of the sun cogwheel.

[0381] In an example, in the second switching action the drive is configured such that the second end of the first spring is held in the fixed position.

[0382] In an example, prior to the first switching action the drive is configured such that a rotation of the second end of the first spring in the first rotational direction is configured to store energy in the first spring.

[0383] The above described switch of embodiment 4 can form part of a low, medium or high voltage vacuum circuit breaker.

[0384] Continuing with the figures, the drive for the low, medium or high voltage switch, and the vacuum circuit breaker, are described in further detail, with respect to specific embodiments.

[0385] The following relates primarily to embodiment 1 described above, but with the driving of different cogwheels whilst other cogwheels are held stationary, with respect to rotation about a centre axis of the drive, provides for the other embodiments, as briefly referred to below.

[0386] Fig. 1 shows three instants of the closing operation of an exemplar drive. Shown from left to right are: OFF position, intermediate position, and ON position.

[0387] The energy for the operation is stored in the

closing spring 70 (also called first spring). Before the closing operation, the closing spring 70 is already exposing or providing torque onto the planetary cogwheel carrier 50 (also called carrier). A first end 74 or inner end of the spring 70 is at the inside of the spring and is coupled to the carrier (the first end 74 is not labelled as such). A second 72 or outer end of spring 70 is held in a fixed position. Thus, energy of the spring 70 leads to the first end 74 rotating with respect to the second end 72 to rotate the carrier. It is to be noted that the first or outer end 72 of the spring 70 can be rotated to store energy in the spring 70, and then again the outer end 72 can be fixed in position.

[0388] The rotation of the planetary cogwheel carrier 50 is however blocked. This is because a locking device 200 (also called carrier locking device) is holding a roller 260 into a locking feature 52 in the form of an indentation in the outer perimeter of a disc that forms part of the carrier 50. The roller 260 cannot be pushed away from the locking feature 52, in other words can't move out of the indentation 52, and the carrier cannot rotate. It is to be noted that roller 260 of locking device 200 is not labelled as such, due to the complexity of the drawings, but it is equivalent to roller 160 of the other locking device 100 shown in the figures.

[0389] Returning to the carrier locking device 200, that is stopping the carrier from rotating, the locking device has a L shaped structure 210 with a spring mounted to the structure 210 and a fixed guide 230 directed toward the centre axis of the drive. A lever system is used to keep the roller 260 in the indentation. The fixed guide has a long hole or slot 232. The roller 260 has guidance pins 262 that enable it to move in the long hole 232 to move in a radial direction with respect to the axis of the drive. However, in keeping the carrier stationary the lever system is stopping the roller 260 of moving radially away from the centre axis, thereby keeping it in the indentation 52 of the carrier 50 to stop the carrier from rotating. To keep the roller 260 in the indentation 52 the first and second levers 240 and 250 of the lever system form a knee-lever that is pushed by a spring 220 practically to its straight position, and therefore the roller 260 at the end cannot move out of the indentation. Again the levers 240 and 250 are not labelled, but are the same as levers 140 and 150 of the other locking device 100. Continuing with the carrier locking device 200, a stopper prevents further pushing of the spring 220, exceeding the straight position of the knee-lever 240, 250 (the stopper is not shown in the figures).

[0390] For starting the closing operation, a trigger point 242 of the lever system, in effect the knee of the knee levers 240, 250 is pushed by external means, for example by a small magnetic actuator of a pushbutton for manual operation. The knee-lever 240, 250 bends and the roller 260 is pulled out of the locking feature 52. The roller 260 need not be pulled out of the indentation, but simply allowed to move radially away from the centre axis of the drive. This is because as discussed above, the torque

provided by the closing spring 70 to the carrier will now enable the carrier to rotate and the roller 260 will roll along the outer perimeter of the carrier out of the indentation 52 and out of the other indentations as the carrier continues to rotate. The guidance pins 262 together with the fixed guides 230 and the long holes 232 ensure that the roller 260 can only move radially with respect to the main axis of the drive and the pushrod.

[0391] Due to the threaded connection 20 of the pushrod 10 and the sun cogwheel 30, the rotation of the carrier 50, whilst the hollow cogwheel ring 60 is help stationary (via the cogwheel ring locking device 100 in the same manner as for stopping the carrier 50 from rotating as discussed above), leads to the planetary cogwheels 40 that are mounted to the carrier 50 rotating as a whole and each individually rotating about its own axis. This rotation of the individual planetary cogwheels 40 is transmitted to the sun cogwheel 30 that itself then rotates. The threaded connection 20 between the sun cogwheel and the pushrod 10 means that the sun cogwheel 30 rotates whilst the pushrod 10 does not rotate, and the threads of each rotate with respect to each other. The rotation of the sun cogwheel 30 therefore results in a linear motion of the pushrod 10. In the case of a closing operation, the pushrod 10 moves upwards.

[0392] On the linearly moving parts, with respect to the pushrod 10, a ring-shaped plate 15 (also termed contact plate) is fixed to the pushrod 10. At the end of the closing operation, this ring 15 collides with a fixed upper end stop 95. The ring can have a defined flexibility, for example by choosing a relatively low thickness of the material, to adjust the damping of the collision to limit the vibration and so to increase the mechanical life of the circuit breaker (CB). Further, a layer of plastics may be used for damping purposes. The fact that here a linear and flat end stop is used reduces the risk of sticking or self-locking of the end stop compared to a solution where a rotating part collides with a stop. In the shown embodiment, the ring 15 also supports the lower end (first end) 84 of the opening spring 80 (also called second spring), which is not labelled as such but is a connection point between spring 80 and the contact plate 15. The upper end (second end) 82 of the opening spring 80 is held in a fixed position. At the end of the closing operation, the closing spring 70 is still exposing force to the pushrod and to the opening spring 80, so that the position is safely kept in this position.

[0393] The triggering of the knee joint 242 is now ended, for example by a relay or by a small mechanism, so that the knee lever 240, 250 is again pushed into its straight position and roller 260 will engage with the next locking feature 52, and roll into the next indentation 52 but not be able to roll out and therefore stop the carrier from rotating.

[0394] For the initiation of the opening operation, the trigger point 142 of the lever system of the other locking device 100 needs to be pushed. This locking device 100 has been locking the cogwheel ring 60 from rotating by

holding a roller 140 in an indentation 62 in on outer perimeter of the cogwheel ring 60 in the same manner as for stopping the carrier from rotating. The knee-lever 140, 150 of the cogwheel ring locking device 100 is then bent against the spring 120 so that the roller 160 leaves the locking feature 62 (the indentation) and the hollow cogwheel ring 60 rotates, driven by the opening spring 80. This rotation brings the pushrod downwards until the ring 15 collides with the lower end stop 90. This is the open position of the CB.

[0395] Thus, a new planetary gear drive system is provided, with means for the end stops and for the latching of the limit positions of a switching device with a linear motion of the switching contact and a rotative motion of the drive. The embodiments use springs and a planetary gear for the transmission of the driving force and the shifting of the direction of the linear motion of the switching contact. The end stops are arranged with respect to the parts that have a linear motion while the latching means are arranged with respect to the parts that have a rotational motion.

[0396] The following examples provide specific details of how technical features, in certain embodiments, can be combined.

Example 1. A drive for a low, medium or high voltage switch, comprising:

- a pushrod 10;
- a sun cogwheel 30;
- at least one planetary cogwheel 40;
- a carrier 50;
- a cogwheel ring 60; and
- a carrier locking device 200;

wherein, an axis of the pushrod is coaxial with an axis of the sun cogwheel, and wherein a rotation of the sun cogwheel is configured to move the pushrod along the axis of the pushrod;

wherein an axis of the carrier is coaxial with the axis of the sun cogwheel, and wherein the carrier comprises at least one latching feature 52;

wherein, an axis of the cogwheel ring is coaxial with the axis of the sun cogwheel;

wherein, the at least one planetary cogwheel is located between the sun cogwheel and the cogwheel ring, wherein each planetary cogwheel of the at least one planetary cogwheel is connected to the carrier such that when the carrier rotates about the axis of the sun cogwheel a centre axis of each planetary cogwheel rotates with the carrier, and wherein each planetary cogwheel is configured to rotate about its own centre axis;

wherein, the carrier locking device is configured to engage with one latching feature of the at least one latching feature of the carrier to stop the carrier from rotating, and wherein the carrier locking device is configured to disengage from the at least one latch-

ing feature of the carrier to permit the carrier to rotate; wherein, initiation of a first switching action comprises a disengagement of the carrier locking device from a latching feature of the at least one latching feature of the carrier; and

wherein, in the first switching action a rotation of the carrier about the axis of the sun cogwheel in a first rotational direction is configured to rotate the sun cogwheel in the first rotational direction to move the pushrod along the axis of the pushrod in a first direction.

