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Lifting device comprising a twistlock assembly

The invention relates to a load handling device or lifting device comprising a twistlock assembly comprising a pivot bolt with a hammer head which is pivotable about a bolt axis between a release position for inserting the hammer head into a latching opening of a body to be lifted and a latching position for latching engagement with side walls of the latching opening by the hammer head, with the pivot bolt comprising an external thread bolt portion; and comprising a bolt nut with an internal thread designed complementarily to the external thread of the external thread bolt portion, with the bolt nut being supported at a lifting device carrier frame via a support wall. Instead of the term "twistlock", the term "Drehverschluss" is known to those skilled in the art.

A lifting device of this type is disclosed in DE 100 21, 480 A1. Other types of lifting device are disclosed in WO 02/092 492 A1, in EP 0 442 154 A1, in DE 102 26 042 A1 and in DE 27 56 340 A1.

It is an object of the present invention to develop a twistlock assembly for a lifting device of the type named at the outset in such a way that as to facilitate the insertion of the hammer head into the latching opening of the body to be lifted.

This object is achieved according to the invention by a lifting device comprising a twistlock assembly comprising a pivot bolt with a hammer head which is pivotable about a bolt axis between a release position for inserting the hammer head into a latching opening of a body to be lifted and a latching position for latching engagement with side walls of the latching opening by the hammer head, with the pivot bolt comprising an external thread



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bolt portion; and comprising a bolt nut with an internal thread designed complementarily to the external thread of the external thread bolt portion, with the bolt nut being supported at a lifting device carrier frame via a support wall, characterized in that the support wall of the bolt nut has a convex shape and/or that a counter wall of a carrier-frame-anchored abutment body with which the support wall is in contact has a concave shape so that a floating support of the bolt nut is achieved.

It has been found according to the invention that the convex shape of the support wall of the bolt nut and/or the complementary concave shape of the counter wall of the carrier-frame-anchored abutment body allows a predetermined tilting degree of freedom of the pivot bolt relative to the carrier frame, which facilitates the insertion of the hammer head into the latching opening of the body to be lifted, in particular into an oblong-hole twistlock receptacle of a container, such as a corner fitting according to DIN ISO 1161. The pivot bolt is thus supported at the carrier frame in a floating manner. The lifting device may be a container lifting device. The lifting device may in particular be in the form of a spreader. The support wall of the bolt nut and/or the counter wall of the abutment body may be manufactured by metal-cutting techniques such as CNC turning. The shape of the support wall on the one hand and of the counter wall on the other may be such that the two walls are complementary to each other. The shape of the support wall with respect to the counter wall may be such that the two walls abut against each other via a ring contact portion encircling the bolt axis. The support wall or the counter wall may be conical. In this respect, an outer cone shape of the support wall is the convex shape of the support wall while a hollow cone shape of the counter wall is the concave shape of the counter wall. The support wall or the counter wall may be in the shape of a hollow cone. Instead of the term "pivot bolt", the term "Drehzapfen" is

known to those skilled in the art (cf. DIN EN 15056). The twistlock assembly according to the invention may be employed both in a load handling device such as a spreader, in particular in a load handling device designed in the manner of a spreading frame, and in a lifting device such as a gantry forklift or a crane. The entire twistlock assembly is producible at low cost.

A spherical shape of the support wall and/or the counter wall provides for a particularly low-wear floating support of the pivot bolt.

10 An abutment body which simultaneously acts as a frame support plate has the additional function of reinforcing the carrier frame. A frame support plate of this type may be secured to the carrier frame for example by means of a screw connection.

15 At a given pitch of the thread of the external thread bolt portion and of the bolt nut, a driver body for positive mechanical coupling of the pivot bolt with an actuator of a pivot drive, with a non-rotational connection device for connecting the driver body to the bolt nut being designed in such a way that the driver body is non-rotationally connectable with the bolt nut in
20 more than two peripheral positions of a rotation of the bolt nut relative to the abutment body, allows a fine length adjustment of a projection of the hammer head of the pivot bolt beyond the carrier frame by screwing up or down the threaded connection between the pivot bolt and the bolt nut. The driver body may be a driver disk having a non-rotationally symmetric driver opening which is complementary to a driver head of the pivot bolt.
25 The driver opening may be axially symmetric, with symmetry axes being orthogonal with respect to one another, or point-symmetric. The actuator of the pivot drive may be a lever which, when pivoted, is extended or compressed.

