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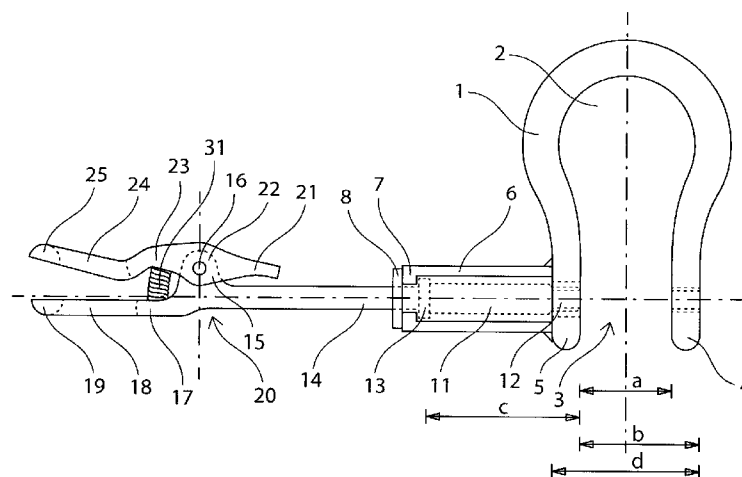


FIG. 1

(57) Abstract: A shackle (110) is described, which comprises a shackle body (1) having a first end (4) with a first hole (101) and a second end (5) with a second hole (102), which holes are aligned with a common centre line (103). The shackle (110) comprises, a shackle bolt (11) which is movable along the common centre line (103) between a closed position and an open position. The shackle (110) comprises a first locking device. The shackle also comprises a first handle (17) which is fixed to the second end (20) of the shackle bolt (11), a second handle (23) which is pivotable in relation to the first handle (17) around a rotational axis (111). A second locking device is arrangeable in a locking position. The second locking device is disengageable from the locking position by pivoting of the second handle (23) towards the first handle (17).



LOCKABLE SHACKLE

Technical field

The present invention relates to a lockable schackle for underwater use. More specifically, the present invention relates to a lockable schackle for underwater use which is adapted to be operated by remotely operated underwater vehicle (ROV).

Background of invention

In oil and mineral exploration, performed under water along the coastal lines, the trend is to go to increased depth on the seabed for exploration and operational activities. Operations to be carried out under water are performed more and more using remotely operated underwater vehicles (ROV). ROV:s are frequently being used to connect and disconnect load cable terminal fittings, like shackles, from the load at the seabed.

An ROV is provided with one or more remotely controlled manoeuvre arms with plier-like, human-hand-like or other similar grip tool at the end of the grip arm. Typically the grip tool can be moved in the three space dimensions left-right, up-down and forward-backward, but in addition the grip tool can usually be rotated an unlimited number of revolutions in clockwise or anticlockwise directions.

For connecting and disconnecting loads the current shackles being used for retrieving or releasing a lifting eye, lifting sling or the like in sub-sea operations are of two types.

Firstly, there are shackles manoeuvred by the use of compressed air, pressurised seawater or pressurized oil, all of which are dependent on external power media sources supplied by a pipe or a hose. This makes the operation complicated, slow and expensive.

Secondly, there are also mechanically self-functioning shackles which are complicated to handle and consist of a large number of mechanically interacting parts, making them unreliable in function and bulky and heavy to handle.

NO 317 141 (NO) describes a shackle to be operated by a remotely operated ROV. However, the shackle according to NO is complicated to manoeuvre for an ROV as the ROV has to know the orientation of the shackle.

Summary of the invention

An object of the present invention is to provide a shackle for connecting and disconnecting loads in sub-sea operation which is an alternative to the shackles according to the prior art.

Another object of the present invention is to provide a shackle for sub-sea operations which may be operated by a remotely operated underwater vehicle (ROV).

A further object of the present invention is to provide a shackle for sub-sea operations which may be operated easily and safely by a remotely located operating person in the control room onshore or at a platform on-surface.

5 Still another object of the present invention is to provide a shackle for load handling operations by releasing or retrieving a cable eye connected to the load or a lifting eye directly attached to the load, which operations shall be carried out by the operator with an ROV, which shackle solves at least one of the problems of the prior art.

At least one of these objects is fulfilled with a shackle according to the independent claim.

Further advantages are provided with the features of the dependent claims.

10 A shackle according to the invention comprises a shackle body having a first end with a first hole and a second end with a second hole. The shackle body has an essentially U-shaped part, wherein the first hole and the second hole are aligned with a common centre line. The shackle also comprises a shackle bolt which is movable along the common centre line between a closed position, in which a first end of the shackle bolt is in engagement with the first hole
15 and closes the gap between the first hole and the second hole, and an open position, in which said gap is at least partially open to allow the insertion of a chain, rope or cable in the shackle. The shackle is characterized in that it comprises a first locking device arranged to prevent axial movement of the shackle bolt in the closed position, wherein the first hole is threaded and constitutes a first locking means of the first locking device, and wherein the first end of
20 the shackle bolt is threaded, constitutes a second locking means of the first locking device and is arranged to engage with the first locking means. The shackle comprises a first handle which is fixed to the second end of the shackle bolt. The shackle also comprises a second handle which is pivotable in relation to the first handle around a rotational axis, wherein the handles, seen in a view perpendicular to the rotational axis and the common centre line, together define
25 an eye, and a second locking device arrangable in a locking position in which the shackle bolt is prevented from leaving the closed position, wherein the second locking device is disengagable from the locking position by pivoting of the second handle towards the first handle.

30 Thus, in the closed position the threaded first end of the shackle bolt is in engagement with the threaded first hole. In order to disengage the first end of the shackle bolt from the first hole the shackle bolt has to be rotated. In the locking position of the second locking device the shackle bolt is prevented from leaving the closed position, i.e., the shackle bolt is prevented from rotation in relation to the first hole. The second locking device is manoeuvred by pivoting of the second handle towards the first handle.

The shackle is of mechanical self-functioning type, which means that any dependence of any kind of external supply for its function is eliminated.

The shackle according to the invention always gives double safety barriers against unintended release and loss of the load. These two safety barriers are the first and second locking devices.

