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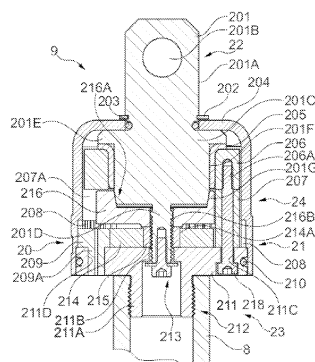
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 (57) Abstract:

This invention relates to a hoist device comprising a linear actuator, said linear actuator (6) comprising an electric motor drive (5), an outer tube (7) and an inner tube (8) that is axially movable in an out of the outer tube (7),

said hoist device (1, 13, 12) comprising a lifting arm (1) and a frame structure (12, 13), wherein said lifting arm (1) is pivotally attached to said frame structure (12, 13) and said linear actuator (6) is pivotally attached at one end to said frame structure (12, 13) and at a second end to said lifting arm (1),

wherein further a manual lowering device (9) arranged to enable lowering of said lifting arm (1) without use of said motor drive (5), said lowering device (9) being connected between the outer end of the inner tube (8) and an attachment device (10) of said lifting arm (1), said manual lowering device (9) comprising a stationary part (22), a rotatable part (23), a coupling (24) and a manually an operated transmission device (20, 21), where in said stationary part (22) includes a first threaded member (201D, 319B), preferably in the form of a stub shaft, and said rotatable part (23) is connected to a threaded, clamp activating second threaded member (215, 315), preferably in the form of a nut device, interacting with said first threaded member (201D, 319B), wherein the axial position of said clamp activating second threaded member (215, 315) is arranged to control said coupling (24) to be in engaged or disengaged state and wherein said manually operated transmission device (20, 21) is arranged to control the axial position of said clamp activating second threaded member (215, 315).



ABSTRACT

This invention relates to a hoist device comprising a linear actuator, said linear actuator (6) comprising an electric motor drive (5), an outer tube (7) and an inner tube (8) that is axially movable in an out of the outer tube (7),

- 5 said hoist device (1, 13, 12) comprising a lifting arm (1) and a frame structure (12, 13), wherein said lifting arm (1) is pivotally attached to said frame structure (12, 13) and said linear actuator (6) is pivotally attached at one end to said frame structure (12, 13) and at a second end to said lifting arm (1),
- wherein further a manual lowering device (9) arranged to enable lowering of said lifting
- 10 arm (1) without use of said motor drive (5), said lowering device (9) being connected between the outer end of the inner tube (8) and an attachment device (10) of said lifting arm (1), said manual lowering device (9) comprising a stationary part (22), a rotatable part (23), a coupling (24) and a manually an operated transmission device (20, 21),
- wherein said stationary part (22) includes a first threaded member (201D, 319B),
- 15 preferably in the form of a stub shaft, and said rotatable part (23) is connected to a threaded, clamp activating second threaded member (215, 315), preferably in the form of a nut device, interacting with said first threaded member (201D, 319B), wherein the axial position of said clamp activating second threaded member (215, 315) is arranged to control said coupling (24) to be in engaged or disengaged state and wherein said
- 20 manually operated transmission device (20, 21) is arranged to control the axial position of said clamp activating second threaded member (215, 315).

HOIST DEVICE COMPRISING A LINEAR ACTUATOR WITH A MANUAL LOWERING DEVICE

TECHNICAL FIELD

- 5 The present invention relates to a hoist device comprising a linear actuator, said linear actuator comprising an electric motor drive, an outer tube and an inner tube that is axially movable in an out of the outer tube,
- said hoist device comprising a lifting arm and a frame structure, wherein said lifting arm is pivotally attached to said frame structure and said linear actuator is pivotally attached
- 10 at one end to said frame structure and at a second end to said lifting arm,
- wherein further a manual lowering device arranged to enable lowering of said lifting arm without use of said motor drive, said lowering device being connected between the outer end of the inner tube and an attachment device of said lifting arm, said manual lowering device comprising a stationary part, a rotatable part, a coupling and a manually
- 15 an operated transmission device.

BACKGROUND ART

- Linear actuators are well-known components for use in machines and control devices, not at least they are widely used within the hospital and care sectors, where they are
- 20 used for adjustable furniture such as patient lifting devices, beds etc., i.e. a kind of hoist device. In this kind of applications, the linear actuator transfers a force between the attachment points of the actuator.

- Basically a linear actuator comprises a spindle driven by a reversible electric motor
- 25 through a transmission. On the spindle there is a nut having an activation rod secured thereto. By fixing the spindle nut against rotation, this moves in or out of the spindle depending of the direction of rotation of the motor and with the spindle nut, the activation rod is either extended or retracted.

- 30 The actuator may be equipped with a manual lowering function. Manual operation may be desired in different kind of applications to facilitate lowering also when the motor is out of operation. In some applications it may even be required, e.g. for actuators incorporated in patient lifts to make it possible to lower the patient despite of power failure.

