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(73) Patenthaver: **OilQuick Deutschland KG, Bürgermeister-Schauer-Straße 1, 82297 Steindorf, Tyskland**

(72) Opfinder: **Friedrich, Thomas, Miesingstr. 1, 83727 Schliersee, Tyskland**

(74) Fuldmægtig i Danmark: **Patrade A/S, Ceresbyen 75, 6., 8000 Århus C, Danmark**

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Quick coupler

The present invention relates to a quick coupler for coupling a tool such as, for example, excavator buckets, clamshell buckets or demolition tongs to a tool guide such as, for example, an excavator stick or the like, comprising a coupler body which has, at opposite end faces, on the one hand a coupling receptacle for receiving a first locking part of a coupler part to be coupled and, on the other hand, a locking receptacle for receiving a second locking part of the coupler part to be coupled, at least one movable locking part for locking the second locking part being associated with at least the locking receptacle, said locking element being manually operable via an actuating gear arranged on the coupler body.

Such a quick coupler is known, for example, from US 2013/160 269 A1, wherein the movable locking parts of the coupler body are preloaded by a spring device and can be actuated by a control arm system, wherein an actuating shaft is provided with a square in order to be able to apply an actuating tool.

On construction machines such as hydraulic excavators or pivoted grabber such as timber handling machines or demolition equipment or similar material handling machines, quick couplers are often used for coupling various tools such as clearing buckets, clamshell buckets or demolition tongs to an excavator stick or similar tool guides such as articulated booms in order to be able to use various tools without long changeover times.

As locking elements such quick couplers can have, in particular, two spaced-apart locking axes on one coupling part, while the other coupling part, in particular the coupling part located on the excavator stick, can have a preferably hook-shaped coupling receptacle for hooking onto a first of the two locking axes and a locking receptacle for locking onto the second locking axis. After hooking the first locking axis into the coupling receptacle, the two coupling parts can be pivoted towards each other, with the locking axis seated in the coupling receptacle forming the axis of rotation, so that the second locking axis enters or is pivoted into the locking receptacle, where said second locking axis can then be locked by a locking element such as an extendable wedge, so that at the same time it is also no longer possible to move the first locking axis out of the coupling receptacle. For moving said locking element, an externally powered actuator is provided, which can be designed, for

example, as a hydraulic cylinder and can usually be actuated by hydraulic pressure from the device.

The said locking axes on the one coupling part can thereby be formed by locking pins which can extend on the corresponding coupling part, in particular parallel to one another, whereby, however, instead of such pins, other structural parts of the coupling part such as, for example, projecting lugs, stub axles, engagement stubs in the form of projections or recesses, for example in the form of pockets, can also serve as the locking part if necessary, which are adapted in shape to the coupling receptacle or the locking receptacle of the other coupling part.

Such quick couplers are also the subject of standards in terms of dimensions and locking parts in order to ensure the compatibility of a coupler half used on the excavator stick with various tools on which a coupler half is mounted, which can come from different manufacturers depending on the tool and must be compatible with the stick-side coupler half to such an extent that the two coupler halves can move together and lock. Such standardization has taken place, for example, in the form of the so-called S-coupler or the S-standard, which specifies the dimensions and arrangement of the locking elements and receiving jaws and was defined by the Swedish Institute Maskinleverantörerna and was last published on May 28, 2010. This S-coupler has, in the manner described above, two parallel, spaced-apart transverse bolts as locking parts on one of the coupler halves, while the other coupler half has, on opposite end faces, a mouth-shaped coupling receptacle on the one hand and an L-shaped locking receptacle on the other, which can be closed by a pair of extendable locking bolts or closed to form a receptacle which is then also U-shaped or mouth-shaped.

Furthermore, the document WO 2016/198638 A1 shows a quick coupler in which the locking elements can be retracted and extended via rotary actuating parts by a drive shaft, wherein a hand tool for manual operation of the quick coupler can be connected to said drive shaft. In addition, a hydraulic rotary motor is connected to said drive shaft in order to be able to actuate the drive shaft and thus the locking elements also by motor.

Further examples of such quick couplers are known from the publications EP 1 852 555 A2, DE 20 2012 007124 U1, DE 20 2014 001 328 U1.

Modern variants of such quick couplers are often hydraulically actuated. Hydraulic actuators, for example in the form of hydraulic cylinders, are assigned to the locking elements by means of which the locking elements can be retracted and extended. If hydraulically actuated tools are to be coupled, the coupler halves also have hydraulic couplings that automatically move together when the two coupler halves are swiveled together.

However, manually operated coupler halves are still needed, especially in smaller companies or for infrequently used machines for which fully hydraulic quick coupler systems are not worthwhile or are too costly.

Such manually operated quick couplers usually have an actuating gear arranged on the coupler body, on which the said locking elements can be retracted and extended or otherwise moved between locking position and unlocking position. By means of such actuators, the required actuating forces are reduced to ensure easy manual operation. For example, a lever mechanism may be provided which can be actuated by a rotatable rotary actuating part so that convenient manual actuation can be achieved via the lever ratios. In this connection, a wrench or a similar tool, such as is known in comparable form for loosening and tightening the wheel nuts when changing the wheels on a motor vehicle, can be detachably applied to the said rotary actuating part, for example via a multi-sided plug-in connection, in order to actuate the rotary actuating part. Such an actuating gear also usefully includes a spring that preloads the locking element.

However, due to the actuating gear, it has been difficult up to now to couple such a manually operated quick coupler to coupler halves on which hydraulic and/or power circuit couplings are also arranged, since the actuating gear and the coupler body surrounding the actuating gear would collide with such hydraulic or power circuit couplings. Usually, such hydraulic or power circuit couplings are arranged centrally between the opposing locking parts to be inserted into the coupling and locking receptacles, and are thus located exactly where said actuating gear is arranged on the opposite coupler half. As a result, so far such manually operated quick couplers can only be coupled with coupler halves that do not have such hydraulic or power circuit couplings.

On this basis, the present invention is based on the task of creating an improved quick coupler of the type mentioned, which avoids disadvantages of the prior art and develops the latter in an advantageous manner. In particular, a safe and at the same time simple manual locking is to be made possible with a compact design, even if the opposite coupler half has hydraulic or other power circuit couplings.

According to the invention, the said task is solved by a quick coupler system according to claim 1. Preferred embodiments of the invention are subject of the dependent claims.

It is thus proposed, in addition to the locking elements associated with the locking recess, to also associate at least one securing element with the receiving recess in order to secure the locking part received therein, and to connect both elements, that is to say locking element and securing element, to the common drive shaft in order to be able to lock and unlock both the locking element and securing element with only one rotary movement of the common drive shaft. According to the invention, both the locking element associated with the locking receptacle and a movable, additional securing element associated with the coupling receptacle for securing the first locking part received therein can be actuated by the common drive shaft and are each hinged via an actuating link to a rotary actuating part connected to the common drive shaft in a rotationally fixed manner, so that the locking element and the securing element move in opposite directions to one another by rotation of the common drive shaft in one direction of rotation. In particular, the locking element moves toward one side of the quick coupler body into the locking receptacle provided there, while the securing element moves toward the opposite coupler body side into the coupling receptacle provided there when the common drive shaft is rotated in one direction. If the drive shaft is rotated in the opposite direction, the locking element and the securing element move in opposite directions to their respective unlocking position.

Advantageously, said drive shaft can extend between the coupling receptacle and the locking receptacle transversely across the coupler body, in particular in a direction perpendicular to the directions of adjustment of the locking and securing elements, wherein advantageously a through recess can be provided in a side cheek of the coupler body through which the drive shaft can extend to an outer side of the coupler body in order to be coupled there with a hand tool. Alternatively, the hand tool can also be inserted through said through recess to be coupled to the drive shaft in said side cheek or also within said side cheek.

Basically, the hand tool can be coupled in various ways. For example, the hand tool can be attached to the drive shaft in a rotationally fixed manner by means of a shaft-hub connection, so that the hand tool and the drive shaft extend approximately coaxially to each other. Alternatively, however, the hand tool and the drive shaft can also be arranged offset from one another, for example by providing a bevel pinion fixed against rotation on the drive shaft and a bevel pinion fixed against rotation on the hand tool and interlocking with one another in the form of a spur gear stage. Alternatively or in addition to such a spur gear stage, a bevel gear stage can also be connected between the hand tool and the drive shaft on the coupler body in order to tilt or bend the axis of rotation of the hand tool relative to the axis of rotation of the drive shaft. At the same time, a reduction or transmission ratio between the hand tool and the drive shaft can be generated by such a pinion or gear stage, which enables particularly effort-saving, smooth operation of the quick coupler.

