

**LIFTING APPARATUS**

The invention concerns an apparatus for lifting a device along an elongate component.

- 5 Lifting devices, in particular for offshore facilities such as offshore platforms, are in principle known in various forms in the prior art, for example in the form of jacking systems.

US 2011/0305521 A1 discloses an offshore platform which can be towed to site by means of a barge. The offshore platform has four vertically displaceable supporting legs, each with a foot  
10 arranged on the sea-bed end. The supporting legs are moved relative to the platform by means of two pinions. The pinions engage in toothed rods which are provided along the supporting legs. By driving the pinions, the supporting legs can first be lowered to the sea bed and the platform can then be lifted out of the sea.

- 15 US 2,944,403 discloses a hydraulic jacking system with two clamping rings, each of which has a plurality of clamping jaws which are arranged around the periphery of the clamping ring and which can be pressed against the outer wall of the supporting leg by means of hydraulic cylinders. The offshore platform can be raised in stages by successively clamping and releasing the two separate clamping rings.

20 US 3,565,400 describes a jacking system with two peripheral clamping rings which are divided by contact faces chamfered in a longitudinal direction and which increase the clamping force on the outer wall of the supporting leg by means of a tensile force on the outer part of the clamping ring. The clamping rings are laid permanently closed around the supporting leg.

- 25 A disadvantage with the pinion system is the relatively complex production of the supporting leg. Furthermore, the disadvantage with the known jacking systems is that these have two separate clamping rings which must be moved relative to each other by means of lifting cylinders or other devices. Production requires a large quantity of materials, and the  
30 installation on the leg takes up a lot of space.

The object of the invention is therefore to provide a lifting apparatus of the type cited initially which uses less material and takes up less space.

- 35 This object is achieved by a lifting apparatus of the type cited initially with the features of claim 1.

The invention concerns a lifting apparatus which, to perform a lifting process, requires only one clamping chain, preferably precisely one clamping chain, per supporting leg. Further clamping chains may be provided to increase the lifting capacity. The lifting apparatus is however already capable of functioning with just one clamping chain. The terms "lifting  
5 process" and "lifting apparatus" here mean a process and an apparatus which allow both lifting and lowering of a device along an elongate component, whereby the term "device" means in particular an offshore facility, in particular an offshore platform, an oil platform or similar, and an "elongate component" is a supporting leg which has a constant external diameter, external circumference or the same external cross-section along its linear extension,  
10 at least in the region of the lifting stroke of the lifting apparatus. The lifting movement takes place preferably precisely parallel or precisely antiparallel to the direction of gravity.

The lifting apparatus has a closed clamping chain, wherein the clamping chain may naturally also have devices for its opening and closure, and for tensioning and releasing the clamping  
15 chain by changing the radius or changing the circumference, but during use of the lifting apparatus the clamping chain is laid closed around a supporting leg. At least two movable groups of clamping elements are arranged on the first clamping chain, wherein the clamping elements of each group have an unchanging relative spacing from the clamping elements of the same group. This means that a relative spacing, for example between the rotary axes of  
20 the clamping elements or between brackets of the clamping elements, does not change during use, but parts or regions of clamping elements of the same group may possibly change their relative spacing. The clamping elements of different groups are movable relative to each other; the clamping elements of different groups can preferably be moved against each other in the longitudinal direction. The clamping elements of each group together form a clamping  
25 cross-section which is variable in size, and the clamping elements of the different groups are moveable relative to each other in successive steps along the elongate component.

According to the invention, in at least one cross-section of the clamping chain, clamping elements of different groups are arranged on the clamping chain perpendicularly to the  
30 longitudinal direction. There are one or more cross-sections in which clamping elements of different groups are arranged in at least one operating position during use of the lifting apparatus. The first and second clamping elements may perhaps alternate along the cross-section or are arranged alternately. Preferably, clamping elements of the first group are arranged between clamping elements of the second group, and/or vice versa.

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In a preferred embodiment of the invention, several elongate segments are provided which are connected together to form the clamping chain and oriented in the longitudinal direction,

and in each of which the first clamping elements of the first group and the second clamping elements of the second group are movable relative to each other. The first clamping elements of the first group may be arranged next to each other along the segment, wherein the first clamping elements may each be pivotable about a rotation axis, and the rotation axes are  
5 arranged parallel to each other. The first clamping elements of the first group are controlled jointly by means of a control device and pivoted together at the same time. The second clamping elements of the second group are preferably also controlled jointly and pivoted at the same time.