Example 2. Drive according to Example 1, wherein the carrier comprises a disc that rotates with the carrier, wherein the at least one latching feature of the carrier comprises at least one indentation in an outer perimeter of the disc of the carrier, wherein the carrier locking device comprises a protrusion, wherein engagement of the carrier locking device with a latching feature of the carrier comprises the carrier locking device being configured to hold the protrusion of the carrier locking device in an indentation of the disc to stop the carrier from rotating, and wherein disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to enable the protrusion of the carrier locking device to move into and out of the at least one indentation of the disc.

Example 3. Drive according to Example 2, wherein the protrusion of the carrier locking device comprises a roller, and wherein engagement of the carrier locking device with a latching feature of the carrier comprises the locking device being configured to hold the roller of the carrier locking device in the indentation of the disc to stop the carrier from rotating, and wherein disengagement of the locking device from the at least one latching feature of the carrier comprises the locking device being configured to enable the roller of the carrier locking device to roll into and out of the at least one indentation of the disc.

Example 4. Drive according to any of Examples 2-3, wherein engagement of the carrier locking device with the latching feature of the carrier comprises the carrier locking device being configured to resist a movement of the protrusion of the carrier locking device in a radial direction away from the axis of the carrier.

Example 5. Drive according to Example 4, wherein the carrier locking device comprises a knee lever and wherein the carrier locking device is configured to hold a first lever and a second lever of the knee-lever of the carrier locking device straight to resist the movement of the protrusion of the carrier locking device in the radial direction away from the axis of the carrier.

Example 6. Drive according to any of Examples 2-5, wherein disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to enable a movement of the protrusion of the carrier locking device in a radial direction away from the axis of the carrier.

Example 7. Drive according to Example 6, wherein disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to pull the protrusion of the carrier locking device in the radial direction away from the axis of the carrier.

Example 8. Drive according to any of Examples 6-7, when dependent upon example 5, wherein disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to bend the knee-lever of the carrier locking device such that the first lever is angled to the second lever.

Example 9. Drive according to any of Examples 1-8, wherein the at least one latching feature of the carrier comprises a plurality of latching features angularly spaced one from the other about the axis of the carrier.

Example 10. Drive according to any of Examples 1-9, wherein in the first switching action the drive is configured such that the cogwheel ring does not rotate.

Example 11. Drive according to any of Examples 1-10, wherein, the cogwheel ring comprises at least one latching feature 62, wherein the drive comprises a cogwheel ring locking device 100, wherein the cogwheel ring locking device is configured to engage with one latching feature of the at least one latching feature of the cogwheel ring to stop the cogwheel ring from rotating, and wherein the cogwheel ring locking device is configured to disengage from the at least one latching feature of the cogwheel ring to permit the cogwheel ring to rotate.

Example 12. Drive according to Example 11, wherein the at least one latching feature of the cogwheel ring comprises at least one indentation in an outer perimeter of the cogwheel ring, wherein the cogwheel ring locking device comprises a protrusion, wherein engagement of the cogwheel ring locking device with a latching feature of the cogwheel ring comprises the cogwheel ring locking device being configured to hold the protrusion of the cogwheel ring locking device in an indentation of the cogwheel ring to stop the cogwheel ring from rotating, and wherein disengagement of the cogwheel ring locking device from the at least one latching feature of the cogwheel ring

comprises the cogwheel ring locking device being configured to enable the protrusion of the cogwheel ring locking device to move into and out of the at least one indentation of the cogwheel ring.

Example 13. Drive according to Example 12, wherein the protrusion of the cogwheel ring locking device comprises a roller, and wherein engagement of the cogwheel ring locking device with a latching feature of the cogwheel ring comprises the locking device being configured to hold the roller of the cogwheel ring locking device in the indentation of the cogwheel ring to stop the cogwheel ring from rotating, and wherein disengagement of the cogwheel ring locking device from the at least one latching feature of the cogwheel ring comprises the locking device being configured to enable the roller of the cogwheel ring locking device to roll into and out of the at least one indentation of the cogwheel ring.

Example 14. Drive according to any of Examples 12-13, wherein engagement of the cogwheel ring locking device with the latching feature of the cogwheel ring comprises the cogwheel ring locking device being configured to resist a movement of the protrusion of the cogwheel ring locking device in a radial direction away from the axis of the cogwheel ring.

Example 15. Drive according to Example 14, wherein the cogwheel ring locking device comprises a knee lever and wherein the cogwheel ring locking device is configured to hold a first lever and a second lever of the knee-lever of the cogwheel ring locking device straight to resist the movement of the protrusion of the cogwheel ring locking device in the radial direction away from the axis of the cogwheel ring.

Example 16. Drive according to any of Examples 12-15, wherein disengagement of the cogwheel ring locking device from the at least one latching feature of the cogwheel ring comprises the cogwheel ring locking device being configured to enable a movement of the protrusion of the cogwheel ring locking device in a radial direction away from the axis of the cogwheel ring.

Example 17. Drive according to Example 16, wherein disengagement of the cogwheel ring locking device from the at least one latching feature of the cogwheel ring comprises the cogwheel ring locking device being configured to pull the protrusion of the cogwheel ring locking device in the radial direction away from the axis of the cogwheel ring.

Example 18. Drive according to any of Examples 16-17, when dependent upon example 15, wherein disengagement of the cogwheel ring locking device

from the at least one latching feature of the cogwheel ring comprises the cogwheel ring locking device being configured to bend the knee-lever of the cogwheel ring locking device such that the first lever is angled to the second lever.

Example 19. Drive according to any of Examples 11-18, wherein the at least one latching feature of the cogwheel ring comprises a plurality of latching features angularly spaced one from the other about the axis of the cogwheel ring.

Example 20. Drive according to any of Examples 1-19, wherein in the first switching action the rotation of the sun cogwheel in the first rotational direction is configured to move the pushrod along the axis of the pushrod in the first direction away from the sun cogwheel.

Example 21. Drive according to any of Examples 1-20, wherein in the first switching action the drive is configured such that the pushrod does not rotate about the pushrod axis.

Example 22. Drive according to any of Examples 1-21, wherein a first end 74 of a first spring 70 is coupled to the carrier, and wherein in the first switching action energy release from the first spring 70 is configured to rotate the carrier in the first rotational direction about the axis of the sun cogwheel.

Example 23. Drive according to Example 22, wherein in the first switching action the drive is configured such that a second end 72 of the first spring is held in a fixed position.

Example 24. Drive according to any of Examples 1-23, wherein in the first switching action movement of the pushrod along the axis of the pushrod is configured to store energy in a second spring 80.

Example 25. Drive according to any of Examples 1-24, wherein at the end of the first switching action, the carrier locking device is configured to engage with a latching feature of the at least one latching feature of the carrier.

Example 26. Drive according to any of Examples 1-25, wherein a contact plate 15 is fixedly connected to the pushrod, wherein the drive comprises a fixed end stop 90, wherein in the first switching action the drive is configured such that the contact plate is moved toward the end stop, and wherein at the end of the first switching action the drive is configured such that the contact plate has contacted the end stop.

Example 27. Drive according to Example 26, wherein

the contact plate comprises a ring-shaped structure and the end stop comprises a ring-shaped structure.

Example 28. Drive according to any of Examples 26-27, wherein the contact plate and/or the end stop have a defined level of flexibility. 5

Example 29. Drive according to any of Examples 11-19 or 20-28 when dependent upon any of Examples 11-19, wherein initiation of a second switching action comprises a disengagement of the cogwheel ring locking device from a latching feature of the at least one latching feature of the cogwheel ring, and wherein in the second switching action a rotation of the cogwheel ring about the axis of the sun cogwheel in the first rotational direction is configured to rotate the sun cogwheel in a second rotational direction opposite to the first rotational direction to move the pushrod along the axis of the pushrod in a second direction opposite to the first direction. 10 15 20

Example 30. Drive according to Example 29 when dependent upon Example 24, wherein in the second switching action energy release from the second spring is configured to rotate the cogwheel ring. 25

Example 31. Drive according to any of Examples 26-28 or any of Examples 29-30 when dependent upon any of Examples 26-28, wherein a first end 84 of the second spring is connected to the contact plate. 30

Example 32. Drive according to Example 31, wherein a second end 82 of the second spring is held in a fixed position. 35

Example 33. Drive according to any of Examples 29-32, wherein in the second switching action the drive is configured such that the carrier does not rotate about the axis of the sun cogwheel. 40

Example 34. A low, medium or high voltage vacuum circuit breaker comprising a drive according to any of Examples 1-33. 45

Example 35. A drive for a low, medium or high voltage switch, comprising:

