[005] The disadvantage of the usual securing of the coupling piece element is that the locking pin must be knocked in during assembly and additionally secured against falling out, for example with a lead plug that is pressed into the locking pin borehole. To open the Kenter shackle, the coupling piece element must be removed by knocking the locking pin out with a hammer. This can result in injuries, especially to the person who has to hold an ejector pin. A non-destructive removal of the coupling piece element at great depth under water, e.g. by a diving robot, is therefore not possible. It is possible to cut the coupling piece element into pieces by cutting and thus opening the shackle. However, the Kenter shackle is no longer easily reusable because a new coupling piece element has to be inserted and because the half elements have to be freed from the remains of the locking pin, which is only possible above water.

[006] A chain link is shown in DE 6605034U. Two half elements can be pushed into each other laterally to form a chain link. To secure the half elements, a clamping element is used that contains two securing bolts in a cross borehole. These can be driven apart via a central clamping element and engage in the inner flanks of the half elements so that the clamping element is held in its position between the coupled half elements. However, the clamping element can be rotated around the axis formed by the securing bolts. The clamping element can also no longer be dismantled if the securing bolts become stuck in their borehole due to corrosion. It is not possible to exert a force on the securing bolts to return them from their locked position. The problem addressed by the present invention is, therefore, to provide a coupling piece element for a Kenter shackle that is easier to insert and remove between the half elements, and from which no residue remains in the half elements even in the event of destructive removal.

[007] According to the invention, a coupling piece element is provided which has at least one securing bolt each on at least two opposite side faces pointing towards the inner flanks of the half elements. Both securing bolts can be completely countersunk into the base body and, when pushed out, only their end protrudes beyond the side surface, so that, in particular, the boreholes in the half elements can also be significantly reduced in length and no longer have to extend into the outer zones adjacent to the toothing receptacle, which have to absorb all tensile stresses. The points of weakness in the half elements, which are formed by the borehole in conventional fastening, are thus eliminated in this preferred embodiment of a coupling piece element.

[008] The improved coupling piece provides two separate securing bolts in a common transverse borehole, which can be pushed outwards via a central spreader-element. In this way, the especially hemispherically rounded or conical ends of the securing bolts protrude from the coupling piece and can engage in corresponding recesses on the inner flanks of the half chain elements. Lateral stop surfaces, which interact with corresponding protrusions or recesses on the inner flanks of the half chain elements, prevent the coupling piece from rotating around the securing bolt axis. Disassembly is now much easier, including when using a diving robot. Only the hexagon socket screw on the coupling piece, which is preferably used as a spreader element, has to be loosened so that the two securing bolts can be pushed back in again. Due to the spherical or conical shape of the ends of the securing bolts, they are automatically pushed back when the coupling piece is pulled out of the Kenter shackle.

[009] The coupling piece element according to the invention is intended in particular for use with anchor chains. As is well known, corrosion in salt water is a major problem, and even with the coupling piece of the present invention, it is taken into account that the advantageous development of the coupling piece element will in many, but not all, cases result in the easy release of the connection. In the case of advanced corrosion, only a destructive disassembly of the coupling piece element may be possible, whereby the coupling piece is cut in the middle, but the half chain elements remain undamaged.

[0010] This effect, which results directly from the application of the anchor chain, is also related to the protrusions and recesses. These serve to guide and form-fit the coupling piece element so that in the main load direction, the half elements of an associated Kenter shackle are additionally held together and twisting of the coupling piece element relative to the Kenter shackle is prevented. The Kenter shackle is to be supported between its inner flanks by the coupling piece element and the supporting surface is only reached in a certain position.

[0011] Therefore, twisting is prevented by the contact surfaces. The invention will be explained in more detail below with reference to the drawings. The Figures show in detail:

[0012] Fig. 1 a coupling piece element in section.

[0013] Figs. 2, 3 individual parts of a Kenter shackle before assembly, each in perspective view; and

[0014] Fig. 4 an assembled Kenter shackle in section.

[0015] Figure 1 shows a cross-section through a preferred embodiment of a coupling piece element 20 according to the invention. It has in a base body 26 a transverse borehole 26.1, in which two securing bolts 22 are slidably arranged. These are rounded hemispherically at their outward facing ends 22.2. They are secured against falling out by screws 24. The securing bolts 22 have a conical section 22.1 on each of the inner surfaces facing each other. A threaded borehole 26.2 is formed perpendicular to the transverse borehole 26.1, in which a spreader element 21 with a threaded shoulder is accommodated. This is a screw-like element that has a screw head that is accommodated in a countersink. A spring washer 28 can also be placed under the screw head.

[0016] The screw head can contain a standard drive such as a hexagon socket.

[0017] The part of the spreader element 21 projecting into the transverse borehole 26.1 is initially smooth and cylindrical, with a truncated cone tip at its end. By screwing the expansion element 21 into the base body 26 of the coupling piece element 20, the tip 21.1 strikes the cone-shaped shoulders 22.1 of the securing bolts 22 and thus pushes them outwards. The rounded outer sides of the securing bolts 22 engage in boreholes formed on the inner flanks of the half elements of the Kenter shackle. This allows the coupling piece element 20 to be fixed between the two half elements. It blocks the half elements pushed into each other and keeps them at a distance under load so that no excess deformations and associated increases in tensile stresses occur in the half elements.