10 The clamping elements of the different groups are movable, in particular displaceable in translation, against each other in the longitudinal direction of the segment. The maximum relative movement length corresponds to the stroke of the lifting apparatus in a single adjustment step.

15 The configuration of the clamping elements need not be further defined structurally. The clamping elements may provoke a reduction or enlargement in cross-section by pivoting of clamping elements arranged on an arm, or by rotation of clamping elements arranged on an arm, or also pneumatically or hydraulically by radial movement of clamping elements.

20 Each of the groups of clamping elements produces a self-locking on the supporting leg. The self-locking can be generated in the longitudinal direction and against the longitudinal direction. Self-locking mechanisms are particularly secure.

In a preferred embodiment of the invention, at least one adjustment device is provided. By  
25 means of the at least one adjustment device, a clamping cross-section of each of the at least two movable groups of clamping elements can be adjusted to form a pretension or for tensioning or release. The clamping chains are laid slightly loosely around the supporting leg. By means of the at least one adjustment device, a pretension of the clamping chain on the supporting leg can be generated. The adjustment device can be set manually or by electronic  
30 or manual control. After setting of the pretension, the clamping elements lie preferably with their slip devices on the outer wall of the supporting leg. By actuating the clamping elements, preferably by self-locking, a clamping effect of the clamping chain on the supporting leg is produced.

35 The adjustment device preferably comprises a radial adjustment device between the clamping elements and a segment housing in which the clamping elements are arranged.

In a preferred embodiment of the invention, the clamping elements are formed trapezoid in cross-section on a radially inner portion, wherein the cross-section is arranged perpendicular to sea level and in the longitudinal direction and radial direction. The radial direction is here a direction pointing into a centre of the closed clamping chain, running perpendicularly from a tangent of the circumference of the clamping chain. The trapezoid portion has a clamping face on the platform-side and one on the non-platform-side, and a radial inner face in-between.

A platform-side clamping face and a non-platform-side clamping face are provided on each of the trapezoid clamping elements. Co-operation of all platform-side and non-platform-side clamping faces of the first and/or the second clamping elements of the first and/or the second group causes a reduction in the clamping cross-section and provokes a clamping effect of the lifting apparatus on the outer wall of the supporting leg. Each of the first and/or the second clamping elements therefore has two clamping positions, namely a first clamping position when the platform-side clamping faces co-operate, and a second clamping position when the non-platform-side clamping faces co-operate, and a released position when the clamping element is situated between the two positions.

Preferably, slip devices such as rollers or slip pads are provided radially on the inside of the segment. The slip devices may be arranged at different locations on the segment. The concept of "slip" is here understood generally and also comprises rolling, slipping, grinding and combinations of these movements.

In a particularly preferred embodiment of the invention, a roller rotating in or against the longitudinal direction is provided as a slip device on the radially inner end of the clamping element, preferably on the radial inside of the trapezoid portion. In released state of the clamping element, the roller is in constant contact with the outer wall of the supporting leg and thus prevents slippage of the lift device or the clamping chain relative to the supporting leg, and hence buckling of the clamping elements towards or away from the platform.

Preferably, each of the segments comprises a box-like housing with rows of clamping elements of a first group arranged along the circumferential length on the sides of the segments and oriented in the longitudinal direction, and clamping elements of a second group arranged between the clamping elements of the first group. Naturally, completely different arrangements of the clamping elements of the groups are conceivable.

Favourably, each of the segments comprises a segment housing, wherein a cassette is arranged in the segment housing, movably to and fro in the longitudinal direction, and the first

clamping elements are arranged position-fixedly on the segment housing, and the second clamping elements are arranged position-fixedly on the cassette. All clamping elements however are configured movably. A segment housing is an open or closed, box-like structure which may also comprise the cassette and/or tension rods. The cassette is preferably  
5 removable from the segment housing in the longitudinal direction and can be replaced by another cassette in the event of repair. The clamping chain retains its clamping tension when the cassette is replaced. When the cassette is replaced, the first clamping elements generate the clamping effect and the second clamping elements are released.

10 Preferably, on the non-platform-side end, the segment comprises a lifting cylinder with a cylinder housing which is connected position-fixedly to the segment housing, and a piston which is connected position-fixedly to the cassette. The lifting cylinder allows movement of the first and the second clamping element groups relative to each other. In principle, the lifting cylinder may also be arranged at other sites, for example between the platform and segment.