- 5 Further, the shackle according to the invention may be designed with very few interacting parts, which would make the operational function extremely reliable. It is possible to design the shackle with only three interacting major parts. Preferably, at least five parts are used.

10 With a shackle according to the invention it is possible to perform the disengagement of the second locking device and the disengagement of the first locking device in one consecutive movement. An advantage with the invention compared with the shackles according to the prior art is that the operation for opening and closing the shackles may be performed in one unbroken sequence without any interruption for shift of grip. The sequence for closing the shackle is:

- clamp handles together in common grip to disengage the second locking device;
- 15 – slide the shackle bolt axially towards the first end of the shackle body;
- rotate the shackle bolt to engage with the first hole; and
- unclamp the handles while finding a blocking position.

Shackle opening is made in reverse order.

20 The rotational position of the handle does not affect the operation of the shackle bolt and shackle body as the second locking device is disengagable from the locking position by pivoting of the second handle towards the first handle. The only consideration that has to be taken is that the handles are pivoted towards each other. This may be done by clamping the handles.

25 In comparison with NO 317 141 one main advantage with the present invention is that, in the open position the shackle bolt with the two handles is rotationally indifferent relative to the shackle body. This makes the gripping around the two handles convenient, as the initial grip does not rotate the shackle body. Also the sliding move along the centre line the distance is made with the shackle bolt rotationally indifferent relative to the shackle body. The rotational movement of the shackle bolt may be performed until a mechanical stop is reached, i.e., when
30 the shackle bolt is screwed as far as possible into the first hole.

In contrast to the present invention, when activating or deactivating the two safety barriers for sliding and rotation in the shackle according to NO, the grip tool of the ROV will have to

execute two different sequential moments with intermediate change of grip. This makes the operation slow more time consuming and less convenient.

Preferably, in the shackle according to the invention the rotational axis is essentially perpendicular to the common centre line of the holes. Such an orientation of the rotational axis is easily implemented.

The shackle may also comprise a guiding means attached to the second end of the shackle body at a distance from the second hole, which guiding means comprises a third hole, wherein the third hole is aligned with the first hole and the second hole. The provision of such a guiding means improves the stability of the shackle bolt in relation to the shackle body when it is moved between its open position and its closed position. It is possible to provide stability in other ways such as, i.e., by making the first end of the shackle body thick along the centre line. It is, however, favourable to design the shackle body as a standard shackle body and to have a guiding means at a distance from the second hole as this makes production cheaper.

The guiding means may have an end plate in which the third hole is arranged. The provision of an end plate is an uncomplicated way of providing the guiding means.

The shackle may also comprise a tube with which the end plate is fixed to the second end of the shackle body. It is of course possible to arrange the end plate at a distance from the second end of the shackle body in other ways. It is possible to use rods to fix the end plate at a distance from the second end of the shackle body. However, the use of a tube means that the number of parts is minimized at the same time as a stable fixation of the end plate is provided.

Further the exterior surfaces of the tube may be arranged to have no major openings to the interior space, where sludge or other solid pollution could enter and cause functional disturbance. It is also possible to have the tube with a complete uninterrupted curved surface area. Such a design of the tube is advantageous compared to the design of the tube in NO 317 141, which has a curved surface with major holes or slots, where sludge or other pollution can penetrate into the interior of the tube or a sliding slot with interacting guide pin. By having a tube with uninterrupted curved surface any malfunction due to sludge or other pollution is eliminated.

The inner dimensions of the tube may be larger than the diameter of the second hole and the third hole and the shackle bolt may comprise a flange which is arranged between the second hole and the third hole inside the tube, preventing the shackle bolt from leaving the second hole and the third hole. Thus, the movement of the shackle bolt is restricted while it still allows the opening between the first end and the second end of the shackle body to be

completely open. As an alternative it is possible to arrange a flange close to the thread at the first end of the shackle bolt.

5 The second locking device of the shackle may comprise a first locking means which is fixed in relation to the second end of the shackle body, wherein the first locking means comprises at least one recess, and a second locking means which is arranged fixed in relation to the second handle on the opposite side of the rotational axis, and which comprises a locking pin which is arranged to engage with said at least one recess of the first locking means. Such a second locking device may easily be implemented.

The first locking means of the second locking device may be arranged on the end plate.

10 The shackle may comprise biasing means which bias the second handle away from the first handle into the locking position of the second locking device. By having such a biasing means the locking pin is automatically forced into a recess when the shackle bolt is turned so that the locking pin is in position to enter a recess.

15 The biasing means of the shackle may be at least one spring. It is of course possible to have two or more springs. It is also possible to have other means for biasing such as, e.g., magnets arranged to repel each other.

Each one of the first handle and the second handle may both define an eye. This provides for stronger handles. When an ROV is to grip the handles a secure grip is provided due to the eyes in the handles.

20 Each one of the handles may comprise a grip area which forms part of the eye and which is essentially perpendicular to the common centre axis.

The handles may be provided with a centreing means which is arranged to guide a grip tool to the grip area. In this way the grip area may be made smaller and centred on the centre line or any other desirable position.

25 The grip area may be located at the end of the handle opening most distant from the shackle body. The centreing means may be arranged as a narrowing of the opening towards the grip area. With such a centreing means a grip tool which is to grip the handle will be guided to the grip area during the gripping by the narrowing opening.

30 The centreing means also comprises two rods which extend from the end of the handle which is most distant from the shackle body away from the grip area. Such rods will help to centre a tool approaching the handle from the rear.

Preferably, the distance between the rods increases with the distance from the grip area. Thus, a grip tool will be gradually centred.

The rods may extend symmetrically on either side of the centreline. This is preferable in that the centring is independent of the side on which the ROV is displaced from the centre line.

- 5 The first handle and the second handle may have sizes which differ from each other no more than 20 %. This provides for an easy grip for the ROV. Preferably, both handles have the same size and the same but mirrored shape.

- 10 Preferably, the first handle and the second handle with grip areas are mirroring each other in shape, and the gripping operation for shackle closing is made without interruption in one continuing sequence: clamp handles together in common grip – slide axially – rotate – release grip while finding blocking position. Shackle opening is made in reverse order.

