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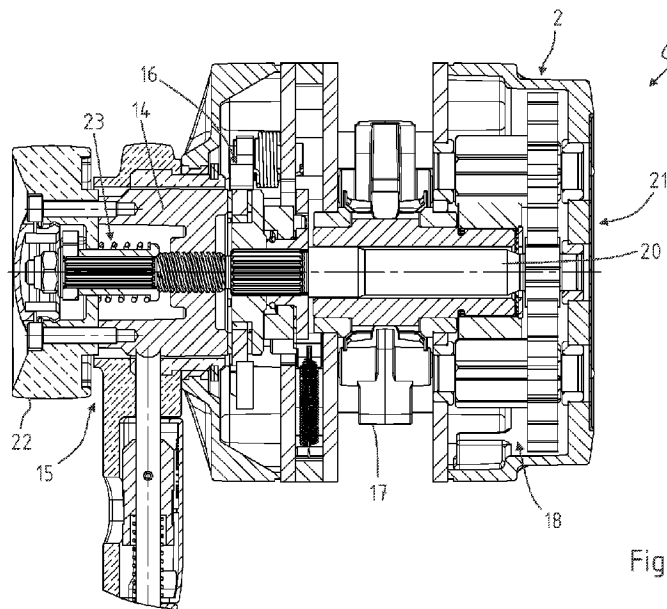


Fig. 1

(57) **Abrégé/Abstract:**

The invention relates to lifting gear, in particular a lever hoist (1). This comprises a housing (2) in which a load chain wheel (17) and a driveshaft (20) driving the load chain wheel (17) via a transmission (18) are rotatably mounted, as well as a drive (12), a load pressure brake (16) and a safety brake (30). A load chain (10) can be moved via the load chain wheel (17). The safety brake (30) brings about an emergency braking in the event of excessive rotational speed of the driveshaft (20). The safety brake (30) comprises a locking disc (32) with locking teeth (33) and a control disc (34) with control cams (35), as well as a catch hook (36). The locking disc (32) and the control disc (34) can be rotated in a limited manner in relation to one another. The rotation is limited by a rotation limiter (47). The catch hook (36) is arranged such that it moves in a swivelling manner and has a latch contour (56) at a front end (55) and a sensing contour (61) at a rear end (60). The sensing contour (61) rests on the control disc (34) under the influence of a spring element (44). When a defined rotational speed is exceeded, the sensing contour (61) of the catch hook (36) lifts off the control disc (34). The latch contour (56) rotates towards the locking disc (32) and lockingly engages with a locking tooth (33) of the locking disc (32).

Abstract

The invention relates to lifting gear, in particular a lever hoist 1. This comprises a housing 2 in which a load chain wheel 17 and a driveshaft 20 driving the load chain wheel 17 via a transmission 18 are rotatably mounted, as well as a drive 12, a load pressure brake 16 and a safety brake 30. A load chain 10 can be moved via the load chain wheel 17. The safety brake 30 brings about an emergency braking in the event of excessive rotational speed of the driveshaft 20. The safety brake 30 has a locking disc 32 with locking teeth 33 and a control disc 34 with control cams 35, as well as a catch hook 36. The locking disc 32 and the control disc 34 can be rotated in a limited manner in relation to one another. The rotation is limited by a rotational travel limiter 47. The catch hook 36 is arranged such that it moves in a swivelling manner and has a latch contour 56 at a front end 55 and a sensing contour 61 at a rear end 60. The sensing contour 61 rests on the control disc 34 under the influence of a spring element 44. In the event of a defined rotational speed being exceeded, the sensing contour 61 of the catch hook 36 lifts off the control disc 34. The latch contour 56 rotates towards the locking disc 32 and lockingly engages with a locking tooth 33 of the locking disc 32. The lifting gear is locked after the triggering of the safety brake. In order to release the lock, an unlocking mechanism 63 is provided for returning the locking disc 32 and control disc 34 to their starting position.

Lifting gear

The invention relates to lifting gear, in particular a lever hoist, according to the features in the preamble of claim 1.

Lifting gear, in particular a lever hoist, usually uses round steel chains as a support or traction device and is used for lifting, lowering and pulling loads. The lifting movement can be generated by manual operation, compressed air or an electric motor. The present invention relates in particular to a hand-operated lever hoist.

A lever-operated lifting gear, which is also referred to as a pull stroke or chain hoist, is known from DE 41 05 050 C2. The lifting gear has a support hook as an upper fastening element and a load hook as a lower limit stop element. The upper fastening element and the lower limit stop element are indirectly connected to one another via a housing. The limit stop element is connected via a load chain as a traction means

to a traction means drive, which is located in the housing of the lifting gear. The traction means drive can be set in rotation within the housing by a pivoting movement of a hand lever. For this purpose, the lever arm engages in a transmission device, which in turn is connected to the traction means drive. In this way it is possible to move or lash an object.

In addition to a drive with a switchable ratchet mechanism, the traction means drive includes a load pressure brake, a load chain wheel and a transmission, wherein the transmission is often designed as a planetary transmission. The hand lever and the locking wheel of the ratchet mechanism sit at one end of a drive shaft which passes through the load pressure brake and the load chain wheel. At the other end of the drive shaft is the transmission, which is then connected to the load chain wheel to transmit torque.

The load pressure brake consists of a locking wheel disc with recesses or teeth provided on its outer circumference, two friction elements located on both sides of the locking wheel disc, mostly friction discs or linings, as well as two locking latches hinged to the housing, which are pressed against the locking wheel disc under the influence of locking hook springs. The two friction elements enter into a frictional connection on the one hand with the locking wheel disc and on the other hand with a pressure disc or the locking wheel attached to the shaft. The locking wheel is axially displaceable on a movement thread of the drive shaft.

The load pressure brake has the task of holding the load carried by the lifting gear at the respective height or position when the locking wheel is stationary. Then the locking wheel is pressed against the pressure disc via the locking wheel disc and the integrated friction elements. The locking latches are located in the circumferential recesses of the locking wheel disc. If the locking wheel is turned in the lifting direction, the locking latches slide over the teeth of the locking wheel disc until the locking wheel comes to a standstill. Then the locking latches snap back into the recesses in the locking wheel disc. When the load is lowered, the locking wheel is rotated in the opposite direction, as a result of which it slides axially on the movement thread of the drive shaft and the frictional contact with the friction elements of the

locking wheel disc and the pressure disc is cancelled. The load can be lowered until the rotating shaft compensates for the axial play again.

In extreme exceptional situations, in particular when tensioning ropes or when lifting and holding swinging loads, the acceleration and excessive rotational speed of the drive or drive shaft can be so high that the standard load pressure brake no longer engages because the locking latches due to their inertia can no longer engage with the recesses of the locking wheel disc. Such an exceptional situation, albeit extremely rare, can arise, for example, when working at great heights on overhead lines. There is then the risk of the load chain fraying out. Such a situation can also occur when lowering against a jammed load chain. Even if the locking hooks of the load pressure brake cannot move freely due to extraordinary circumstances such as corrosion or ice formation, such an exceptional situation can arise.

EP 0 279 144 B1 means that a safety brake for a driven shaft is part of the prior art. This comprises a brake disk and a cam disk for a roller which can be pressed onto it by a release spring and which causes a locking latch to engage in a toothed ring arranged on the shaft when the rotational speed of the shaft is too high.

In addition to the load pressure brake, EP 3 395 746 A1 proposes a further safety device in the form of a safety brake which uses the centrifugal force of centrifugal elements to limit the speed.

On the basis of the prior art, the invention is based on the object of providing lifting gear which is improved in terms of safety and operational technology, in particular a lever hoist, in which an inadmissible increase in the rotational speed of the drive shaft is prevented.

This object is achieved according to the invention in lifting gear according to the features of claim 1.

Advantageous further developments and configurations of the lifting gear according to the invention are the subject matter of the dependent claims.

Lifting gear, in particular a lever hoist, comprises a housing in which a load chain wheel and a drive shaft that drives the load chain wheel via a transmission are

rotatably mounted. A drive, a load pressure brake and a safety brake are also provided. A load chain can be moved via the load chain wheel.

The safety brake has a locking disc with locking teeth and a control disc with control cams, as well as a catch hook. According to the invention, the locking disc and the control disc can be rotated relative to one another, the rotation being limited by a rotational travel limiter. The catch hook is arranged to be pivotable. The catch hook is arranged such that it moves in a swivelling manner and has a latch contour at a front end and a sensing contour at a rear end. The catch hook is assigned to the locking disc and the control disc in such a way that the sensing contour, under the influence of a spring element, rests against the control disc, in particular the outer contour of the control disc, and slides along it when the control disc is rotated. The latch contour can be brought into locking engagement with a locking tooth of the locking disc. This means that in normal operation of the lifting gear, the catch hook is guided with the sensing contour over the control disc and the latch contour does not engage the locking disc. In the event of release when a defined rotational speed is exceeded, the sensing contour of the catch hook lifts off the control disc or the control cam of the control disc and the latch contour of the catch hook snaps into a locking tooth on the locking disc. As a result, the locking disc is stopped while the control disc, which is arranged coaxially behind the locking disc, continues to rotate along a predetermined rotational path of the rotational travel limiter until the rotational path is exhausted and the locking disc and the control disc lock against each other.

This creates a positive connection between the drive shaft and the lifting gear. Emergency braking takes place. A spinning of the load chain wheel or a rushing out of the load chain is prevented. During the interlocking, the control disc actively presses the catch hook into the recess or the locking tooth of the locking disc. In the locked position, the control disc also prevents the locking hook from turning back so that the safety brake is locked.

After the safety brake is released, the locking disc is in the blocked end position. To release the lock, the locking disc and the control disc must be aligned with one another again. For this purpose, an unlocking mechanism is provided to return the locking disc and control disc to their starting position. The unlocking mechanism

includes a reset button and a blocking body which is designed to block the locking disc while the control disc connected to the drive shaft is rotated in the stroke direction (clockwise) until the two discs are aligned with each other again in the starting position.

The blocking body can be brought into an unlocked position by actuating the reset button. In the unlocked position, the locking disc comes to rest on the blocking body and is held by this in such a way that the control disc can be rotated relative to the locking disc and can be rotated into the starting position. The unlocking mechanism creates the possibility of unlocking the safety brake from the outside without having to dismantle the device. In this way, the safety brake can be completely reset to its normal operating state, i.e. the standby mode, in the starting position of the locking disc and control disc. The unlocking is initiated by actuating the reset button. The blocking body is thereby brought into the unlocked position. The safety brake is turned clockwise using the handwheel until the locking disc comes to rest on the blocking body. This is done with an outer flank of the locking disk, which rests against an abutment surface of the blocking body. In this position, further clockwise rotational movement of the locking disc is not possible. The locking disc is held by the blocking body. The safety brake is then turned further clockwise via the handwheel, usually by an angle of 45°, until the locking disc and the control disc are congruent again. In this position the safety brake engages noticeably. The unlocking mechanism can be automatically released, i.e. the reset button and the blocking body can automatically return to their original position or be released manually.

The reset button is preferably rotatably mounted in the housing, in particular it is pivotable to a limited extent.

Another useful configuration provides that the reset button interacts with a tension spring. The tension spring is used to release the unlocking mechanism and to move the reset button and the blocking body back to their starting position after unlocking.

A practically advantageous configuration provides that the reset button and the blocking body form a unit.

Furthermore, the unlocking mechanism can have a latch which secures the reset button and/or the blocking body in the unlocked position.