15 The invention is described in six figures with reference to an exemplary embodiment. The drawings show:

Fig. 1 a lifting apparatus according to the prior art,

20 Fig. 2 a perspective view of a lifting apparatus according to the invention with an offshore platform and a supporting leg,

25 Fig. 3 a view of an individual segment of the lifting apparatus with connecting tabs to an adjacent segment of the lifting apparatus in Fig. 2,

Fig. 4 a perspective view of a non-platform-side portion of the segment, without connecting tabs, according to Fig. 3,

30 Fig. 5 a section view along line V-V in Fig. 4,

Fig. 6 a section view along line VI-VI in Fig. 4.

35 Fig. 1 shows a lifting apparatus 10 according to the prior art. The lifting apparatus 10 has two clamping chains, a platform-side clamping chain 11 and a non-platform-side clamping chain 12, according to the prior art. Each of the two clamping chains 11, 12 comprises a plurality of platform-side segments 111 or non-platform-side segments 121 according to the prior art,

each of which is oriented in a longitudinal direction L of a supporting leg 13. The clamping chains 11, 12 are each closed around the supporting leg 13. The two clamping chains are connected together by means of several lifting cylinders 14 according to the prior art, wherein platform-side and non-platform-side segments 111, 121, arranged directly above each other in the longitudinal direction L according to the prior art, are connected together movably by a respective lifting cylinder 14 according to the prior art. Horizontally, i.e. circumferentially to the supporting leg 13, adjacent platform-side and non-platform-side segments 111, 121 (according to the prior art) are connected pivotably together and to the platform-side or non-platform-side clamping chain 11, 12 respectively by a plurality of connecting tabs 24.

Fig. 1 shows a deck 15 of an offshore platform, on which platform-side ends of the platform-side segments 111 are position-fixedly connected in the longitudinal direction L. Each of the segments 111, 121 comprises a plurality of clamping elements which, by reducing the size of the clamping cross-section, independently of each other allow the non-platform-side clamping chain 12 and/or platform-side clamping chain 11 to be clamped fixedly to the supporting leg 13, and by enlarging the clamping cross-section release this again, and hence by alternate clamping and releasing in combination with an extension and contraction of the lifting cylinder 14, move the offshore platform on the supporting leg 3 in successive steps in the longitudinal direction L. Preferably, the lifting process is used to raise offshore platforms floating in water along a plurality of supporting legs 13, preferably four supporting legs 13. Figure 1 shows only one of the four supporting legs 13; naturally any other number of supporting legs 13 may be used, and so-called monopiles are also conceivable.

Fig. 2 in contrast shows a lifting apparatus 20 modified according to the invention. The lifting apparatus 20 according to the invention has only one closed clamping chain 21 running around the supporting leg 13. Fig. 2 shows the deck 15 of an offshore platform with fixing devices 22 for the clamping chain 21. The supporting leg 13 is guided completely through an opening in the deck 15 through the offshore platform; one end of the supporting leg 13 stands on the seabed, and another end of the supporting leg 13 is free. The clamping chain 21 again comprises a plurality of segments 23 which are formed elongate and oriented in the longitudinal direction L and arranged parallel to each other, wherein the segments 23 differ structurally from the known segments 111, 121 according to the prior art in figure 1, as will be described further below.

Adjacent segments 23 of the clamping chain 21 are connected together pivotably by connecting tabs 24. The individual connecting tabs 24 may in turn each comprise a bundle of individual connecting tabs 24. The connecting tabs 24 have a hole 241 at both ends. The

connecting tabs 24 are attached pivotably to the associated segment 23 by bolts guided through the holes 241. The clamping chain 21 is connected position-fixedly in the longitudinal direction L to the individual segments 23 on the deck 15 by means of the fixing devices 22, and are preferably pivotable radially inwardly or outwardly. The radial direction here means  
5 the direction along the radius of the clamping chain 21 laid around the supporting leg 13.