- a pushrod 10;
- a sun cogwheel 30;
- at least one planetary cogwheel 40;
- a carrier 50;
- a cogwheel ring 60; and
- a cogwheel locking device 100;

wherein, an axis of the pushrod is coaxial with an axis of the sun cogwheel, and wherein a rotation of the sun cogwheel is configured to move the pushrod

along the axis of the pushrod;

wherein an axis of the carrier is coaxial with the axis of the sun cogwheel;

wherein, an axis of the cogwheel ring is coaxial with the axis of the sun cogwheel, and wherein the cogwheel ring comprises at least one latching feature 62; wherein, the at least one planetary cogwheel is located between the sun cogwheel and the cogwheel ring, wherein each planetary cogwheel of the at least one planetary cogwheel is connected to the carrier such that when the carrier rotates about the axis of the sun cogwheel a centre axis of each planetary cogwheel rotates with the carrier, and wherein each planetary cogwheel is configured to rotate about its own centre axis;

wherein, the cogwheel ring locking device is configured to engage with one latching feature of the at least one latching feature of the cogwheel ring to stop the cogwheel ring from rotating, and wherein the cogwheel ring locking device is configured to disengage from the at least one latching feature of the cogwheel ring to permit the cogwheel ring to rotate; wherein, initiation of a first switching action comprises a disengagement of the cogwheel ring locking device from a latching feature of the at least one latching feature of the cogwheel ring; and wherein, in a first switching action a rotation of the cogwheel ring about the axis of the sun cogwheel in a first rotational direction is configured to rotate the sun cogwheel in a second rotational direction opposite to the first rotational direction to move the pushrod along the axis of the pushrod in a first direction.

Example 36. Drive according to Example 35, wherein the at least one latching feature of the cogwheel ring comprises at least one indentation in an outer perimeter of the cogwheel ring, wherein the cogwheel ring locking device comprises a protrusion, wherein engagement of the cogwheel ring locking device with a latching feature of the cogwheel ring comprises the cogwheel ring locking device being configured to hold the protrusion of the cogwheel ring locking device in an indentation of the cogwheel ring to stop the cogwheel ring from rotating, and wherein disengagement of the cogwheel ring locking device from the at least one latching feature of the cogwheel ring comprises the cogwheel ring locking device being configured to enable the protrusion of the cogwheel ring locking device to move into and out of the at least one indentation of the cogwheel ring. 50

Example 37. Drive according to Example 36, wherein the protrusion of the cogwheel ring locking device comprises a roller, and wherein engagement of the cogwheel ring locking device with a latching feature of the cogwheel ring comprises the locking device being configured to hold the roller of the cogwheel ring locking device in the indentation of the cogwheel

ring to stop the cogwheel ring from rotating, and wherein disengagement of the cogwheel ring locking device from the at least one latching feature of the cogwheel ring comprises the locking device being configured to enable the roller of the cogwheel ring locking device to roll into and out of the at least one indentation of the cogwheel ring.

Example 38. Drive according to any of Examples 36-37, wherein engagement of the cogwheel ring locking device with the latching feature of the cogwheel ring comprises the cogwheel ring locking device being configured to resist a movement of the protrusion of the cogwheel ring locking device in a radial direction away from the axis of the cogwheel ring.

Example 39. Drive according to Example 38, wherein the cogwheel ring locking device comprises a knee lever and wherein the cogwheel ring locking device is configured to hold a first lever and a second lever of the knee-lever of the cogwheel ring locking device straight to resist the movement of the protrusion of the cogwheel ring locking device in the radial direction away from the axis of the cogwheel ring.

Example 40. Drive according to any of Examples 36-39, wherein disengagement of the cogwheel ring locking device from the at least one latching feature of the cogwheel ring comprises the cogwheel ring locking device being configured to enable a movement of the protrusion of the cogwheel ring locking device in a radial direction away from the axis of the cogwheel ring.

Example 41. Drive according to Example 40, wherein disengagement of the cogwheel ring locking device from the at least one latching feature of the cogwheel ring comprises the cogwheel ring locking device being configured to pull the protrusion of the cogwheel ring locking device in the radial direction away from the axis of the cogwheel ring.

Example 42. Drive according to any of Examples 40-41, when dependent upon Example 39, wherein disengagement of the cogwheel ring locking device from the at least one latching feature of the cogwheel ring comprises the cogwheel ring locking device being configured to bend the knee-lever of the cogwheel ring locking device such that the first lever is angled to the second lever.

Example 43. Drive according to any of Examples 35-42, wherein the at least one latching feature of the cogwheel ring comprises a plurality of latching features angularly spaced one from the other about the axis of the cogwheel ring.

Example 44. Drive according to any of Examples 35-43, wherein in the first switching action the drive is configured such that the carrier does not rotate about the pushrod axis.

Example 45. Drive according to any of Examples 35-43, wherein, the carrier comprises at least one latching feature 52, wherein the drive comprises a carrier locking device 200, wherein the carrier locking device is configured to engage with one latching feature of the at least one latching feature of the carrier to stop the carrier from rotating, and wherein the carrier locking device is configured to disengage from the at least one latching feature of the carrier to permit the carrier to rotate.

Example 46. Drive according to Example 45, wherein the carrier comprises a disc that rotates with the carrier, wherein the at least one latching feature of the carrier comprises at least one indentation in an outer perimeter of the disc of the carrier, wherein the carrier locking device comprises a protrusion, wherein engagement of the carrier locking device with a latching feature of the carrier comprises the carrier locking device being configured to hold the protrusion of the carrier locking device in an indentation of the disc to stop the carrier from rotating, and wherein disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to enable the protrusion of the carrier locking device to move into and out of the at least one indentation of the disc.

Example 47. Drive according to Example 46, wherein the protrusion of the carrier locking device comprises a roller, and wherein engagement of the carrier locking device with a latching feature of the carrier comprises the locking device being configured to hold the roller of the carrier locking device in the indentation of the disc to stop the carrier from rotating, and wherein disengagement of the locking device from the at least one latching feature of the carrier comprises the locking device being configured to enable the roller of the carrier locking device to roll into and out of the at least one indentation of the disc.

Example 48. Drive according to any of Examples 46-47, wherein engagement of the carrier locking device with the latching feature of the carrier comprises the carrier locking device being configured to resist a movement of the protrusion of the carrier locking device in a radial direction away from the axis of the carrier.

Example 49. Drive according to Example 48, wherein the carrier locking device comprises a knee lever and wherein the carrier locking device is configured to hold a first lever and a second lever of the knee-

lever of the carrier locking device straight to resist the movement of the protrusion of the carrier locking device in the radial direction away from the axis of the carrier.

Example 50. Drive according to any of Examples 46-49, wherein disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to enable a movement of the protrusion of the carrier locking device in a radial direction away from the axis of the carrier.

Example 51. Drive according to Example 50, wherein disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to pull the protrusion of the carrier locking device in the radial direction away from the axis of the carrier.

Example 52. Drive according to any of Examples 50-51, when dependent upon example 49, wherein disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to bend the knee-lever of the carrier locking device such that the first lever is angled to the second lever.

Example 53. Drive according to any of Examples 45-52, wherein the at least one latching feature of the carrier comprises a plurality of latching features angularly spaced one from the other about the axis of the carrier.

Example 54. Drive according to any of Examples 35-53, wherein in the first switching action the rotation of the sun cogwheel in the second rotational direction is configured to move the pushrod along the axis of the pushrod in the first direction away from the sun cogwheel.

Example 55. Drive according to any of Examples 35-54, wherein in the first switching action the drive is configured such that the pushrod does not rotate about the pushrod axis.

Example 56. Drive according to any of Examples 35-55, wherein a first end 74 of a first spring 70 is coupled to the cogwheel ring, and wherein in the first switching action energy release from the first spring (70) is configured to rotate the cogwheel ring in the first rotational direction about the axis of the sun cogwheel.

Example 57. Drive according to Example 56, wherein in the first switching action the drive is configured such that a second end (72) of the first spring is held in a fixed position.

Example 58. Drive according to any of Examples 35-57, wherein in the first switching action movement of the pushrod along the axis of the pushrod is configured to store energy in a second spring 80.

Example 59. Drive according to any of Examples 35-59, wherein at the end of the first switching action, the cogwheel ring locking device is configured to engage with a latching feature of the at least one latching feature of the cogwheel ring.

Example 60. Drive according to any of Examples 35-59, wherein a contact plate 15 is fixedly connected to the pushrod, wherein the drive comprises a fixed end stop 90, wherein in the first switching action the drive is configured such that the contact plate is moved toward the end stop, and wherein at the end of the first switching action the drive is configured such that the contact plate has contacted the end stop.

Example 61. Drive according to Example 60, wherein the contact plate comprises a ring-shaped structure and the end stop comprises a ring-shaped structure.

Example 62. Drive according to any of Examples 60-61, wherein the contact plate and/or the end stop have a defined level of flexibility.