In the following preferred embodiments of the invention will be described with reference to the drawings

Short description of the drawings

- 15 In the embodiment of the invention illustrated by fig 1 – 5 there is a shackle consisting of three major parts, where details are given by numbers in the figures and the corresponding denominations are given as follows:

110. Shackle

1. Shackle body, U-shaped
 20 2. Internal space
 3. Opening
 4. First end of shackle with threaded hole
 5. Second end of shackle with non-threaded hole
 6. Tube
 25 7. End plate with centre hole
 8. Axially protruding ring
 9. Recess

100. Shackle bolt with handle

- 30 11. Shackle bolt
 12. Threaded first end
 13. Flange
 14. Handle shaft

- 15. Pivotable joint area
- 16. Joint pin
- 17. First handle
- 18. Handle opening
- 5 19. Grip area
- 20. Second end of shackle bolt

- 200. Locking lever
- 10 21. Locking pin
- 22. Pivotal joint area
- 23. Second handle
- 24. Handle opening
- 25. Grip area
- 15 300. Spring
- 31. Compression spring
- 32. Compression spring

- 20 400. External eyes/links (dotted)
- 41. First upward link
- 42. Second downward link

- 50. First rod
- 25 51. Second rod
- 52. First side part
- 53. Second side part

Fig 1 shows a shackle according to an embodiment of the invention in an open position.

- 30 Fig 2 shows, partly in cross section, the shackle in Fig 1 in a closed position with the second locking device disengaged.

Fig 3 shows in cross section the first locking means of the second locking device in engagement with the second locking means of the second locking device.

Fig 4 shows in detail the first locking means of the second locking device.

- 35 Fig 5 shows the handles in a view perpendicular to the view in Fig 1.

Fig 6 shows the second locking device according to a second embodiment.

Fig 7 shows the second locking device according to the second embodiment in a view along the centre line.

Fig 8 shows a shackle 110 according to a third embodiment.

5 Fig 9 shows a handle according to an alternative embodiment.

Fig 10 shows a handle according to an alternative embodiment.

Description of preferred embodiments

10 In the following description of preferred embodiments similar features will be denoted with the same reference numerals in the different drawings. It should be noted that the drawings are not drawn to scale.

Fig 1 shows a shackle 110 according to an embodiment of the invention. Fig 2 shows, partly in cross section, the shackle in Fig 1 in a closed position with the second locking device disengaged. Fig 3 shows in cross section the first locking means of the second locking device in engagement with the second locking means of the second locking device. Fig 4 shows in detail the first locking means of the second locking device. Fig 5 shows the handles in a view perpendicular to the view in Fig 1. The shackle 110 comprises an essentially U-shaped shackle body 1 having a first end 4 with a first hole 101 and a second end 5 with a second hole 102. The shackle body 2 comprises an essentially U-formed part which defines an internal space 2, and the ends 4, 5, of the shackle body 2 define an opening 3. The holes 101, 102, are aligned along a common centre line 103. The shackle 110 also comprises a shackle bolt 11 with a threaded first end 12 and a second end 20. The first hole 101 is also threaded so that the first end 12 of the shackle bolt may be screwed into the first hole 101. The threaded first hole 101 comprises a first locking means and the threaded first end 12 of the shackle bolt constitutes a second locking means. The threaded first hole 101 and the threaded first end 12 of the shackle bolt 11 comprises a first locking device arranged to prevent axial movement of the shackle bolt in the closed position.

The shackle 110 also comprises a first handle 17 which is fixed in relation to the second end 20 of the shackle bolt 11 by means of a handle shaft 14. The first handle 17 has an opening 18 and a grip area 19 which an ROV is arranged to engage with. The handle shaft and the shackle bolt could be of the same diameter but the handle shaft 14 may also be of a different diameter. The shackle also comprises a second handle 23 which is pivotable in relation to the first handle 17 around a rotational axis 111, which is essentially perpendicular to the common centre line 103 of the holes 4, 5. The second handle 23 is attached to the first handle 17 with a joint pin 16 in pivotable joint areas 15, 22, of the first handle 17 and the second handle 23, respectively. The second handle 23 has an opening 24 and a grip area 25 which an ROV is

arranged to engage with. The openings 18, 24, of the handles 17, 23, seen in a view perpendicular to the rotational axis 111 and the common centre line 103, together define an eye as is shown in Fig 5 below. Thus, it is not necessary that each one of the handles 17, 23, form an eye. One of the side parts 52, 53, may be removed on one of the handles while the opposite side part 52, 53 may be removed from the other handle.

The shackle 110 also comprises a guiding means in the form of an end plate 7 attached to the second end of the shackle body 1 at a distance from the second hole 102, by means of a tube 6, which is fixed to the second end of the shackle body 1. The guiding means in the form of the end plate 7 comprises a third hole 112, which is aligned with the first hole 101 and the second hole 102. An axially protruding ring 8 is arranged on the end plate. The ring 8 comprises four recesses 9, which form a first locking means which is fixed in relation to the second end of the shackle body. The inner dimensions of the tube 6 is larger than the diameter of the second hole 102 and the third hole 112 and the shackle bolt 11 comprises a flange 13 which is arranged between the second hole 102 and the third hole 112 inside the tube 6, preventing the shackle bolt 11 from leaving the second hole 102 and third hole 112.

The shackle 110 also comprises a second locking means in the form of a locking pin 21 which is arranged fixed in relation to the second handle 23 on the opposite side of the rotational axis 111, and which comprises a locking pin which is arranged to engage with one of said recesses 9 of the first locking means. The second handle 23 and the locking pin 21 together form a locking lever 200.

The shackle also comprises biasing means in the form of springs 31, 32 which forces the handles away from each other. In the shown embodiment the biasing means are helical springs. Alternatively, the biasing means may be magnets arranged to repel each other.