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From DE 196 47 556 A1 there is known such a device where the activation rod is released by pulling out a pin, and in doing so, the activation rod may manually be

turned. Further DK 130 460 discloses an activation rod that is retained by a split bushing which may be loosened by means of an operating hand lever. DE 199 50 689 discloses a construction having two coupling parts with teeth, which are spring loaded for mutual mesh. By releasing the clutch, the activation rod may manually be rotated
 5 inwards. EP 0 789 665 discloses a design with a prestressed friction disc, where the friction is adopted so that the activation rod is secured against rotation during normal operation, but may be overcome with an external torque, i.e. by turning a bushing causing the activation rod to be screwed backwards. WO 2007/025550 A1 and WO 2009/097856 A1 disclose a design with a coil spring, which as a clutch spring with a
 10 number of windings, placed tightly around the cylindrical part connected to the front mounting and with an end is secured to the other cylindrical part connected to the activation rod. The device is operated by means of an operating handle designed as a bushing, in which the upper end of the spring, which is located opposite the cylindrical part connected to the front mounting, is secured.

15 The above design is generally based on the use of an actuator where the spindle/nut in itself is self-locking. However, to achieve better efficiency of an actuator there are many advantages gained by using a design having a non-self-locking spindle, and preferably instead provide a gearing and motor that provides sufficient self-locking ability.

20 From EP 1 457 710 A1 it is known a design based on a non-self-locking spindle comprising a braking mechanism in combination with a claw clutch surrounded by a coil spring, functioning as a coupling. By rotating the operating handle to a certain angle, the claw clutch is released and the load on the mounting fittings thus causes the
 25 spindle nut, and the activation rod connected thereto, to be screwed inwards on the non-self-locking spindle, by means of which the claw clutch again engages the retracting spring and thus hinders the further movement of the activation rod.

30 There are problems related to known emergency lowering mechanisms in that they are either too risky to use in connection with a non-self-locking spindle and/or too complex (e.g. the need of both a brake device and a coupling device) and/or too dependent on load and are sensitive to the friction, which during operation changes from a static friction to a dynamic friction, which may result in that the lowering occurs at an uncontrolled speed or that it requires so much torque that the operation becomes
 35 difficult, or even impossible.

SUMMARY OF THE INVENTION

The main object of the present invention is to provide a linear actuator which eliminates or at least minimizes any or some of the problems mentioned above, which is achieved in accordance with a device in accordance with claim 1.

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Thanks to the invention there is provided a reliable lowering device for the linear actuator of a hoist device, which moreover is relatively simple in its construction and which enables easy maneuvering without need of applying large forces for its activation.

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According to further aspects of the invention it may be preferred;

- that manually operated transmission device includes a manual maneuvering part and a planetary gear having a plurality planetary gears and a sun gear wheel that is interlocked with said clamp activating nut device, which provides the
15 advantage that the axial displacement may be achieved with application of a relatively low torque.
- that plurality planetary gears interfit with a dented wheel arranged on the manual maneuvering part, wherein preferably said manual maneuvering part includes a
20 gripable knob having said dented wheel integrated therewith, which provides the advantage that an easy and cost efficient technical solution may be provided for a safe and secure lowering device.
- that coupling is in the form of a stack of discs., which provides the advantage
25 that a reliable and cost efficient technical solution may be provided for a secure operation of the lowering device.
- that rotatable part, includes an axial thrust bottom plate that supports an axial thrust sleeve arranged to transfer thrust and to provide space for a transmission,
30 which provides the advantage that an easy and cost efficient technical solution may be provided for a safe and lowering device, and preferably that axial thrust bottom plate also rotatably supports at least one member of said transmission.
- that said there is arranged at least one bearing between said stationary part and
35 said rotatable part arranged to provide for easy maneuvering of the manually operated transmission device, preferably in the form of a sliding bearing., which

provides the advantage that an easily handled and cost efficient technical solution may be provided.

- 5 - that said manually operated transmission device forms a housing arranged to enclose at least most of the parts of the lowering device which provides the advantage that an easy and cost efficient technical solution may be provided for a protect lowering device.

BRIEF DESCRIPTION OF THE DRAWINGS

10 In the following, the invention will be described in more detail with reference to preferred embodiments and the appended drawings, where,

Fig. 1 shows a side view of an embodiment according to the invention,

15 Fig. 2 shows a cross sectional view of a part of a manual lowering device according to a first embodiment of the invention,

Fig. 3 shows a cross-sectional view of a second embodiment of the invention, and,

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Fig. 4 shows an exploded view of the second embodiment of the invention.

DETAILED DESCRIPTION

25 In Fig 1 there is shown hoisting device, preferably for the use as a patient lifting device, which includes a lifting arm 1, that is pivotally attached to a frame structure 12, 13 by means of an arm joint 2. As presented in Fig. 1 the lifting arm 1 can tilt up and down about an arm joint 2 by means of a linear actuator 6. The linear actuator includes an inner tube 8 which can be moved backwards and forwards within an outer tube 7. As is well known in the art (therefore not shown in detail) the inner tube 8 meshes within the outer tube 7 with a driving means 5 including a driving motor. The inner tube 8 is pivotally attached to the lifting arm 1 via a top end bracket 10 and the driving means 5/outer tube 7 is pivotally attached to the frame structure 13 via a low end bracket 11.

35 Normally the inner tube 8 is prevented from rotating and will travel upwards or downwards depending on the moving direction of the driving means 5. Thus, according to the known art the inner tube 8 is non-rotatable fixed to the lifting arm 1. Accordingly,

if the driving motor should collapse or its supply of electricity should be broken there is a need for a manual lowering device 9, if it is desired to provide for lowering also in such situations. The manual lowering device 9 is a connector between the free end of the inner tube 8 and the lifting arm 1.