Example 63. Drive according to any of Examples 45-53 or 54-62 when dependent upon any of Examples 45-53, wherein initiation of a second switching action comprises a disengagement of the carrier locking device from a latching feature of the at least one latching feature of the carrier, and wherein in the second switching action a rotation of the carrier about the axis of the sun cogwheel in the first rotational direction is configured to rotate the sun cogwheel in a first rotational direction opposite to the second rotational direction to move the pushrod along the axis of the pushrod in a second direction opposite to the first direction.

Example 64. Drive according to Example 63 when dependent upon Example 58, wherein in the second switching action energy release from the second spring is configured to rotate the carrier.

Example 65. Drive according to any of Examples 60-62 or any of Examples 63-64 when dependent upon any of Examples 60-62, wherein a first end 84 of the second spring is connected to the contact plate.

Example 66. Drive according to Example 65, wherein a second end 82 of the second spring is held in a fixed position.

Example 67. Drive according to any of Examples 63-66, wherein in the second switching action the drive is configured such that the cogwheel ring does not rotate about the axis of the sun cogwheel.

Example 68. A low, medium or high voltage vacuum circuit breaker comprising a drive according to any of Examples 35-67.

Example 69. A drive for a medium voltage switch, comprising:

- a pushrod 10;
- a sun cogwheel 30;
- at least one planetary cogwheel 40;
- a carrier 50;
- a cogwheel ring 60; and
- a carrier locking device 200;

wherein, an axis of the pushrod is coaxial with the axis of the cogwheel ring, and wherein a rotation of the cogwheel ring is configured to move the pushrod along the axis of the pushrod;

wherein an axis of the carrier is coaxial with the axis of the sun cogwheel, and wherein the carrier comprises at least one latching feature 52;

wherein, the axis of the cogwheel ring is coaxial with an axis of the sun cogwheel;

wherein, the at least one planetary cogwheel is located between the sun cogwheel and the cogwheel ring, wherein each planetary cogwheel of the at least one planetary cogwheel is connected to the carrier such that when the carrier rotates about the axis of the sun cogwheel a centre axis of each planetary cogwheel rotates with the carrier, and wherein each planetary cogwheel is configured to rotate about its own centre axis;

wherein, the carrier locking device is configured to engage with one latching feature of the at least one latching feature of the carrier to stop the carrier from rotating, and wherein the carrier locking device is configured to disengage from the at least one latching feature of the carrier to permit the carrier to rotate; wherein, initiation of a first switching action comprises a disengagement of the carrier locking device from a latching feature of the at least one latching feature of the carrier; and

wherein, in the first switching action a rotation of the carrier about the axis of the sun cogwheel in a first rotational direction is configured to rotate the cogwheel ring in a first rotational direction to move the pushrod along the axis of the pushrod in a first direction.

Example 70. Drive according to Example 69, wherein the carrier comprises a disc that rotates with the carrier, wherein the at least one latching feature of the carrier comprises at least one indentation in an outer

perimeter of the disc of the carrier, wherein the carrier locking device comprises a protrusion, wherein engagement of the carrier locking device with a latching feature of the carrier comprises the carrier locking device being configured to hold the protrusion of the carrier locking device in an indentation of the disc to stop the carrier from rotating, and wherein disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to enable the protrusion of the carrier locking device to move into and out of the at least one indentation of the disc.

Example 71. Drive according to Example 70, wherein the protrusion of the carrier locking device comprises a roller, and wherein engagement of the carrier locking device with a latching feature of the carrier comprises the locking device being configured to hold the roller of the carrier locking device in the indentation of the disc to stop the carrier from rotating, and wherein disengagement of the locking device from the at least one latching feature of the carrier comprises the locking device being configured to enable the roller of the carrier locking device to roll into and out of the at least one indentation of the disc.

Example 72. Drive according to any of Examples 70-71, wherein engagement of the carrier locking device with the latching feature of the carrier comprises the carrier locking device being configured to resist a movement of the protrusion of the carrier locking device in a radial direction away from the axis of the carrier.

Example 73. Drive according to Example 72, wherein the carrier locking device comprises a knee lever and wherein the carrier locking device is configured to hold a first lever and a second lever of the knee-lever of the carrier locking device straight to resist the movement of the protrusion of the carrier locking device in the radial direction away from the axis of the carrier.

Example 74. Drive according to any of Examples 70-73, wherein disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to enable a movement of the protrusion of the carrier locking device in a radial direction away from the axis of the carrier.

Example 75. Drive according to Example 74, wherein disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to pull the protrusion of the carrier locking device in the radial direction away from the axis of the carrier.

Example 76. Drive according to any of Examples 74-75, when dependent upon Example 73, wherein disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to bend the knee-lever of the carrier locking device such that the first lever is angled to the second lever.

Example 77. Drive according to any of Examples 69-76, wherein the at least one latching feature of the carrier comprises a plurality of latching features angularly spaced one from the other about the axis of the carrier.

Example 78. Drive according to any of Examples 69-77, wherein in the first switching action the drive is configured such that the sun cogwheel does not rotate.

Example 79. Drive according to any of Examples 69-78, wherein, the sun cogwheel comprises at least one latching feature, wherein the drive comprises a sun cogwheel locking device, wherein the sun cogwheel locking device is configured to engage with one latching feature of the at least one latching feature of the sun cogwheel to stop the sun cogwheel from rotating, and wherein the sun cogwheel locking device is configured to disengage from the at least one latching feature of the sun cogwheel to permit the cogwheel ring to rotate.

Example 80. Drive according to Example 79, wherein the sun cogwheel comprises a disc that rotates with the sun cogwheel, wherein the at least one latching feature of the sun cogwheel comprises at least one indentation in an outer perimeter of the disc of the sun cogwheel wherein the sun cogwheel locking device comprises a protrusion, wherein engagement of the sun cogwheel locking device with a latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to hold the protrusion of the sun cogwheel locking device in an indentation of the disc of the sun cogwheel to stop the sun cogwheel from rotating, and wherein disengagement of the sun cogwheel locking device from the at least one latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to enable the protrusion of the sun cogwheel locking device to move into and out of the at least one indentation of the disc of the sun cogwheel.

Example 81. Drive according to Example 80, wherein the protrusion of the sun cogwheel locking device comprises a roller, and wherein engagement of the sun cogwheel locking device with a latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to hold the roller of the sun cogwheel locking device in the indentation

of the disc of the sun cogwheel to stop the sun cogwheel from rotating, and wherein disengagement of the sun cogwheel locking device from the at least one latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to enable the roller of the sun cogwheel locking device to roll into and out of the at least one indentation of the disc of the sun cogwheel.

Example 82. Drive according to any of Examples 80-81, wherein engagement of the sun cogwheel locking device with the latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to resist a movement of the protrusion of the sun cogwheel locking device in a radial direction away from the axis of the sun cogwheel.

Example 83. Drive according to Example 82, wherein the sun cogwheel locking device comprises a knee lever and wherein the sun cogwheel locking device is configured to hold a first lever and a second lever of the knee-lever of the sun cogwheel locking device straight to resist the movement of the protrusion of the sun cogwheel locking device in the radial direction away from the axis of the sun cogwheel.

Example 84. Drive according to any of Examples 80-83, wherein disengagement of the sun cogwheel locking device from the at least one latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to enable a movement of the protrusion of the sun cogwheel locking device in a radial direction away from the axis of the sun cogwheel.

Example 85. Drive according to Example 84, wherein disengagement of the sun cogwheel locking device from the at least one latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to pull the protrusion of the sun cogwheel locking device in the radial direction away from the axis of the sun cogwheel.

Example 86. Drive according to any of Examples 84-85, when dependent upon example 83, wherein disengagement of the sun cogwheel locking device from the at least one latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to bend the knee-lever of the sun cogwheel locking device such that the first lever is angled to the second lever.

Example 87. Drive according to any of Examples 79-86, wherein the at least one latching feature of the sun cogwheel comprises a plurality of latching features angularly spaced one from the other about the axis of the sun cogwheel.

Example 88. Drive according to any of Examples 69-87, wherein in the first switching action the rotation of the cogwheel ring in the first rotational direction is configured to move the pushrod along the axis of the pushrod in the first direction away from the sun cogwheel.

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Example 89. Drive according to any of Examples 69-88, wherein in the first switching action the drive is configured such that the pushrod does not rotate about the pushrod axis.

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Example 90. Drive according to any of Examples 69-89, wherein a first end 74 of a first spring 70 is coupled to the carrier, and wherein in the first switching action energy release from a first spring 70 is configured to rotate the carrier in the first rotational direction about the axis of the sun cogwheel.

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Example 91. Drive according to Example 90, wherein in the first switching action the drive is configured such that a second end 72 of the first spring is held in a fixed position.