The shackle bolt is movable along the common centre line 103 between the shown closed position, in which

The shackle 110 is shown in Fig 1 in an open position ready to receive a first upward 41 and a second downward 42 eye, link, sling, closed cable end loop or the like, through the opening 3 into the internal space 2. The shackle body has a first end 4 with an ear with a first threaded hole 101 and a second end 5 with an ear with a non-threaded second hole 102, which second end is firmly attached with an outwardly directed tube 6 with an end plate 7, which end plate 7 has an axially protruding ring 8 with a number of recesses 9 along its circumference, all details being fixed parts of the shackle body 1 with tube 6. The threaded first hole 101, the second hole 102, the tube 6 and the third hole 112 are all oriented along the same common centre line 103.

The shackle bolt 11 has a threaded first end 12, and another end expanding radially to a flange 13. The latter is fixed to a handle shaft 14, which extend with some clearance through the third hole 112 in the end plate 7 and then transfers into a pivotal joint area 15 and an adjacent fixed handle 17 with a handle opening 18 and a grip area 19 at the rear end. All parts from threaded bolt end 12 extending to and including handle shaft 14 are oriented along the same common centre line 103. The rotational axis 111 of the pivotal joint area 15 is mainly at right angle to the centre line 103.

The locking lever 200 has one end provided with a locking pin 21, which with some clearance is moving in and out of the recesses 9, when the second handle 23 is rotating around the rotational axis 111. The rotation is initiated by the movement of the second handle 23 towards and away from the fixed handle 17. The second handle 23 is also provided with an opening 24 and a grip area 25 at the rear end, thereby creating a mirror image of the fixed handle 17 with included parts. The locking pin 21, the pivotal joint area 22 and the second handle 23 the opening 24 and the grip area 25 form a third major part, being the locking lever 200.

Biasing springs 32 and 33 are mounted to interact between the first handle 17 and the second handle 23 so that at steady state the two handles are held away from each other. When the grip areas 19, 25, are brought together the locking pin 21 will be moved away from the recess 9.

The operational sequence for operating the shackle is as follows:

- 1) When the shackle is in open position the relevant links 41, 42, are brought into or released from the shackle;
- 2) One grip is made around the two grip areas 19, 25, to bring them together against the force of the biasing springs;
- 3) While the grip is held together – however not necessary - the shackle bolt with the handles 17, 23, is slidingly moved along the centre line 103 the distance “a” (fig 1)
- 4) While the grip is held together – now necessary – the grip is made to rotate in the threading direction of the threaded end 12 and the threaded hole 4 to make the total centreline distance “b” (fig 1).

For a good practical design the distance “c” should be about the same as distance “d”.

- 5) When reaching the last revolution before tightening stop of the thread of the first hole 101 the second handle 23 is smoothly released from the grip. With a gentle rotation of the handles 17, 23, the locking pin 21 is finding its nearest recess 9 and by the spring force from the biasing springs 31, 32, goes into a steady state of embedded position in the recess. The

grip can now be released and the shackle is locked in operational load-handling position with two safety barriers in the form of the first locking device and the second locking device. The threaded first end 12 of the shackle bolt 11 and the threaded first hole 101 of the shackle body constitute the first locking device while the locking pin 21 and recesses 9 constitute the second locking device.

Operational sequence for releasing is made in reverse order.

Fig 6 and fig 7 show the second locking device according to a second embodiment. Only the differences in relation to the first embodiment will be described. The locking pin 21 is interacting with a radially protruding ring 8 instead of an axially protruding ring. The radially protruding ring 8 is provided with a number of recesses 9 along its circumference, thus giving the same operational function. The second locking device according to the second embodiment may be implemented in the shackle 110 according to the first embodiment.

Fig 8 show a shackle 110 according to a third embodiment. Only the differences in relation to the first embodiment will be described. The shackle body comprises a second U-formed part 222 to which the first upward link 41 is connected to the shackle 110 through a separate clevis type connection firmly integrated in the top of the shackle body 1. The downward link 42 has entered the through the opening 3 into the internal space 2. The shackle body according to the third embodiment may be combined with the shackle 110 according to the first embodiment and/or with the second locking device according to the second embodiment.

Fig 9 shows a handle 17, 23, according to an alternative embodiment. The shown handle 17, 23, can be used for the first 17 and/or the second handle 23. The grip area 19, 25, is located at the end of the handle opening most distant from the shackle body. The shackle body is located to the right in the figure. The centreing means is arranged as a narrowing of the opening towards the grip area 19, 25.

Fig 10 shows a handle 17, 23, according to an alternative embodiment. The shown handle 17, 23, can be used for the first 17 and/or the second handle 23. The centreing means is arranged as a narrowing of the opening 18, 24, towards the grip area 19, 25 and also comprises two rods 50, 51, which extend from the side of the handle 17, 23, which is most distant from the shackle body away from the grip area. The shackle body is located to the right in the figure. The distance between the rods 50, 51, increases with the distance from the grip area. The rods 50, 51, extend symmetrically on either side of the centreline 103.

The described embodiments may be amended in many ways without departing from the spirit and scope of the present invention, which is limited only by the appended claims.

CLAIMS

1. Shackle (110) comprising

a shackle body (1) having a first end (4) with a first hole (101) and a second end (5) with a second hole (102), wherein the shackle body (1) has an essentially U-shaped part, wherein
5 the first hole (101) and the second hole (102) are aligned with a common centre line (103),

a shackle bolt (11) which is movable along the common centre line (103) between a closed position, in which a first end (12) of the shackle bolt (11) is in engagement with the first hole (101) and closes the gap between the first hole (101) and the second hole (102), and an open position, in which said gap is at least partially open to allow the insertion of a chain, rope or
10 cable in the shackle (110), **characterized in** that it comprises

a first locking device arranged to prevent axial movement of the shackle bolt (11) in the closed position, wherein the first hole (101) is threaded and constitutes a first locking means of the first locking device, and wherein the first end (12) of the shackle bolt (11) is threaded, constitutes a second locking means of the first locking device and is arranged to engage with
15 the first locking means,

a first handle (17) which is fixed to the second end of the shackle bolt (11),

a second handle (23) which is pivotable in relation to the first handle (17) around a rotational axis (111), wherein the handles (17, 23), seen in a view perpendicular to the rotational axis (111) and the common centre line (103), together define an eye, and

a second locking device arrangable in a locking position in which the shackle bolt (11) is prevented from leaving the closed position, wherein the second locking device is disengagable from the locking position by pivoting of the second handle (23) towards the first handle (17).
20

2. The shackle (110) according to claim 1, wherein the rotational axis (111) is essentially perpendicular to the common centre line (103) of the holes (101, 102, 112).
25

3. The shackle (110) according to claim 1 or 2, also comprising a guiding means attached to the second end of the shackle body (1) at a distance from the second hole (102), which guiding means comprises a third hole (112), wherein the third hole (112) is aligned with the first hole (101) and the second hole (102).