Advantageously, the additional securing element can be moved into the coupling receptacle at an angle and/or at an acute angle in order to positively prevent the locking part located there from slipping out of the coupling receptacle. In particular, said coupling receptacle may form a mouth-shaped blind notch having a longitudinal notch axis open toward a side of the coupler body facing away from the locking receptacle, wherein the coupling receptacle may extend with its said longitudinal notch axis inclined at an acute angle to an actuation axis of the securing element and/or to a connecting plane passing through both the coupling receptacle and the locking receptacle. Considering the approximately, for example, cuboidal coupling body in a horizontally aligned position, said coupling receptacle may extend, for example, inclined upwardly at an acute angle and/or inclined downwardly at an acute angle, wherein the securing element may be moved substantially horizontally and partially into the coupling receptacle to block the insertion and removal path for the associated locking part.

Advantageously, the locking element can also be moved substantially horizontally when said cuboidal coupling body is viewed in a horizontal position. In this case, the locking element and the securing element can both be moved horizontally or along axes substantially parallel to each other, which is favorable for actuation by the common drive shaft and at the same time allows for a compact, flat construction of the coupler.

Advantageously, the rotary actuating parts to which the locking element on the one hand and the securing element on the other hand are hinged via the aforementioned actuating links can extend on opposite sides of the drive shaft and be arranged in such a way that the actuating links of the locking element and of the securing element are overextended and each passes a dead point when the drive shaft is rotated from the unlocking position to the locking position. By means of such a configuration, in which the actuating links are overextended and a dead point is crossed, the locking and securing elements can be held by the drive shaft securely in the locking and unlocking position by approaching rotary dead stops without the need for special, additional securing measures, for example in the form of locking latches.

The securing element on the one hand and the locking element on the other hand can be connected to the rotational movement of the common drive shaft in different ways, in particular in such a way that the securing element is coupled to the rotation of the drive shaft in a substantially backlash-free, positively controlled manner, while the locking element has limited free travel relative to the rotational movement of the drive shaft, for example by providing a longitudinal notch or a longitudinal slot, which can form a pivot point of the actuating link. This makes it possible to drive the locking element in a form-fitting manner on impact against the locking element or in the sense of a stop against the locking element, even if the actuating link is overextended when approaching the locking position and passes the dead point. Advantageously, a preloading device, for example in the form of a spring device, can be assigned to said free travel in order to move the locking element into the contacting, abutting position on the locking part.

The aforementioned free travel is relatively small in this case and in any case so limited that even if the free travel is utilized, the locking element locks the locking receptacle sufficiently to reliably prevent the locking element from falling out.

On the other hand, the additional securing element associated with the coupling receptacle can forcibly translate the rotational drive shaft of the drive shaft without free travel. In particular, due to the aforementioned inclined position of the coupling receptacle, the securing element need not be driven to a stop, but it may be sufficient to drive said securing element sufficiently far at an angle into the coupling receptacle to obstruct the path for the locking part.

It is further proposed to relocate the actuating gear for manual actuation of the at least one locking element out of the collision area with the hydraulic or power circuit couplings on the coupling part to be coupled and to recess the coupler body in the area which, during coupling, is intended to come to rest against the said hydraulic or power circuit couplings of the mating part, so that the hydraulic or power circuit couplings can move into the recessed area. According to the invention, the coupler body has in a central section between its coupling and locking receptacles provided on opposite end faces a recess open towards the coupler part to be coupled for receiving and/or retracting hydraulic connections of the coupler part to be coupled, wherein the actuating gear for manual actuation of the at least one locking part being arranged next to said recess, leaving the recess free. Due to such an cutout, in combination with an arrangement of the actuating gear at the edge of or adjacent to said cutout, the hydraulic connections can enter said cutout between edge-mounted coupler structure parts and/or actuating gear sections, and thus allows the coupler body to be driven onto the coupler part to be coupled without collision. At the same time, the quick coupler can also be used for hydraulics-free coupler solutions, since in this case the said cutout in the coupler body simply remains free if no hydraulic or power circuit couplings are provided on the mating part.

In this case, said cutout can form a cup- or trough-shaped depression in the underside of the coupler body, i.e. in the coupler body side which is moved onto the coupling part to be coupled during coupling, said cup- or trough-shaped depression being sufficiently deep to accommodate the hydraulic or power circuit couplings on the coupling part to be coupled. In particular, said cutout may be bordered or surrounded on the edge side by stiffening and/or strength-increasing structural thickenings and/or edge beads and/or actuating gear sections of the manually operable actuating gear, wherein such structural thickenings or edge beads may advantageously be provided on at least two or three edge sides of said cutout.

In particular, said structural thickenings or edge beads may extend along the side edges of the coupler body, while the central region of the coupler body is recessed from such structural thickenings and/or may be formed by a flat, thin plate or similar thin structural sheet or structural part.

In an advantageous further embodiment of the invention, the aforementioned actuating gear sections may also be disposed at least partially within the aforementioned edge-enclosing edge beads.

In an advantageous further development of the invention, said central recess may be at least partially formed as a through recess so that a central through hole with a free viewing axis there through is provided in the coupler body. Said through recess may pass centrally through the coupler body and extend from the underside of the coupler body, which is intended to be driven onto the mating part or coupler part to be coupled, to the top side thereof. Through such a through hole, the hydraulic or power circuit couplings possibly present on the coupler part to be coupled remain accessible from above or through said through recess even when the quick coupler is coupled. In addition, the quick coupler can be built particularly flat, irrespective of the overall height of any hydraulic couplings that may be present.

The said recess in the coupler body can vary in size, but in any case it is sufficiently large to accommodate the hydraulic or power circuit couplings present on the mating part. In order to ensure collision-free mating even with differently positioned hydraulic or power circuit couplings, said recess can advantageously have a clear width in the transverse direction - i.e. transverse to the actuating axis of the locking element and/or transverse to the plane of the coupling movement and/or parallel to the bolt-shaped locking parts of the coupler part to be coupled - of more than 50% or more than 66% of the width of the entire coupler body. In the longitudinal direction - i.e. approximately in the direction of the spacing of the two coupling and locking receptacles from one another - the recess can advantageously have a clear width or length of at least more than 33% or more than 50% of the spacing of the coupling and locking receptacles, while a length of more than 66% of the said spacing of the receptacles is also possible. Such a sufficiently large recess prevents collision of the coupler body with the hydraulic connections on the mating part even in the event of unclean coupling movements.

In an advantageous further development of the invention, the actuating gear placed next to the said recess can have a rotatably mounted rotary actuating part which, by rotation via an actuating link, displaces the locking element with which the locking receptacle is closed or the locking part received therein is locked. Advantageously, a spring device can be coupled to said rotary actuating part, in particular in such a way that when the rotary actuating part

is rotated, a dead point is passed and the rotary actuating part is preloaded by the spring device into opposite end positions, which can correspond to the locked and unlocked positions of the coupler. The spring device is more relaxed in both end positions of the rotary actuating part than in the dead point position in between, so that the spring device can hold the actuating gear both in the unlocked position and in the locked position by spring force. To move from the unlocked position to the locked position or vice versa from the locked to the unlocked position, the spring force mentioned must be overcome manually.

Advantageously, said spring device on the one hand and the actuating link on the other hand, which converts the rotary movement of the rotary actuating part into an actuating movement of the locking element, can be arranged on different or opposite sides of the locking part. This provides a particularly slim design so that said assembly comprising the rotary actuating part, the actuating link and the spring device can extend laterally along the coupler body and/or along said recess without the assembly obstructing or restricting the recess and the retractability of the hydraulic couplings in the region of the recess. Nevertheless, said assembly can be made relatively long or utilize a large portion of the available length of the coupler body, thereby providing favorable leverage and a simply constructed spring device.

Advantageously, said spring device can directly engage to said rotary actuating part and/or preload a tensioning link, which on the one hand is articulated in a hinged manner to said rotary actuating part and on the other hand is slidably guided on the coupler body. In particular, the spring device can be associated with said tensioning link in such a way that said tensioning link is preloaded along its longitudinal direction and is attempted to be displaced relative to the coupler body by the spring force. This spring-loaded displacement movement of the tensioning link attempts to rotate the rotary actuating part to one of its end positions.

Advantageously, the quick coupler may have two locking elements associated with said locking receptacle and capable of locking a locking part received therein. Advantageously, each of said locking elements has associated therewith a separate actuating gear assembly comprising, respectively, a rotary actuating part, an actuating link pivotally connected thereto, and a spring device, wherein said actuating gear assemblies may advantageously extend laterally on opposite edges of the coupler body and/or on opposite sides of the aforementioned recess.