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Example 92. Drive according to any of Examples 69-91, wherein in the first switching action movement of the pushrod along the axis of the pushrod is configured to store energy in a second spring 80.

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Example 93. Drive according to any of Examples 69-92, wherein at the end of the first switching action, the carrier locking device is configured to engage with a latching feature of the at least one latching feature of the carrier.

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Example 94. Drive according to any of Examples 69-93, wherein a contact plate 15 is fixedly connected to the pushrod, wherein the drive comprises a fixed end stop 90, wherein in the first switching action the drive is configured such that the contact plate is moved toward the end stop, and wherein at the end of the first switching action the drive is configured such that the contact plate has contacted the end stop.

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Example 95. Drive according to Example 94, wherein the contact plate comprises a ring-shaped structure and the end stop comprises a ring-shaped structure.

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Example 96. Drive according to any of Examples 94-95, wherein the contact plate and/or the end stop have a defined level of flexibility.

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Example 97. Drive according to any of Examples 79-87 or 88-96 when dependent upon any of Examples 79-87, wherein initiation of a second switching action comprises a disengagement of the sun cogwheel locking device from a latching feature of the

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at least one latching feature of the sun cogwheel, and wherein in the second switching action a rotation of the sun cogwheel about the axis of the sun cogwheel in a first rotational direction is configured to rotate the cogwheel ring in a second rotational direction opposite to the first rotational direction to move the pushrod along the axis of the pushrod in a second direction opposite to the first direction. Example 98. Drive according to Example 97 when dependent upon Example 92, wherein in the second switching action energy release from the second spring is configured to rotate the sun cogwheel.

Example 99. Drive according to any of Examples 94-96 or any of Examples 97-98 when dependent upon any of Examples 94-96, wherein a first end 84 of the second spring is connected to the contact plate.

Example 100. Drive according to Example 99, wherein a second end 82 of the second spring is held in a fixed position.

Example 101. Drive according to any of Examples 97-100, wherein in the second switching action the drive is configured such that the carrier does not rotate about the axis of the sun cogwheel.

Example 102. A low, medium or high voltage vacuum circuit breaker comprising a drive according to any of Examples 69-101.

Example 103. A drive for a low, medium and high voltage switch, comprising:

- a pushrod 10;
- a sun cogwheel 30;
- at least one planetary cogwheel 40;
- a carrier 50;
- a cogwheel ring 60; and
- a sun cogwheel locking device;

wherein, an axis of the pushrod is coaxial with the axis of the cogwheel ring, and wherein a rotation of the cogwheel ring is configured to move the pushrod along the axis of the pushrod;

wherein an axis of the carrier is coaxial with the axis of the sun cogwheel, and wherein the sun cogwheel comprises at least one latching feature;

wherein, the axis of the cogwheel ring is coaxial with an axis of the sun cogwheel;

wherein, the at least one planetary cogwheel is located between the sun cogwheel and the cogwheel ring, wherein each planetary cogwheel of the at least one planetary cogwheel is connected to the carrier such that when the carrier rotates about the axis of the sun cogwheel a centre axis of each planetary cogwheel rotates with the carrier, and wherein each

planetary cogwheel is configured to rotate about its own centre axis;

wherein, the sun cogwheel locking device is configured to engage with one latching feature of the at least one latching feature of the sun cogwheel to stop the sun cogwheel from rotating, and wherein the sun cogwheel locking device is configured to disengage from the at least one latching feature of the sun cogwheel to permit the sun cogwheel to rotate; wherein, initiation of a first switching action comprises a disengagement of the sun cogwheel locking device from a latching feature of the at least one latching feature of the sun cogwheel; and wherein, in the first switching action a rotation of the sun cogwheel in a first rotational direction is configured to rotate the cogwheel ring in a second rotational direction counter to the first rotational direction to move the pushrod along the axis of the pushrod in a first direction.

Example 104. Drive according to Example 103, wherein the sun cogwheel comprises a disc that rotates with the sun cogwheel, wherein the at least one latching feature of the sun cogwheel comprises at least one indentation in an outer perimeter of the disc of the sun cogwheel wherein the sun cogwheel locking device comprises a protrusion, wherein engagement of the sun cogwheel locking device with a latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to hold the protrusion of the sun cogwheel locking device in an indentation of the disc of the sun cogwheel to stop the sun cogwheel from rotating, and wherein disengagement of the sun cogwheel locking device from the at least one latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to enable the protrusion of the sun cogwheel locking device to move into and out of the at least one indentation of the disc of the sun cogwheel.

Example 105. Drive according to Example 104, wherein the protrusion of the sun cogwheel locking device comprises a roller, and wherein engagement of the sun cogwheel locking device with a latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to hold the roller of the sun cogwheel locking device in the indentation of the disc of the sun cogwheel to stop the sun cogwheel from rotating, and wherein disengagement of the sun cogwheel locking device from the at least one latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to enable the roller of the sun cogwheel locking device to roll into and out of the at least one indentation of the disc of the sun cogwheel.

Example 106. Drive according to any of Examples 104-105, wherein engagement of the sun cogwheel

locking device with the latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to resist a movement of the protrusion of the sun cogwheel locking device in a radial direction away from the axis of the sun cogwheel.

Example 107. Drive according to Example 106, wherein the sun cogwheel locking device comprises a knee lever and wherein the sun cogwheel locking device is configured to hold a first lever and a second lever of the knee-lever of the sun cogwheel locking device straight to resist the movement of the protrusion of the sun cogwheel locking device in the radial direction away from the axis of the sun cogwheel.

Example 108. Drive according to any of Examples 104-107, wherein disengagement of the sun cogwheel locking device from the at least one latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to enable a movement of the protrusion of the sun cogwheel locking device in a radial direction away from the axis of the sun cogwheel.

Example 109. Drive according to Example 108, wherein disengagement of the sun cogwheel locking device from the at least one latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to pull the protrusion of the sun cogwheel locking device in the radial direction away from the axis of the sun cogwheel.

Example 110. Drive according to any of Examples 108-109, when dependent upon Example 107, wherein disengagement of the sun cogwheel locking device from the at least one latching feature of the sun cogwheel comprises the sun cogwheel locking device being configured to bend the knee-lever of the sun cogwheel locking device such that the first lever is angled to the second lever.

Example 111. Drive according to any of Examples 103-110, wherein the at least one latching feature of the sun cogwheel comprises a plurality of latching features angularly spaced one from the other about the axis of the sun cogwheel.

Example 112. Drive according to any of Examples 103-111, wherein in the first switching action the drive is configured such that the carrier does not rotate about the axis of the sun cogwheel.

Example 113. Drive according to any of Examples 103-112, wherein the drive comprises a carrier locking device 200, wherein the carrier comprises at least one latching feature 52, wherein, the carrier locking device is configured to engage with one latching fea-

ture of the at least one latching feature of the carrier to stop the carrier from rotating, and wherein the carrier locking device is configured to disengage from the at least one latching feature of the carrier to permit the carrier to rotate.

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Example 114. Drive according to Example 113, wherein the carrier comprises a disc that rotates with the carrier, wherein the at least one latching feature of the carrier comprises at least one indentation in an outer perimeter of the disc of the carrier, wherein the carrier locking device comprises a protrusion, wherein engagement of the carrier locking device with a latching feature of the carrier comprises the carrier locking device being configured to hold the protrusion of the carrier locking device in an indentation of the disc to stop the carrier from rotating, and wherein disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to enable the protrusion of the carrier locking device to move into and out of the at least one indentation of the disc.

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Example 115. Drive according to Example 114, wherein the protrusion of the carrier locking device comprises a roller, and wherein engagement of the carrier locking device with a latching feature of the carrier comprises the locking device being configured to hold the roller of the carrier locking device in the indentation of the disc to stop the carrier from rotating, and wherein disengagement of the locking device from the at least one latching feature of the carrier comprises the locking device being configured to enable the roller of the carrier locking device to roll into and out of the at least one indentation of the disc.

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Example 116. Drive according to any of Examples 114-115, wherein engagement of the carrier locking device with the latching feature of the carrier comprises the carrier locking device being configured to resist a movement of the protrusion of the carrier locking device in a radial direction away from the axis of the carrier.

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Example 117. Drive according to Example 116, wherein the carrier locking device comprises a knee lever and wherein the carrier locking device is configured to hold a first lever and a second lever of the knee-lever of the carrier locking device straight to resist the movement of the protrusion of the carrier locking device in the radial direction away from the axis of the carrier.

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Example 118. Drive according to any of Examples 114-117, wherein disengagement of the carrier locking device from the at least one latching feature of

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the carrier comprises the carrier locking device being configured to enable a movement of the protrusion of the carrier locking device in a radial direction away from the axis of the carrier.