4. The shackle (110) according to claim 3, wherein the guiding means is an end plate (7).
30

5. The shackle (110) according to claim 4, comprising a tube (6) with which the end plate (7) is fixed to the second end (5) of the shackle body (1).
6. The shackle (110) according to claim 5, wherein the inner dimensions of the tube (6) is larger than the diameter of the second hole (102) and the third hole (112) and wherein the shackle bolt (11) comprises a flange (13) which is arranged between the second hole (102) and the third hole (112) inside the tube (6), preventing the shackle bolt (11) from leaving the second hole (102) and third hole (112).
7. The shackle (110) according to any one of the preceding claims, wherein the second locking device comprises
- 10 a first locking means which is fixed in relation to the second end of the shackle body (1), wherein the first locking means comprises at least one recess (9), and
- a second locking means which is arranged fixed in relation to the second handle (23) on the opposite side of the rotational axis (111), and which comprises a locking pin (21) which is arranged to engage with said at least one recess (9) of the first locking means.
- 15 8. The shackle (110) according to claim 7, wherein the first locking means of the second locking device is arranged on the end plate (7).
9. The shackle (110) according to claim 7 or 8, comprising biasing means which bias the second handle (23) away from the first handle (17) into the locking position of the second locking device.
- 20 10. The shackle (110) according to claim 9, wherein the biasing means is at least one spring (31, 32).
11. The shackle (110) according to any one of the preceding claims, wherein each one of the first handle (17) and the second handle (23) both define an eye.
12. The shackle (110) according to claim 11, wherein each one of the handles (17, 23) comprises a grip area (19, 25) which forms part of the eye
- 25 13. The shackle (110) according to claim 12 wherein each grip area (19, 25) is essentially perpendicular to the common centre axis.
14. The shackle (110) according to claim 12 or 13, wherein the handles (17, 23) are provided with a centreing means which is arranged to guide a grip tool to the grip area (19, 25).

15. The shackle (110) according to claims 14, wherein the grip area (19, 25) is located at the end of the handle opening (18, 24) most distant from the shackle body (1), and wherein the centreing means is arranged as a narrowing of the opening (18, 24) towards the grip area (19, 25).
- 5 16. The shackle (110) according to claim 15, wherein the centreing means also comprises two rods (50, 51) which extend from the end of the handle (17, 23) which is most distant from the shackle body (1) away from the grip area (19, 25).
17. The shackle (110) according to claim 16, wherein the distance between the rods (51, 51) increases with the distance from the grip area (19, 25).
- 10 18. The shackle (110) according to claim 17, wherein the rods (50, 51) extend symmetrically on either side of the centre line (103).
19. The shackle (110) according to any one of the preceding claims, wherein the first handle (17) and the second handle (23) have sizes which differ no more than 20 % from each other.
- 15 20. The shackle according to any one of the preceding claims, comprising a handle shaft (14) which connects the first handle (17) to the second end (20) of the shackle bolt (11).

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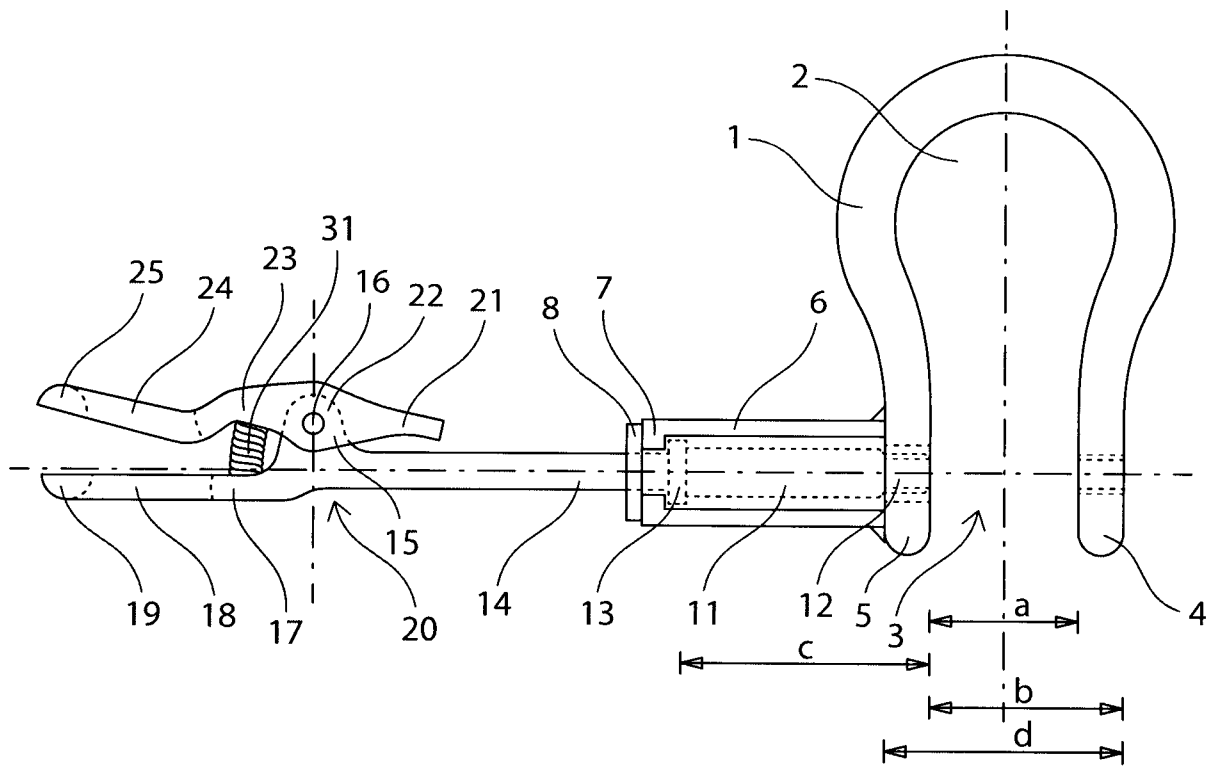