A connection via the connection device which takes place via in each case one combination of connection points on the bolt nut on the one hand and on the driver body on the other, with the connection device having a predetermined number of connection points on the bolt nut and a number of connection points on the driver body which is increased by an integer multiple, can be manufactured at low effort. The connection points may be embodied by connection openings. The connection points of the bolt nut may be provided with internal threads. The connection points of the driver body, which are designed as connection openings, allow connection screws to be inserted.

Another object of the present invention is to develop a twistlock assembly of a lifting device of the type named at the outset in such a way as to improve radial guidance of the pivot bolt.

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This object is achieved according to the invention by a lifting device comprising a lifting device carrier frame and a twistlock assembly comprising a pivot bolt with a hammer head which is pivotable about a bolt axis between a release position for inserting the hammer head into a latching position of a body to be lifted and a latching position for latching engagement with side walls of the latching opening by the hammer head; a guide sleeve for radial guidance of the pivot bolt, with the guide sleeve extending up to the hammer head and comprising an abutment portion by means of which the guide sleeve is axially supported at the carrier frame and/or at the hammer head, characterized by a preloading spring for preloading the guide sleeve against the carrier frame and/or against the hammer head.

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It has been found according to the invention that the radial guidance of the pivot bolt can be improved if said radial guidance is guided up to the ham-

mer head. The guide sleeve may be supported, via the abutment portion, against the carrier frame and/or the hammer head. The preloading spring for preloading the guide sleeve against the abutment portion avoids unwanted constraints between the pivot bolt and the carrier frame while simultaneously allowing the pivot bolt to be supported at the carrier frame in a floating manner. The preloading spring may be made of steel, rubber or plastics, in particular of polyurethane (PUR). A conceivable supporting connection of the guide sleeve with an abutment portion of the carrier frame instead of the hammer head may prevent an unwanted wear of the hammer head. This may increase the service life of the twistlock assembly. Instead of the term "pivot bolt", the term "Drehzapfen" (cf. DIN EN 15056) is known to those skilled in the art. The twistlock assembly according to the invention may both be employed in a load handling device such as a spreader or a lifting device such as a gantry forklift or a crane. The entire twistlock assembly is producible at low cost.

A guide piece of the guide sleeve which is adjacent to the hammer head of the pivot bolt and has a peripheral step via which the guide sleeve can be brought into axial contact with a carrier frame contact portion provides a low-cost contact between the guide sleeve and the abutment portion.

An interference fit assembly for connecting the guide piece with the sleeve base body provides a simple and at the same time secure connection of the guide piece with the sleeve base body.

Profiled contact walls of the guide sleeve and of the hammer head which are complementary to each other prevent radial yielding of the hammer head in the direction of the guide sleeve. This also prevents an unwanted wear of the hammer head.

A clearance in portions between the pivot bolt contact wall and the hammer head contact wall may ensure a defined contact between the two contact walls in the region of their respective radial profiling. Furthermore, the clearance may ensure a desirable tilting degree of freedom of the pivot bolt
5 in the guide sleeve.

A lubrication spot of the guide sleeve for supplying a lubricant provides lubrication of the pivot bolt without having to remove said pivot bolt from the guide sleeve.

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A support of the preloading spring against the frame via a frame support plate which simultaneously reinforces the carrier frame simplifies the design of the twistlock assembly. The frame support plate may be supported against the surface of the carrier frame.

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A carrier frame which is formed by a hollow profile comprising a top box section and a bottom box section is stable and producible at low cost. In one embodiment of the twistlock assembly, the top box section may at the same time form the abutment body where the bolt nut is supported in a
20 floating manner. The hollow profile of the carrier frame may extend up to the pivot bolt and beyond. With such a design of the carrier frame, the carrier frame may be continued in one piece in the region of the twistlock assembly which improves the integrity of the carrier frame and therefore the stability thereof.

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A design of the abutment body where the abutment body is supported against the surface of the top box section provides an advantageous reinforcement of the carrier frame in the region of the twistlock assembly.