Example 119. Drive according to Example 118, wherein disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to pull the protrusion of the carrier locking device in the radial direction away from the axis of the carrier.

Example 120. Drive according to any of Examples 118-119, when dependent upon Example 117, wherein disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to bend the knee-lever of the carrier locking device such that the first lever is angled to the second lever.

Example 121. Drive according to any of Examples 113-120, wherein the at least one latching feature of the carrier comprises a plurality of latching features angularly spaced one from the other about the axis of the carrier

Example 122. Drive according to any of Examples 103-121, wherein in the first switching action the rotation of the cogwheel ring in the second rotational direction is configured to move the pushrod along the axis of the pushrod in the first direction away from the sun cogwheel.

Example 123. Drive according to any of Examples 103-104, wherein in the first switching action the drive is configured such that the pushrod does not rotate about the pushrod axis.

Example 124. Drive according to any of Examples 103-105, wherein a first end 74 of a first spring 70 is coupled to the sun cogwheel; and wherein in the first switching action energy release from the first spring 70 is configured to rotate the sun cogwheel in the first rotational direction about the axis of the sun cogwheel.

Example 125. Drive according to Example 124, wherein in the first switching action the drive is configured such that a second end (72) of the first spring is held in a fixed position.

Example 126. Drive according to any of Examples 103-125, wherein in the first switching action movement of the pushrod along the axis of the pushrod is configured to store energy in a second spring 80.

Example 127. Drive according to any of Examples 103-126, wherein at the end of the first switching action, the sun cogwheel locking device is configured to engage with a latching feature of the at least one latching feature of the sun cogwheel.

Example 128. Drive according to any of Examples 103-127, wherein a contact plate 15 is fixedly connected to the pushrod, wherein the drive comprises a fixed end stop 90, wherein in the first switching action the drive is configured such that the contact plate is moved toward the end stop, and wherein at the end of the first switching action the drive is configured such that the contact plate has contacted the end stop.

Example 129. Drive according to Example 128, wherein the contact plate comprises a ring-shaped structure and the end stop comprises a ring-shaped structure.

Example 130. Drive according to any of Examples 128-129, wherein the contact plate and/or the end stop have a defined level of flexibility.

Example 131. Drive according to any of Examples 113-121 or 122-130 when dependent upon any of Examples 113-121, wherein initiation of a second switching action comprises a disengagement of the carrier locking device from a latching feature of the at least one latching feature of the carrier, and wherein in the second switching action a rotation of the carrier about the axis of the sun cogwheel in the first rotational direction is configured to rotate the cogwheel ring in a first rotational direction opposite to the second rotational direction to move the pushrod along the axis of the pushrod in a second direction opposite to the first direction.

Example 132. Drive according to Example 131 when dependent upon Example 126, wherein in the second switching action energy release from the second spring is configured to rotate the carrier.

Example 133. Drive according to any of Examples 128-130, or any of Examples 131-132 when dependent upon any of Examples 128-130, wherein a first end 84 of the second spring is connected to the contact plate.

Example 134. Drive according to any of Example 133, wherein, a second end 82 of the second spring is held in a fixed position.

Example 135. Drive according to any of Examples 131-134, wherein in the second switching action the drive is configured such that the sun cogwheel does not rotate about the axis of the sun cogwheel.

136. A low, medium and high voltage switch comprising a drive according to any of claims 103-135.

Reference Numerals

[0397]

10	Pushrod incl. contact pressure springs
15	Ring-plate (contact plate) of 10
20	High-Helix thread
30	Sun cogwheel
40	Planetary cogwheels
50	Carrier of 40
52	Latching feature in 50
60	Hollow cogwheel ring
62	Latching feature in 60
70	Closing spring (first spring)
72	Outer end (second end) of 70
74	Inner end (first end) of 70
80	Opening spring (second spring)
82	Upper end (second end) of 80
84	Lower end (first end) of 80
90	Lower end stop
95	Upper end stop
100	Cogwheel ring locking device
110	Fixed frame of 100
120	Spring of 100
130	Fixed guide of 100
132	Long hole in 130
140	First lever of 100
142	Trigger point of 140
150	Second lever of 100 1
60	Roller of 100
162	Guidance pin of 160
200	Carrier locking device
210	Fixed frame of 200
220	Spring of 200
230	Fixed guide of 200
232	Long hole in 230
240	First lever of 200
242	Trigger point of 240
250	Second lever of 200
260	Roller of 200

Claims

1. A drive for a low, medium or high voltage switch, comprising:

- a pushrod (10);
- a sun cogwheel (30);
- at least one planetary cogwheel (40);
- a carrier (50);
- a cogwheel ring (60); and
- a carrier locking device (200);

wherein, an axis of the pushrod is coaxial with an

- axis of the sun cogwheel, and wherein a rotation of the sun cogwheel is configured to move the pushrod along the axis of the pushrod;
 wherein an axis of the carrier is coaxial with the axis of the sun cogwheel, and wherein the carrier comprises at least one latching feature (52);
 wherein, an axis of the cogwheel ring is coaxial with the axis of the sun cogwheel;
 wherein, the at least one planetary cogwheel is located between the sun cogwheel and the cogwheel ring, wherein each planetary cogwheel of the at least one planetary cogwheel is connected to the carrier such that when the carrier rotates about the axis of the sun cogwheel a centre axis of each planetary cogwheel rotates with the carrier, and wherein each planetary cogwheel is configured to rotate about its own centre axis;
 wherein, the carrier locking device is configured to engage with one latching feature of the at least one latching feature of the carrier to stop the carrier from rotating, and wherein the carrier locking device is configured to disengage from the at least one latching feature of the carrier to permit the carrier to rotate;
 wherein, initiation of a first switching action comprises a disengagement of the carrier locking device from a latching feature of the at least one latching feature of the carrier; and
 wherein, in the first switching action a rotation of the carrier about the axis of the sun cogwheel in a first rotational direction is configured to rotate the sun cogwheel in the first rotational direction to move the pushrod along the axis of the pushrod in a first direction.
2. Drive according to claim 1, wherein the carrier comprises a disc that rotates with the carrier, wherein the at least one latching feature of the carrier comprises at least one indentation in an outer perimeter of the disc of the carrier, wherein the carrier locking device comprises a protrusion, wherein engagement of the carrier locking device with a latching feature of the carrier comprises the carrier locking device being configured to hold the protrusion of the carrier locking device in an indentation of the disc to stop the carrier from rotating, and wherein disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to enable the protrusion of the carrier locking device to move into and out of the at least one indentation of the disc.
 3. Drive according to claim 2, wherein the protrusion of the carrier locking device comprises a roller, and wherein engagement of the carrier locking device with a latching feature of the carrier comprises the locking device being configured to hold the roller of the carrier locking device in the indentation of the disc to stop the carrier from rotating, and wherein disengagement of the locking device from the at least one latching feature of the carrier comprises the locking device being configured to enable the roller of the carrier locking device to roll into and out of the at least one indentation of the disc.
 4. Drive according to any of claims 2-3, wherein engagement of the carrier locking device with the latching feature of the carrier comprises the carrier locking device being configured to resist a movement of the protrusion of the carrier locking device in a radial direction away from the axis of the carrier.
 5. Drive according to claim 4, wherein the carrier locking device comprises a knee lever and wherein the carrier locking device is configured to hold a first lever and a second lever of the knee-lever of the carrier locking device straight to resist the movement of the protrusion of the carrier locking device in the radial direction away from the axis of the carrier.
 6. Drive according to any of claims 2-5, wherein disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to enable a movement of the protrusion of the carrier locking device in a radial direction away from the axis of the carrier.
 7. Drive according to claim 6, wherein disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to pull the protrusion of the carrier locking device in the radial direction away from the axis of the carrier.
 8. Drive according to any of claims 6-7, when dependent upon claim 5, wherein disengagement of the carrier locking device from the at least one latching feature of the carrier comprises the carrier locking device being configured to bend the knee-lever of the carrier locking device such that the first lever is angled to the second lever.
 9. Drive according to any of claims 1-8, wherein the at least one latching feature of the carrier comprises a plurality of latching features angularly spaced one from the other about the axis of the carrier.
 10. Drive according to any of claims 1-9, wherein in the first switching action the drive is configured such that the cogwheel ring does not rotate.
 11. Drive according to any of claims 1-10, wherein, the cogwheel ring comprises at least one latching feature (62), wherein the drive comprises a cogwheel ring locking device (100), wherein the cogwheel ring locking device is configured to engage with one