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In Fig. 2 there is shown a cross-sectional view of a manual lowering device 9 in accordance with a first embodiment according to the invention. This manual lowering device 9 may in case of fault in the normal drive system 5 provide for a possibility to achieve a lowering function by means of manual maneuvering of the manual lowering device 9. The manual lowering device 9 comprises four basic parts. A first one is an upper stationary part 22. A second one is a rotatable part 23. A third one is a manually operated transmission device part 20, 21, and a fourth one is a coupling 24.

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The stationary part 22 is non-rotatably fixed to the top end bracket 10. The rotational part 23 is attached to the inner tube 8 by means of threads 212 and is rotatable in at least one direction due to the fact that the inner tube 8 is rotatably arranged within the nut 60 of the linear actuator 6.

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The coupling part 24 provides the possibility to either have the stationary part 22 and the rotational part 23 non-rotationally connected to each other or have the rotational part 23 rotational in relation to the stationary part 22. The manually operated transmission device part 20, 21 may be activated to provide for decoupling of the coupling 24 by means of a transmission 21, that transmits movement from a manual maneuvering part 20 to a coupling force member 215 that controls whether the coupling 24 is in a coupled or decoupled state.

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The stationary part 22 comprises a top end bracket attachment part 201 having an upper portion 201A with an attachment hole 201B. A lower portion 201C has an external threaded stub shaft 201D centrally positioned at its bottom end. The threaded stub shaft 201D has an inner threaded bore adapted for a mounting screw 213 and washer that positions an axial thrust bottom plate 211 of the rotatable part 23. Between the upper portion 201A and the lower portion 201C there is a flange portion 201E. In between the flange portion 201E and the threaded stub shaft 201D there is a generally cylindrical body portion of a smaller diameter than the flange portion 201E, presenting a cylindrical upper surface portion 201F and a frustoconical lower surface portion 201G.

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An axial and radial thrust bearing 205, in the form of a socket, having an L-shaped cross-sectional shape, is applied onto the cylindrical part 201F and in contact with the lower surface of the flange 201E. The coupling force member 215 is threaded onto the outer threads of the threaded stub shaft 201D. A lowering knob 204 that also forms a

5 housing for the lowering device 9 has a central opening that encloses the upper portion 201A of the stationary part 22 and that rests upon the upper surface of the flange 201E. The manual knob 204 is rotatably attached to the stationary part 22, by means of a clip 202 that keeps it in place and a sealing 203 that allows the knob to rotate in relation to the upper bracket attachment device 201. Adjacent the lower end of the manual knob

10 204 there is a seal 210 that also allows rotation. Above the position for the seal 210 there are arranged inner dents 208 providing a gear wheel intended to interact with planetary gears 209 of a planetary transmission 21 (see further details below).

The rotating part 23 comprises an axial thrust bottom plate 211. The axial thrust bottom

15 plate 211 has a downwardly extending stub shaft 211A with threads 212 for the inner tube 8. The stub shaft 211A is hollow to provide space for the attachment screw 213 and washer. Within the hollow of the stub shaft 211 there is a collar 211B for interaction with the washer to secure the axial thrust bottom plate 211 axially in relation to the top end bracket attachment device 201. Further the axial thrust bottom plate 211 presents a

20 plurality (e.g. three) axially extending through holes 211C for mounting screws 218. It also presents through holes 211D (which need not be through holes to fulfil the functions) to rotatably support a shaft end 209A of planetary gears 209, which are also provided in a plurality, (e.g. three).

Also included in the rotational part 23 is an axial thrust sleeve 207. The thrust sleeve

25 207 is in the form of a cylindrical sleeve arranged with openings 207A to accommodate the planetary gears 209. In this embodiment the width of the sleeve 207 is sufficiently thick to have the mounting screws 218 passing through via longitudinal through holes. On top of the axial thrust sleeve 207 is an axial top thrust plate 206. The top thrust plate

30 206 is provided with threaded bores 206A adapted for interaction with the mounting screws 218 to securely clamp the axial thrust sleeve 207 between the axial thrust bottom plate 211 and the axial thrust top plate 206. The axial thrust top plate 206 has its inner surface and upper surface in contact with the sliding bearing 205, which facilitates rotational movement between the stationary part 22 and the rotational part 23 at a

35 relatively low friction, e.g. to facilitate easy tightening of the coupling parts reliably also at low loads and thus low torques.

The coupling part 24 includes a rotatable coupling member 216. The rotatable coupling member 216 is in the form of a disc provided with a central hole 216B to allow for passage of the stub shaft 201D of the stationary part 22. Further it has a centrally
 5 positioned upper void that is radially delimited by means of an upwardly diverging frustoconical surface 216A. This frustoconical surface 216A has the same angle α as the frustoconical surface 201G of the stationary part 22. The rotatable coupling member 216 may be axially repositioned by means of movement of the coupling activation nut 215. Accordingly, when the coupling activation nut 215 is tightened (moved upwardly
 10 in the figures) the rotatable coupling member 216 will be clamped into interlocking engagement with the stationary part 22, by means of the frustoconical surface 201G and 216A respectively. Likewise, the rotational coupling member 216 will be out of clamping engagement with the stationary part 22 when the clamp activating nut 215 is not tightened, due to insufficient friction/clamping action between the frustoconical
 15 surfaces 201G, 216A.