A wear plate which reinforces the carrier frame on a side facing the hammer head provides an additional reinforcement of the carrier frame in the region of the twistlock assembly. The wear plate may be supported against the surface of the carrier frame and particularly at a bottom box section of the carrier frame. The wear plate may be secured to the carrier frame by means of a weld joint which need not be a supporting connection able to transmit a lifting force. A weld joint of this type is easy to produce. The wear plate may have a through opening for the pivot bolt which is then dimensioned such as to provide the above-explained tilting degree of freedom of the pivot bolt. The through opening of the wear plate may be produced by thermal gouging according to DIN 8590, for example by oxy-fuel cutting or plasma or laser cutting, respectively.

Embodiments of the invention will hereinafter be explained in more detail by means of the drawing in which

Fig. 1 is a perspective sectional view of a near-end portion of a carrier frame of a lifting device or load handling device, the near end portion being partially cut open in the region of a twistlock assembly, at the example of a spreader for container handling;

Fig. 2 is a perspective view, corresponding to Fig. 1, of the twistlock assembly of the lifting device;

Fig. 3 is a view of the twistlock assembly according to Fig. 2, seen from a direction opposite to that of Fig. 2;

Fig. 4 is a view, similar to Fig. 1, of another embodiment of a lifting device comprising a twistlock assembly;

Fig. 5 is a vertical axial longitudinal cut through the near-end frame portion of the lifting device comprising the twistlock assembly according to Fig. 4;

5 Fig. 6 is an axial longitudinal cut through a twistlock assembly corresponding to the embodiment according to Figs. 4 and 5 which is however arranged at the opposite near-end portion of the carrier frame, with the cutting plane being perpendicular to that of Fig. 5;

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Fig. 7 shows the detail VII in Fig. 6; and

Fig. 8 shows the detail VIII in Fig. 6.

15 A lifting device or load handling device in the form of a spreader for container handling has a lifting device or load handling device carrier frame 1 in the form of a hollow profile designed as a rectangular box profile comprising a top box section 2, a bottom box section 3 and two side walls or webs 4, 5 interconnecting the top box section 2 and the bottom box section
20 3 at the respective edges thereof. If the load handling device is a spreader, the carrier frame 1 is an end girder or head girder (cf. DIN EN 15056)

The lifting device has a twistlock assembly 6 which is completely shown in Figs. 2 and 3. The twistlock assembly 6 has a pivot bolt 7 comprising a
25 hammer head 8. The hammer head 8 is pivotable about a bolt axis 9 between a release position shown in the drawing for inserting the hammer head 8 into a latching opening of a body to be lifted (not shown), particularly a container, and a latching position for latching engagement with side walls of the latching opening by the hammer head 8. Compared to the re-

lease position, the pivot bolt 7 is pivoted through 90° about the bolt axis 9 when in the latching position.

5 The pivot bolt 7 has an external-thread bolt portion 10. A bolt nut 11 has an internal thread which is complementary to an external thread of the external thread bolt portion 10. The bolt nut 11 is supported at a counter wall 13 of an abutment body 14 of the carrier frame 1 via a support wall 12. The bolt nut 11 is sealed against the abutment body 14 via a sealing ring 14a (cf. in particular Figs. 4 et seqq.) which encircles the outside of the bolt nut
10 11. The sealing ring 14a prevents dirt from entering the support, formed by the walls 12, 13, of the bolt nut 11 at the abutment body 14. The abutment body 14 is a frame support plate reinforcing the top box section 2 of the carrier frame 1.

15 The support wall 12 of the bolt nut 11 has a spherical convex shape. Other shapes of the support wall 12, which result in a contact with the counter wall 13 encircling the bolt axis 9 in the manner of a sphere, are conceivable as well. The counter wall 13 of the carrier-frame-anchored abutment body 14 is in the shape of a hollow cone.