- latching feature of the at least one latching feature of the cogwheel ring to stop the cogwheel ring from rotating, and wherein the cogwheel ring locking device is configured to disengage from the at least one latching feature of the cogwheel ring to permit the cogwheel ring to rotate.
12. Drive according to claim 11, wherein the at least one latching feature of the cogwheel ring comprises at least one indentation in an outer perimeter of the cogwheel ring, wherein the cogwheel ring locking device comprises a protrusion, wherein engagement of the cogwheel ring locking device with a latching feature of the cogwheel ring comprises the cogwheel ring locking device being configured to hold the protrusion of the cogwheel ring locking device in an indentation of the cogwheel ring to stop the cogwheel ring from rotating, and wherein disengagement of the cogwheel ring locking device from the at least one latching feature of the cogwheel ring comprises the cogwheel ring locking device being configured to enable the protrusion of the cogwheel ring locking device to move into and out of the at least one indentation of the cogwheel ring.
13. Drive according to claim 12, wherein the protrusion of the cogwheel ring locking device comprises a roller, and wherein engagement of the cogwheel ring locking device with a latching feature of the cogwheel ring comprises the locking device being configured to hold the roller of the cogwheel ring locking device in the indentation of the cogwheel ring to stop the cogwheel ring from rotating, and wherein disengagement of the cogwheel ring locking device from the at least one latching feature of the cogwheel ring comprises the locking device being configured to enable the roller of the cogwheel ring locking device to roll into and out of the at least one indentation of the cogwheel ring.
14. Drive according to any of claims 12-13, wherein engagement of the cogwheel ring locking device with the latching feature of the cogwheel ring comprises the cogwheel ring locking device being configured to resist a movement of the protrusion of the cogwheel ring locking device in a radial direction away from the axis of the cogwheel ring.
15. Drive according to claim 14, wherein the cogwheel ring locking device comprises a knee lever and wherein the cogwheel ring locking device is configured to hold a first lever and a second lever of the knee-lever of the cogwheel ring locking device straight to resist the movement of the protrusion of the cogwheel ring locking device in the radial direction away from the axis of the cogwheel ring.
16. Drive according to any of claims 12-15, wherein dis-
- engagement of the cogwheel ring locking device from the at least one latching feature of the cogwheel ring comprises the cogwheel ring locking device being configured to enable a movement of the protrusion of the cogwheel ring locking device in a radial direction away from the axis of the cogwheel ring.
17. Drive according to claim 16, wherein disengagement of the cogwheel ring locking device from the at least one latching feature of the cogwheel ring comprises the cogwheel ring locking device being configured to pull the protrusion of the cogwheel ring locking device in the radial direction away from the axis of the cogwheel ring.
18. Drive according to any of claims 16-17, when dependent upon claim 15, wherein disengagement of the cogwheel ring locking device from the at least one latching feature of the cogwheel ring comprises the cogwheel ring locking device being configured to bend the knee-lever of the cogwheel ring locking device such that the first lever is angled to the second lever.
19. Drive according to any of claims 11-18, wherein the at least one latching feature of the cogwheel ring comprises a plurality of latching features angularly spaced one from the other about the axis of the cogwheel ring.
20. Drive according to any of claims 1-19, wherein in the first switching action the rotation of the sun cogwheel in the first rotational direction is configured to move the pushrod along the axis of the pushrod in the first direction away from the sun cogwheel.
21. Drive according to any of claims 1-20, wherein in the first switching action the drive is configured such that the pushrod does not rotate about the pushrod axis.
22. Drive according to any of claims 1-21, wherein a first end (74) of a first spring (70) is coupled to the carrier, and wherein in the first switching action energy release from the first spring (70) is configured to rotate the carrier in the first rotational direction about the axis of the sun cogwheel.
23. Drive according to claim 22, wherein in the first switching action the drive is configured such that a second end (72) of the first spring is held in a fixed position.
24. Drive according to any of claims 1-23, wherein in the first switching action movement of the pushrod along the axis of the pushrod is configured to store energy in a second spring (80).
25. Drive according to any of claims 1-24, wherein at the

end of the first switching action, the carrier locking device is configured to engage with a latching feature of the at least one latching feature of the carrier.

26. Drive according to any of claims 1-25, wherein a contact plate (15) is fixedly connected to the pushrod, wherein the drive comprises a fixed end stop (90), wherein in the first switching action the drive is configured such that the contact plate is moved toward the end stop, and wherein at the end of the first switching action the drive is configured such that the contact plate has contacted the end stop. 5
27. Drive according to claim 26, wherein the contact plate comprises a ring-shaped structure and the end stop comprises a ring-shaped structure. 10
28. Drive according to any of claims 26-27, wherein the contact plate and/or the end stop have a defined level of flexibility. 15
29. Drive according to any of claims 11-19 or 20-28 when dependent upon any of claims 11-19, wherein initiation of a second switching action comprises a disengagement of the cogwheel ring locking device from a latching feature of the at least one latching feature of the cogwheel ring, and wherein in the second switching action a rotation of the cogwheel ring about the axis of the sun cogwheel in the first rotational direction is configured to rotate the sun cogwheel in a second rotational direction opposite to the first rotational direction to move the pushrod along the axis of the pushrod in a second direction opposite to the first direction. 20
30. Drive according to claim 29 when dependent upon claim 24, wherein in the second switching action energy release from the second spring is configured to rotate the cogwheel ring. 25
31. Drive according to any of claims 26-28 or any of claims 29-30 when dependent upon any of claims 26-28, wherein a first end (84) of the second spring is connected to the contact plate. 30
32. Drive according to claim 31, wherein a second end (82) of the second spring is held in a fixed position. 35
33. Drive according to any of claims 29-32, wherein in the second switching action the drive is configured such that the carrier does not rotate about the axis of the sun cogwheel. 40
34. A low, medium or high voltage vacuum circuit breaker comprising a drive according to any of claims 1-33. 45
35. A drive for a low, medium or high voltage switch, comprising: 50

- a pushrod (10);
- a sun cogwheel (30);
- at least one planetary cogwheel (40);
- a carrier (50);
- a cogwheel ring (60); and
- a cogwheel locking device (100);

wherein, an axis of the pushrod is coaxial with an axis of the sun cogwheel, and wherein a rotation of the sun cogwheel is configured to move the pushrod along the axis of the pushrod;

wherein an axis of the carrier is coaxial with the axis of the sun cogwheel;

wherein, an axis of the cogwheel ring is coaxial with the axis of the sun cogwheel, and wherein the cogwheel ring comprises at least one latching feature (62);

wherein, the at least one planetary cogwheel is located between the sun cogwheel and the cogwheel ring, wherein each planetary cogwheel of the at least one planetary cogwheel is connected to the carrier such that when the carrier rotates about the axis of the sun cogwheel a centre axis of each planetary cogwheel rotates with the carrier, and wherein each planetary cogwheel is configured to rotate about its own centre axis;

wherein, the cogwheel ring locking device is configured to engage with one latching feature of the at least one latching feature of the cogwheel ring to stop the cogwheel ring from rotating, and wherein the cogwheel ring locking device is configured to disengage from the at least one latching feature of the cogwheel ring to permit the cogwheel ring to rotate; wherein, initiation of a first switching action comprises a disengagement of the cogwheel ring locking device from a latching feature of the at least one latching feature of the cogwheel ring; and

wherein, in a first switching action a rotation of the cogwheel ring about the axis of the sun cogwheel in a first rotational direction is configured to rotate the sun cogwheel in a second rotational direction opposite to the first rotational direction to move the pushrod along the axis of the pushrod in a first direction. 35

36. A low, medium or high voltage vacuum circuit breaker comprising a drive according to claim 35. 40

37. A drive for a medium voltage switch, comprising: 45

- a pushrod (10);
- a sun cogwheel (30);
- at least one planetary cogwheel (40);
- a carrier (50);
- a cogwheel ring (60); and
- a carrier locking device (200);

wherein, an axis of the pushrod is coaxial with the axis of the cogwheel ring, and wherein a rotation of

the cogwheel ring is configured to move the pushrod along the axis of the pushrod;
 wherein an axis of the carrier is coaxial with the axis of the sun cogwheel, and wherein the carrier comprises at least one latching feature (52);
 wherein, the axis of the cogwheel ring is coaxial with an axis of the sun cogwheel;
 wherein, the at least one planetary cogwheel is located between the sun cogwheel and the cogwheel ring, wherein each planetary cogwheel of the at least one planetary cogwheel is connected to the carrier such that when the carrier rotates about the axis of the sun cogwheel a centre axis of each planetary cogwheel rotates with the carrier, and wherein each planetary cogwheel is configured to rotate about its own centre axis;
 wherein, the carrier locking device is configured to engage with one latching feature of the at least one latching feature of the carrier to stop the carrier from rotating, and wherein the carrier locking device is configured to disengage from the at least one latching feature of the carrier to permit the carrier to rotate;
 wherein, initiation of a first switching action comprises a disengagement of the carrier locking device from a latching feature of the at least one latching feature of the carrier; and
 wherein, in the first switching action a rotation of the carrier about the axis of the sun cogwheel in a first rotational direction is configured to rotate the cogwheel ring in a first rotational direction to move the pushrod along the axis of the pushrod in a first direction.