The blocking body can be brought into an unlocked position by actuating the reset button, in which the locking disc is held by the blocking body in such a way that the control disc can be rotated relative to the locking disc and so the control disc and the locking disc are again aligned congruently with one another, i.e. can be transferred into the starting position. The blocking body advantageously has an abutment surface on which the locking disc is supported in the unlocked position with an outer flank of a locking tooth.

One aspect of the invention provides that the latch has a latch body which engages in a latch receptacle in the unlocked position. The unlocking process is then carried out and the locking disc and the control disc are returned to their initial aligned position. In the starting position, the locking disc and the control disc work together, with the joint rotational movement applying such a high torque or force to the abutment surface of the blocking body that the latch body is moved, in particular lifted, out of the latch receptacle. The unlocked position is then cancelled and the tension spring swivels the reset button and the blocking body into the starting or neutral position.

A further advantageous configuration of the lifting gear according to the invention provides that the blocking body has a tooth contour with a tooth flank which can be brought into engagement with a locking tooth of the locking disc. This configuration creates the possibility of bringing the safety brake into a parking mode in which the safety brake is locked manually.

To manually lock the safety brake, the reset button is also actuated until it is in the unlocked position. The safety brake can then be turned anticlockwise using the handwheel until the locking tooth of the locking disc rests on the tooth flank of the tooth contour of the blocking body. The safety brake is then turned 45° further anticlockwise using the handwheel until the locking disc and the control disc are completely interlocked. In this position the safety brake engages noticeably. The reset button springs back automatically or is released manually. The tension spring

swivels the reset button and the blocking body back into the starting position. The safety brake is now locked. After a further rotation of a maximum of 45° anticlockwise, the catch hook of the safety brake would automatically take over the load. Further movement, in particular lowering a load, is then no longer possible.

Another aspect of the invention provides that the rotational travel limiter has at least one cam track and a limit stop body which can be displaced along the cam track. In the end position, i.e. after exhaustion of the rotational path between the locking disc and the control disc, the limit stop body comes to a stop at the end of the cam track in a blocking manner.

The cam track is preferably formed by an elongated hole. In particular, the elongated hole is formed in the control disc. An elongated hole is preferably arcuate with a radius around the centre of the control disc. It is particularly advantageous for a plurality of elongated holes to be provided offset from one another on a partial circle in the control disc. But it is also possible that the cam track is formed in a groove. This can be provided in the control disc or in the locking disc.

The limit stop body is preferably a pin. The limit stop pin or pins are preferably fixed in the locking disc and protrude from it in the direction of the control disc, engaging in the elongated holes.

Another configuration provides that latching elements are incorporated between the locking disc and the control disc. These fix the locking disc and the control disc in the starting position or in the end position. The latching elements are preferably formed by balls. The latching elements are held in receptacles and interact with latching surfaces. An advantageous configuration provides that the receptacles are in the control disc and the latching surfaces are formed in the locking disc.

A plurality of locking teeth are advantageously arranged in a uniformly distributed manner on the circumference of the locking disc. Likewise, a plurality of control cams are provided evenly distributed on the circumference of the control disc. The control cams are formed in particular by the contour of the control disc itself. For this purpose, the control disc is preferably configured in a triangular shape with a rounded outer contour.

The control disc has a central connector provided with inner tothing. With the inner tothing, the control disc sits on a length section of the drive shaft provided with outer tothing. The control disc with a central bearing section is positioned on the central connector. The locking disc is secured on the connector by means of securing elements.

An advantageous practical configuration provides that, in the starting position of the locking disc and control disc, the rear outer contour of the locking teeth is aligned with the outer contour of the control disc. The control disc covers the adjacent flat side of the locking disc.

The catch hook of the safety brake is pivotably mounted on a bolt on a side plate that can be integrated into the housing. The spring element is preferably a leg spring.

Optionally, damping elements can be incorporated between the locking disc and the control disc in order to dampen the braking effect during emergency braking.

The lifting gear according to the invention can be used in a wide variety of applications. It can be used in any application with reversing loads, for example in overhead line construction or for personal safety.

The lifting gear is compact and lightweight. The additional securing function via the safety brake is implemented with just a few parts. The mechanics require an active movement, so that if the spring is no longer available, the locking latches of the load pressure brake, etc., become stuck, and the safety brake is released. The safety brake locks automatically. As a result, the catch hook always remains in engagement even if the load oscillates.

The invention is explained in more detail below with reference to drawings.

Figure 1 shows lifting gear according to the invention in the form of a lever hoist in a longitudinal section;

Figure 2 shows the lever hoist in an exploded view of its components;

Figure 3 shows a side view of part of the lever hoist;

- Figure 4 shows a perspective view of the safety brake of the lever hoist;
- Figure 5 shows a perspective view of the locking disc and the control disc of the safety brake;
- Figure 6 shows components of the safety brake in an explosion-like exploded manner of illustration;
- Figure 7 shows a view of the illustration of Figure 5 from above;
- Figure 8 shows a section through the illustration of Figure 7 along the line A-A;
- Figure 9 shows a section through the illustration of Figure 7 along the line B-B;
- Figure 10 shows the illustration corresponding to Figure 5 in a view from below;
- Figure 11 shows the opened lever hoist with a view of the region of the load pressure brake and the safety brake in a normal situation;
- Figure 12 shows the illustration corresponding to Figure 11 in a problematic situation;
- Figure 13 shows a view of the safety brake of the lever hoist in a first operating situation;
- Figure 14 shows the safety brake in a second operating situation;
- Figure 15 shows the safety brake in a third operating situation;
- Figure 16 shows the safety brake in a fourth operating situation;
- Figure 17 shows the illustration of the safety brake with an unlocking mechanism during an unlocking process for resetting the locking disc and control disc to their starting position;
- Figure 18 shows a lever hoist with an unlocking mechanism in the standby mode;
- Figure 19 shows the lever hoist corresponding to the illustration of Figure 18 with the safety brake locked;

Figure 20 shows the lever hoist in a first stage of the unlocking process;

Figure 21 shows the lever hoist in a second stage of the unlocking process;

Figure 22 shows the lever hoist with the illustration of the first stage of a manual locking process and

Figure 23 shows the lever hoist in a second stage of a manual locking process.

Figures 1 and 2 show a lever hoist according to the invention in the form of a hand-operated lever hoist 1. A component of the lever hoist 1 is a housing 2, which is composed of several housing parts 3, 4 as well as side plates 5, 6 and distance frame 7. The lever hoist 1 has a support hook 8 as an upper fastening element and a load hook 9 as a lower limit stop element. The support hook 8 and the load hook 9 are indirectly connected to one another via the housing 2. The load hook 9 is attached to one end of a load chain 10. At the other end of the load chain 10, a chain end piece 11 is provided. The load chain 10 can be moved via a traction means drive. The traction means drive substantially comprises a drive 12 with a hand lever 13, a locking wheel 14 and a switchable ratchet mechanism 15, a load pressure brake 16, a load chain wheel 17 and a transmission 18. The hand lever 13 and the locking wheel 14 of the ratchet mechanism 15 sit at one end 19 of a drive shaft 20 which passes through the load pressure brake 16 and the load chain wheel 17. At the other end 21 of the drive shaft 20 is the transmission 18, which is connected to the load chain wheel 17 in a torque-transmitting manner. A handwheel 22 is used to move the locking wheel 14 axially on the drive shaft 20 in order to actuate a freewheel mechanism 23 of the lever hoist 1.

The load pressure brake 16 has a locking wheel disk 24 provided with teeth on its outer circumference. The locking wheel disk 24 is provided on both sides with friction elements 25 in the form of friction linings. Furthermore, the load pressure brake 16 has two locking latches 26 which are pivotably mounted on the side plate 6 in the housing 2 and which are pressed against the locking wheel disk 24 under the influence of locking hook springs 27. Moreover, the load pressure brake 16 includes a pressure disc 28 on which the locking wheel disk 24 is mounted. The locking wheel 14 is axially displaceable on a movement thread 29 of the drive shaft 20. Figure 3

shows the lever hoist 1 with the locking wheel 14, hand lever 13 and handwheel 22 removed.

The load pressure brake 16 has the task of holding the load carried by the lever hoist 1 when the locking wheel 14 is stationary. Then the locking wheel 14 is pressed against the pressure disc 28 via the locking wheel disc 24 and the integrated friction elements 25. The locking latches 26 are located in the circumferential recesses of the locking wheel disc 24. If the locking wheel 14 is turned in the lifting direction, the locking latches 26 slide over the teeth of the locking wheel disc 24 until the locking wheel 14 comes to a standstill. Then the locking latches 26 snap back into the recesses of the locking wheel disc 24. When the load is lowered, the locking wheel 14 is rotated in the opposite direction, as a result of which it slides axially on the movement thread 29 of the drive shaft 20 and the frictional contact with the friction elements 25 of the locking wheel disc 24 and the pressure disc 28 is cancelled. The load can then be lowered until the rotating drive shaft 20 compensates for the axial play again.

In addition to the standard load pressure brake 16, the lever hoist 1 has a safety brake 30, 31. The safety brake 30, 31 has the task of performing emergency braking in extreme situations in which the rotational speed of the drive shaft 20 can be so high that the load pressure brake 16 no longer engages due to inertia.

A safety brake 30 and its mode of operation is described with reference to Figures 4 to 17. A corresponding embodiment of a safety brake 31 is also shown in Figures 18 to 23. Mutually corresponding components or structural components are provided with the same reference symbols. The safety brake 30, 31 is arranged coaxially below or behind the load pressure brake 16 in the direction of the load chain wheel 17.

The safety brake 30, 31 has a locking disc 32 with locking teeth 33 and a control disc 34 with control cams 35, as well as a catch hook 36. A plurality of locking teeth 33, three in the exemplary embodiment, are arranged in a uniformly distributed manner on the circumference of the locking disc 32. The control disc 34 has a triangular configuration with control cams 35 which are rounded on its circumference. The

control disc 34 has a central connector 38 provided with an inner tothing 37, on which the locking disc 32 is positioned with a central bearing section 39 and is secured in position by securing elements 40, 41. The control disc 34 and, with the control disc 34, the locking disc 32 are held on a threaded section 43 of the drive shaft 20 provided with an outer tothing 42 via the connector 38 and the inner tothing 37.

The catch hook 36 is arranged to be pivotable on the side plate 5 of the lever hoist 1. With the incorporation of a spring element 44 in the form of a leg spring, the catch hook 36 is mounted on a bolt 45 on the side plate 5 and secured by a securing ring 46. The mounting of the catch hook 36 on the bolt 45 is in the middle length region of the catch hook 36, so that the catch hook 36 is mounted like a rocker.

The locking disc 32 and the control disc 34 can be rotated in relation to one another. The rotation of locking disc 32 and control disc 34 relative to one another is limited by a rotational travel limiter 47. The rotational travel limiter 47 comprises a cam track 48 which is formed in an elongated hole 49 in the form of a section of a circular arc in the control disc 34. A limit stop body 50 in the form of a pin can be displaced along the cam track 48. It can be seen that three elongated holes 49 are arranged uniformly offset on a partial circle in the control disc 34. Correspondingly, three pins are incorporated as limit stop bodies 50 in mounting openings 51 of the locking disc 32. The limit stop bodies 50 protrude in the direction of the control disc 34 with respect to the locking disc 32 and engage in the elongated holes 49. In the exemplary embodiment shown here, the rotational travel limiter 47 enables the locking disc 32 to be rotated by 45° with respect to the control disc 34.