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Such as the other main components of the twistlock assembly 6 and the lifting device comprising the carrier frame 1, both the bolt nut 11 and the abutment body 14 are made of structural steel, for instance of the steel type S355J2+N (earlier designation: structural steel St 52). In particular non-
25 welded components of the twistlock assembly 6 may be made of other materials. The bolt nut 11 may be made of tempering steel. The support wall 12 of the bolt nut 11 and the counter wall 13 of the abutment body 14 are produced by metal-cutting techniques according to DIN 8589, for example a numerically controlled turning lathe, in other words by CNC turning.

The pivot bolt support formed by the support wall 12 and the counter wall 13 allows the pivot bolt 7 to be supported at the carrier frame 1 in a floating manner. This provides for a predetermined tilting degree of freedom of the pivot bolt 7 which facilitates insertion of the hammer head 8 into the latching opening of the body to be lifted, in particular into an oblong-hole twistlock receptacle of a container.

A driver body 15 allows positive mechanical coupling of the pivot bolt 7 with an actuator 16 in the form of a lever of a pivot drive (not shown in more detail) for pivoting the pivot bolt 7 between the release position and the latching position. The driver body 15 is designed as a driver disk comprising a stadium-shaped, in other words non-rotationally symmetric driver opening 17. The driver opening 17 is complementary to a driver head 18 of the pivot bolt 7.

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A connection device 19 for non-rotationally connecting the driver body 15 with the bolt nut 11 is designed in such a way that the driver body 15 is connectable with the bolt nut 11 in more than two peripheral positions when rotating the bolt nut 11 about the bolt axis 9 relative to the abutment body 14. The non-rotational connection of the driver body 15 with the bolt nut 11 via the connection device 19 is in each case provided by one combination of pairs of connection points on the bolt nut 11 on the one hand and on the driver body 15 on the other. To this end, the connection device 19 has a predetermined number of connection points on the bolt nut 11, namely a total of four connection openings comprising internal threads not visible in the drawing, and a number of connection points on the driver body 15 which is increased by an integer multiple, namely a total of eight through connection openings 20. The through connection openings 20 in the driver body 15 allow connection screws 21 to be passed through and

inserted into the internal threads of the bolt nut connection openings if the connection openings in the driver body 15 on the one hand and in the bolt nut 11 on the other are flush with each other. The four connection openings comprising internal threads in the bolt nut 11 and the eight through connection openings 20 in the driver body 15 are arranged at identical radial distance to the bolt axis 9 and equidistantly in the peripheral direction, thus allowing in each case four of the eight through connection openings in the driver body 15 to be brought in flush alignment with the four internal thread connection openings of the bolt nut 11. At a given position of the driver body 15, this flush alignment is provided at a total of eight peripheral positions when rotating the bolt nut 11 about the bolt axis 9 relative to the abutment body 15, in other words at 45° steps of a complete revolution of the bolt nut 11 about the bolt axis 9.

15 The possibility of positioning the bolt nut 11 relative to the abutment body, in other words the frame support plate 14, allows a projection of a hammer head 8 beyond an underside of the carrier frame 1 to be fine-tuned by means of the thread of the external thread bolt portion 10 having a given pitch.

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The hollow profile comprising the top box section 2 and the bottom box section 3 and the two side walls 4, 5 extends transversely to the bolt axis 9 beyond the pivot bolt 7. The pivot bolt 7 penetrates through openings 22, 23 formed in the top box section 2 and the bottom box section 3. The hollow profile of the carrier frame 1 is a continuous, one-piece frame even in the region of the twistlock assembly 6. Between the frame support plate 14 and the top box section 2 is arranged a reinforcing plate 24 which is welded to the upper side of the top box section 2 via a fillet weld, in other words a non-supporting weld. The abutment body 14, in other words the frame sup-

port plate, is secured to the top box section 2 and the reinforcing plate 24 via screw connections 25.

5 A wear plate 26 reinforces the bottom box section 3 of the carrier frame 1 on the side of the carrier frame 1 facing the hammer head 8. The wear plate 26 is supported against the surface of the bottom box section 3 and is secured thereto via another fillet weld which again does not provide a supporting connection but only ensures a predetermined position of the wear plate 26 relative to the bottom box section 3.

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The wear plate 26 has a through opening 27 for the pivot bolt 7 which is dimensioned in such a way as to ensure the tilting degree of freedom of the pivot bolt 7. The wear plate through opening 27 as well as a corresponding through opening through the frame support plate 14 for the pivot bolt 7 to
15 pass through a formed by oxy-fuel cutting or plasma cutting.