FIG. 1

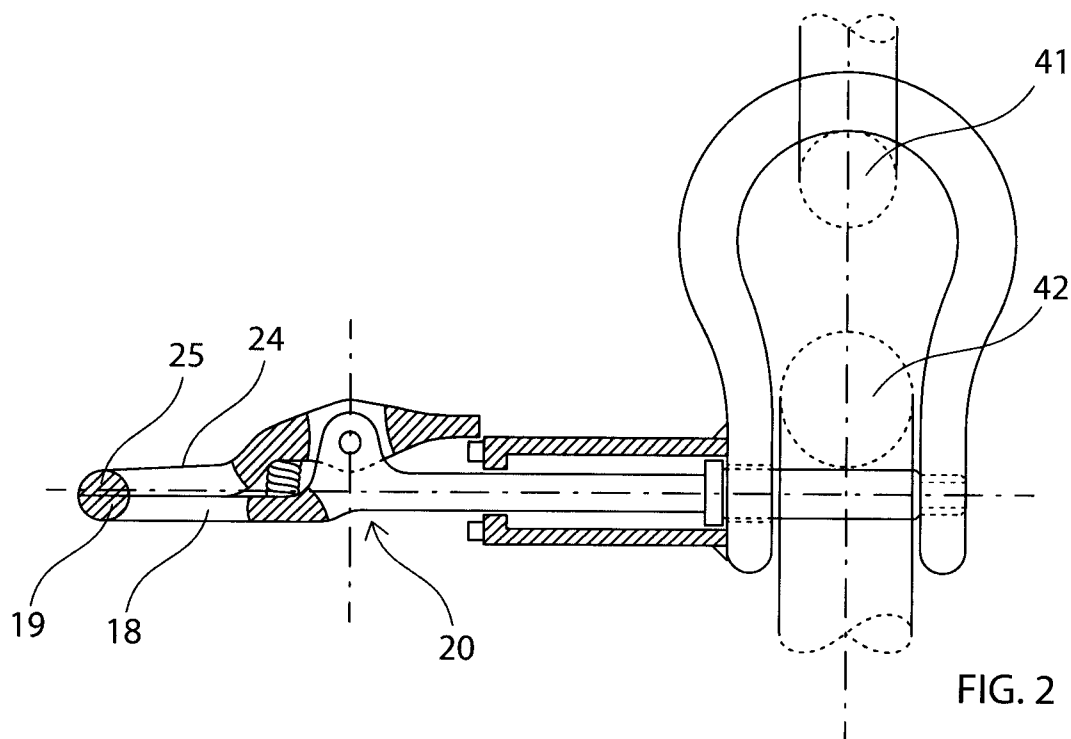


FIG. 2

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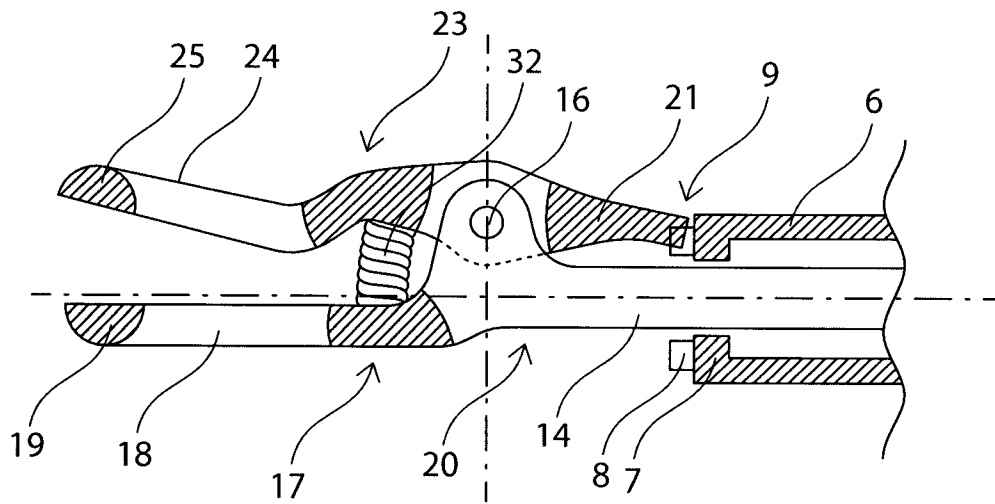