The two actuating gear assemblies may thereby be synchronized by a synchronization shaft that interconnects the two rotary actuating parts and synchronizes them with respect to their rotation. However, such rotational synchronization of the two rotary actuating parts and thus of the locking movement of the locking elements can also be achieved by the actuating tool to be applied, which can, for example, replace or comprise said synchronization shaft. For example, the hand tool can be inserted into both rotary actuating parts from one side, for example via a multi-sided recess and/or a wedge shaft recess and/or an otherwise torque-transmitting recess in the two rotary actuating parts. The two actuating gear assemblies can thus also be synchronized by the hand tool to be used, so that even more installation space is available for the coupling movement when the actuating tool is removed. Alternatively, however, said two actuating gear assemblies can also be actuated by separate actuation tools.

Advantageously, said at least one rotary actuating part may be positioned on the coupler body such that the axis of rotation of said rotary actuating part is aligned with a recess provided in a side flange of the coupler part to be coupled, such that said axis of rotation of said rotary actuating part in the collapsed or coupled state is located in an area bounded by side flanges of the coupler part to be coupled. In other words, the axis of rotation of the rotary actuating parts enters an inner space between the side flanges of the coupler part to be coupled, thus enabling a particularly flat design of the quick coupler.

In order to nevertheless be able to apply the actuating tool to the said rotary actuating part from the side, the rotary actuating part is positioned in such a way that its axis of rotation - in the coupled state - is aligned with a through recess provided in the said side flange of the coupler part to be coupled. The actuating tool to be applied can thus be inserted through said through recess in the side flange and brought into engagement with the rotary actuating part.

In an advantageous further embodiment of the invention, said drive shaft may not only be manually actuated by coupling a hand tool, but the quick coupler may include a drive or externally power operable actuator to rotate the drive shaft by means of external power and thereby retract and extend the locking and securing elements.

For this purpose, the common drive shaft can have an actuator connection for connecting such an actuator for rotating the drive shaft, said actuator connection being provided, for

example, on one of the rotary actuating parts already mentioned or on a further rotary actuating part which is connected to the drive shaft in a rotationally fixed manner.

The said actuator can in principle be of different design. In advantageous further development of the invention, for example, a pressure medium cylinder can be provided which can be actuated hydraulically or, if appropriate, also pneumatically. Advantageously, such an actuator may extend substantially parallel to a connecting plane passing through the locking recess and the coupling receptacle, wherein said actuator may advantageously be oriented with its longitudinal and/or effective axis substantially perpendicular to the longitudinal axis of the drive shaft.

Alternatively or in addition to such a pressure medium cylinder, the actuator may also comprise an electric motor and/or an electric actuator.

The invention is explained in more detail below with reference to a preferred embodiment and associated drawings. The drawings show:

Fig. 1: a schematic side view of a quick coupler according to an advantageous embodiment of the invention, which is attached to a boom arm of an excavator and couples a digging bucket as an attachment tool,

Fig. 2: a perspective view of the quick coupler of Fig. 1 in an uncoupled position, in which the two coupling parts which can be coupled to each other are shown shortly before hooking onto the hook section,

Fig. 3: a schematic representation of the electric/hydraulic drive system of the quick coupler from the preceding figures according to an advantageous embodiment of the invention,

Fig. 4: a perspective view of the quick coupler of Fig. 3 obliquely from below, i.e. from the side facing the coupler part to be coupled, showing the extendable locking elements on the locking receptacle,

Fig. 5: a top view of the underside of the quick coupler from Figs. 3 and 4, i.e. the side facing the coupler part to be coupled, showing the arrangement of the two actuating gears on the right and left of the recess, and

Fig. 6: a schematic, partially cutaway view of the quick coupler in a side view showing the locking and securing elements, which can be moved in opposite directions, and their connection to a common drive shaft, the partial view (a) showing the drive shaft in a rotational position in which the securing and locking elements are unlocked and the partial view (b) showing the drive shaft in a rotational position in which the securing and locking elements are locked,

Fig. 7: a partial cutaway perspective view of the quick coupler of the preceding figures, showing an actuator coupled to the drive shaft in the form of a hydraulic cylinder, and

Fig. 8: a partially cutaway, perspective view of the quick coupler from the preceding figures, showing an actuator coupled to the drive shaft in the form of an electric motor.

As Fig. 1 shows, the quick coupler 1 can be mounted between the free end of the boom arm 5 of an excavator 30 and the tool 4 to be attached thereto, said attachment tool 4 in Fig. 1 being in the form of a digging bucket, but in a manner customary in itself may of course also comprise other corresponding construction, handling or demolition tools, for example in the form of clamshell buckets, demolition tongs, shears or the like. Said quick coupler 1 is, on the one hand, mountable to said boom arm 5 by means of a coupler part 2 on the boom side so as to be pivotable about a horizontal pivot axis aligned transversely to the longitudinal axis of the boom arm 5, so that the quick coupler 1 together with the tool 4 attached thereto can be pivoted relative to the boom arm 5, for example by means of a pressure medium cylinder 36 and an interposed pivot piece 37.

By means of a coupler part 3 on the tool side - cf. Fig. 2 - said quick coupler, on the other hand, can be attached to the attachment tool 4 and/or an intermediate rotary drive.

As shown in Figs. 2 and 3, one of the two coupler parts 2 and 3, respectively, preferably the stick-side coupler part 2 can comprise a coupling receptacle 6 on the one hand and a locking receptacle 10 on the other hand, which can be hooked onto or engaged with two locking parts, for example in the form of locking axes 13 and 14, on the other coupler part 3, preferably the tool-side coupler part 3. Contrary to the representation in the drawing, however, it would also be conceivable in principle to provide a locking axis and a receptacle on one coupler part and in turn a locking axis and a receptacle on the other coupler part, although the design shown with two receptacles, i.e. locking receptacle and coupling receptacle on one coupler part and two locking axes corresponding thereto on the other coupler part, is preferred, since the associated securing and locking elements and their actuation can then be combined on one coupler part.

As Fig. 2 shows, the coupling receptacle 6 and the locking receptacle 10 each form a mouth-shaped receptacle which is open to one side and into which the locking axes 13 and 14, which can be formed by transverse bolts or locking bolts respectively, can enter, cf. Fig. 2. In this case, the coupling receptacle 6 and the locking receptacle 10 are advantageously arranged and configured in such a way that when a first locking axis 13 of one coupler part 3 is retracted or hooked into the preferably hook-shaped coupling receptacle 6 of the other coupler part 2, the two coupler parts can be pivoted relative to each other in such a way that the coupling receptacle 6 or the locking axis 13 accommodated therein form the axis of rotation and the second locking axis 14 can be moved into the locking receptacle 10 by the corresponding pivoting movement, so that the two coupler parts 2 and 3 can be coupled to each other in a two-stage coupling process. First, the coupling receptacle 6 is hooked onto the first locking axis 13, so that the locking receptacle 10 can then be brought into engagement with the second locking axis 14 by pivoting the two coupling parts 2 and 3 relative to one another - which can be done, for example, by actuating the aforementioned pivot cylinder 36.

Once the second locking axis 14 has been moved into the locking receptacle 10, said second locking axis 14 is locked in the locking receptacle 10 or the locking receptacle 10 is closed so that the second locking axis 14 can no longer come out. For this purpose, a locking element 11 is provided, for example in the form of a locking wedge, which can be moved on the opening side of the locking receptacle 10 in front of the locking axis 14 accommodated

therein, cf. Fig. 3. For manual actuation of said locking element 11, a tool 15 can advantageously be applied here.

By locking the locking element 11, not only is the second locking axis 14 held in the locking receptacle 10, but the two coupling parts 2 and 3 are also locked to each other, since the coupling receptacle 6 is designed in such a way that the first locking axis 13 received therein cannot come out of the coupling receptacle 6 when the second locking axis 14 is trapped in the locking receptacle 10.

Nevertheless, advantageously, a securing element 25 is also associated with the coupling receptacle 6, which secures or locks the locking axis 13 in the coupling receptacle 6 and preventing the locking axis 13 from moving out of the coupling receptacle 6. Said securing element 25 may comprise a movable latch part which can be retracted into the coupling receptacle 6 in the region of the open end thereof, cf. Fig. 6 (b).

As Figures 3-5 show, two locking elements 11 are advantageously associated with the locking receptacle 10 for locking therein the second locking axis 14, wherein said locking elements 11 may advantageously be arranged at opposite edge or side portions of the coupler body 7.