A guide sleeve 28 acts as a radial guidance for the pivot bolt 7. The guide sleeve 28 abuts the carrier frame 1 via a rigid carrier frame contact portion 29, namely via an edge region of the bottom box section 3 encircling the
20 through opening 23. Between the carrier frame contact portion 29 and the edge region of the bottom box section 3 encircling the through opening 23, there may be provided a clearance if the twistlock assembly 6 is used in the usual manner.

25 The guide sleeve 28 has a tubular sleeve base body 30 and a guide piece 31 in the form of a stepped ring which is adjacent to the hammer head 8 of the pivot bolt 7. The guide piece 31 has a peripheral step 32 via which the guide piece 31 of the guide sleeve 28 is in axial contact with the carrier frame contact portion 29. The guide piece 31 has a guide piece sleeve por-

tion 32a which is guided from the peripheral step 32 through the through openings 23 and 27 up to the hammer head 8. The guide sleeve 28 is supported against the hammer head 8 via the guide piece sleeve portion 32a.

- 5 The guide piece 31 is connected to the sleeve base body 30 via an interference fit assembly. At the point of connection with the guide piece 31, the sleeve base body 30 therefore has an external diameter which is shaped by turning to fit on the guide piece 31 while the guide piece 31 is provided with an internal diameter correspondingly shaped by turning to fit inside
10 the sleeve base body 30.

The guide piece 31 of the guide sleeve 28 extends up to the hammer head 8 and has a pivot bolt contact wall 33 facing the hammer head 8, the radial profile thereof being complementary to a radial profile of the hammer head
15 contact wall 34 facing the guide sleeve 28. The radial profile of the hammer head contact wall 34 is formed by a recess or fillet 35. The pivot bolt contact wall 33 of the guide piece 31 has a protruding profile bead which is complementary to the recess 35.

- 20 Adjacent to the hammer head 8, the guide piece 31 has a cross-section adapted to the cross-section of the hammer head 8, as shown in Figs. 2 and 3. Adapting the cross-section of the guide piece 31 to that of the hammer head 8 facilitates insertion of the hammer head 8 into the latching opening of the body to be lifted.

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There is no rotation of the guide piece 31 when latching the pivot bolt 7.

The two contact walls 33, 34 rest against each other in such a way that their profiles prevent an unwanted radial yielding of the hammer head 8 in the direction of the guide sleeve 28.

- 5 The sleeve base body 30 of the guide sleeve 28 has a lubrication spot 36 for supplying a lubricant. This allows for lubrication of the pivot bolt 7 without having to demount, in other words remove the pivot bolt 7 from the guide sleeve 28.
- 10 In order to detect that a body to be lifted is in contact with the bottom box section 3, the twistlock assembly 6 has a sensor pin 37 a free pin end of which projects downward beyond the bottom box section 3. The sensor pin 37 is an offset turned part having an external thread portion 38 at its end near the top box section. A sensor pin spring 39 is supported between a
- 15 sensor pin portion 40 which is rigidly connected to the free end of the sensor pin 37 and the frame support plate 14. This ensures that the free end of the sensor pin 37 is preloaded in the extended position shown in the drawing. A splint pin shown in the drawing serves as a mounting or demounting aid.
- 20 A locking button 41 prevents a pivoting movement of the pivot bolt 7 when the body to be lifted is up and hanging. This function of the locking button 41 is known from prior art. The driver body 15 is non-positively connected with the pivot bolt 7, the bolt nut 11 and the actuator 16. In the end posi-
- 25 tions of the actuator 16, which on the one hand correspond to the latching position and on the other to the release position of the hammer head 8 of the pivot bolt 7, the driver body 15 is latched with the locking button 41. The locking button 41 is secured to the sensor pin 37 via an internal thread which is complementary to the external thread of the external thread por-

tion 38. The locking button 41 is secured to the sensor pin 37 via a counter nut 42.

5 In order for the sensor pin 37 to pass through, the frame support plate 14, the reinforcing plate 24, the top box section 2, the bottom box section 3 and the wear plate 26 have corresponding through openings which are again formed by oxy-fuel cutting or plasma cutting.