FIG. 3

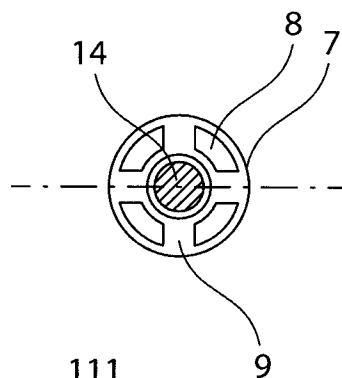


FIG. 4

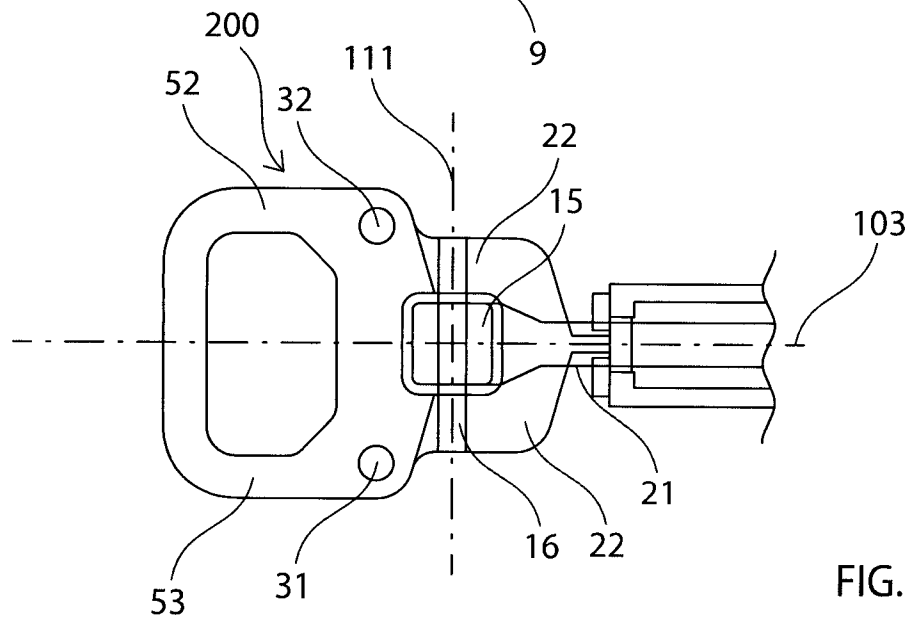


FIG. 5

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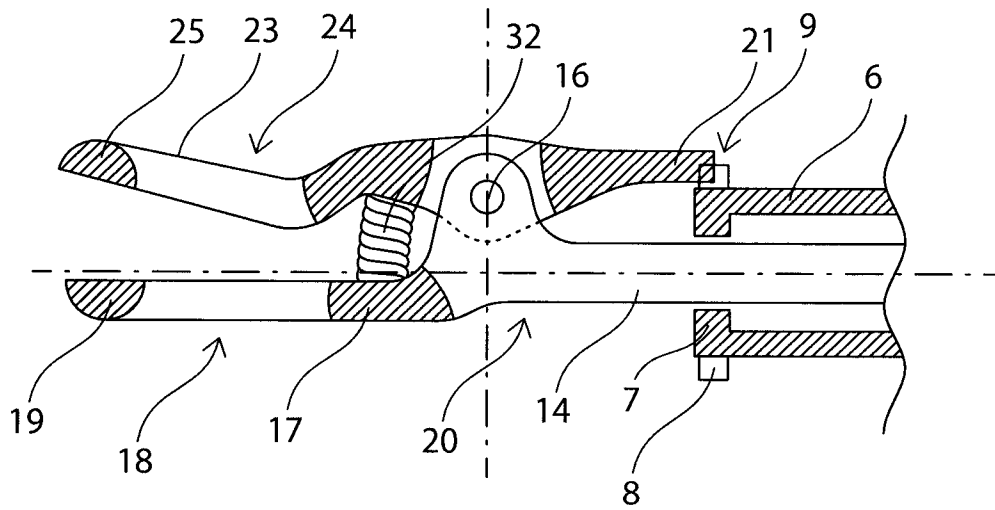


FIG. 6

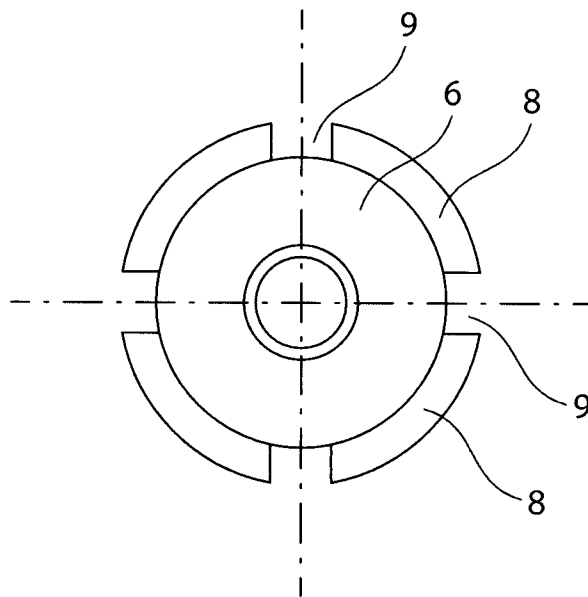


FIG. 7

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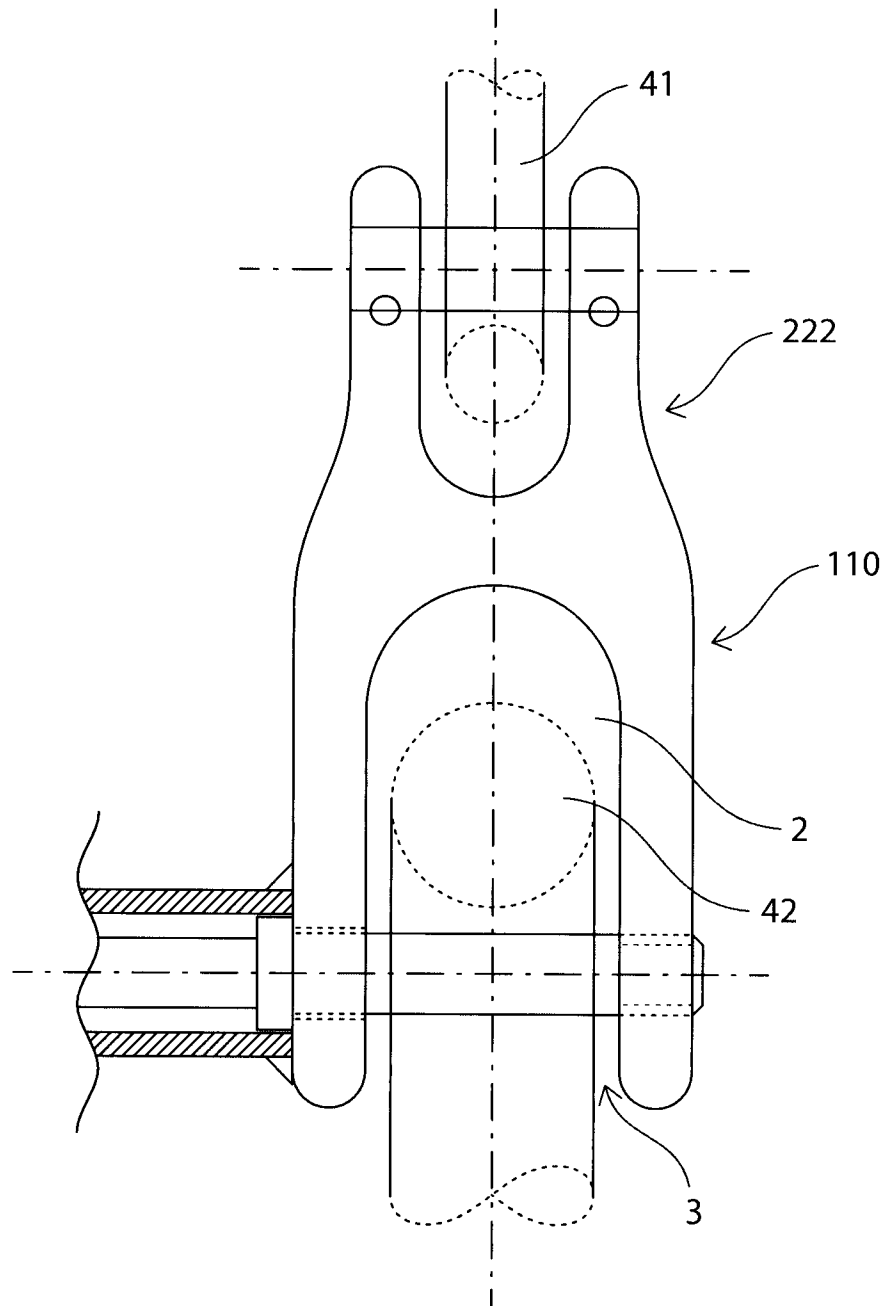