Similarly, two securing elements 25 may be associated with the coupling receptacle 6 to lock the first locking axis 14 therein, said securing elements 25 being advantageously arranged on opposite edge or side portions of the coupler body 7.

The two locking elements 11 and the two securing elements 25 can advantageously be driven manually via an actuating gear 12, wherein each locking element 11 and securing element 25 can be associated with its own actuating gear assembly, which can be synchronized with each other via the tool 15 to be applied or a synchronization shaft.

As best shown in Fig. 5, each actuating gear assembly of the actuating gear 12 comprises a rotary actuating part 16 which is rotatably mounted on the coupler body 11 about a transverse axis approximately parallel to the longitudinal extent of the locking receptacle 10 or transverse to the longitudinal axis of the locking element 11, wherein advantageously the axes of rotation of the two rotary actuating parts 16 may be aligned with each other.

On the one hand, an actuating link 17 is articulated to said rotary actuating part 16 in a hinged manner, which on the other hand is articulated in a hinged manner to the associated locking element 11. If the rotary actuating part 16 is rotated, said actuating link 17 converts the rotary movement into a displacement of the locking element 11. For this purpose, said locking element 11 is mounted longitudinally displaceably on the coupler body 7.

In order to be able to move the locking element 25, a second rotary actuating part 26 can be provided, which can be formed separately from the first rotary actuating part 16, but can also be combined with said rotary actuating part 16. An actuating link 27 directs the securing element 25 to said rotary actuating part 26 in order to convert a rotation of the rotary actuating part 16 into a translatory sliding movement of the securing element 25.

Advantageously, the rotary actuating parts 16 and 26 extend on opposite sides of the axis of rotation, so that the locking and securing elements 11 and 25 are moved in opposite directions to each other when the rotary actuating parts are rotated in one direction of rotation, compare in comparison to each other Fig. 6 (a) and Fig. 6 (b).

On the other hand, a tensioning link 18 is articulated in a hinged manner to said rotary actuating part 16 and/or rotary actuating part 26, which on the other hand is slidably guided on the coupler body 7. More specifically, said tensioning link 18 is slidably guided on a rotatable stop 19 so that the tensioning link 18 can be slid on the stop 19 during rotational movements of the rotary actuating part 16, the stop 19 being able to rotate at the same time to take into account the pivoting of the tensioning link 18.

Said tensioning link 18 is thereby preloaded by a spring device 20, wherein said spring device 20 may be arranged between said stop 19 and a shoulder of the tensioning link 18, for example in the form of a helical spring slid over the tensioning link 18

The tensioning force of the spring device 20 attempts to displace the tensioning link 18 in one direction, which causes a rotational preload on the rotary actuating part 16 and/or the rotary actuating part 26.

The spring device 20 and/or the tensioning link 18 are arranged on the rotary actuating part 16 in such a way that when the rotary actuating part 16 is rotated from the unlocked position to the locked position and vice versa from the locked position to the unlocked position, a dead point position is passed over in each case and the spring device 20 attempts to pretension the rotary actuating part 16 once in one direction and the other time in the other direction. In other words, the spring device 20 preloads the rotary actuating part 16 into the unlocked end position on the one hand and into the locked end position on the other hand, depending on the side towards which the said dead point has been passed.

Advantageously, the two actuating gear assemblies of the actuating gear 12, each comprising the rotary actuating parts 16 and 26, the actuating links 17 and 27, the tensioning link 18 and the spring device 20, extend along an elongated installation space which is located laterally or at the edge on the left or right of the coupler body 7, so that the actuating gear assemblies are limited in their extension to the right and left edge regions of the coupler body 7.

Advantageously, for this purpose the spring device 20 and the tensioning link 18 on the one hand and the actuating link 17 on the other hand are arranged on opposite sides of the rotary actuating part 16 in order to achieve an overall very slim design of the actuating gear assemblies.

As Fig. 5 shows, the two actuating gear assemblies can be synchronized with each other by a drive or synchronization shaft 21, which couples the two rotary actuating parts 16 with each other so that they are rotated synchronously with each other.

Said drive shaft 21 may be permanently installed or, alternatively thereto, may be formed by the actuating tool 15 to be applied, which may be insertable into both rotary actuating parts 16 or 26 from one side. For this purpose, the rotary actuating parts 16 and 26 can have a torque-transmitting plug-in recess, for example in the form of a multi-sided hole or a profiled shaft recess.

The rotary actuating parts 16 and 26 can thereby advantageously be arranged in such a way that the actuating tool 15 can be inserted through a through recess 22 in one of the side flanges of the coupler part 3 to be coupled, cf. Fig. 2.

As shown in Figures 3-5, the coupler body 7 of the coupler part 2 has a central recess 8 provided between the coupling and locking receptacles 6 and 10 and extending on the underside of the coupler body 7, cf. Figures 4 and 5.

Said recess 8 is framed in the manner of a frame, on the one hand by said coupling and locking receptacles 6 and 10 and the sections of the coupler body 7 forming them, and on the other hand by longitudinal webs extending in the longitudinal direction, which form the coupler body 7 on the right and left and connect the two coupling and locking receptacles 6 and 10 to one another. The central region of the coupler body 7 is thus recessed, said recess 8 being able to extend over more than two thirds of the width of the coupler body 7 and over at least half of the length in terms of spacing between the two coupling and locking receptacles 6 and 10.

In particular, said recess 8 may form a central cup- or trough-shaped depression in the underside of the coupler body 7 which is driven onto the coupler part 3 to be connected during coupling, said recess 8 being laterally bordered on the right and left by strength-increasing, stiffening structural thickenings, in particular in the form of edge beads 23. Said edge beads 23 may form an elongated box girder profile or may also consist of a solid longitudinal beam or web, so that the thickness of the coupler body at the lateral edge beads 23 increases massively compared to the recessed central region and is in particular a multiple of the thickness in the central region. As Fig. 4 and Fig. 5 show, the central recess 8 can be enclosed along three sides by such edge beads, wherein edge beads 23l and 23r arranged on the left and right can be formed at least partially as a box girder profile and/or can accommodate the actuating gear sections of the actuating gear 12. A transversely extending edge bead 23q can form the receiving mouth 6 and/or connect laterally formed edge mouths 6 to one another and be formed, for example, in the form of a solid half-shell profile.

In the recessed central region between the aforementioned edge beads 23, the coupler body 7 can consist essentially only of a structural plate 24, for example in the form of a sheet metal plate, in particular sheet steel plate, or a thin, approximately planar structural part, which can also be of a bar-like or net-like or mesh-like nature.

As shown in Figures 4 and 5, in the central structural part 24, which is much thinner than the edge beads 23 and which connects said edge beads 23 to each other, a central through recess

8a may be provided which may form part of said recess 8 and in the region of which said recess 8 extends from the underside to the top side of the coupler body 7. Said through recess 8a may, for example, have an extension whose clear width is more than 50% or even more than 66% of the width of the entire coupler body and/or whose clear length is more than 33% or even more than 50% of the spacing of the coupling and locking receptacles.

The actuating gear 12 extends laterally to the right and left of said recess 8 and leaves said recess 8 free so that hydraulic couplings 9 present on the coupler part 3 to be coupled can move into the recess 8 or between the two coupling and locking receptacles 6 and 10 without collision.

Said actuating gear 12 may extend at least partially inside said edge-sided edge beads 23l and 23r, and alternatively or additionally said edge beads 23 may have cutouts in the region of which said actuating gears 12 are exposed.

As can be seen from Figures 6 (a) and 6 (b), the quick coupler is advantageously characterized in that both the locking element 11 associated with the locking receptacle 10 and a movable securing element 25 associated with the coupling receptacle 6 for securing the first locking part 13 received therein, can be actuated by the common drive shaft 21 and are each articulated via an actuating link 17, 27 on a rotary actuating part 16, 26 connected fixedly in terms of rotation to the common drive shaft 21, so that the locking element 11 and the securing element 25 move in opposite directions to one another by rotation of the common drive shaft 21 in one direction of rotation.

Advantageously, it may be provided that said drive shaft 21 extends transversely across the coupler body 7 between the coupling receptacle 6 and the locking receptacle 10, and a side cheek 7s of the coupler body 7 has a through recess 28 through which the drive shaft 21 extends to an outer side of the coupler body 7 and/or the hand tool can be coupled to the drive shaft 21.

Advantageously, it may be provided that the coupling receptacle 6 forms a mouth-shaped blind notch with a longitudinal notch axis 29 which is open towards a side facing away from the locking receptacle 10, the longitudinal notch axis 29 being inclined at an acute angle to

an actuating axis 25a of the securing element 25 and/or to a connecting plane 30 which passes through both the coupling receptacle 6 and the locking receptacle 10.