10 In the lifting device comprising the carrier frame 1, the twistlock assembly 6 is employed as follows: The pivot bolt 7 is at first in the release position shown in the drawing. Prior to lifting, the projection of the hammer head 8 of the pivot bolt 7 is adjusted – within the scope of a one-time adjustment – by a corresponding rotational positioning of the bolt nut 11 relative to the frame support plate 14 when the pivot bolt 7 is screwed down and when the support wall 12 is in contact with the counter wall 13. Upon reaching the correct length, the bolt nut 11 is rotated into the nearest rotational position where pairs of the connection openings in the driver body 15 and in the bolt nut 11 are flush with each other for inserting the connection screws 21. In the release position, the carrier frame 1 is then positioned above the body to be lifted in such a way that the pivot bolts 7, which come to rest at the four corners of the body to be lifted, in particular at corner fittings of the container, can be inserted into the oblong-hole twistlock receptacles of the body to be lifted. Container fittings of this type are described in DIN ISO 1161. Supporting the pivot bolt 7 in a floating manner via the spherical walls 12, 13 ensures a tilting degree of freedom, in other words a tilting clearance of the pivot bolt 7 which facilitates the insertion thereof. After inserting the hammer heads 8 of the twistlock assemblies 6 at the four corners of the body to be lifted, the sensor pins 37 are retracted and the locking button 41 allows a pivoting movement of the pivot bolt 7 from the re-

lease position into the latching position. In the latching position, the hammer heads 8 engage behind the side walls of the latching openings of the body to be lifted, in other words for example the shape of a container corner fitting, from inside. Thus, a positive connection is provided between the carrier frame 1 and the body to be lifted, allowing the lifting device to lift the body to be lifted.

The following is a description, by means of Figs. 4 to 8, of another embodiment of a twistlock assembly 43 which may replace the twistlock assembly 6 in the lifting device comprising the carrier frame 1. Components which correspond to those already described above with reference to Figs. 1 to 3 have the same reference numerals and are not discussed in detail again.

Compared to Figs. 4 and 5, Figs. 6 to 8 show a mirror-inverted design of the twistlock assembly 43 which is employed at the other end of the lifting device carrier frame 1. Apart from the fact that the twistlock assembly according to Figs. 6 to 8 is mirror-symmetric to the twistlock assembly according to Figs. 4 and 5, there is no major difference between these twistlock assemblies 43.

The enlarged sectional views according to Figs. 7 and 8 illustrate the type of contact between the support wall 12 of the bolt nut 11 and the counter wall 13 of the frame support plate 14. The counter wall 13 is in the shape of a hollow cone. In the longitudinal sectional view according to Figs. 6 and 7, the counter wall 13 has a constant slope in the radial direction. The support wall 12 is convex, in particular spherically convex, and is in contact with the counter wall 13 via a central ring portion 45, which encircles the bolt axis 9 and is illustrated by a dashed oval in Fig. 7, when the pivot

bolt 7 is aligned centrally in the carrier frame 1. When the pivot bolt 7 is tilted relative to the carrier frame 1, the spherical design of the support wall 12 ensures that the ring contact portion 45 remains stationary. If the support wall 12 has a non-spherical design, the ring contact portion 45 is also
5 able migrate towards the inside or outside when the pivot bolt 7 is pivoted relative to the carrier frame 1.

Instead of the straight hollow cone shape, the counter wall 13 may also have a concave hollow cone design; in this case, the radii of curvature of
10 the support wall 12 and the counter wall 13 may be adapted to each other in such a way as to be complementary to each other. The radii of curvature may also be adapted to each other in such a way as to form an annular ring contact portion in the manner of the rings contact portion 45. In another variant, the support wall 12 may be in the shape of a straight cone and the
15 counter wall 13 may be correspondingly convex, in particular spherically convex, thus again resulting in an annular ring contact portion in the manner of the ring contact portion 45 according to Fig. 7. Finally, it is conceivable as well for the counter wall 13 to be convex and the support wall 12 to be concave, wherein the walls 12, 13 may again be designed in such a way
20 that they are complementary to each other or, alternatively, that a ring contact portion in the manner of the ring contact portion 45 is formed when the walls 12, 13 are in contact with each other. It is conceivable as well to design both walls 12, 13 in a convex manner.