The planetary transmission 21 comprises a sun gear wheel 214 that is radially interlocked with the clamp activating nut 215, e.g. by means of an adapted hexagon central through hole 214A. At the periphery of the sun gear wheel 214 there are dents
 20 adapted to interfit with the dents of the planetary gears 209.

The manual maneuvering part 20 comprises a gripable knob 204, forming a kind of housing covering the inner parts of the manual lowering device 9. On the inner side of the gripable knob 204 there are dents forming a dented wheel 208. When the knob 204
 25 is rotated it will cause the planetary gears to rotate which in turn will cause the sun gear wheel 214 to rotate. When the sun gear wheel 214 rotates it will bring with it the coupling activating nut 215. Accordingly, when the manual lowering knob 204 is rotated in a first direction it will affect the coupling activating nut 215 to untighten, thereby separating the coupling part 24, i.e. the frustoconical surfaces 201G, 216A and
 30 allow for rotational movement of the rotatable part 23. When the rotational part 23 is rotated in that first direction the inner tube will also be rotated and in a direction that will move the inner tube 8 downwardly due to interaction with the actuator nut 60.

Accordingly, at the same time as the coupling activating nut 215 is threaded
 35 downwardly also the inner tube will rotate and move downwardly. As a consequence, there will be created a gap between the frustoconical surfaces 201G, 216A.

Now, if a load of sufficient magnitude is applied onto the top end bracket device 201 (e.g. a load from a person hanging on to the handle on the lifting bar 1), a counterforce will be created in the linear actuator nut 60, which, if the pitch of the inner tube and nut 60 is large enough will cause rotational movement of the inner tube 8, forcing the inner
 5 tube downwardly in interaction with the linear actuator nut 60. Simultaneously, the rotation of the inner tube 8 will affect the axial thrust bottom plate 211 to rotate together with it and thereby cause the planetary gears 9 to rotate, which in turn will affect the sun wheel 214 to rotate in a second direction to tighten the coupling activating nut 215. Accordingly, an intermittent maneuvering of the manual knob 204 will arrange for a
 10 lowering of the lifting arm.

As is evident for the skilled person the manual lowering device 9 will always be in its coupled state when the motor unit 5 is running, since there will be a rather large momentum acting on the inner tube 8 when the actuator is expanding due to the
 15 gravitational force, whereas when rotating the actuator in the other direction the gravitational force will provide for a very little momentum acting of the inner tube, which is insufficient to affect decoupling of the coupling 24. This is especially true if there is load applied to the lifting arm 1, which load will also provide a reaction that forces the coupling activating nut 215 to be tightened, as described above.

20 In Fig. 4 there is shown a second embodiment of a manual lowering device 9 in accordance with the invention, wherein a majority of the parts are more or less the same as that already described in connection with the first embodiment. Therefore, the same reference numerals have been used except for the fact that 3 is set in front of a detail
 25 providing the same kind of functionality as the one described in connection with the first embodiment, e.g. 206/306, 207/307, 208/308, etc., and will therefore not be described in more detail below.

The main difference between the first and second embodiment is that in the second
 30 embodiment a different kind of coupling 24 is used. The coupling 24 used in the second embodiment is more reliable due to the fact that a larger amount of interacting surfaces is used in the second embodiment compared to the one in the first embodiment. In the second embodiment the interacting surfaces are achieved by stacking a plurality of stationary discs 316 intermixed with a plurality of rotatable discs 317. From Fig. 4 it is
 35 more clear that the stationary coupling shaft 319 has a hexagonal intermediate portion 319A which interfit with hexagonal holes of the stationary discs 317. The rotational

discs 316 are connected to rotate with the rotational part 23 by means of the mounting screws 318 and peripheral recesses 316A that interfit with the mounting nut 318.

- A corresponding planetary transmission 21 is also used in the second embodiment. A difference is that the mounting screws 318 are here used as shafts to also rotationally position the planetary gears 309 to rest upon the upper surface of the axial thrust bottom plate 311. Also the use of a coupling activating nut 315 is the same, which via a lower coupling force washer 320 and an intermediate lower break force washer 321 (which transfer pressure to the outer periphery of the discs 316, 317), may couple the discs 316, 317 together and decouple the discs 316, 317 respectively. Thanks to the use of a plurality of discs a much more gradual interaction may be achieved between the coupling discs 316, 317 making the coupling 24 easier to control, especially easier to decouple.
- Also here a bearing 305 is used to facilitate rotation between the rotational and stationary parts 22, 23. The bearing is preferably of a low friction type to avoid issues with tightening the coupling parts reliably also at low loads and thus low torques. To further minimize the required torque to manually disengage the coupling 24, this embodiment further uses a low friction member 325, preferably in the form of a washer, between the coupling activating nut 315 and the lower coupling force washer 320. The invention is not limited by the embodiments described above but may be varied within the scope of the appended claims. For instance, it is evident for the skilled person that the decoupling may be achieved by other means than the use of planetary transmission. For instance, it may function well to use a worm gear, wherein the manual hub 204 would suitably be exchanged to instead use a little crank to achieve the coupling. An even simpler modification would be to instead have the manual knob 204, 304 slidably arranged onto the upper bracket mounting device 201, and to merely use a wrench for deactivation of the coupling by means of untightening the coupling activating nut 215, 315. Also other embodiments for this transmission 21 regarding this aspect are easily foreseeable for the skilled person. Further it is evident that the clamp activating nut device may be in many various forms, e.g. integrated or a separate part, but that it is beneficial to use a separate, easily obtained standard nut (e.g. hexagonal).