According to the invention, the lifting apparatus 20 of figure 2 has just one clamping chain 21 with two different groups of clamping elements 40, 41. The clamping elements 40, 41 of each of the two groups are each moved together as a group to and fro in the longitudinal direction  
10 L, and moved or pivoted together as a group to and fro in the radial direction, or otherwise moved as a group to generate a clamping effect. Both groups of clamping elements 40, 41 may generate a clamping effect on the outer wall of the supporting leg 13 by a reduction in the clamping cross-section. On the non-platform-side end of the segment 23, lifting cylinders 25 are arranged which allow the two groups of clamping elements 40, 41 to move relative to each  
15 other in each segment 23.

Fig. 2 depicts the visible housing 250 of the lifting cylinder 25. On the non-platform-side end of the segment 23, a crossmember 43 with two recesses 431 is attached on the platform side of the lifting cylinder 25. Tension rods 45 which span the associated segment 23 are clamped  
20 between the recesses 431 and the associated eyelets 221 on the fixing devices 22. The tension rods 45 have hammerheads on the non-platform-side end, and eyes on the platform-side end. Figure 4 shows the structure in more detail.

Fig. 3 shows in a top view, without the supporting leg 13, a radial inside of one of the  
25 segments 23. The segment 23 comprises a housing 30 open on the radial inside. At its platform-side end 301, the housing 30 is connected position-fixedly in the longitudinal direction L to the fixing device 22 at the deck 15. The fixing devices 22 are arranged concentrically around the opening 32 in the deck 15. In the peripheral direction of the clamping chain 21, on the outside brackets are provided on the housing 30 for bolts which are pushed through the  
30 holes 241 of the connecting tabs 24, whereby each of the connecting tabs 24 is attached pivotably via a bolt to the outside of the housing 36. Fig. 3 shows only the connecting tabs 24 on a radial outside of the housing 30. The free ends of the connecting tabs 24 in figure 3 are connected pivotably via bolts to an adjacent housing (not shown) of one of the adjacent segments 23 in the same way. The same applies to the further segment 23 shown on the left  
35 of the segment 23 in figure 3. The clamping chain 21 is formed by the alternating succession of segments 23 and connecting tabs 24.

The lifting cylinder 25 is provided on a platform-side end 302 of the housing 30.

Fig. 4 shows the non-platform-side end 302 of the housing 30 of the segment 23 in figure 3 in a more detailed depiction. Figure 4 shows three rows of clamping elements 40, 41 arranged in the longitudinal direction L. The clamping elements 40, 41 are of two different types. The clamping elements 40 of one type are assigned to a first clamping element group, and the clamping elements 41 of the other type are assigned to a second clamping element group. The clamping elements 40, 41 of both groups are rotatable relative to the housing 30. On their portion facing radially towards the supporting leg 13, all clamping elements 40, 41 are formed trapezoid in a cross-section face running in the radial direction and in the longitudinal direction L, along their outer peripheral line. Each of the clamping elements 40, 41 has two clamping faces 401, 402, 411, 412, namely respectively the platform-side clamping faces 401, 411 and the non-platform-side clamping faces 402, 412, which are each formed by the associated oblique trapezium sides. The radially inner, middle trapezium face has a roller 50, 51 which, in the released state of the clamping elements 40, 41 shown in figure 4, creates a contact to the outer wall of the supporting leg 13 and thus counters a slippage of the clamping chain 21 relative the supporting leg 13, preventing buckling of the clamping elements 40, 41. By turning the clamping elements 40, 41 of the first group or the second group, for example clockwise or counterclockwise in figure 4, the platform-side clamping faces 401 of the clamping elements 40 or the platform-side clamping faces 411 of the second clamping elements 41, or the non-platform-side clamping faces 402 of the clamping elements 40 or the non-platform-side clamping faces 412 of the second clamping elements 41, create a contact with the outer wall of the supporting leg 13 and thus, by co-operation of all clamping elements 40, 41 of the first or the second group, by a reduction in cross-section, generate a clamping effect by self-locking. The cross-section reduction is relative to the position of the clamping elements 40, 41 in figure 4, and is achieved in that the radial inner face of the clamping elements 40, 41 is formed trapezoid and the two clamping faces 401, 402, 411, 412 have a greater distance from the rotary axis of the clamping elements 40, 41 than the middle face on which the roller 50, 51 is arranged. In principle, other embodiments of the mechanisms of the clamping elements 40, 41 are conceivable, for example with lifting apparatus, with obliquely positioned faces etc.