Latch elements 52 in the form of steel balls are incorporated between the locking disc 32 and the control disc 34. The latch elements 52 fix the locking disc 32 and the control disc 34 in the starting position or in the end position after rotation. The latch elements 52 are held in receptacles 53 in the control disc 34 and contact spherical section-shaped latch surfaces 54 in the locking disc 32 and cooperate with them in an opposing and movement-inhibiting manner.

The catch hook 36 has a latch contour 56 at a front end 55. The latch contour 56 has a pointed catch tooth 57 with a frontal catch flank 58, which is configuratively adapted to a front locking flank 59 of a locking tooth 33 of the locking disc 32.

At the rear end 60, a sensing contour 61 is formed on the catch hook 36. For this purpose, the rear end 60 of the catch hook 36 is designed to be rounded. With the sensing contour 61, the catch hook 36 rests against the outer contour of the control disc 34 under the influence of the leg spring. The spring element 44 has the effect that the latch contour 56 lies outside the outer circumference of the locking disc 32 during normal operation. In normal operation, the catch hook 36 slides with the rear sensing contour 61 along the control disc 34. The front latch contour 56 is lifted out.

When a certain excessive rotational speed is exceeded, the sensing contour 61 of the catch hook 36 lifts off the control disc 34 or the control cam 35 due to the inertia and the acting acceleration forces. The catch hook 36 tilts and rotates around the bolt 35 in the locking disc 32. The latch contour 56 of the catch hook 36 snaps into a locking tooth 33 of the locking disc 32 and there comes to rest with the catch flank 58 on the locking flank 59. As a result, the locking disc 32 is stopped while the control disc 34 arranged coaxially behind it continues to rotate along the predetermined rotational path of the rotational travel limiter 47. The rotation takes place until the limit stop bodies 50 come to the limit stop at the end 62 of the elongated holes 49 located in the direction of rotation. The locking disc 32 and the control disc 34 can then be blocked in relation to one another. In this way, a positive connection between the drive shaft 20 and the lever hoist 1 is established. Any further spinning of the load chain wheel 17 or a rushing out of the load chain 10 is prevented.

Figure 11 shows a normal situation of load pressure brake 16 and safety brake 30. The locking latches 26 engage the locking wheel disc 24 and hold the load.

Figure 12 shows a problematic situation. The locking latches 26 of the load pressure brake 16 are not free to move. The locking latches 26 do not engage the locking wheel disc 24. A load cannot be held. This can lead to a dangerous excessive rotational speed increase in the opposite direction to the pulling direction of the lever hoist 1, combined with a rushing out of the load chain 10.

Figures 13 and 14 show the safety brake 30 each in a normal situation or starting position. The locking disc 32 and the control disc 34 are aligned in such a way that the rear outer contour of the locking teeth 33 coincides with the outer contour of the control disc 32. The sensing contour 61 of the catch hook 36 is pressed against the outer contour of the control disc 34 by the spring force of the leg spring and slides along the control cam 35. The sensing contour 61 lies on a control cam 35 both in the top dead centre of the control disc 34 (Figure 13) and in the bottom dead centre of the control disc 34 (Figure 14). During the rotation of the control disc 34 and locking disc 32, the front latch contour 56 of the catch hook 36 is lifted out of the effective region of the locking disc 32 or its locking teeth 33.

With increasing acceleration of the drive shaft 20 and with it the safety brake 30, i.e. at excessive speed, caused for example by a falling load, the sensing contour 61 of the safety hook 36 is accelerated outward and lifts off the control disc 34. The front catch tooth 57 of the latch contour 56 snaps into the locking disc 32 (see Figure 15) and comes to rest with its frontal catch flank 58 blocking the locking flank 59 of a locking tooth 33 (see Figure 16). After the catch hook 36 has collapsed, the control disc 34 rotates further anticlockwise (arrow P1) by 45°, driven by the load, and thereby locks the locking wheel 14. This effect is self-reinforcing, i.e. the catch hook 36 falls the deeper the more the sensing contour 61 on the opposite side is raised by the control disc 34.

In order to release the blocking of the safety brake 30 and to put the control disc 34 and the locking disc 32 back into the aligned initial state, an unlocking mechanism 63 is provided. In the configuration according to Figure 17, this includes a reset button 64 in the form of a slide for actuating the unlocking mechanism 63 and a blocking body 66 under the influence of a tension spring 65. By actuating the reset button 64 (arrow P2) it blocks the locking disc 32 with the blocking body 66 and holds it in place so that the locking disc 32 is prevented from rotating, while the control disc 34 is actuated in the lifting direction (clockwise) (arrow P3) via the handwheel 22 or the hand lever 13. In this way, the locking disc 32 and the control disc 34 are displaced relative to one another and brought into their aligned starting position.

The lever hoist 1 shown in Figures 18 to 23 has a safety brake 31 which corresponds in structure and mode of operation to the safety brake 30 explained above. The safety brake 31 has, as described above, a locking disc 32 with locking teeth 33 and a control disc 34 with control cams 35, as well as a catch hook 36.

The lever hoist 1 has an unlocking mechanism 63. The unlocking mechanism 63 has a reset button 64 and a blocking body 66 which functionally form a unit 67. The reset button 64 and the blocking body 66 are non-positively and positively connected to one another.

The reset button 64 is rotatable or pivotable in the housing 2 of the lever hoist 1, mounted about a bolt 68. The reset button 64 interacts with a tension spring 65 which is mounted in the housing 2 and engages the lever arm 69 of the reset button 64.

The unlocking mechanism 63 also has a latch 70 with a latch body 71 which can be displaced against the force of a compression spring, not shown here, arranged in the reset button 64.

A support strip 72 is provided in the housing 2. Two latch receptacles 73, 74 are formed in the support strip 72 at a distance from one another. The latch body 71 engages in the latch receptacles 73, 74 depending on the position of the reset button 64.

In principle, the unlocking mechanism 63 can also be designed without a latch 70 and the latch function. To carry out an unlocking process, the reset button 64 is then actuated and held manually.

Figure 18 shows the lever hoist 1 and the safety brake 31 in standby mode, i.e. the locking disc 32 and the control disc 34 of the safety brake 31 are in their starting position, in which the locking disc 32 and the control disc 34 are congruent, i.e. the rear outer contour of the locking teeth 33 is aligned with the outer contour of the control disc 34. The sensing contour 61 of the catch hook 36 is spring-loaded against the control disc 34. A load can be raised and lowered at any time without any problems. The unlocking mechanism 63 is in its neutral position. The latch body 71 of the latch 70 is located in the first latch receptacle 73 located further out. The blocking

body 66 is outside of its unlocked position E, in which it comes into operative connection with the locking disc 32.

The illustration in Figure 19 shows the safety brake 31 in the locked state. The safety brake 31 was released after a load was lowered too quickly or after the load chain was manually pulled too quickly in the load direction in the unlocking mode. The catch tooth 57 of the catch hook 36 engages in the locking disc 32 (point S). The locking disc 32 and the control disc 34 are interlocked with one another. The 45° rotated contour of the control disc 34 prevents the catch hook 36 from falling out (point N). As a result, the safety brake 31 or the lever hoist 1 is completely locked and no more lifting or lowering movements are possible.

In order to unlock the safety brake 31 from the outside and to reset the locking disc 32 and control disc 34 to their starting position, the unlocking mechanism 63 is actuated. As can be seen in Figure 20, the reset button 64 is pressed for this purpose (arrow P4). The reset button 64 is moved inwardly into the housing 2. The blocking body 66 is brought into an unlocked position E by the reset button 64. The latch body 71 of the latch 70 is moved with the reset button 64 and latches in the unlocked position E in the second inner latch receptacle 74. As a result, the reset button 64 and with it the blocking body 66 are secured in the unlocked position E.

The safety brake 31 is then turned clockwise (arrow P5) using the handwheel until the locking disc 32 comes to rest on the blocking body 66 (point E). In the unlocked position E, the blocking body 66 and the locking disc 32 come into an operative relationship.

The blocking body 66 has a profiled abutment surface 75 on its outside. In the unlocked position E, the locking disc 32 is supported with an outer flank 76 of a locking tooth 33 on the abutment surface 75. In the unlocked position E, the locking disc 32 is prevented from further rotation in the clockwise direction by the blocking body 66.

In the unlocked position E, the locking disc 32 is held by the blocking body 66 in such a way that the control disc 34 can be rotated relative to the locking disc 32 and brought into the starting position (see Figure 21). For this purpose, the safety brake

31 is rotated 45° further clockwise using the handwheel (arrow P6) until the locking disc 32 and the control disc 34 are congruent again, i.e. the starting position is reached. In this position the safety brake 31 engages noticeably. The reset button 64 springs back (arrow P7). This is brought about by the action of the control disc 34 and the locking disc 32 against the rounded contour of the abutment surface 75. When the control disc 34 is rotated into the congruent starting position with the locking disc 32, the limit stop bodies 50 are also moved in the elongated holes 49 of the rotational travel limiter 47 (see also Figures 6 to 10 in this regard). In the starting position of locking disc 32 and control disc 34, limit stop bodies 50 designed as pins come to rest on the end of the cam track 48 or elongated holes 49. The torque applied via the handwheel is then transmitted via the control disc 34 and the locking disc 32 and the latch body 71 of the latch 70 is lifted out of the latch receptacle 74. The tension spring 65 pivots the reset button 64 back into its starting or neutral position in the standby mode. The safety brake 31 is ready for use again and is in its freely moving normal position.

A manual locking process of the safety brake 31 is explained with the aid of Figures 22 and 23.

The blocking body 66 has a tooth contour 77 with a tooth flank 78.

In order to be able to lock the safety brake 31 manually, the reset button 64 is pressed (arrow P8) until it engages. The latch body 71 of the latch 70 is located in the first latch receptacle 74 located further out. The position corresponds to the unlocked position. If a safety brake 31 is not equipped with a locking function, the reset button 64 is pressed and held manually.

The safety brake 31 is then turned anticlockwise using the handwheel (arrow P9) until the locking tooth 33 of the locking disk 32 rests on the tooth flank 78 of the blocking body 66 (point P in Figure 22).

The safety brake 31 is then turned 45° further anticlockwise using the handwheel (arrow P10) until the locking disc 32 and the control disc 34 are completely interlocked. The interlocking of locking disc 32 and control disc 34 can be seen in Figure 23. The safety brake 31 noticeably engages in this position as well. The reset

button 64 automatically springs back. In the case of a safety brake 31 without a latch function, the reset button 64 is released. The tension spring 65 pivots the reset button 64 back to its starting position according to the arrow P11. The safety brake 31 is now locked.

After a further rotation of a maximum of 45° anticlockwise, the catch hook 36 of the safety brake 31 would automatically take over the load. Further lowering is then no longer possible.