25 The enlarged sectional view according to Fig. 8 illustrates the situation when the pivot bolt contact wall 33 of the guide piece sleeve portion 32a of the guide piece 31 of the guide sleeve 28 is in contact with the hammer head contact wall 34. It shall be noted that the detailed sectional view according to Fig. 8 shows the guide piece sleeve portion 32a in a longitudinal

sectional view whereas the pivot bolt 7 comprising the hammer head 8 is shown in a side view which is not cut open. The recess encircling the pivot bolt axis 9 is therefore visible in Figs. 6 and 8 only at those positions where it runs out of the hammer head 8 when the shape thereof deviates from the rotational symmetry about the bolt axis 9. The profile bead of the pivot bolt contact wall 33 of the guide piece sleeve portion 32a, which profile bead extends from a radially inner portion 46 of the guide piece sleeve portion 32a to the hammer head 8 in the axial direction, immerses into the recess 35 of the hammer head 8 and therefore immerses into an upper hammer head level 47. Apart from the radially inner portion 46 of the guide piece sleeve portion 32a comprising the profile bead, the other pivot bolt contact wall 33 of the guide piece sleeve portion 32a has a lower guide sleeve level 48. Between these levels 47, 48, there is a clearance S which may for example be 0.5 mm. The size of the clearance S is adjustable by rotating the bolt nut 11 about the bolt axis 9. A clearance S having a comparable size is disposed between an outer peripheral wall of the pivot bolt 7 and an inner peripheral wall of the guide sleeve 28 so that it is possible for the pivot bolt 7 to be pivoted about the bolt axis 9 in the guide sleeve 28.

20 In the twistlock assembly 34, the guide sleeve 28 is preloaded against the hammer head contact wall 34 via a preloading spring 44. The peripheral step 32 of the guide piece 31, which is in contact with the carrier frame contact portion 29, secures the guide sleeve 28 when the hammer head 8 is torn off the pivot bolt 7 in the event of average. In the illustrated embodiment according to Figs. 4 and 5, the preloading spring 44 is a disk spring.

Figs. 4 and 5 show the guide piece 31 of the guide sleeve 28 which is displaced opposite to the preloading force of the preloading spring 44 and spaced from the carrier frame contact portion 29. When the twistlock as-

sembly 43 is mounted, there is a defined gap between the peripheral step 32 of the guide piece 31 and the carrier frame contact portion 29, with the result that the peripheral step 32 and the carrier frame contact portion 29 are not in contact with each other in the normal operation of the twistlock assemblies 6 or 43, respectively.

The preloading spring 44 may be a steel spring, a rubber spring, a plastic spring, for instance of polyurethane (PUR), or a spring made of soft plastics. Between the frame support plate 14 and the preloading spring 44, there may be arranged an intermediate plate.

Alternatively, the preloading spring 44 may be supported against the top box section 2 of the carrier frame 1.

The preloading spring 44 ensures a constant axial positioning of the guide sleeve 28, thus avoiding an unwanted constraint of the pivot bolt 7 in the region of the walls 12, 13 or an unwanted constraint in the region of contact between the guide sleeve 28 and the frame support plate 14. The preloading spring 44 ensures that the pivot bolt 7 returns from a tilted position into a position which is centered relative to the carrier frame 1.

The carrier frame contact portion 29 and the pivot bolt contact wall 33 of the guide sleeve 28 may serve as abutments for supporting the guide sleeve 28 against the carrier frame 1 and/or against the hammer head 8 of the pivot bolt 7. Both the carrier frame contact portion 29 and the pivot bolt contact wall 33 of the guide sleeve 28 may thus form an abutment body via which the guide sleeve 28 is axially supported at the carrier frame 1 and/or at the hammer head 8.