CLAIMS

1. A hoist device comprising a linear actuator, said linear actuator (6) comprising an electric motor drive (5), an outer tube (7) and an inner tube (8) that is axially movable in an out of the outer tube (7),
 - 5 said hoist device (1, 13, 12) comprising a lifting arm (1) and a frame structure (12, 13) , wherein said lifting arm (1) is pivotally attached to said frame structure (12, 13) and said linear actuator (6) is pivotally attached at one end to said frame structure (12, 13) and at a second end to said lifting arm (1), wherein further a manual lowering device (9) arranged to enable lowering of said
 - 10 lifting arm (1) without use of said motor drive (5), said lowering device (9) being connected between the outer end of the inner tube (8) and an attachment device (10) of said lifting arm (1), said manual lowering device (9) comprising a stationary part (22), a rotatable part (23), a coupling (24) and a manually operated transmission device (20, 21),
 - 15 characterized in that said stationary part (22) includes a first threaded member (201D, 319B), preferably in the form of a stub shaft, and that said rotatable part (23) is connected to a threaded, clamp activating second threaded member (215, 315), preferably in the form of a nut device, interacting with said first threaded member (201D, 319B), wherein said manually operated transmission device (20, 21)
 - 20 is arranged to control the axial position of said clamp activating second threaded member (215, 315) enabling the clamp activating second threaded member (215, 315) to untighten allowing for rotational movement of the rotatable part (23), preferably including a bearing (205, 305) between said stationary part (22) and said rotatable part (23).
 - 25
2. A hoist device according to claim 1, characterized in that said manually operated transmission device (20, 21) includes a manual maneuvering part (20) and a planetary gear (21) having a plurality of planetary gears (209) and a sun gear wheel (214) that is interlocked with said clamp activating second threaded member (215,315).
 - 30
3. A hoist device according to claim 2, characterized in that said plurality planetary gears (209) interfit with a dented wheel (208) arranged on the manual maneuvering part (20), wherein preferably said manual maneuvering part (20)
 - 35 includes a gripable knob (204) having said dented wheel (208) integrated therewith.

4. A hoist device according to any of claims 1- 3, characterized in that said coupling (24) is in the form of a stack of discs (316, 317).
- 5 5. A hoist device according to any of claims 1- 3, characterized in that said coupling (24) is in the form of frusto-conical surfaces (216, 201G).
6. A hoist device according to any preceding claim, characterized in that said rotatable part (23), includes an axial thrust bottom plate (211, 311) arranged to support an axial thrust sleeve (207) arranged to transfer thrust and to provide space
10 for a transmission (21).
7. A hoist device according to claim 6, characterized in that said axial thrust bottom plate (211, 311) also rotatably supports at least one member of said transmission (21).
15
8. A hoist device according to any preceding claim, characterized in that there is arranged a bearing (205, 305) between said stationary part (22) and said rotatable part (23) arranged to provide for easy maneuvering of the manually operated transmission device (20, 21), preferably in the form of a sliding bearing.
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9. A hoist device according to any preceding claim, characterized in that the manually operated transmission device (20, 21) forms a housing arranged to enclose at least most of the parts of the lowering device (9).
- 25 10. Method for operating a hoist device, said hoist device comprising a linear actuator (6) including an electric motor drive (5), an outer tube (7) and an inner tube (8) that is axially movable in an out of the outer tube (7), said hoist device (1, 13, 12) comprising a lifting arm (1) and a frame structure (12, 13), wherein said lifting arm (1) is pivotally attached to said frame structure (12, 13)
30 and said linear actuator (6) is pivotally attached at one end to said frame structure (12, 13) and at a second end to said lifting arm (1), wherein further a manual lowering device (9) enables lowering of said lifting arm (1) without use of said motor drive (5), said lowering device (9) being connected between the outer end of the inner tube (8) and an attachment device (10) of said
35 lifting arm (1), said manual lowering device (9) comprising a stationary part (22), a rotatable part (23), a coupling (24) and a manually a operated transmission device (20, 21),

- characterized by said stationary part (22) including a first threaded member (201D, 319B), preferably in the form of a stub shaft, and by having said rotatable part (23) connected to a threaded, clamp activating second threaded member (215, 315), preferably in the form of a nut device, interacting with said first threaded member (201D, 319B), wherein the axial position of said clamp activating second threaded member (215, 315) controls said coupling (24) to be in engaged or disengaged state and wherein said manually operated transmission device (20, 21) controls the axial position of said clamp activating second threaded member (215, 315),) causing the clamp activating second threaded member (215, 315) to untighten allowing for rotational movement of the rotatable part (23).
11. Method according to claim 10, wherein said manually operated transmission device (20, 21) includes a manual maneuvering part (20) and a planetary gear (21) having a plurality of planetary gears (209) and a sun gear wheel (214) that interlocks with said clamp activating second threaded member (215,315).
12. Method according to claim 11, wherein said plurality of planetary gears (209) interfit with a dented wheel (208) arranged on the manual maneuvering part (20), wherein preferably said manual maneuvering part (20) includes a gripable knob (204) having said dented wheel (208) integrated therewith.
13. Method according to claim 10, 11 or 12, wherein said engaged, coupled state is achieved by pressing a stack of discs (316, 317) into gripping contact.
14. Method according to any of claims 10-13, wherein said rotatable part (23) includes an axial thrust bottom plate (211, 311) that supports an axial thrust sleeve (207) that transfers thrust and provides space for a transmission (21).
15. Method according to any of claims 10-13, wherein a bearing (205, 305) between said stationary part (22) and said rotatable part (23) arranged to ensure that the rotatable part (23) rotates and thereby tightens the activating nut (315) throughout a wide range of loads and resulting torques, preferably in the form of a sliding bearing, and more preferred wherein a further low friction member (325) is arranged between said stationary part (22) and said rotatable part (23).