[0018] Figure 2 shows two identical half elements 10 in the correct position for assembly. The half elements 10 must be positioned such that the end faces of the short legs 12 abut each other in the center plane. The half elements 10 are connected by sliding them in laterally so that the toothing engages on both sides. The area of the short leg 12 provided with external toothing 12.1 is pushed into the cavity 16 with the internal toothing 16.1 on a long leg 11. The mounting direction is therefore exactly transverse to the longitudinal axis or to the load direction.

[0019] To secure to each other the two half elements 10 pushed into each other and also to enable support of the two long legs 11 under load, the coupling piece element 20 is inserted between the legs 11, 12. It has recesses 23 on the side surfaces, which are intended for contact with corresponding protrusions 14, 15 on the half elements 10. The positive guide over the edges of the protrusions and recesses 14, 15, 23 prevents twisting of the coupling piece element 20. The coupling piece element 20 is secured in the Z direction by turning the spreader element 21 using a wrench so that the laterally emerging ends of the securing bolts 22 are pushed out to engage in recesses on the inner flanks of the inserted half elements 10.

[0020] With the insertion of the coupling piece element 20 between the half elements 10 a Kenter shackle 100 is fully assembled.

[0021] Figure 3 shows the parts of the Kenter shackle 100 with the two half elements 10 and the coupling piece element 20 in a somewhat different perspective. It can still be seen here that the inward facing surfaces of the short leg 12 do not have any toothing, as no engagement is possible with a counterpart on the respective long leg 11. However, a protrusion 15 is formed on the inside of the short leg 12 to fill and complete the protrusion 14 accordingly after the half elements 10 have been pushed into each other.

[0022] The center axis of the securing bolts 22 is located exactly in the central plane M between the half elements 10, such that the receiving borehole for the securing bolts 22 is also divided into two. As can be seen in Figure 3, one half 14.1 of the borehole is noticeable on the protrusion 14 on the inside of the long leg 11. Another half 15.1 of the borehole is formed on the protrusion 15 of the short leg 12. When the half elements 10 are pushed together, a closed borehole is created in which the securing bolts 22 or their rounded ends 22.2, respectively, can engage.

[0023] Figure 4 shows a fully assembled Kenter shackle 100 in a section. The toothing 12.1 on the short leg 12 outside and on the inside of the receiving space 16 interlock completely. Above the toothing 12.1 on the short leg 12, however, the receiving space 16 expands into a cavity 17, which remains empty even with the fully assembled Kenter shackle 100. It is essential that the hollow space 17 with a lateral flank 17.1 moves away from the last tooth tip 16.3 in the uppermost toothing plane roughly in the direction of the longitudinal axis of the Kenter shackle 100, i.e., parallel to the longitudinal axis or at an acute angle to it. With a further rounding, the

lateral flank 17.1 of the cavity 17 merges into a roof area. With the Kenter shackle 100 under tension, the forces are transferred to the contact surfaces of the toothing, which are aligned transversely to the longitudinal axis. The arrangement of the cavity 17, which complements the actual receiving space 16 for receiving the toothing 12.1, the tensile stresses occurring under load to be diverted much better. This avoids stress concentration selectively at points. Rather, the stresses are redirected past the cavity 17 into the initial region of the respective long leg 11 and from there into the bent clasp 13.

[0024] The securing bolts 22 engage in the recesses on the half elements. A rotation of the coupling piece element 20 around the axis of the securing bolts 22 is prevented by the fact that the side edges of the recess 23 on the coupling piece element 20 rest against the side edges of the protrusions 14, 15 on the half elements 10.

Claims:

1. A coupling piece element for a Kenter shackle for anchor chains, which comprises two half elements which can be coupled to one another and between which the coupling piece element can be inserted, wherein:

- the coupling piece element has a base body with at least one transverse borehole into which at least two securing bolts can be inserted for engagement in recesses on the inner flanks of the half elements,

- the at least two securing bolts are arranged axially aligned in a common transverse borehole running through the base body and can be slidably moved outwards by means of at least one spreader element engaging between the securing bolts;

- the base body has protrusions and/or recesses on its side surfaces facing the half elements for positive guidance on the half elements;

- the laterally protruding ends of the securing bolts are spherical or conical in shape;

characterized in that,

- the spreader element is a screw having a screw head with a drive which is accommodated in a counter bore in the base body and which has a threaded shoulder which is accommodated in a threaded borehole in the base body which borehole is perpendicular to the transverse borehole; and

- the spreader element has a tip at its end facing opposite from the screw head.

2. The coupling piece element as in claim 1, characterized in that on at least one side of the spreader element the securing bolt is divided longitudinally into several bolt sub-elements.

3. A Kenter shackle for anchor chains, which comprises two half elements that can be pushed into each other laterally and having a coupling piece element that can be inserted between the half elements and locked therein as in one of the preceding claims.

4. The Kenter shackle as in claim 3, characterized in that the half elements each have an L-shaped or J-shaped configuration, in which external toothing with a plurality of parallel toothing planes is formed at the end of a short connecting leg, and in which a receiving chamber is formed at the end of a long connecting leg, which receiving chamber has internal toothing having a plurality of parallel toothing planes in which the external toothing of the short connecting leg engages, the connecting legs being connected to one another via a curved clasp.

5. The Kenter shackle as in claim 3 or 4, characterized in that the transverse borehole is aligned perpendicularly to the longitudinal axis of the coupling piece element and the Kenter shackle.

6. The Kenter shackle as in one of claims 3 to 5, characterized in that the center axis of the securing bolts is located in a central plane between the half elements and a receiving borehole for the securing bolts is divided into two halves.