Claims

1. Lifting device comprising a twistlock assembly (6; 43)
 - comprising a pivot bolt (7) with a hammer head (8) which is pivo-
5 table about a bolt axis (9) between a release position for inserting
the hammer head (8) into a latching opening of a body to be lifted
and a latching position for latching engagement with side walls of
the latching opening by the hammer head (8),
- with the pivot bolt (7) comprising an external thread bolt portion
10 (10),
- comprising a bolt nut (11) with an internal thread designed com-
plementarily to the external thread of the external thread bolt por-
tion (10), with the bolt nut (11) being supported at a lifting device
carrier frame (1) via a support wall (12);
15 **characterized in that** at least one of the following holds true:
- the support wall (12) of the bolt nut (11) has a convex shape;
- a counter wall (13) of a carrier-frame-anchored abutment body (14)
with which the support wall (12) is in contact has a concave shape;
so that a floating support of the bolt nut (11) is achieved.
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2. Lifting device according to claim 1, **characterized in that** at least one
of the support wall (12) and the counter wall (13) are spherical.
3. Lifting device according to claim 1, **characterized in that** the abut-
25 ment body (14) simultaneously acts as a frame support plate which re-
inforces the carrier frame (1).

4. Lifting device according to claim 1, **characterized by** a driver body (15) for positive mechanical coupling of the pivot bolt (7) with an actuator (16) of a pivot drive,
- with a non-rotational connection device (19) for connecting the driver body (15) to the bolt nut (11) being designed in such a way that the driver body (15) is non-rotationally connectable with the bolt nut (11) in more than two peripheral positions of a rotation of the bolt nut (11) relative to the abutment body (14).
5. Lifting device according to claim 4, **characterized in that** the connection via the connection device (19) takes place via in each case one combination of connection points (20) on the bolt nut (11) on the one hand and on the driver body (15) on the other, with the connection device (19) having a predetermined number of connection points on the bolt nut (11) and a number of connection points (20) on the driver body (15) which number is increased by an integer multiple.
6. Lifting device comprising a lifting device carrier frame (1) and a twist-lock assembly (6; 43) comprising
- a pivot bolt with a hammer head (8) which is pivotable about a bolt axis (9) between a release position for inserting the hammer head (8) into a latching position of a body to be lifted and a latching position for latching engagement with side walls of the latching opening by the hammer head (8);
 - a guide sleeve (28) for radial guidance of the pivot bolt (7),
 - with the guide sleeve (28) extending up to the hammer head (8) and comprising an abutment portion (29; 33) by means of which the guide sleeve (28) is axially supported on at least one of the carrier frame and the hammer head (8),

characterized by a preloading spring (44) for preloading the guide sleeve (28) against at least one of the carrier frame (1) and the hammer head (8).

- 5 7. Lifting device according to claim 6, **characterized in that** the guide sleeve (28) has a sleeve base body (30) and a guide piece (31) adjacent to the hammer head (8) of the pivot bolt (7), the guide piece (31) having a peripheral step (32) via which the guide sleeve (28) can be brought into axial contact with a carrier frame contact portion (29).
- 10
8. Lifting device according to claim 7, **characterized in that** the guide piece (31) is connected with the sleeve base body (30) via an interference fit assembly.
- 15 9. Lifting device according to claim 6, **characterized in that** the guide sleeve (28) comprises a pivot bolt contact wall (33) facing the hammer head (8), the radial profile of the pivot bolt contact wall (33) being complementary to a radial profile of a hammer head contact wall (34) facing the guide sleeve (28).
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10. Lifting device according to claim 9, **characterized in that** there is a clearance (S) in portions between the pivot bolt contact wall (33) and the hammer head contact wall (34).
- 25 11. Lifting device according to claim 6, **characterized in that** the guide sleeve (28) has a lubrication spot (36) for supplying a lubricant.

12. Lifting device according to claim 6, **characterized in that** the preloading spring (44) is supported against the frame via a frame support plate (14) which simultaneously reinforces the carrier frame (1).
- 5 13. Lifting device according to claim 1, **characterized in that** the carrier frame (1) is formed by a hollow profile comprising a top box section (2) and a bottom box section (3).
- 10 14. Lifting device according to claim 13, **characterized in that** the abutment body (14) is supported against the surface of the top box section (2).
- 15 15. Lifting device according to claim 1, **characterized by** a wear plate (26) which reinforces the carrier frame (1) on a side facing the hammer head (8).