I följande bilaga finns en översättning av patentkraven till svenska. Observera att det är patentkravens lydelse på engelska som gäller.

A Swedish translation of the patent claims is enclosed. Please note that only the English claims have legal effect.

LYFTANORDNING INNEFATTANDE ETT LINJÄRT STÄLLDON MED EN MANUELL SÄNKANORDNING

1. En lyftanordning innefattande ett linjärt ställdon (6) innefattande en elektrisk
 5 motordrivenhet (5), ett yttre rör (7) och ett inre rör (8) som är axiellt rörligt in i och ut ur
 det yttre röret (7),
 varvid lyftanordningen (1, 13, 12) innefattar en lyftarm (1) och en ramkonstruktion (12,
 13), varvid lyftarmen (1) är svängbart fäst vid ramkonstruktionen (12, 13) och det
 linjära ställdonet (6) är svängbart fäst vid en ände till ramkonstruktionen (12, 13) och
 10 vid en andra ände till lyftarmen (1),
 varvid ytterligare en manuell sänkingsanordning (9) är anordnad att möjliggöra
 sänkning av lyftarmen (1) utan användning av nämnda motordrivenhet (5), varvid
 sänkingsanordningen (9) är förbunden mellan inner-rörets (8) yttre ände och en
 fastsättningsanordning (10) hos lyftarmen (1), vilken manuella sänkingsanordning (9)
 15 innefattar en stationär del (22), en roterbar del (23), en koppling (24) och en manuell
 manövrerad överföringsanordning (20, 21),
 kännetecknad av att den stationära delen (22) innefattar en första gängad del (201D,
 319B), företrädesvis i form av en axelände, och att den roterbara delen (23) är ansluten
 till ett gängat, klämaktiverande andra gängat element (215 315), företrädesvis i form av
 20 en mutteranordning, som interagerar med nämnda första gängade del (201D, 319B),
 varvid den manuellt manövrerade överföringsanordningen (20, 21) är anordnad att
 reglera det axiella läget hos det klämaktiverande andra gängade elementet (215, 315)
 som möjliggör att den klämaktiverande andra gängade delen (215, 315) lösgörs vilket
 tillåter rotationsrörelse av den roterbara delen (23), företrädesvis innefattande ett lager
 25 (205, 305) mellan den stationära delen (22) och den roterbara delen del (23).
2. Lyftanordning enligt krav 1, kännetecknad av att den manuellt manövrerade
 överföringsanordningen (20, 21) innefattar en manuell manövreringsdel (20) och en
 planetväxel (21) med ett flertal planethjul (209) och ett solhjul (214) som är
 30 sammankopplat med nämnda klämaktiverande andra gängade del (215, 315).
3. Lyftanordning enligt patentkrav 2, kännetecknad av att nämnda flertal planethjul
 (209) är inbördes förbundna med ett kugghjul (208) anordnat vid den manuella
 manövreringsdelen (20), varvid den manuella manövreringsdelen (20) företrädesvis
 35 innefattar en greppbart vred (204) med nämnda kugghjul (208) integrerat därmed.

4. Lyftanordning enligt något av kraven 1-3, kännetecknad av att kopplingen (24) är i form av en stapel skivor (316, 317).
- 5 5. Lyftanordning enligt något av kraven 1-3, kännetecknad av att kopplingen (24) är i form av stympade koniska ytor (216, 201G).
- 10 6. Lyftanordning enligt något av föregående patentkrav, kännetecknad av att den roterbara delen (23) innefattar en axiell tryckbottenplatta (211, 311) anordnad att uppbära en axiell tryckhylsa (207) anordnad att överföra tryckkraft och för att ge utrymme för en transmission (21).
7. Lyftanordning enligt patentkrav 6, kännetecknad av att den axiella tryckbottenplattan (211, 311) också roterbart stöder åtminstone en del av transmissionen (21).
- 15 8. Lyftanordning enligt något av föregående patentkrav, kännetecknad av att ett lager (205, 305) är anordnat mellan den stationära delen (22) och den roterbara delen (23) anordnat att möjliggöra enkel manövrering av den manuellt drivna överföringsanordningen (20, 21), företrädesvis i form av ett glidlager.
- 20 9. Lyftanordning enligt något av föregående patentkrav, kännetecknad av att den manuellt manövrerade överföringsanordningen (20, 21) bildar ett hus anordnat att innesluta åtminstone de flesta delarna av sänkningsanordningen (9).
- 25 10. Förfarande för att driva en lyftanordning, varvid lyftanordningen innefattar ett linjärt ställdon (6) innefattande en elektrisk motordrivenhet (5), ett yttre rör (7) och ett inre rör (8) som är axiellt rörligt in och ut i det yttre röret (7),
varvid lyftanordning (1, 13, 12) innefattar en lyftarm (1) och en ramkonstruktion (12, 13), varvid lyftarmen (1) är svängbart fäst vid ramkonstruktionen (12, 13) och det linjära ställdonet (6) är svängbart fäst vid en ände till ramkonstruktionen (12, 13) och
30 vid en andra ände till lyftarmen (1),
varvid ytterligare en manuell sänkningsanordning (9) möjliggör sänkning av lyftarmen (1) utan användning av motordrivenheten (5), varvid sänkningsanordningen (9) är förbunden mellan inner-rörets (8) yttre ände och en fastsättningsanordning (10) hos lyftarmen (1), varvid den manuella sänksanordningen (9) innefattar en stationär del
35 (22), en roterbar del (23), en koppling (24) och en manuellt styrd överföringsanordning (20, 21),