Advantageously, it may be provided that the rotary actuating parts 16, 26, to which the locking element 11 on the one hand and the securing element 25 on the other hand are articulated, extend on opposite sides of the drive shaft 11 and are arranged in such a way that the actuating links 17, 27 of the locking element 11 and of the securing element 25 are overextended and pass a dead point in each case when the drive shaft 21 is rotated from the unlocking position into the locking position.

In further development of the invention, the quick coupler may be characterized in that the securing element 25 is coupled to the rotary movement of the drive shaft 21 via the actuating link 27 and the rotary actuating part 26 in an at least substantially backlash-free manner, and the rotary movement of the drive shaft 21 is converted in a positively controlled manner into an actuating movement of the securing element 25, while the locking element 11 has a limited free travel relative to the drive shaft 21, with which a tensioning device is preferably associated for preloading into an end position of the free travel.

Advantageously, it may be provided that a monitoring sensor system 31 for monitoring the locking has at least one rotational position sensor 32 for monitoring the attainment of a locking rotational position of the drive shaft 21 and two receptacle sensors 33, 34 which are associated on the one hand with the coupling receptacle 6 and on the other hand with the locking receptacle 10 and monitor the presence of the first and second locking parts 13, 14 in the coupling receptacle 6 and the locking receptacle 10.

Advantageously, it may be provided that the common drive shaft 21 comprises an actuator connection for connecting an externally powered actuator 35 for rotating the drive shaft 21.

In further embodiments of the invention, the quick coupler may be characterized in that the actuator 35 comprises at least one pressure medium cylinder 36 extending substantially parallel to a connecting plane passing through both the coupling receptacle 6 and the locking receptacle 10.

In further aspects of the invention, the quick coupler may be characterized in that the actuator 35 comprises an electric motor and/or an electric actuator.

Patentkrav

1. Hurtigkoblersystem til tilkobling af et værktøj (4) til et værktøjsførende element som en gravemaskinearm (5), med et koblerkorpus (7) samt en koblerdel (3), der kan kobles hertil, hvor koblerkorpusset (7) i området med modsatte endeflader på den ene side har et tilkoblingsoptag (6) til optag af en første låsedel (13) af koblerdelen (3), som skal tilkobles, og på den anden side et låseoptag (10) til optag af en anden låsedel (14) af koblerdelen (3), der skal tilkobles, hvor i det mindste låseoptaget (10) har tilknyttet i det mindste et bevægeligt låseelement (11) til låsning af den anden låsedel (14), hvor det nævnte låseelement (11) kan betjenes manuelt via et aktuatordrev (12) anbragt på koblerkorpusset (7), hvilket aktuatordrev (12) har en drejeligt lejret drivaksel (21), som kan kobles med et håndværktøj, hvor både låseelementet (11) tilknyttet låseoptaget (10) og et bevægeligt sikringselement (25), som er tilknyttet tilkoblingsoptaget (6) til sikring af den første låsedel (13) optaget heri, kan aktiveres via den fælles drivaksel (21) og hver via en aktiveringsstang (17, 27) er hængt på en drejeindstillingsdel (16, 26) drejefast forbundet med den fælles drivaksel (21), sådan at låseelementet (11) og sikringselementet (25) ved drejning af den fælles drivaksel (21) i en drejeretning bevæger sig modsat hinanden, kendetegnet ved, at koblerkorpusset (7) i et midterafsnit mellem dets tilkoblings- og låseoptag (6, 10) har en udsparing (8) åben imod den koblerdel (3), som skal tilkobles, og aktuatordrevet (12) er placeret ved siden af udsparingen (8), så udsparingen (8) er fri, og koblerdelen (3) har hydraulik- og/eller energikoblinger mellem de to første og yderligere låsedele (13, 14), som stikker frem mod koblerkorpusset (7) og kan køres ind i udsparingen (8) på koblerkorpusset (7).

2. Hurtigkoblersystem ifølge det foregående krav, hvor den nævnte drivaksel (21) strækker sig tværs over koblerkorpusset (7) mellem tilkoblingsoptaget (6) og låseoptaget (10), og en sidevange (7s) af koblerkorpusset (7) har en gennemgangsudsparing (28), igennem hvilken drivakslen (21) strækker sig til en yderside af koblerkorpusset (7), og/eller håndværktøjet kan kobles med drivakslen (21).

3. Hurtigkoblersystem ifølge et af de foregående krav, hvor drejeindstillingsdele (16, 26), på hvilke låseelementet (11) på den ene side og sikringselementet (25) på den anden side er hængslet, strækker sig på modsatte sider af drivakslen (11) og er anbragt sådan, at låseelementets (11) og sikringselementets (25) aktiveringsstænger (17, 27) ved drejning af drivakslen (21) overstrækkes ud af oplåsepositionen ind i låsepositionen, og hver bevæger sig forbi et dødpunkt.

4. Hurtigkoblersystem ifølge det foregående krav, hvor sikringselementet (25) via aktiveringsstangen (27) og drejeindstillingsdelen (26) i det mindste i det væsentlige er koblet slørfrit til drivakslens (21) drejebevægelse, og drivakslens (21) drejebevægelse omsættes tvangsstyret til en indstillingsbevægelse for sikringselementet (25), mens låseelementet (11) har en begrænset frigang i forhold til drivakslen (21), som foretrukket er tilknyttet en forspændingsanordning til forspænding i en endeposition af frigangen.

5. Hurtigkoblersystem ifølge et af de foregående krav, hvor udsparingen (8) i det mindste delvist er en gennemgangsudsparing (8a), som er udformet åbent imod både den side af koblerkorpusset (7), som vender mod den koblerdel (3), der skal tilkobles, og den modsatte side af koblerkorpusset (7), hvor udsparingen (8) i tværgående retning i forhold til planet for koblingsbevægelsen har en fri bredde (B) på mere end 1/2 eller mere end 2/3 af bredden af det samlede koblerkorpus (7) og i længderetningen, som forbinder de to tilkoblings- og låseoptag (6, 10), har en længde (L) på mere end 1/3 eller mere end 1/2 af afstanden mellem tilkoblings- og låseoptagene (6, 10).

6. Hurtigkoblersystem ifølge et af de to foregående krav, hvor udsparingen (8) i kantsiden er omsluttet af afstivende og/eller styrkeøgende kantvulster (23) af koblerkorpusset (7), hvor i området med de nævnte kantvulster (23) tykkelsen (D) af koblerkorpusset (7) udgør et multipel af koblerkorpusset (7) i området med udsparingen (8), hvor særligt den nævnte udsparing (8) danner en skål- eller karformet fordybning i en underside af koblerkorpusset (7), som er omsluttet af de nævnte kantvulster (23) på i det mindste to eller tre sider, hvor aktuatordrevet (12) i det mindste delvist er optaget indvendigt i eller i området med kantvulsterne (23).

7. Hurtigkoblersystem ifølge et af de foregående krav, hvor en fjederanordning (20) er koblet sådan med drejeindstillingsdelen (16), at der ved drejning af drejeindstillingsdelen (16) køres forbi et dødpunkt, og drejeindstillingsdelen (16) kan spændes af fjederanordningen (20) i modsatrettede endepositioner, hvor fjederanordningen (20) forspænder en spændestang (18), som er leddelt koblet på drejeindstillingsdelen (16) og føres forskydeligt på koblerkorpusset (7).

8. Hurtigkoblersystem ifølge det foregående krav, hvor fjederanordningen (20) og låseelementets (11) aktiveringsstang (17) er anbragt på modsatte sider af

drejeindstillingsdelen (16) og strækker sig langs et fælles plan, som er orienteret vinkelret på drejeindstillingsdelens drejeakse.

9. Hurtigkoblersystem ifølge et af de foregående krav, hvor aktuatordrevet (12) har to aktuatordrevmoduler omfattende respektive drejeindstillingsdele (16, 26) og aktiveringsstænger (17, 27) til hver et simpelt modsatbevægeligt låse- og sikringselement (11, 25) og en fjederanordning (20), som strækker sig i modsatte sideliggende kantområder af koblerkorpusset (7) og/eller langs modsatte sider af udsparingen (8) og er tilvejebragt til forspænding af to låseelementer (11), som er tilknyttet låseoptaget (10), og af to sikringselementer (25), som er tilknyttet tilkoblingsoptaget (6), hvor drejeindstillingsdelene (16, 26) af de to aktuatordrevmoduler af aktuatordrevet (12) er rotatorisk synkroniseret og koblet med hinanden ved hjælp af den fælles drivaksel (21) og/eller et indførbart aktiveringsværktøj (15).