Reference numerals:

- 1 - lever hoist
- 2 - housing
- 3 - housing portion
- 4 - housing portion
- 5 - side plate
- 6 - side plate
- 7 - distance frame
- 8 - support hook
- 9 - load hook
- 10 - load chain
- 11 - chain end piece
- 12 - drive
- 13 - hand lever
- 14 - locking wheel
- 15 - ratchet mechanism
- 16 - load pressure brake
- 17 - load chain wheel
- 18 - transmission
- 19 - end of 20
- 20 - drive shaft
- 21 - end of 20
- 22 - handwheel
- 23 - freewheel mechanism
- 24 - locking wheel disc
- 25 - friction element
- 26 - locking latch
- 27 - locking hook spring
- 28 - pressure disc
- 29 - movement threads
- 30 - safety brake
- 31 - safety brake

- 32 - locking disc
- 33 - locking tooth
- 34 - control disc
- 35 - control cam
- 36 - catch hook
- 37 - inner toothing
- 38 - connector
- 39 - bearing section
- 40 - securing element
- 41 - securing element
- 42 - outer toothing
- 43 - thread section
- 44 - spring element
- 45 - bolt
- 46 - safety ring
- 47 - rotational travel limiter
- 48 - cam track
- 49 - elongated hole
- 50 - limit stop body
- 51 - mounting opening
- 52 - latching element
- 53 - receptacle
- 54 - latch surface
- 55 - front end of 36
- 56 - latch contour
- 57 - catch tooth
- 58 - catch flank
- 59 - locking flank
- 60 - rear end of 36
- 61 - sensing contour
- 62 - end of 49
- 63 - unlocking mechanism
- 64 - reset button

- 65 - tension spring
- 66 - blocking body
- 67 - unit
- 68 - bolt
- 69 - lever arm
- 70 - latch
- 71 - latch body
- 72 - support strip
- 73 - latch receptacle
- 74 - latch receptacle
- 75 - abutment surface
- 76 - flank of 33
- 77 - tooth contour
- 78 - tooth flank

- P1 - arrow
- P2 - arrow
- P3 - arrow
- P4 - arrow
- P5 - arrow
- P6 - arrow
- P7 - arrow
- P8 - arrow
- P9 - arrow
- P10 - arrow
- P11 - arrow

E - unlocked position

Claims

1. Lifting gear, in particular a lever hoist (1) comprising a housing (2) in which a load chain wheel (17) and a driveshaft (20) driving the load chain wheel (17) via a transmission (18) are rotatably mounted, as well as a drive (12), a load pressure brake (16) and a safety brake (30, 31), wherein a load chain (10) can be moved via the load chain wheel (17), characterised in that the safety brake (30, 31) has a locking disc (32) with locking teeth (33) and a control disc (34) with control cams (35), as well as a catch hook (36), wherein

the locking disc (32) and the control disc (34) can be rotated in relation to one another, wherein the rotation is limited by a rotational travel limiter (47) and wherein the catch hook (36) is arranged such that it moves in a swivelling manner and has a latch contour (56) at a front end (55) and a sensing contour (61) at a rear end (60), wherein the sensing contour (61) rests on the control disc (34) under the influence of a spring element (44) and the latch contour (56) can be brought to lockingly engage with a locking tooth (33) of the locking disc (32)

and an unlocking mechanism (63) is provided for returning the locking disc (32) and control disc (34) to their starting position, wherein the unlocking mechanism (63) has a reset button (64) and a blocking body (66), wherein the blocking body (66) can be brought into an unlocking position (E) by actuation of the reset button (64), in which the locking disc (32) is held by the blocking body (66) in such a way that the control disc (34) is rotatable relative to the locking disc (32) and can be transferred to the starting position.

2. Lifting gear according to claim 1, characterised in that the rotation path limiter (47) has at least one cam track (48) and a limit stop body (50) which can be displaced along the cam track (48).

3. Lifting gear according to claim 2, characterised in that the cam track (48) is formed by an elongated hole (49) or a groove in the control disc (34) or the locking disc.
4. Lifting gear according to claim 2 or 3, characterised in that the limit stop body (50) is a pin.
5. Lifting gear according to any one of claims 1 to 4, characterised in that latch elements (52) are incorporated between the locking disc (32) and the control disc (34).
6. Lifting gear according to any one of claims 1 to 5, characterised in that a plurality of locking teeth (33) are arranged evenly distributed on the circumference of the locking disc (32).
7. Lifting gear according to any one of claims 1 to 6, characterised in that a plurality of control cams (35) are evenly distributed on the circumference of the control disc (34).
8. Lifting gear according to any one of claims 1 to 7, characterised in that the control disc (34) has a central connector (38) provided with inner toothing (37), on which the locking disc (32) is positioned with a central bearing section (39) and is secured by a securing element (40, 41).
9. Lifting gear according to any one of claims 1 to 8, characterised in that in the starting position of the locking disc (32) and the control disc (34), the rear outer contour of the locking teeth (33) is aligned with the outer contour of the control disc (34).
10. Lifting gear according to any one of claims 1 to 9, characterised in that the catch hook (36) is mounted on a side plate (5, 6) that can be integrated into the housing (2).
11. Lifting gear according to any one of claims 1 to 10, characterised in that the reset button (64) is rotatably mounted.

12. Lifting gear according to any one of claims 1 to 11, characterised in that the reset button (64) cooperates with a tension spring (65).
13. Lifting gear according to any one of claims 1 to 12, characterised in that the reset button (64) and the blocking body (66) form a unit.
14. Lifting gear according to any one of claims 1 to 13, characterised in that the unlocking mechanism (63) has a latch (70) which secures the reset button (64) and/or the blocking body (66) in the unlocking position (E).
15. Lifting gear according to claim 14, characterised in that the latch (70) has a latch body (71), which in the unlocked position (E) engages in a latch receptacle (74), wherein the latch body (71) can be moved out of the latch receptacle (74) in the starting position of the locking disc (32) and control disc (34).
16. Lifting gear according to any one of claims 1 to 14, characterised in that the blocking body (66) has an abutment surface (75) on which the locking disc (32) is supported in the unlocked position (E) with an outer flank (76) of a locking tooth (33).
17. Lifting gear according to any one of claims 1 to 15, characterised in that the blocking body (66) has a tooth contour (77) with a tooth flank (78) which can be brought into engagement with a locking tooth (33) of the locking disc (32).