The rotary axes of the first clamping elements 40 are fixed in position relative to the housing 30, while the second clamping elements 41 are movable to and fro in the longitudinal direction L in the housing 30. Lifting cylinder 25 according to the invention drives the second clamping elements 41 of a segment 23 to and fro together in the longitudinal direction L. On the non-platform-side end 302 of the housing 30, radially on the inside, two radial slip pads 63 are also provided. They limit the axial movement of the segment 23. In a lower position of the second

clamping elements 41, the non-platform-side connecting tab 24 which is under tension would pull the segment 23 against the supporting leg 13. The slip pads 63 prevent this undesirable tightening.

5 In the height of each connecting tab 24, on its radially outer region, the segment 23 has a clamp 64 with two stop eyes 65, through which bolts are provided for pivotable fixing of each connecting tab 24. An adjustment device (not shown) may be arranged between the clamp 64 and the housing 30, which allows the first clamping elements 40 to be shifted radially together with the second clamping elements 41, and hence preset a clamping cross-section. The  
10 clamping chain 21 is first laid around the supporting leg 13 and then pretensioned by means of the adjustment device, so that the first clamping elements 40 not under tension touch the outer wall of the supporting leg by their rollers 50. By turning all the first clamping elements 40 in the first or the second direction, a self-locking of the first clamping elements 40 is achieved by contact of the platform-side clamping faces 401 or by contact of the non-platform-side  
15 clamping faces 402. The same applies to the second clamping elements 41.

Fig. 5 shows the inner structure of the segment 23 and the lifting cylinder 25 in cross-section along line V-V in Fig. 4. The first clamping elements 40 and the second clamping elements 41 are each pivoted together and in the same way, so that either the first group of clamping  
20 elements 40 and/or the second group of clamping elements 41 generates a clamping effect on the supporting leg 13. The first clamping elements 40 are arranged position-fixedly on the housing 30 segment 23. "Position-fixedly" means that the first clamping elements 40 are indeed arranged pivotably relative to the housing 30 about a rotary axis 60, but the first rotary axis 60 is unchanging in its position relative to the housing 30. In contrast, the second  
25 clamping elements 41 are arranged on a cassette 62, rotatably relative to the cassette 62, and the cassette 62 is movable to and fro in direction L of the housing 30. The cassette 62 with the second clamping elements 41 arranged thereon is driven in the longitudinal direction L by means of lifting cylinder 25 and is displaceable to and fro. The cassette 62 is connected position-fixedly to the piston 251 of the lifting cylinder 25, while the lifting cylinder housing 250  
30 is connected position-fixedly to the housing 30 of segment 23.

The piston 251 is extended fully down in Fig. 5. By pressing down the piston 251, the second clamping elements 41, which are arranged centrally between two rows of the first clamping elements 40, move in the direction of the deck 15. Figure 5 shows the first rotary axis 60 of the  
35 first clamping elements 40 and the second rotary axis 61 of the second clamping elements 41. The inner structure of each of the segments 23 is the same.

Fig. 6 shows a horizontal section view along line VI-VI in Fig. 4. The first clamping elements 40 are rotatable about the first rotary axes 60. Between two rows of clamping elements 40 formed in the longitudinal direction L, a middle row of other clamping elements 41 formed in a longitudinal direction L is arranged. The clamping elements 41 rotatable around the second rotary axes 61 have greater dimensions and a greater material thickness than the clamping elements 40. The first rotary axes 60 and the second rotary axes 61 are horizontal and parallel to the deck 15, and slightly tilted relative to each other in order to take account of the curvature of the supporting leg 13. Figure 6 shows the contact of the two first clamping elements 40 by means of the rollers 50, and the contact of the second clamping element 41 by means of the second roller 51, against the outer face of the supporting leg 13.

The process for raising the offshore platform out of the sea along the supporting leg 13 takes place, as with the known lifting apparatus 10 in figure 1, by means of successive clamping of the first group of clamping elements 40 and the second group of clamping elements 41. For example, in the position in figure 5, the first clamping elements 40 are clamped on the supporting leg 13 while the second clamping elements 41 are released. The lifting cylinder 25 is then extended, whereby the platform is raised slightly further, namely by the stroke of the lifting cylinder 25, since the housing 30 of the segments 23 in the longitudinal direction L is connected position-fixedly to the deck 15. When the lifting cylinder 25 is extended, the second clamping elements 41 are clamped against the outer wall of the supporting leg 13 and then the first clamping elements 40 are released. Thus the position of the offshore platform relative to the supporting leg 13 is maintained. The lifting cylinder 25 is retracted again, and the second clamping elements 41 are moved by the stroke in the longitudinal direction L, and in the retracted position the clamping effect of the first and the second group of clamping elements 40, 41 is again exchanged. By this method, the platform is raised out of the sea in successive steps along the supporting leg 13. The platform can be lowered again accordingly.