10. Hurtigkoblersystem ifølge et af de foregående krav, hvor den fælles drivaksel (21) har en justeringsaktuatortilslutning til tilslutning af en justeringsaktuator (35) aktiveret ved ekstern energi til drejning af drivakslen (21).

11. Hurtigkoblersystem ifølge det foregående krav, hvor justeringsaktuatoren (35) i det mindste omfatter en trykmiddelcylinder (36), som i det væsentlige strækker sig parallelt med et forbindelsesplan, som både går gennem tilkoblingsoptaget (6) og gennem låseoptaget (10).

12. Hurtigkoblersystem ifølge et af de to foregående krav, hvor justeringsaktuatoren (35) omfatter en elektrisk motor og/eller en elektrisk justeringsaktuator.

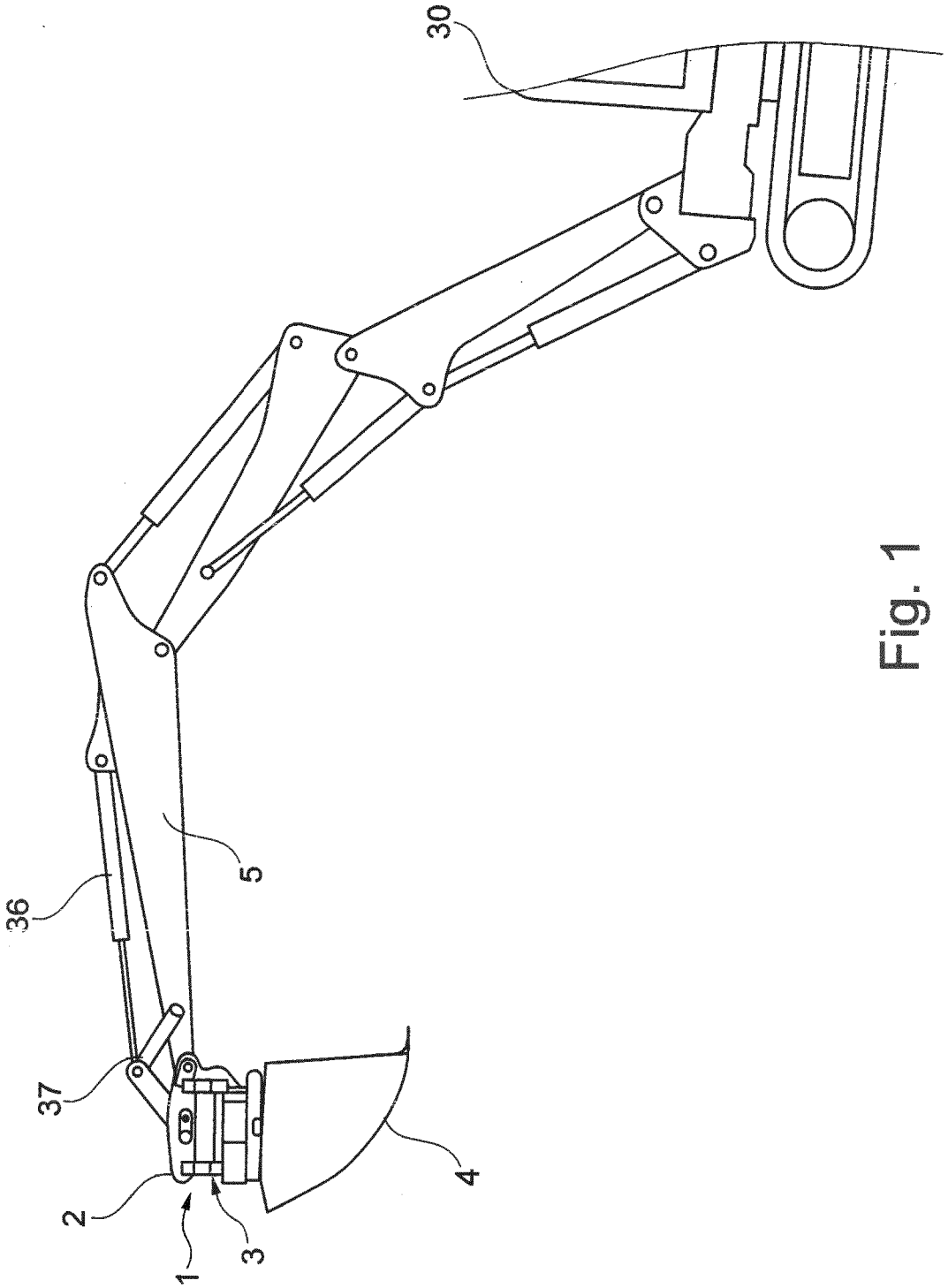