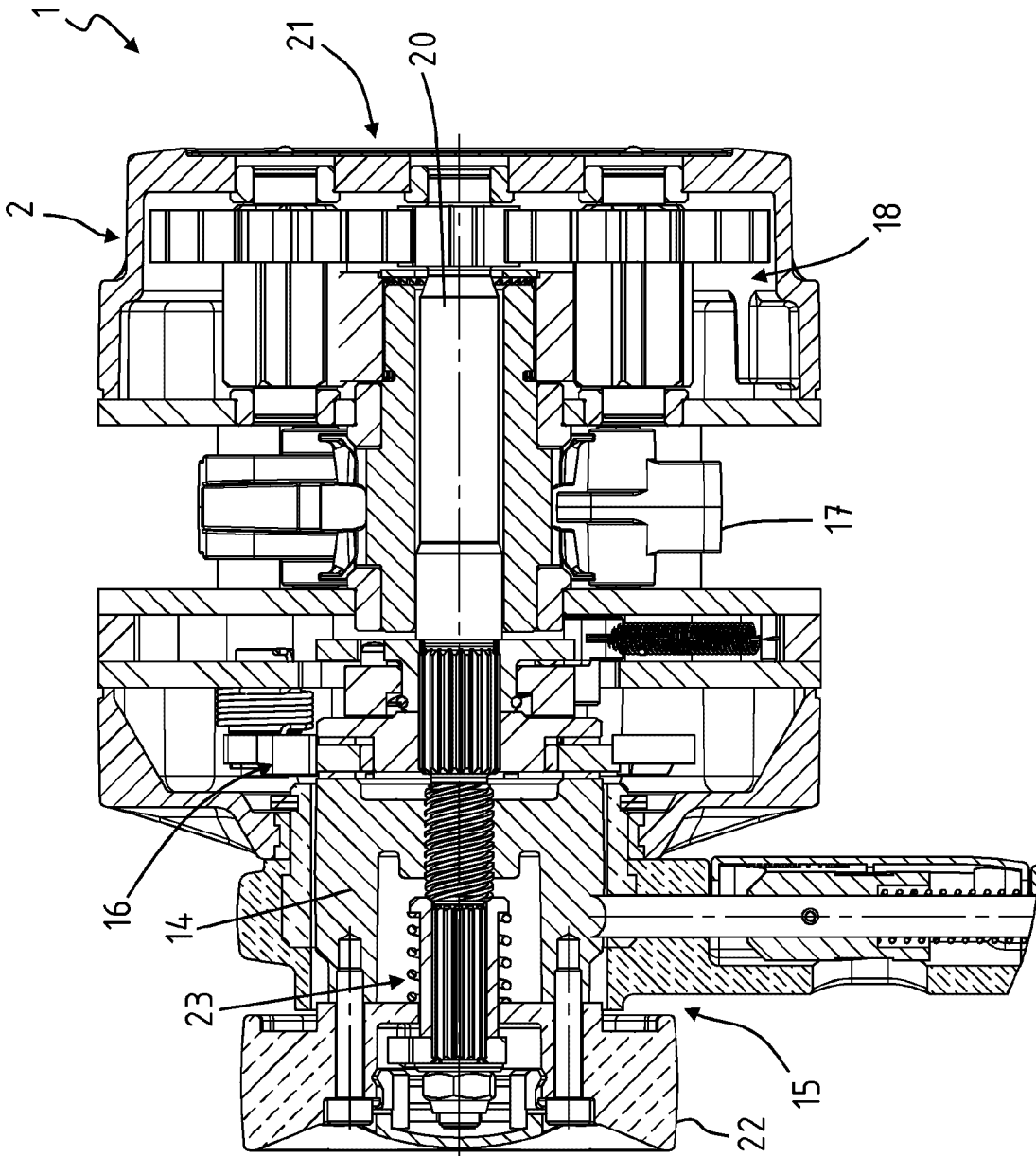


Fig. 1

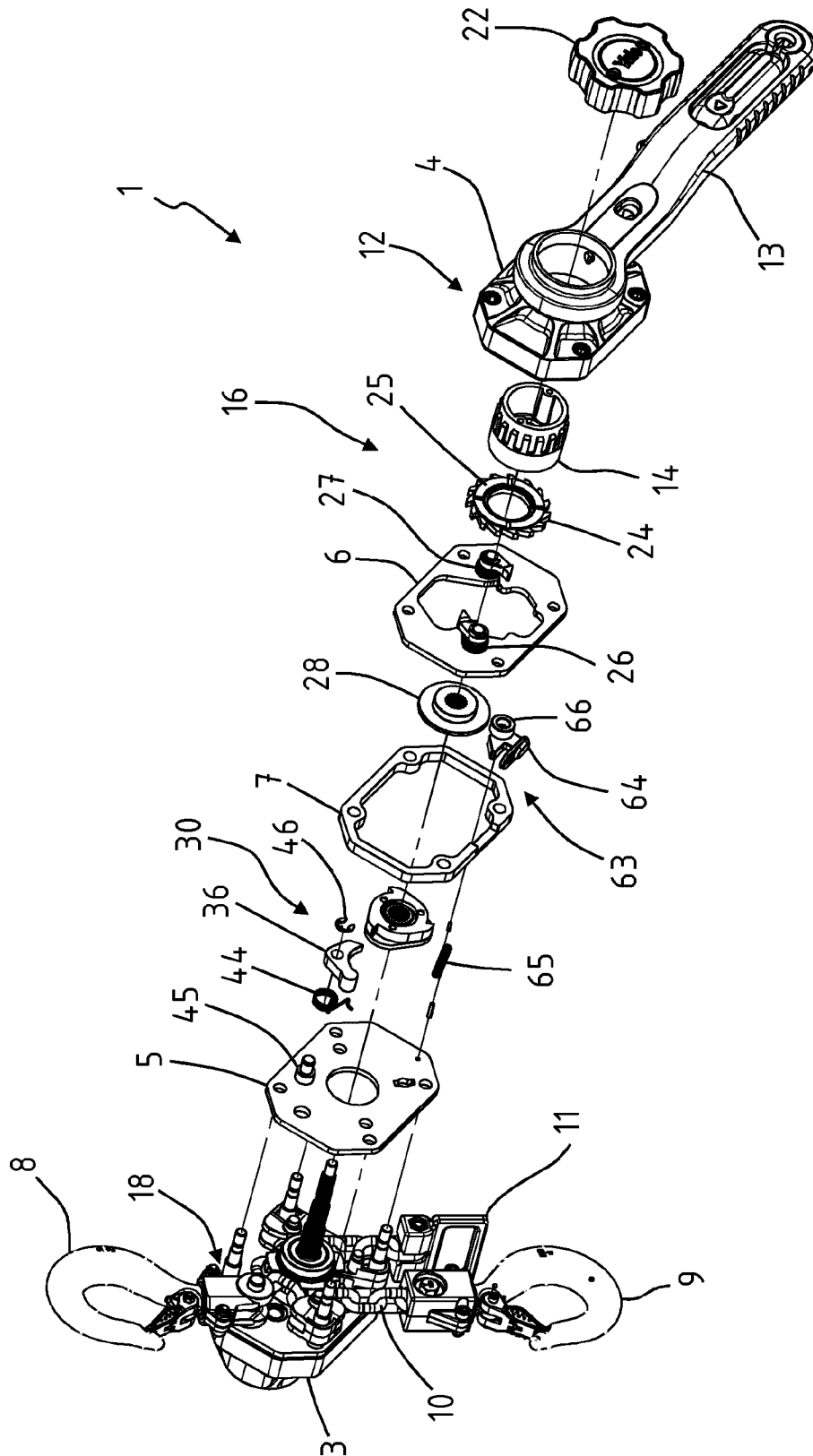


Fig. 2

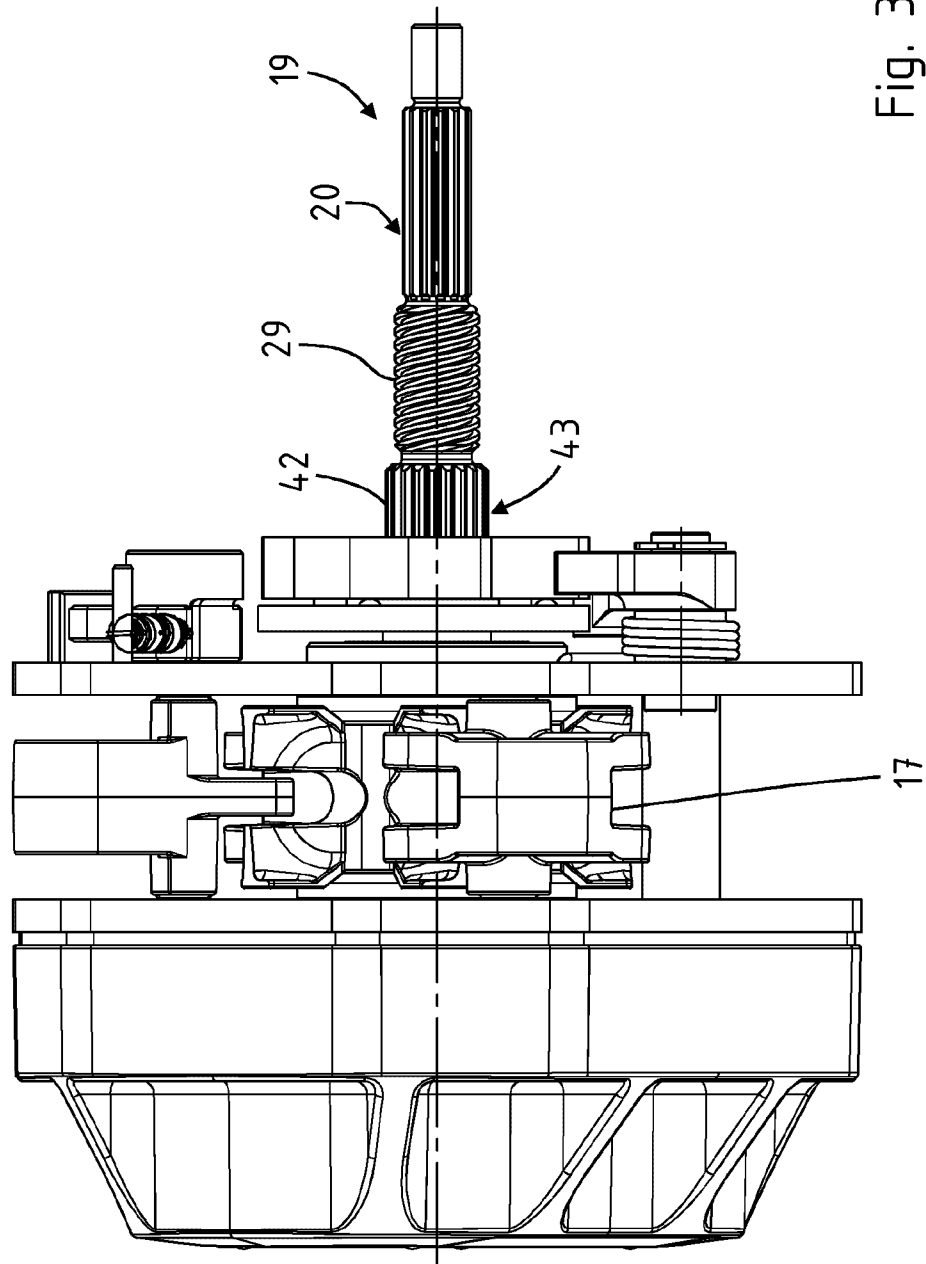


Fig. 3

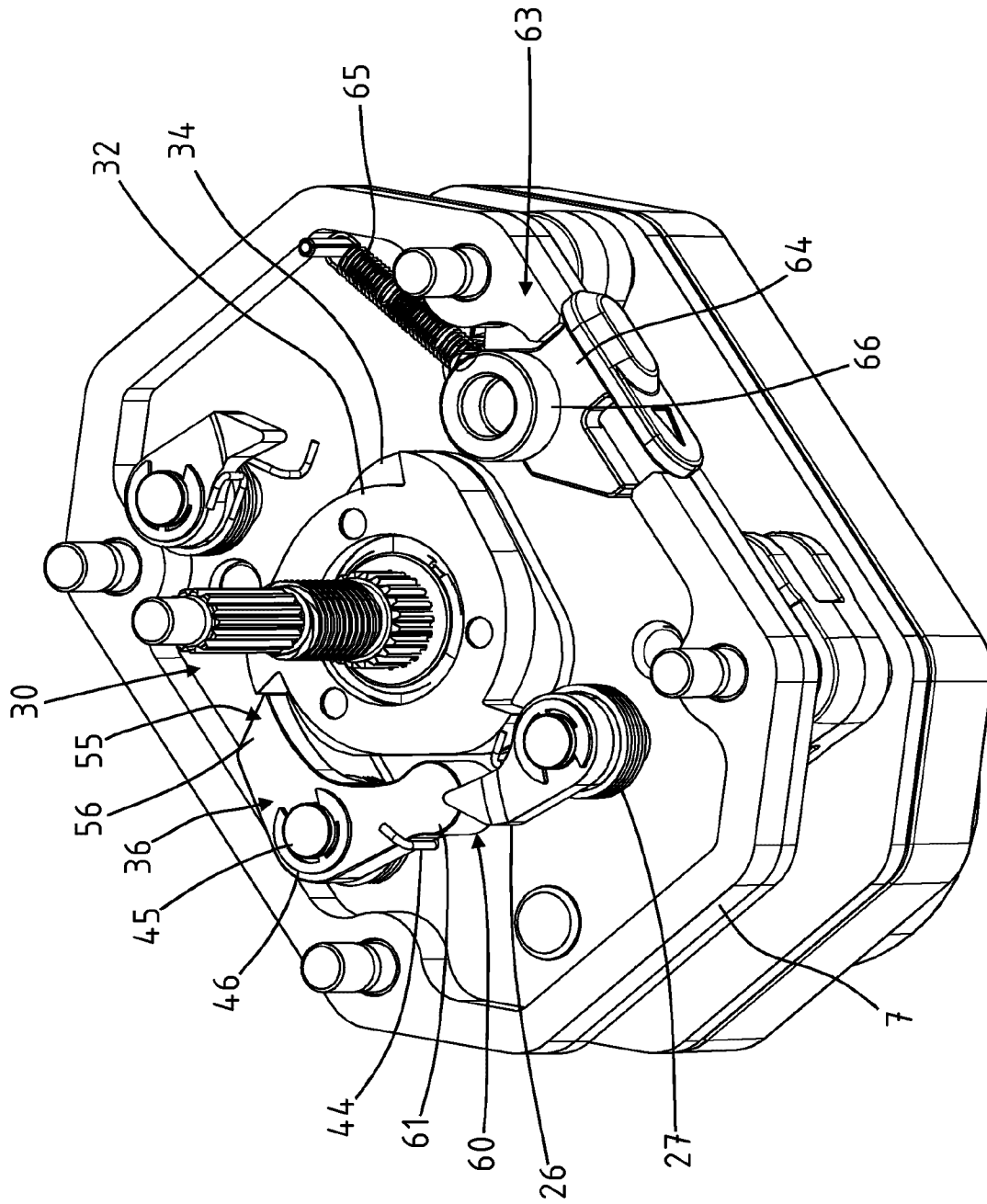
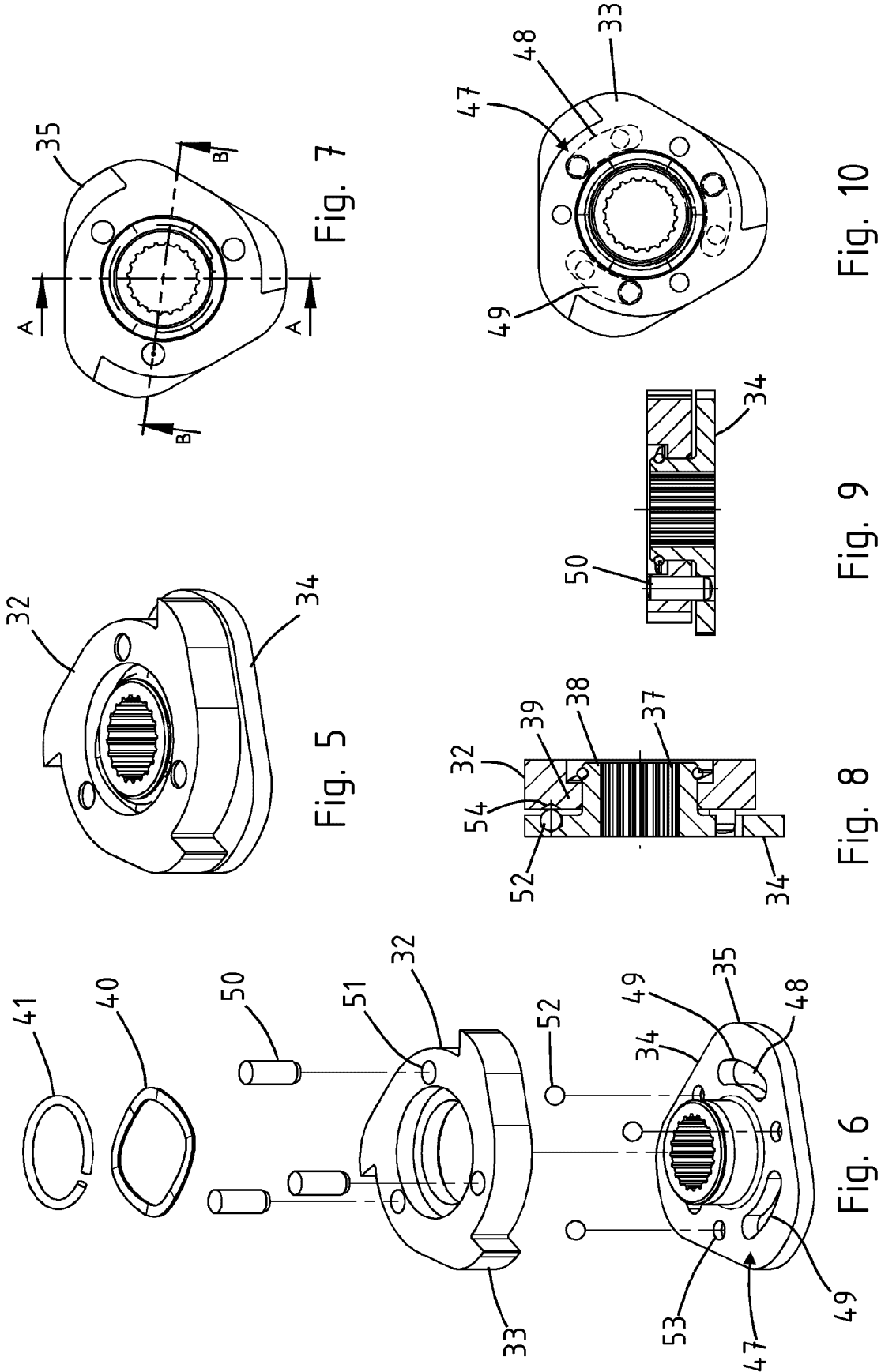