**List of Reference Numerals**

|    |     |                                              |
|----|-----|----------------------------------------------|
|    | 10  | Lifting apparatus according to the prior art |
| 5  | 11  | Platform-side clamping chain                 |
|    | 12  | Non-platform-side clamping chain             |
|    | 13  | Supporting leg                               |
|    | 14  | Lifting cylinder according to the prior art  |
|    | 15  | Deck                                         |
| 10 |     |                                              |
|    | 20  | Lifting apparatus according to the invention |
|    | 21  | Clamping chain                               |
|    | 22  | Fixing devices                               |
|    | 23  | Segments                                     |
| 15 | 24  | Connecting tabs                              |
|    | 25  | Lifting cylinder according to the invention  |
|    | 30  | Housing                                      |
|    | 32  | Opening                                      |
| 20 |     |                                              |
|    | 40  | Clamping elements/group of clamping elements |
|    | 41  | Clamping elements                            |
|    | 43  | Crossmember                                  |
|    | 45  | Tension rod                                  |
| 25 |     |                                              |
|    | 50  | Roller                                       |
|    | 51  | Roller                                       |
|    | 60  | First rotation axis                          |
| 30 | 61  | Second rotation axis                         |
|    | 62  | Cassette                                     |
|    | 63  | Radial slip pad                              |
|    | 64  | Clamp                                        |
|    | 65  | Stop eye                                     |
| 35 |     |                                              |
|    | 111 | Platform-side segment                        |
|    | 121 | Non-platform-side segment                    |

- 221 Eyelets for fixing devices
- 241 Holes in connecting tabs
- 5
- 250 Lifting cylinder housing
- 251 Piston
- 301 Platform-side end of housing 30
- 10 302 Non-platform-side end of housing 30
- 401 Platform-side clamping face
- 402 Non-platform-side clamping face
- 15 411 Platform-side clamping face
- 412 Non-platform-side clamping face
- 431 Recesses
- L Longitudinal direction
- 20

**CLAIMS**

1. Apparatus for lifting a device along an elongate component (13), with a closed clamping chain (21) with a longitudinal direction (L),  
5 wherein at least two movable groups of clamping elements (40, 41) are arranged on the clamping chain (21),  
and the clamping elements (40, 41) of each group have a fixed relative spacing from clamping elements (40, 41) of the same group,  
and the clamping elements (40, 41) of different groups can be moved relative to each  
10 other in the longitudinal direction (L),  
and the clamping elements (40, 41) of each group together form a clamping cross-section of variable size,  
characterised in that in at least one cross-section of the clamping chain (21) perpendicular to the longitudinal direction (L), clamping elements (40, 41) of different  
15 groups are arranged on the clamping chain (21).
2. Lifting apparatus according to claim 1, characterised by a plurality of elongate segments (23) connected together to form the clamping chain (21) and oriented in the longitudinal direction (L), in which the first clamping elements (40) of the first group and the second  
20 clamping elements (41) of the second group are arranged movably relative to each other in the longitudinal direction (L).
3. Lifting apparatus according to claim 1 or 2, characterised by at least one adjustment device with which a clamping cross-section of at least two movable groups of clamping  
25 elements (40, 41) can be adjusted to form a pretension or for tensioning or release.
4. Lifting apparatus according to one of claims 2 or 3, characterised by slip devices (50, 51) at the radially inner end of the segments (23).
- 30 5. Lifting apparatus according to any of claims 2, 3 or 4, characterised in that each of the segments (23) comprises a segment housing (30), and a cassette (62) is arranged displaceably in the longitudinal direction (L) in the segment housing (30), and the first clamping elements (40) are arranged position-fixedly on the segment housing (30) and the second clamping elements (41) are arranged position-fixedly on the cassette (62).
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6. Lifting apparatus according to any of claims 2 to 5, characterised in that the segment (23) has a lifting cylinder (25) on the non-platform-side end, with a cylinder housing (250) which is position-fixedly connected to the segment housing (30) and with a piston (251) which is position-fixedly connected to the cassette (62).
- 5