kännetecknad av att den stationära delen (22) innefattar en första gängad del (201D, 319B), företrädesvis i form av en axelände, och genom att nämnda roterbara del (23) är ansluten till en gängad, klämaktiverande andra gängad del (215, 315), företrädesvis i form av en mutteranordning, som interagerar med nämnda första gängade del (201D, 319B), varvid det axiella läget hos det klämaktiverande andra gängade elementet (215, 315) styr nämnda koppling (24) för att vara i inkopplat eller fränkopplat tillstånd och varvid den manuellt manövrerade överföringsanordningen (20, 21) styr det axiella läget för det klämaktiverande andra gängade elementet (215, 315), vilket medför att det klämaktiverande andra gängade elementet (215, 315) lösgörs så att det är möjligt att rotera den roterbara delen (23).

11. Förfarande enligt krav 10, varvid nämnda manuellt drivna överföringsanordning (20, 21) innefattar en manuell manövreringsdel (20) och en planetväxel (21) med ett flertal planethjul (209) och ett solhjul (214) som sammankopplar med nämnda klämaktiverande andra gängade del (215, 315).

12. Förfarande enligt patentkrav 11, varvid nämnda flertal planethjul (209) samverkar med ett kugghjul (208) anordnat på den manuella manövreringsdelen (20), varvid den manuella manövreringsdelen (20) företrädesvis innefattar en greppbar knopp (204)) som har det kugghjulet (208) integrerat därmed.

13. Förfarande enligt krav 10, 11 eller 12, varvid nämnda inkopplade tillstånd uppnås genom att pressa en stapel av skivor (316, 317) i greppande kontakt.

14. Förfarande enligt något av patentkraven 10-13, varvid den roterbara delen (23) innefattar en axiell tryckplatta (211, 311) som uppbär en axiell tryckhylsa (207) som överför trycket och ger utrymme för en transmission (21).

15. Förfarande enligt något av patentkraven 10-13, varvid ett lager (205, 305) mellan nämnda stationära del (22) och den roterbara delen (23) är anordnat att säkerställa att den roterbara delen (23) roterar och därmed spänner den aktiverande muttern (315) inom ramen för ett stort intervall av laster och resulterande vridmoment, företrädesvis i form av ett glidlager, och mer föredraget, varvid en ytterligare lågfriktionsdel (325) är anordnad mellan den stationära delen (22) och den roterbara delen (23).