Fig. 4



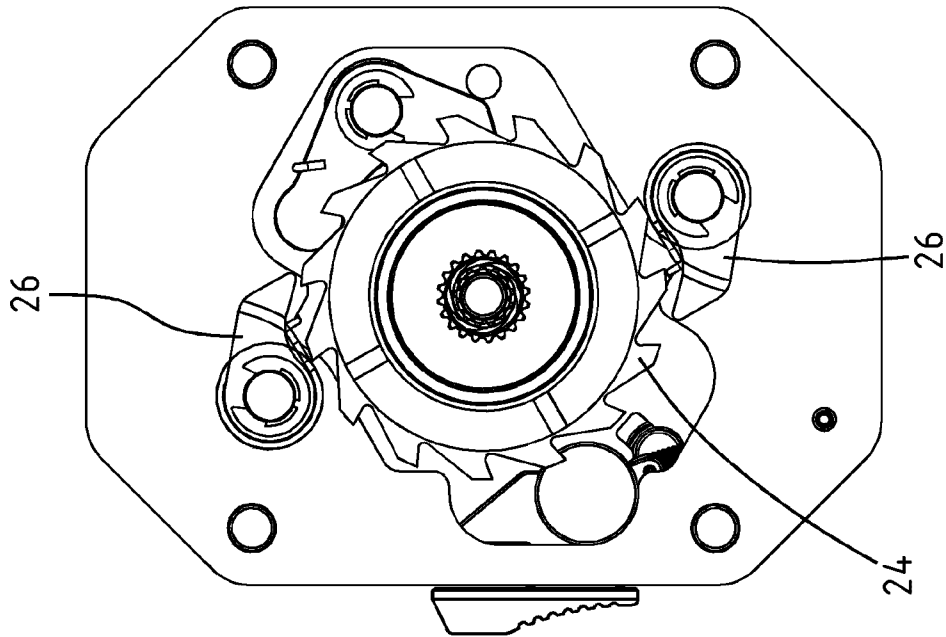


Fig. 12

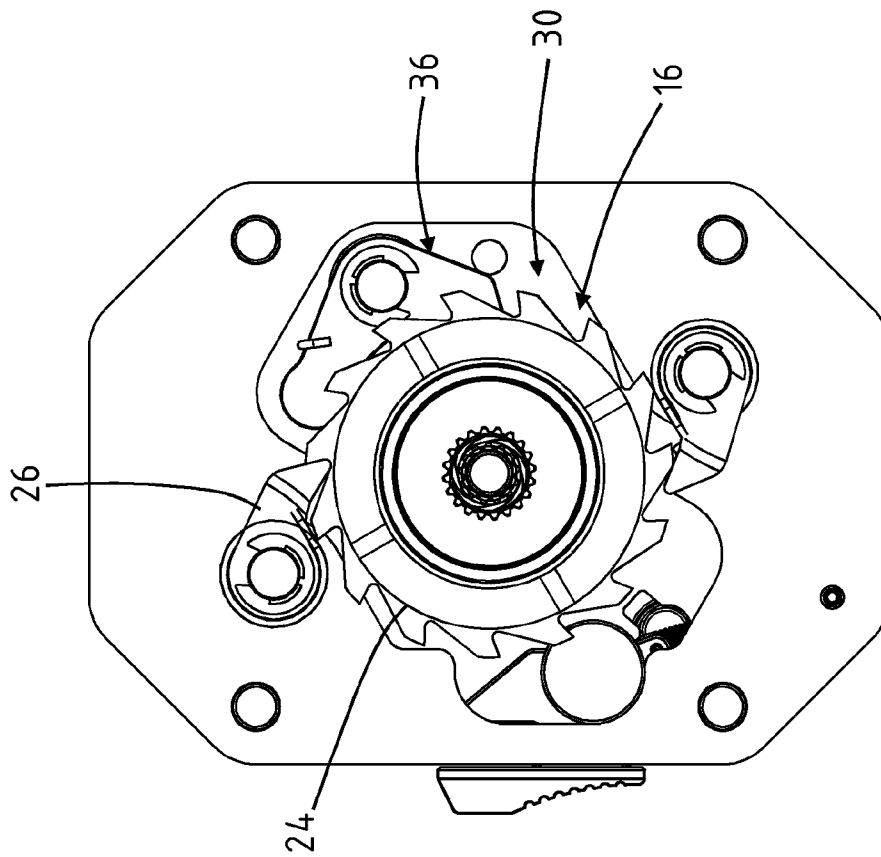


Fig. 11

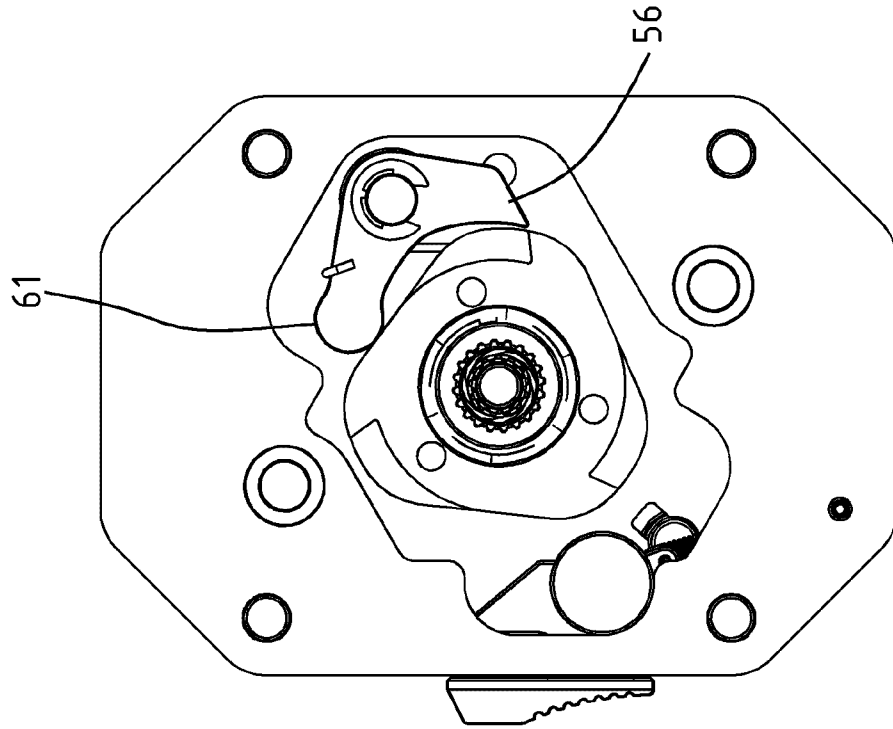


Fig. 14

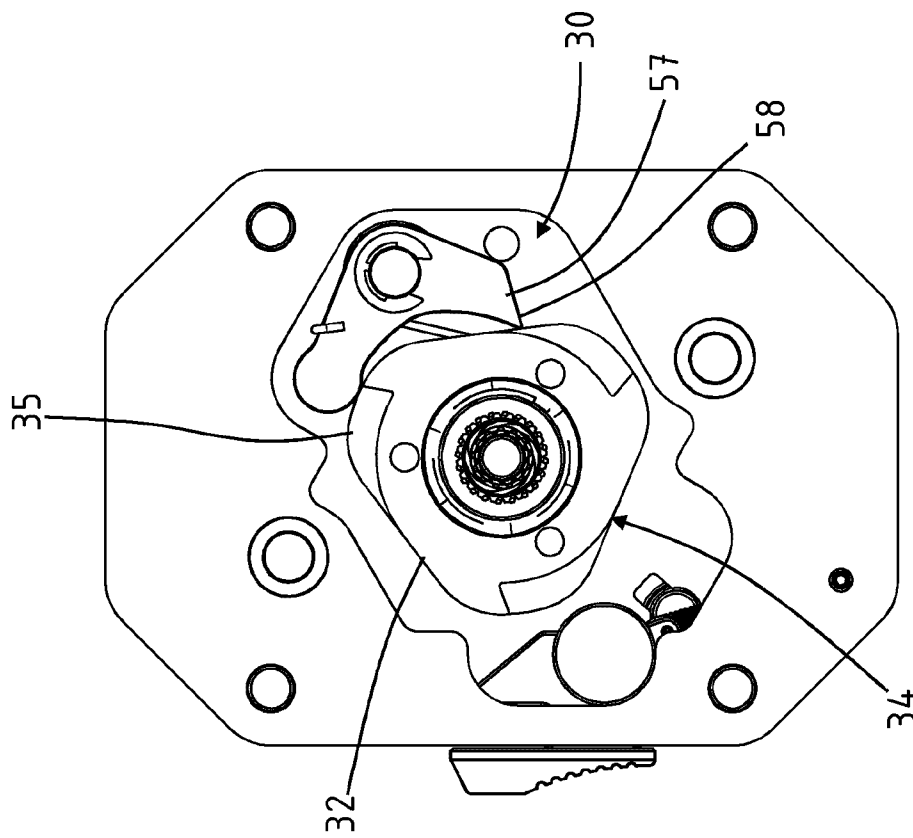


Fig. 13

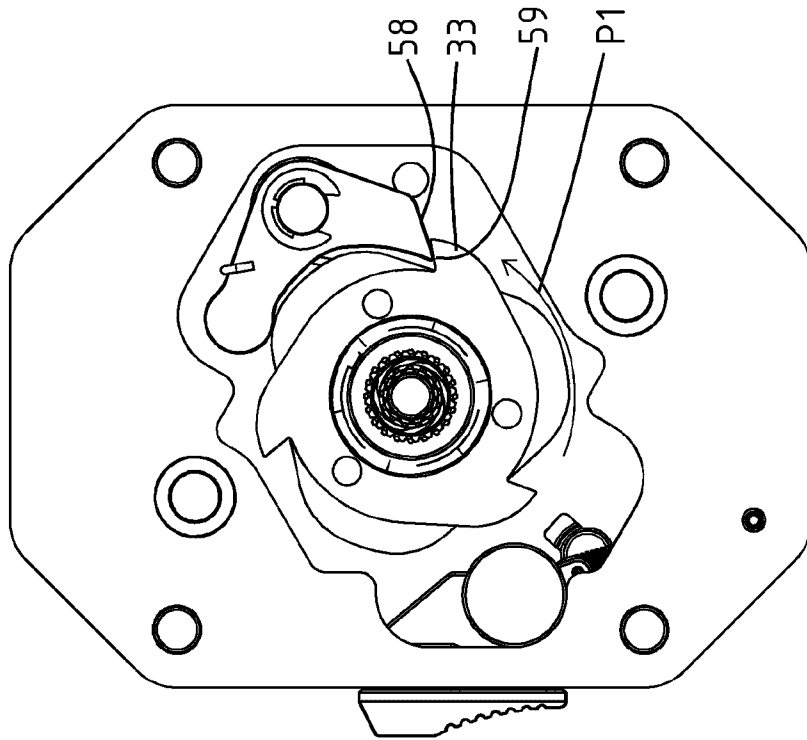