38. A low, medium or high voltage vacuum circuit breaker comprising a drive according to claim 37.

39. A drive for a low, medium and high voltage switch, comprising:

- a pushrod (10);
- a sun cogwheel (30);
- at least one planetary cogwheel (40);
- a carrier (50);
- a cogwheel ring (60); and
- a sun cogwheel locking device;

wherein, an axis of the pushrod is coaxial with the axis of the cogwheel ring, and wherein a rotation of the cogwheel ring is configured to move the pushrod along the axis of the pushrod;
 wherein an axis of the carrier is coaxial with the axis of the sun cogwheel, and wherein the sun cogwheel comprises at least one latching feature;
 wherein, the axis of the cogwheel ring is coaxial with an axis of the sun cogwheel;
 wherein, the at least one planetary cogwheel is located between the sun cogwheel and the cogwheel ring, wherein each planetary cogwheel of the at least

one planetary cogwheel is connected to the carrier such that when the carrier rotates about the axis of the sun cogwheel a centre axis of each planetary cogwheel rotates with the carrier, and wherein each planetary cogwheel is configured to rotate about its own centre axis;
 wherein, the sun cogwheel locking device is configured to engage with one latching feature of the at least one latching feature of the sun cogwheel to stop the sun cogwheel from rotating, and wherein the sun cogwheel locking device is configured to disengage from the at least one latching feature of the sun cogwheel to permit the sun cogwheel to rotate;
 wherein, initiation of a first switching action comprises a disengagement of the sun cogwheel locking device from a latching feature of the at least one latching feature of the sun cogwheel; and
 wherein, in the first switching action a rotation of the sun cogwheel in a first rotational direction is configured to rotate the cogwheel ring in a second rotational direction counter to the first rotational direction to move the pushrod along the axis of the pushrod in a first direction.

40. A low, medium and high voltage switch comprising a drive according to claim 39.

OFF→ON

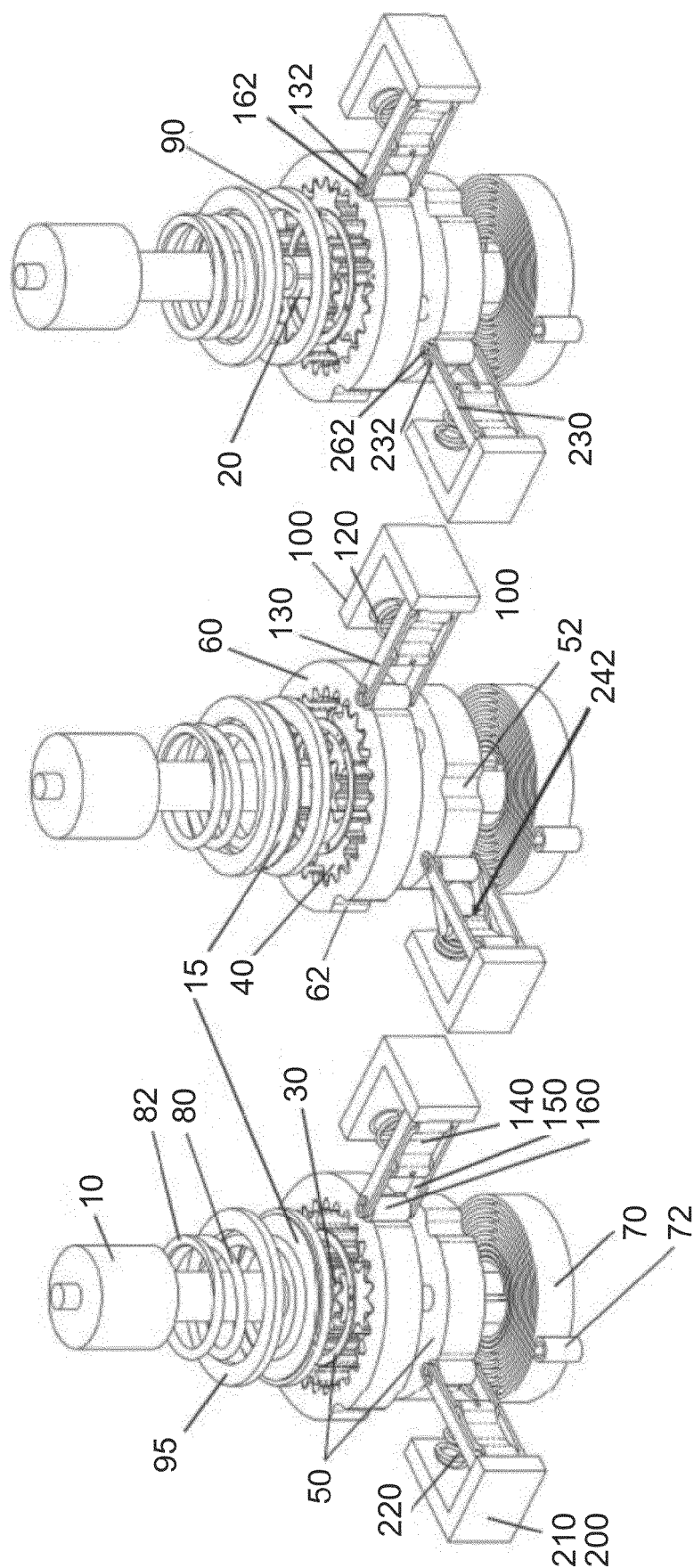


Fig. 1

ON → OFF

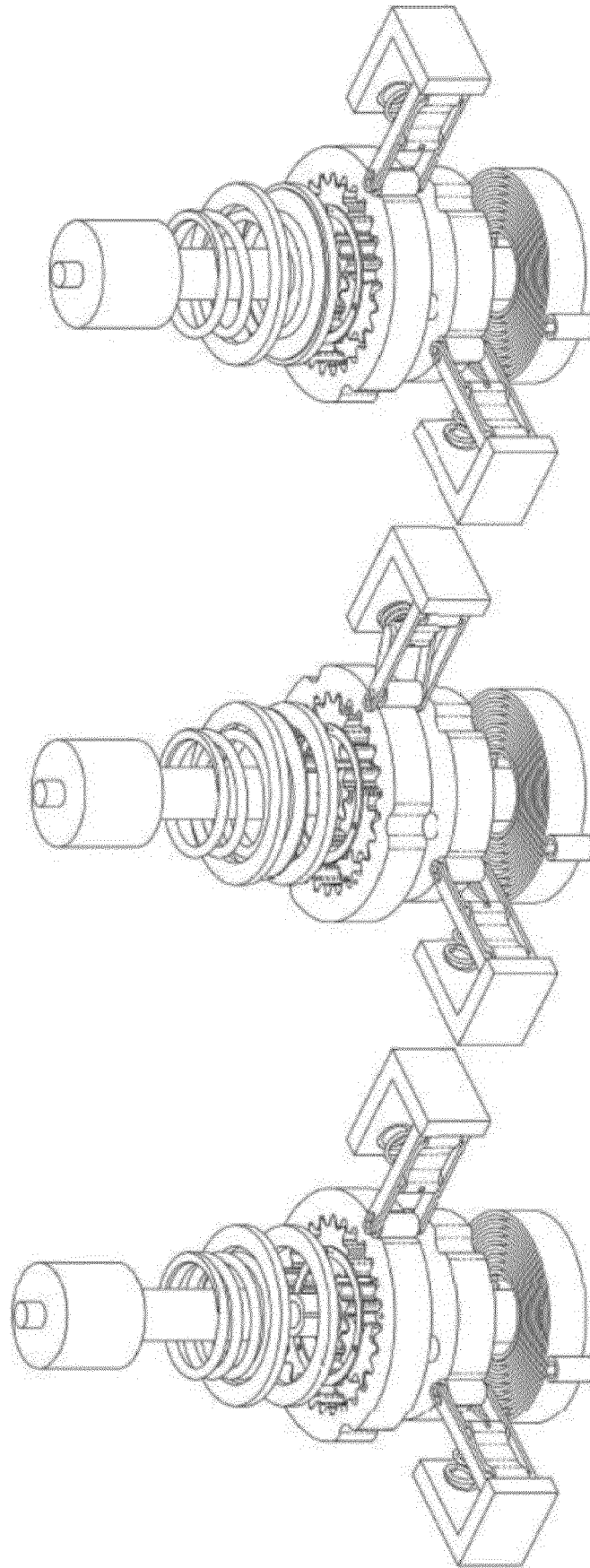


Fig. 2



EUROPEAN SEARCH REPORT

 Application Number
 EP 20 19 5069

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CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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05-02-2021

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