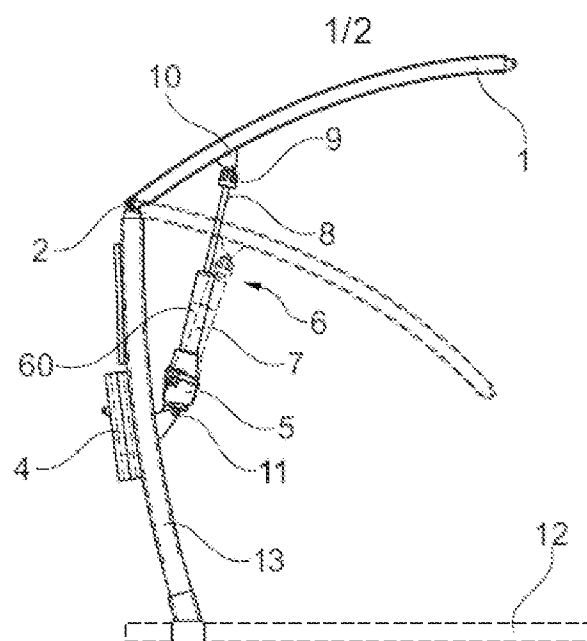


Fig. 1

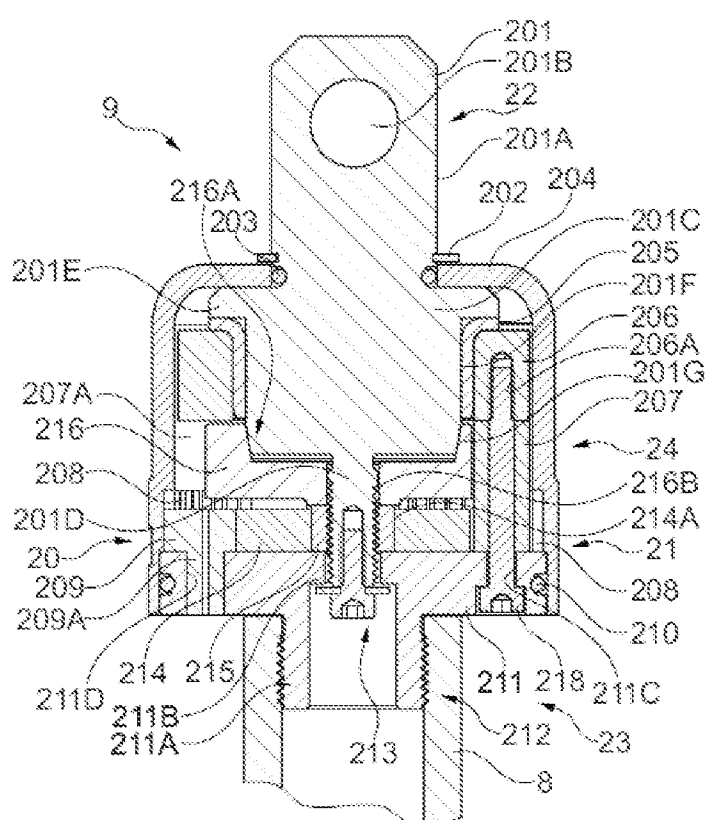


Fig. 2

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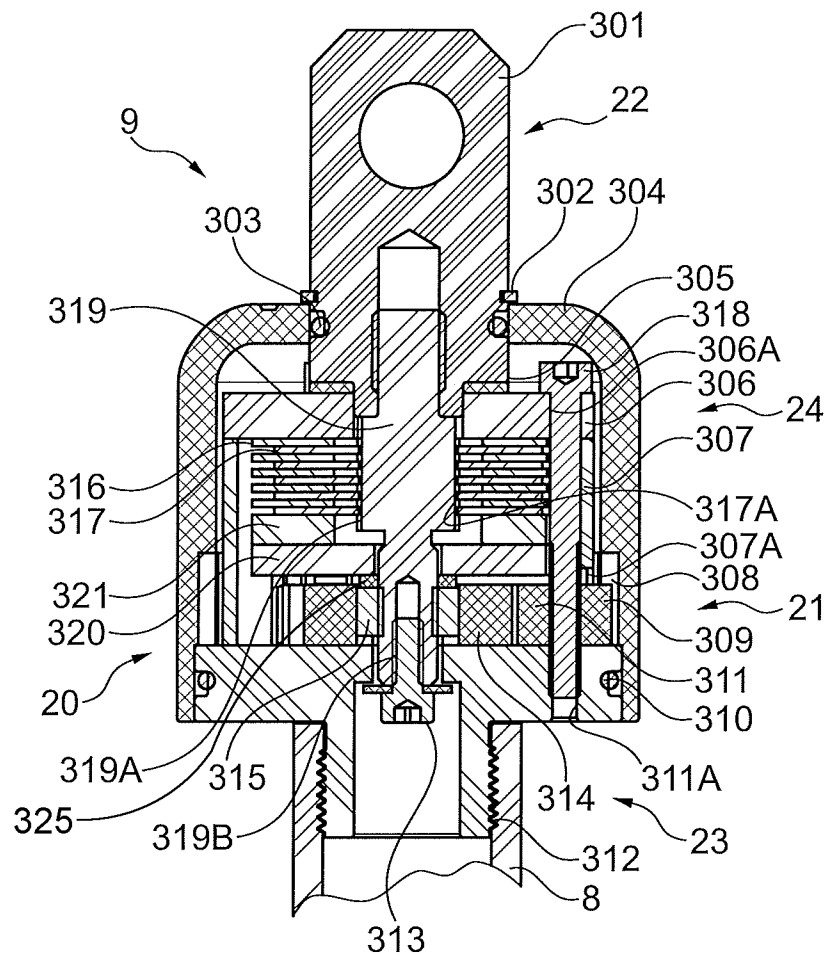


Fig. 3

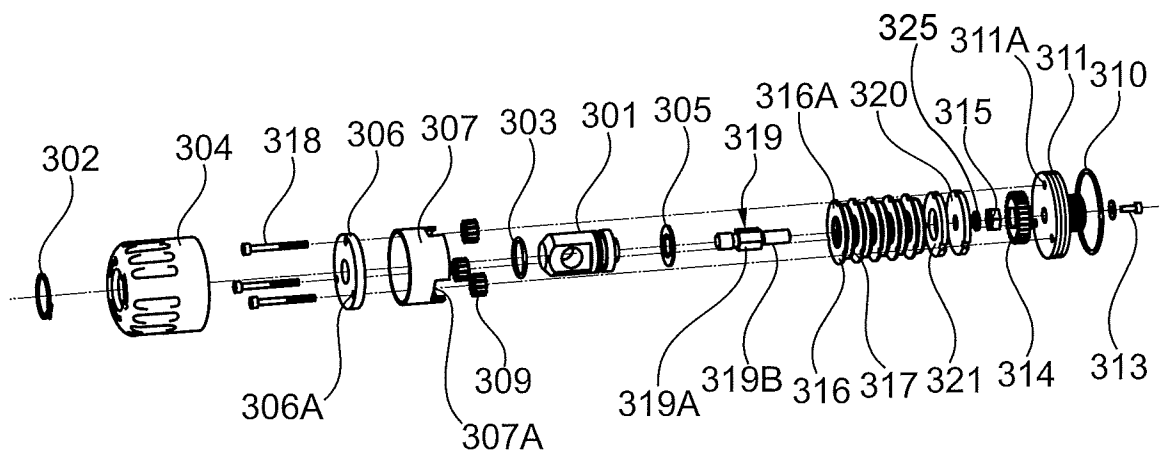


Fig. 4