Fig. 15

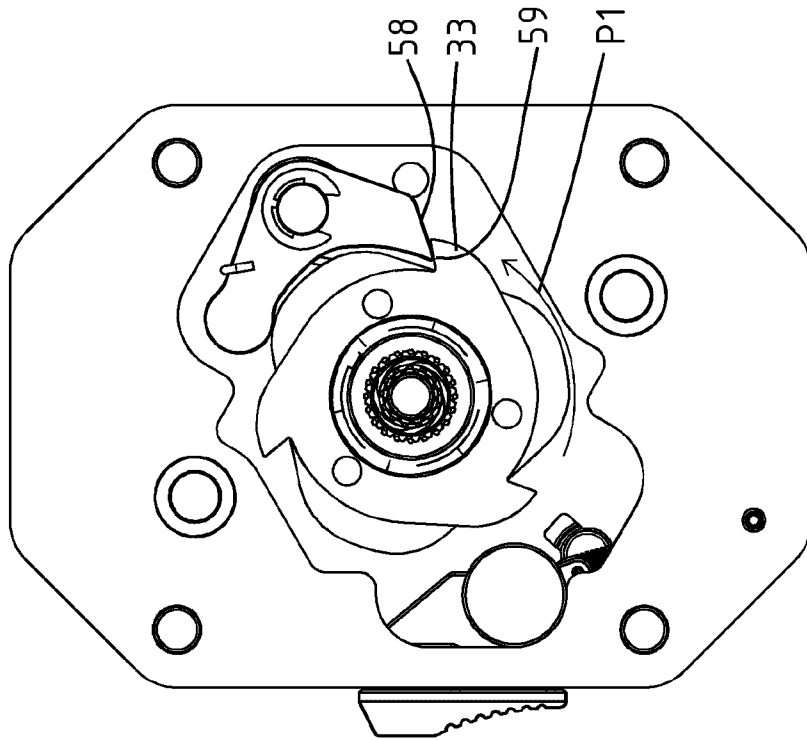


Fig. 16

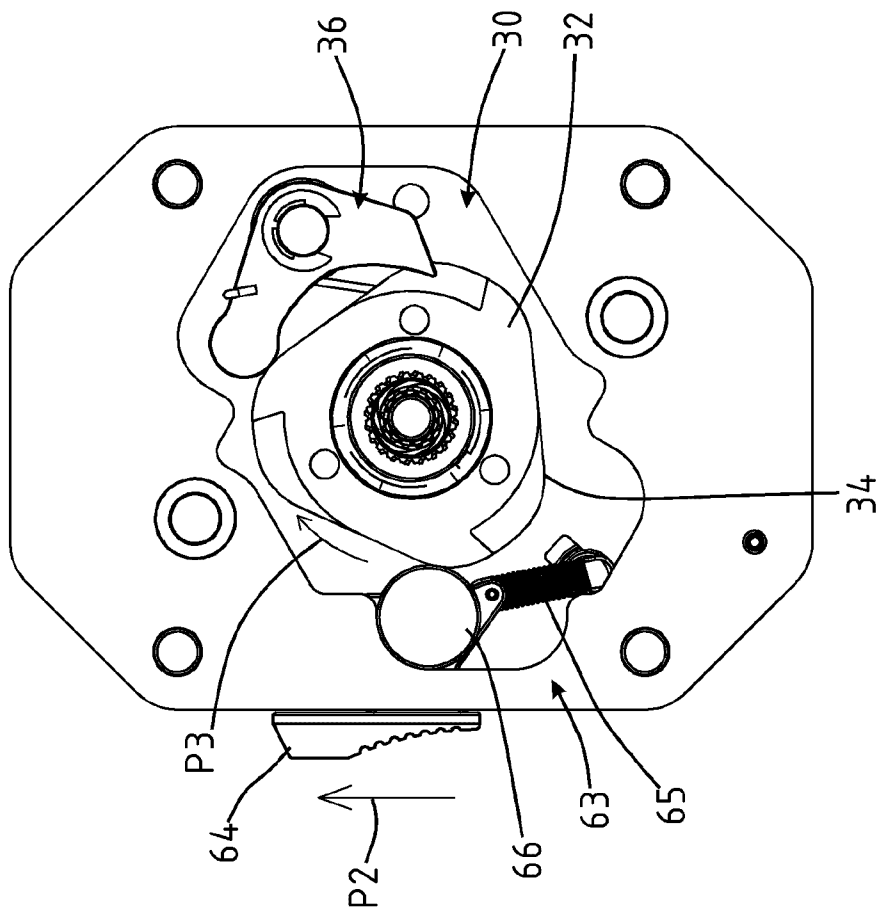


Fig. 17

10/12

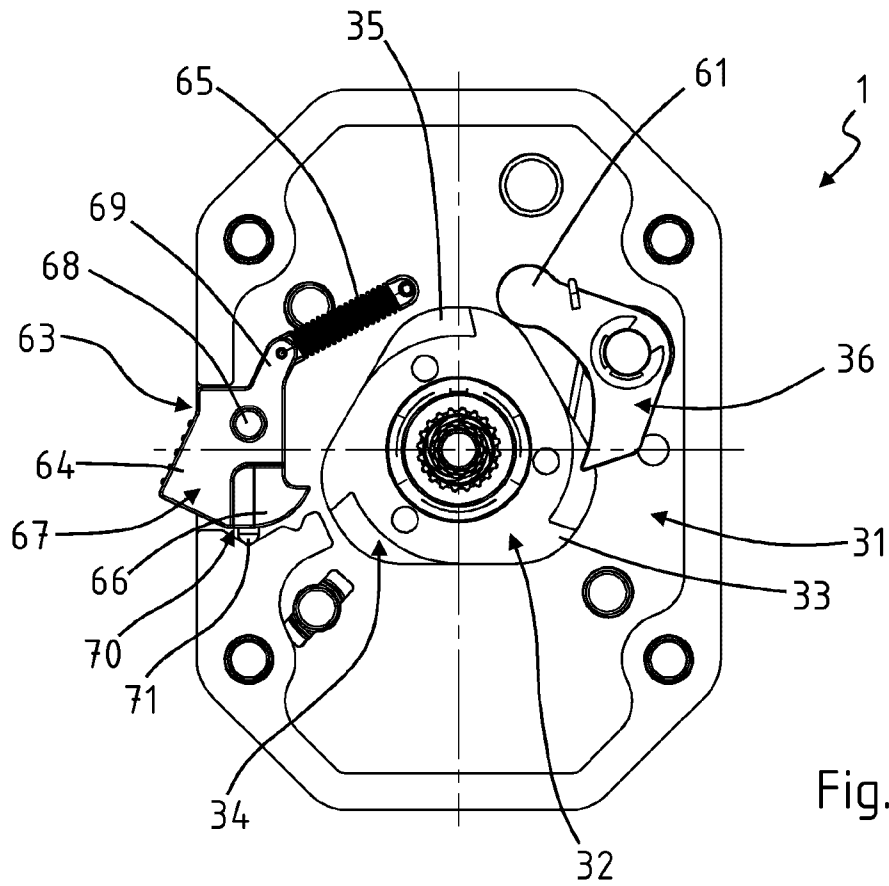


Fig. 18

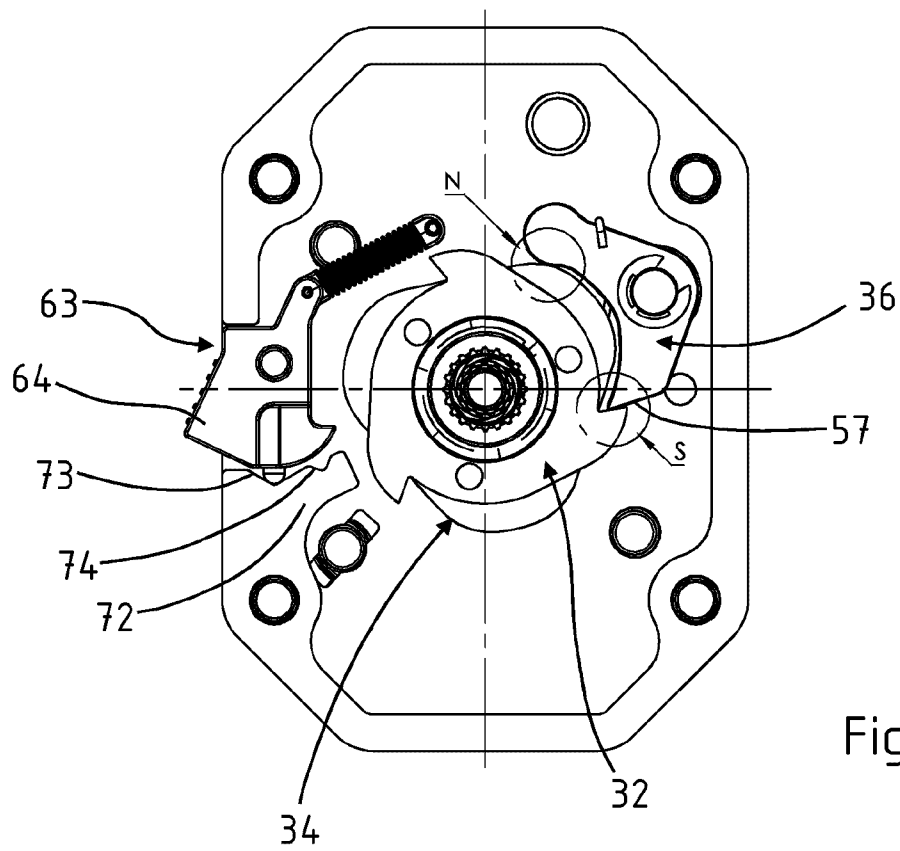


Fig. 19