Fig. 1

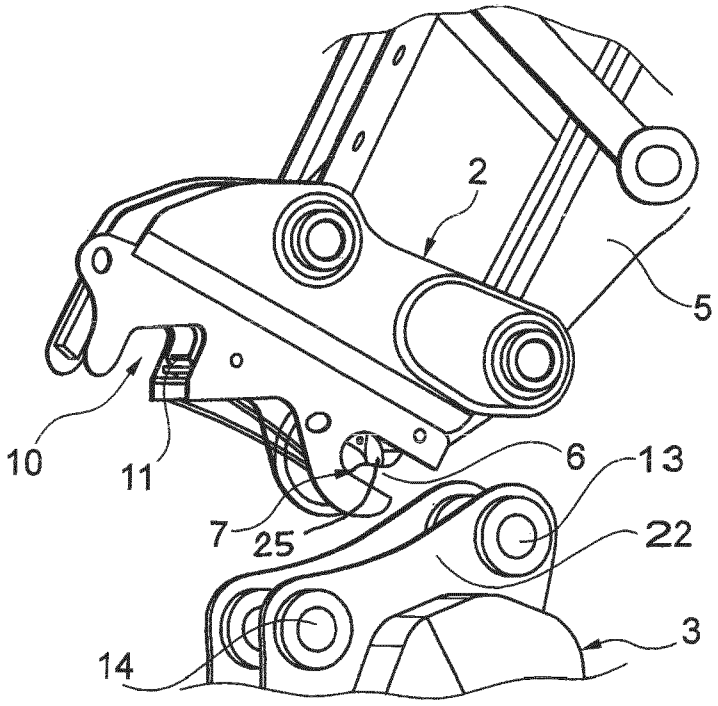

Fig. 2

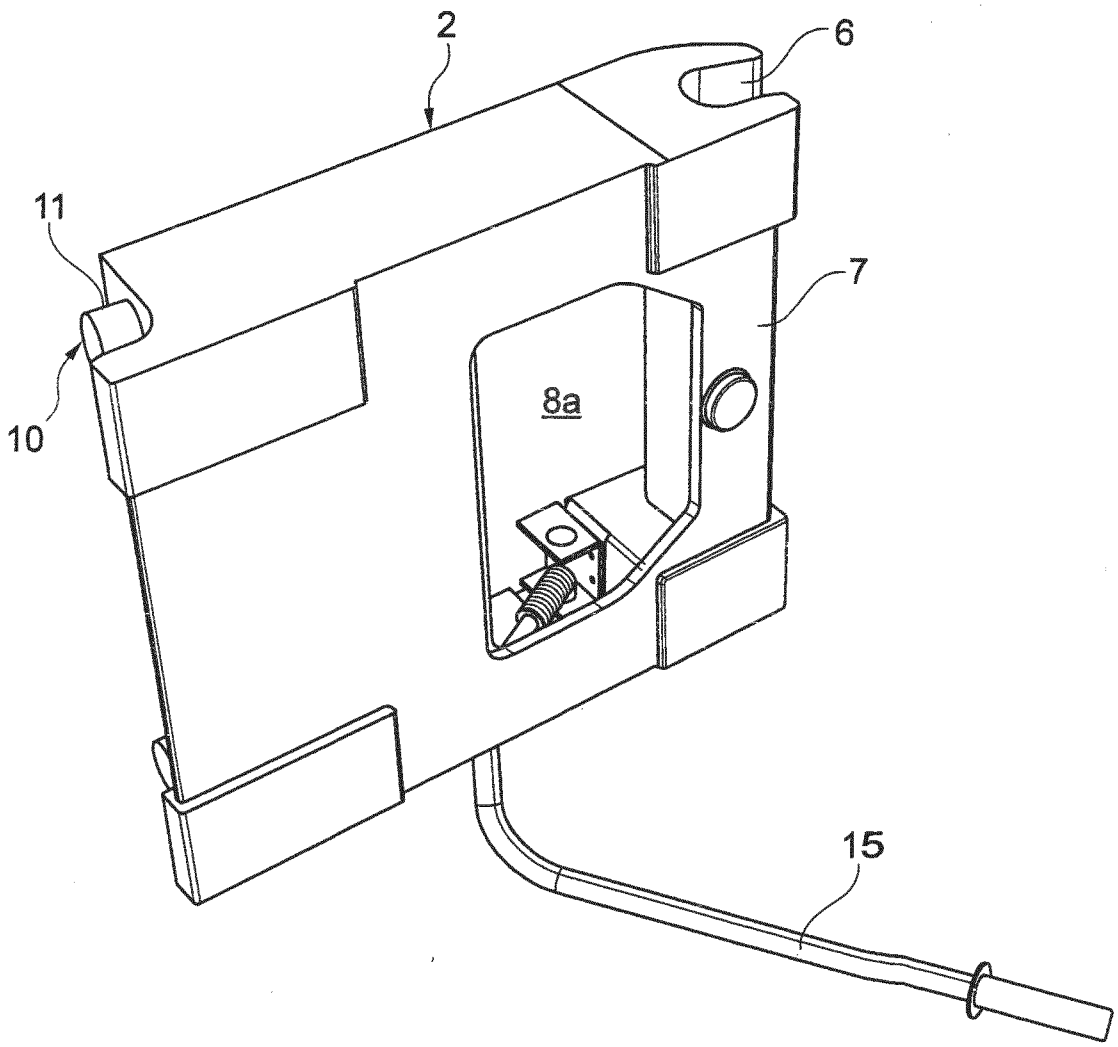

Fig. 3

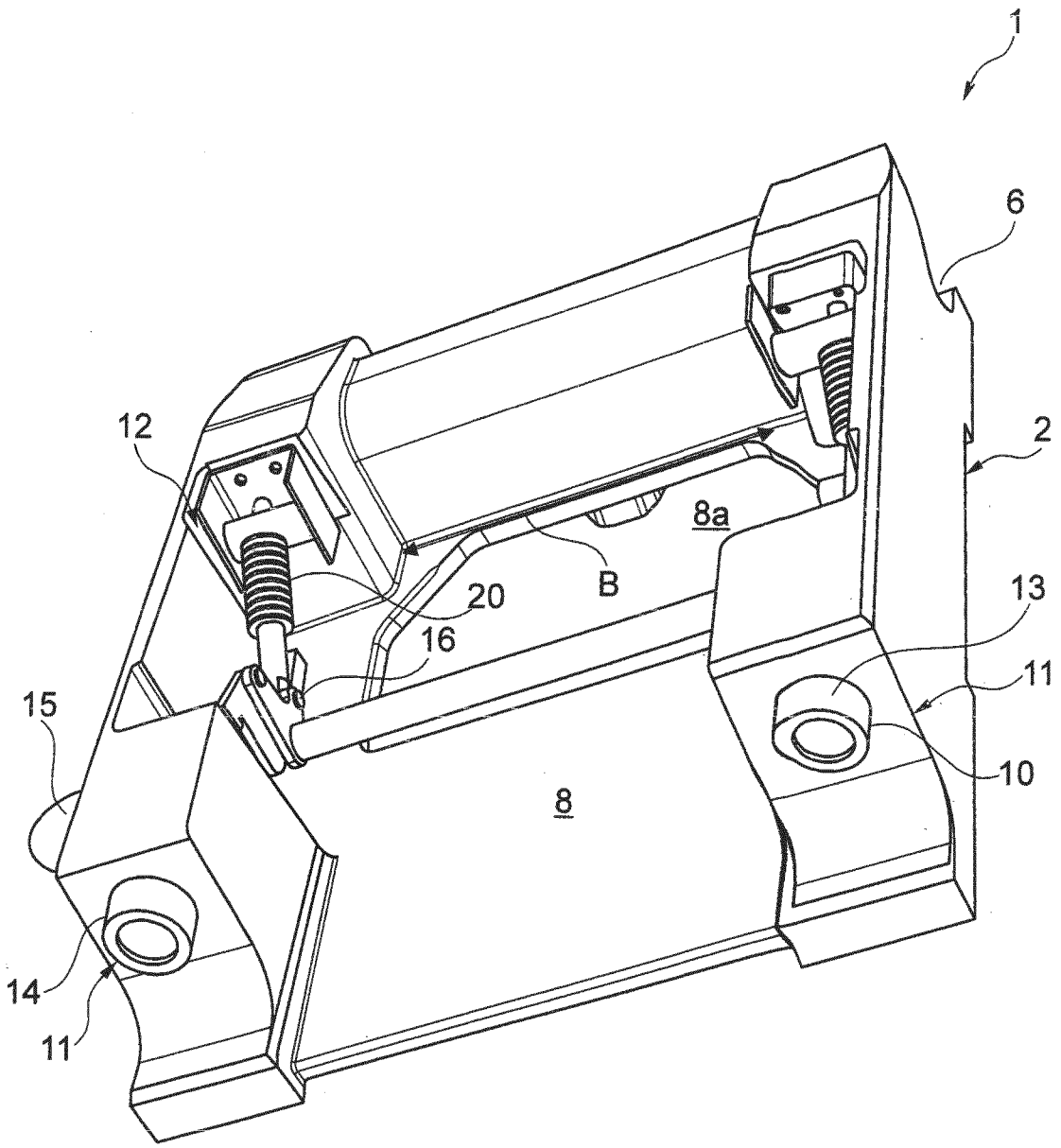

Fig. 4

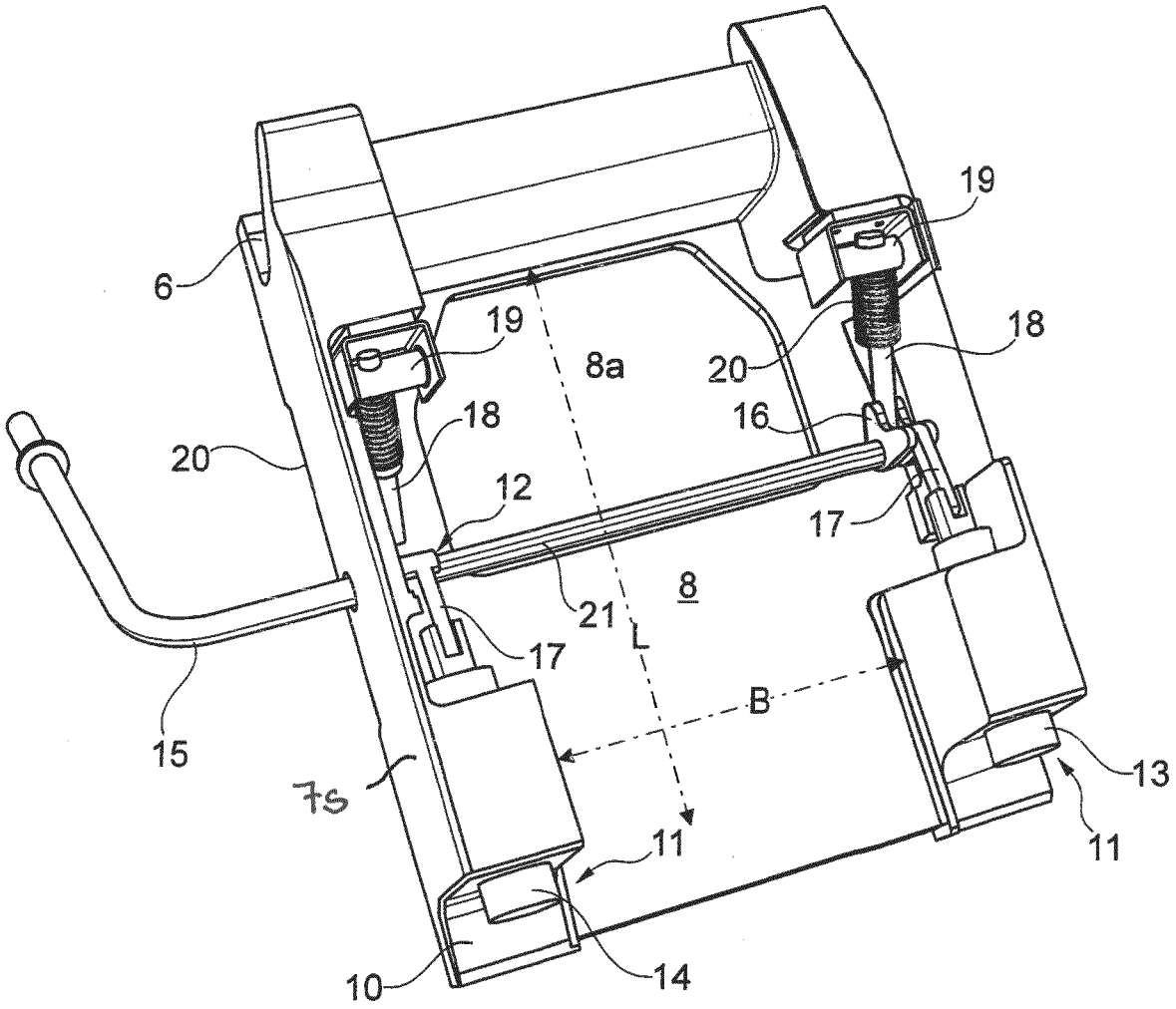

Fig. 5

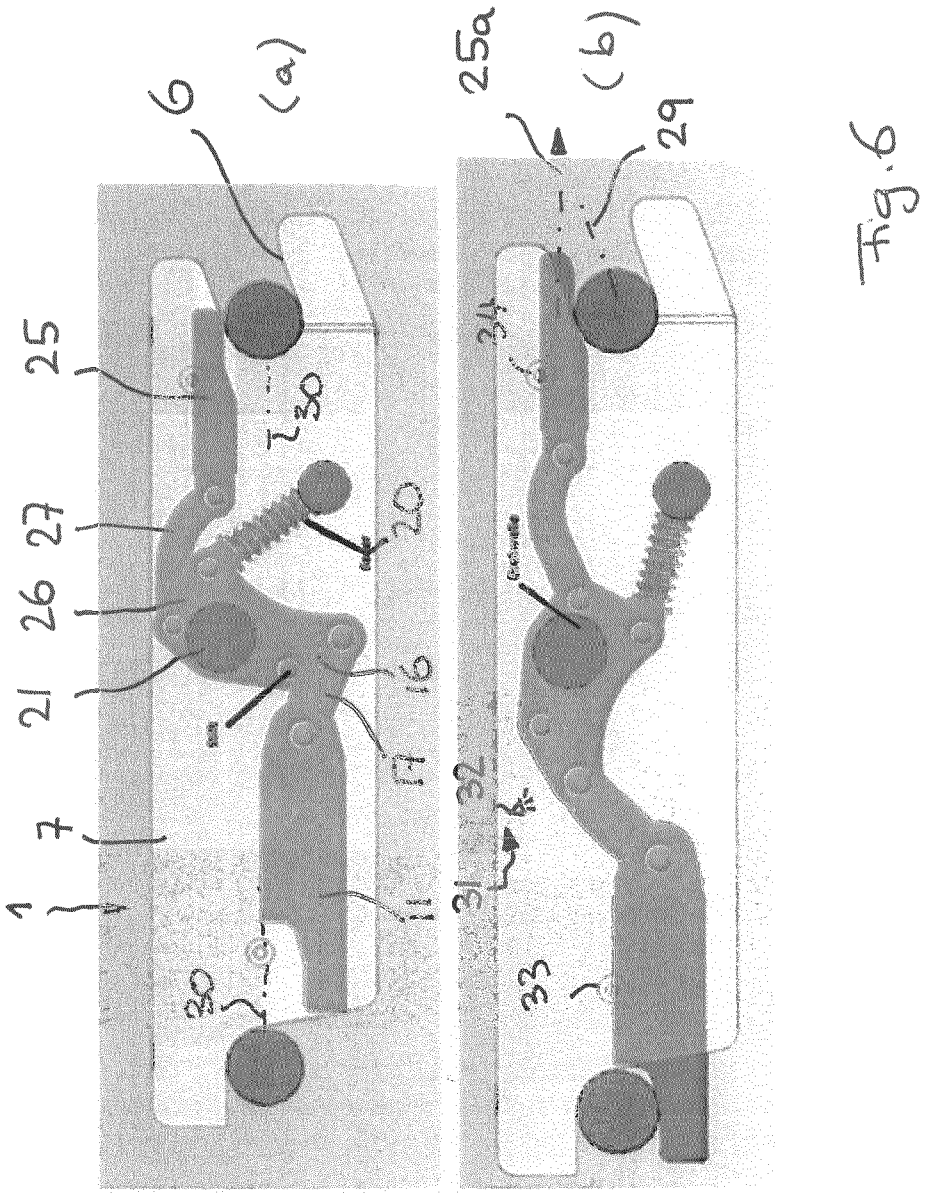

Fig.6

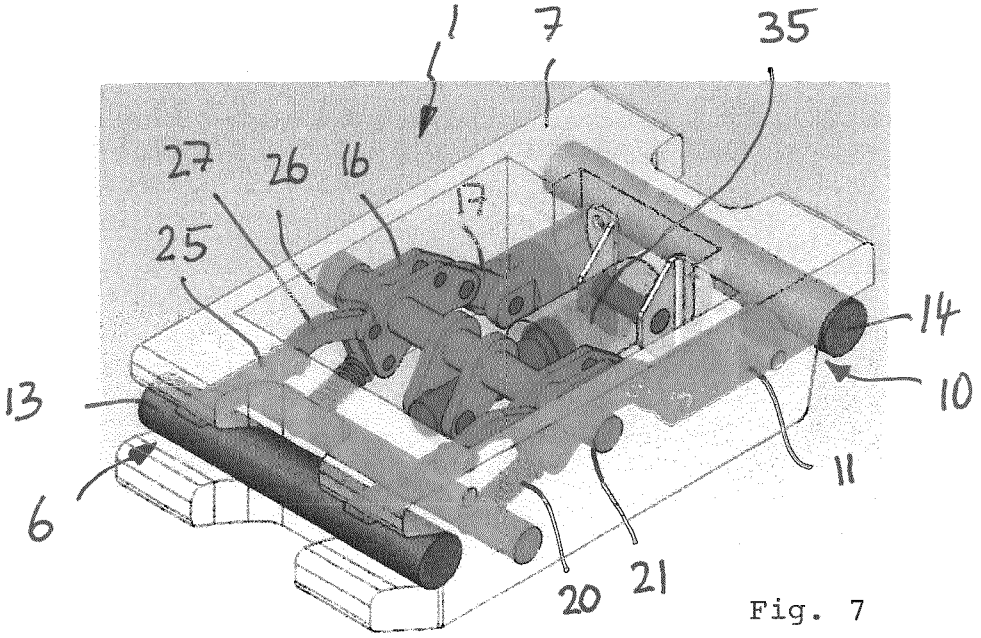

Fig. 7

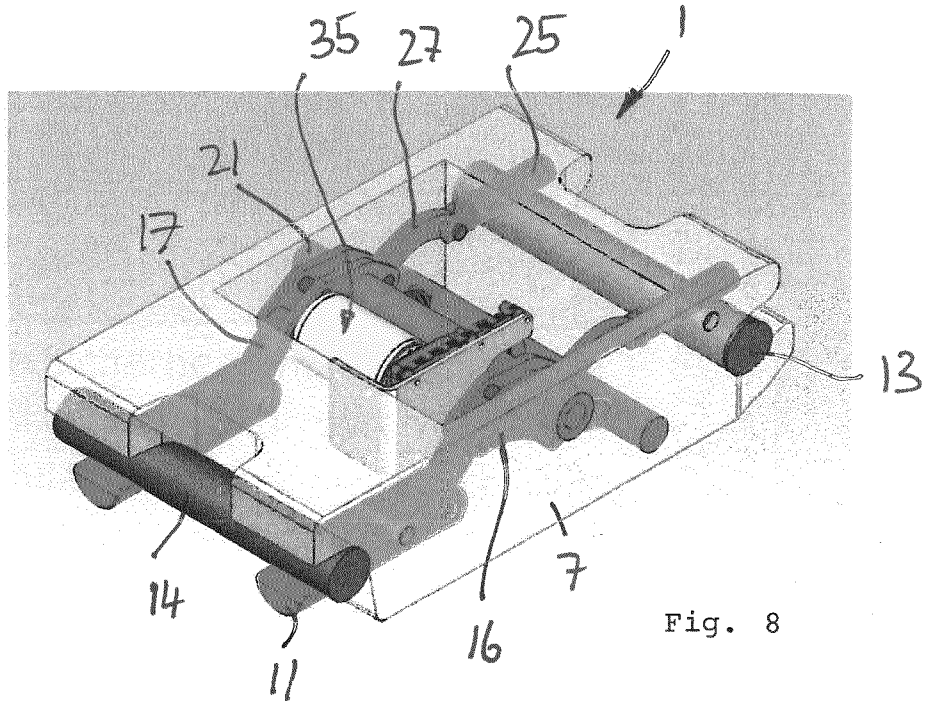

Fig. 8