FIG. 8

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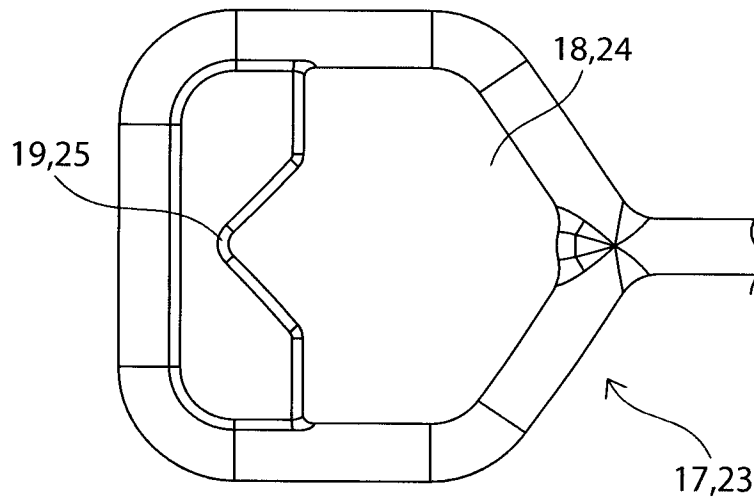


FIG. 9

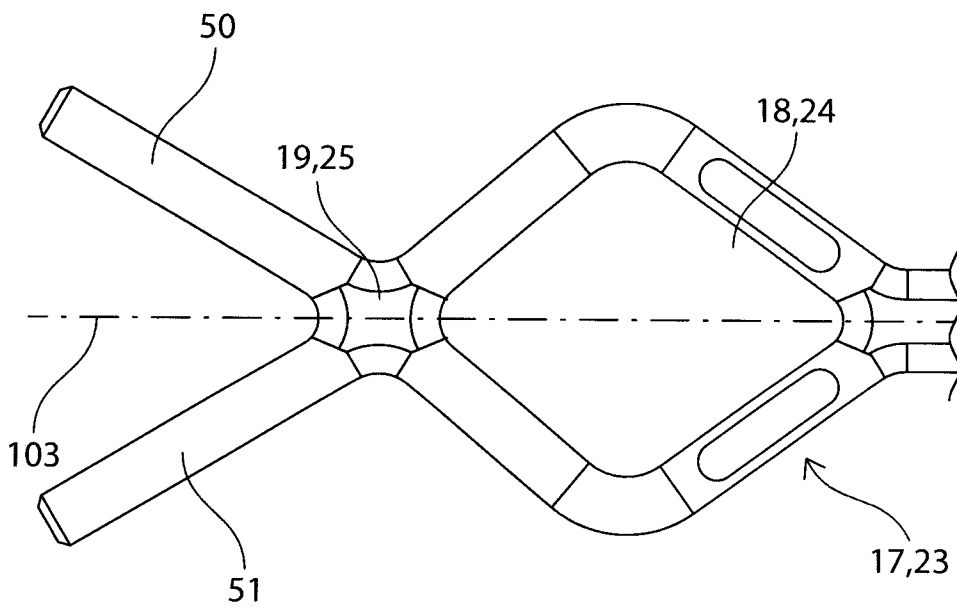


FIG. 10

INTERNATIONAL SEARCH REPORT

International application No
PCT/SE2014/051245

A. CLASSIFICATION OF SUBJECT MATTER
INV. F16G15/06
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F16G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EP0-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 433 547 A (HART JUDY L [US] ET AL) 18 July 1995 (1995-07-18) figures column 3, line 65 - column 6, line 61 -----	1-19
X	US 4 759 177 A (BRAZELL REX K [US]) 26 July 1988 (1988-07-26) figures column 2, line 30 - column 3, line 16 -----	1,2, 11-13,20
X	GB 2 371 288 A (ABB OFFSHORE SYSTEMS LTD [GB]) 24 July 2002 (2002-07-24) figure 2 pages 1,2 -----	1,2
A	WO 2006/055581 A2 (OCEANEERING INT INC [US]) 26 May 2006 (2006-05-26) figures ----- -/--	3-6,8



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See patent family annex.

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Date of the actual completion of the international search

19 February 2015

Date of mailing of the international search report

25/02/2015

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Authorized officer

Terrier de la Chaise

INTERNATIONAL SEARCH REPORT

International application No
PCT/SE2014/051245

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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A	----- US 6 023 927 A (EPSTEIN IRVING [US]) 15 February 2000 (2000-02-15) figures -----	1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/SE2014/051245

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