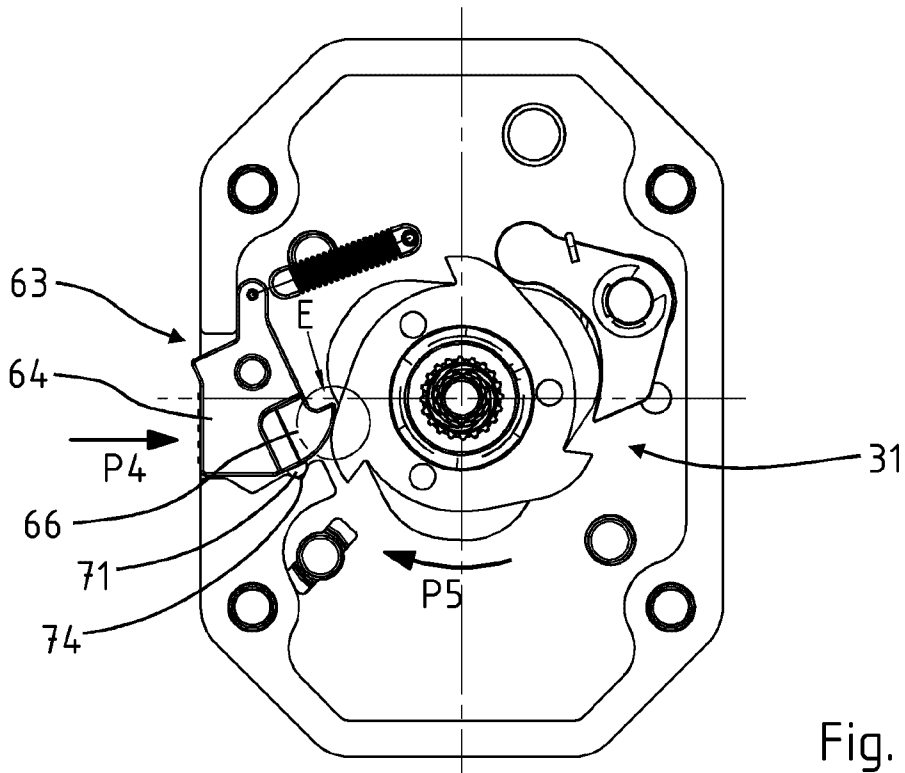


Fig. 20

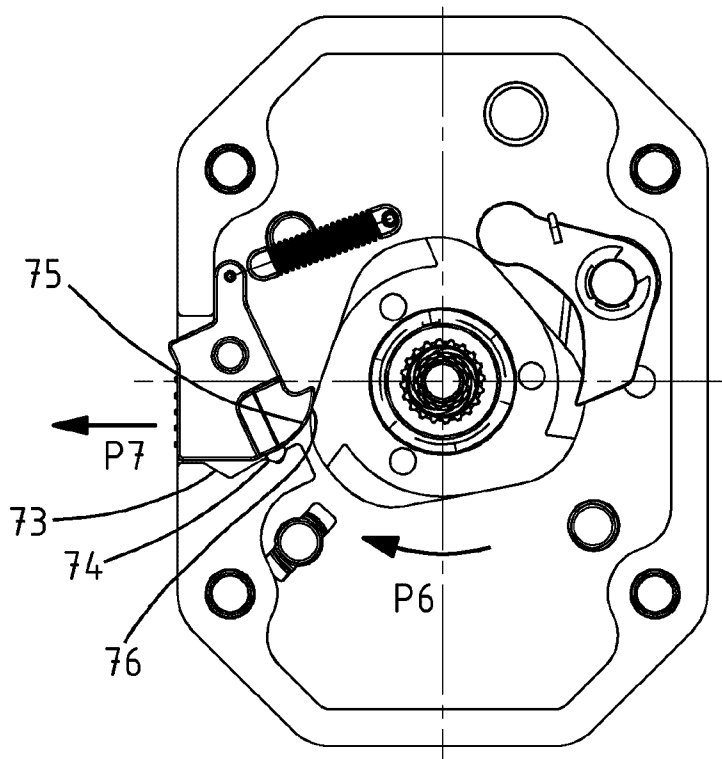


Fig. 21

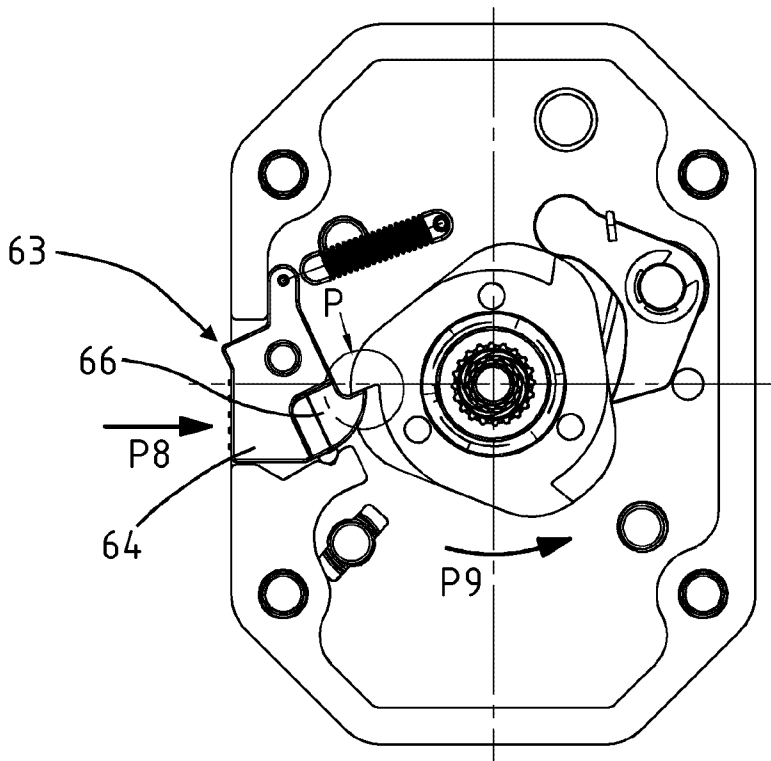


Fig. 22

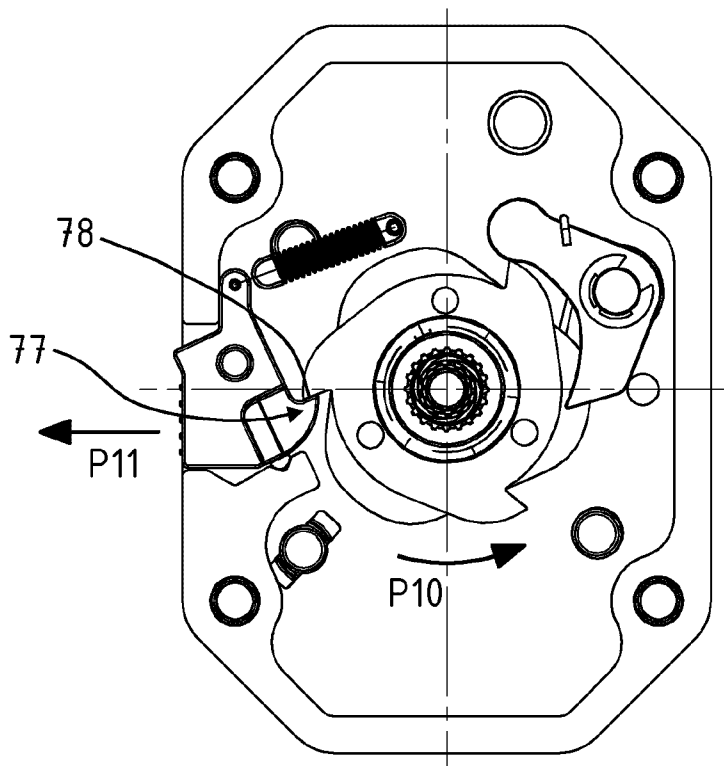


Fig. 23

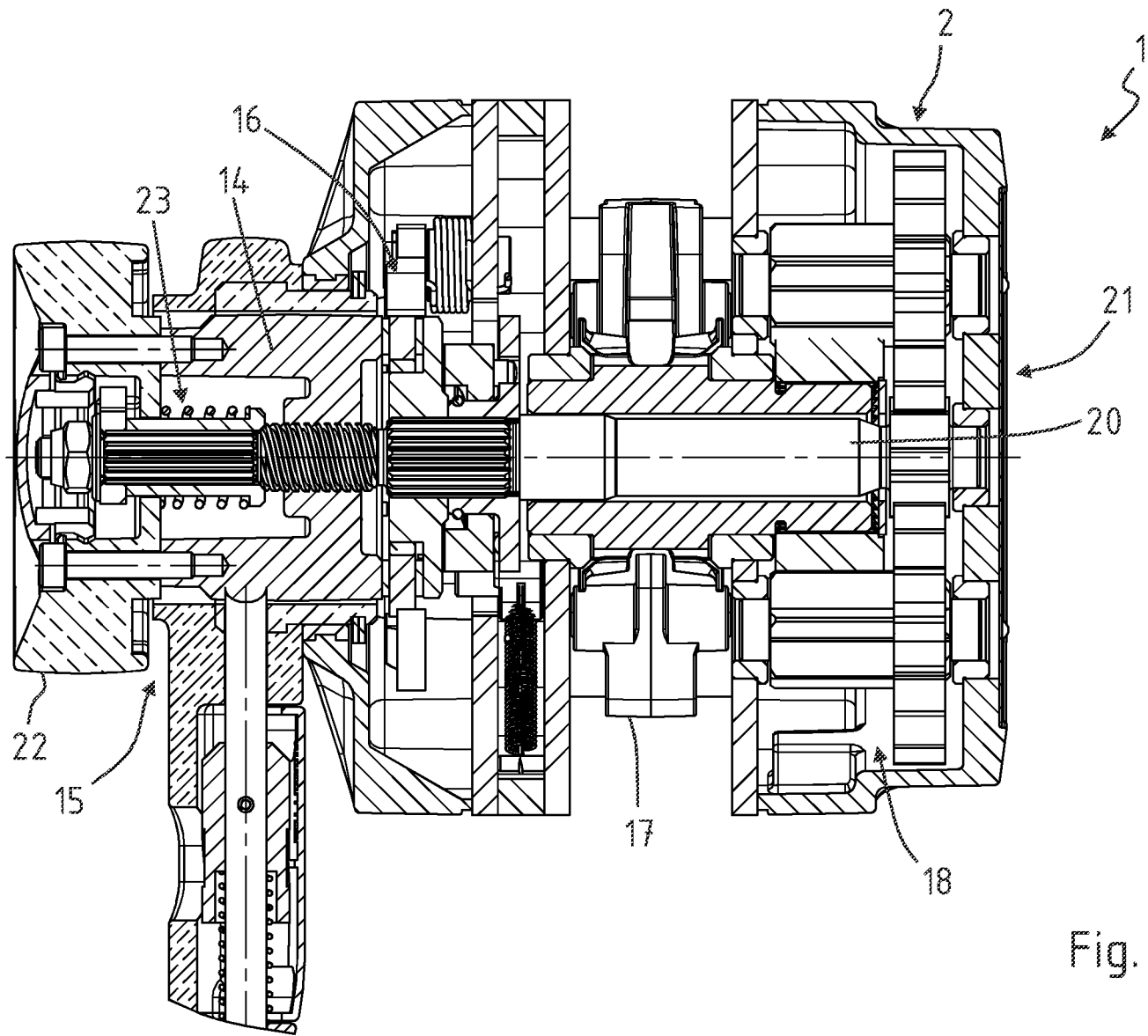


Fig. 1