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(54) Method and assembly for safe transfer of personnel from a vessel to a stationary object

(57) A person is transferred from an object (1) floating in a sea to a stationary object (3). The stationary object (3) comprises a support structure (8) for supporting the person. The support structure (8) can be moved between a first level and a second level. The support structure (8) is biased in a bias direction towards its second level. The object (1) floating in the sea is connected to the support structure (8) by means of a connecting member (6) when the support structure (8) is situated at its second level. The length of the connecting member (6) is adjusted by operating a driving unit (5) for moving the support structure (8) from its second level to its first level, opposite to the bias direction. Then, the length of the connecting member (6) is fixed for fixing the support structure (8) relative to the object (1) floating in the sea. As a result, the support structure (8) is moving up and down in unison with the object (1) floating in the sea. Then, the person is transferred from the object (1) floating in the sea to the support structure (8). With the support structure (8) carrying the person, the length of the connecting member (6) is adjusted by operating the driving unit (5) for moving the support structure (8) back from its first level to its second level.

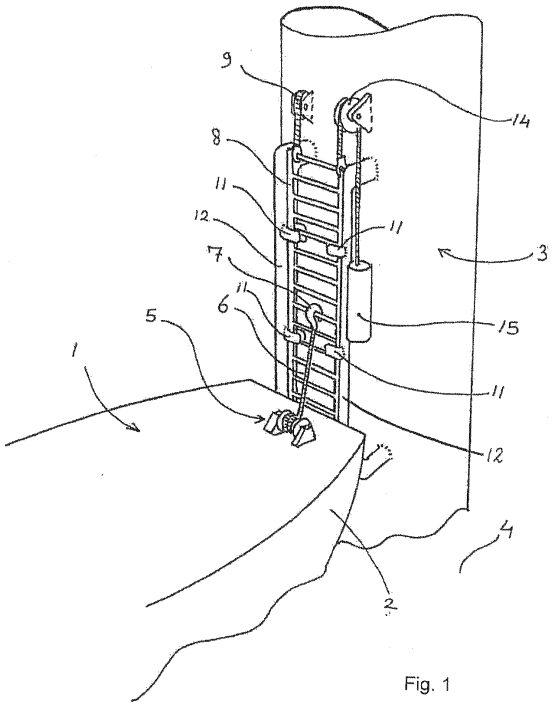

Fig. 1

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Description

[0001] The invention relates to a method for transfer of at least one person from an object floating in a sea to a stationary object.

[0002] W02010/034429 describes a method and assembly for the transfer of personnel from a ship to an offshore wind turbine. The ship is moved by the motion of the waves, in particular in a vertical direction, in relation to the offshore wind turbine. In a first embodiment, the offshore wind turbine comprises a ladder which can be moved vertically relative to the tower of the offshore wind turbine. The ladder is held in position by a friction brake and a buoyancy body. The ladder has a first coupling element. The ship comprises a second coupling element which is provided at the bow of the ship. For the transfer of personnel, the bow of the ship is urged by motor power against the ladder, and the second coupling element of the ship engages with the first coupling element of the ladder. The friction force of the friction brake and the buoyancy force of the buoyancy body are overcome by the force exerted by the ship being subjected to the motion of the waves. As a result, the ladder moves together with the ship and a person transfers from the ship to the ladder. Then, the first and second coupling elements are disconnected so as to allow the ship to move away from the ladder.

[0003] Although the movement of the ladder is damped by the friction brake and the buoyancy body, the disconnection will initially cause a significant shock to the ladder carrying the person. In addition, the damped movement of the ladder to a rest position will always start with a downward movement because of the weight of the person. This downward movement will position the person between the ladder and the bow of the ship. This is extremely dangerous because the bow of the ship is subjected to the motion of the waves. Moreover, the damped movement of the ladder carrying the person to the rest position by means of the friction brake and the buoyancy body is unpleasant for the person on the ladder. After the ladder has come to rest, the person may climb up the ladder to a platform of the offshore wind turbine.

[0004] When a second person is to be transferred from the ship to the offshore wind turbine, the procedure is repeated, i.e. the bow of the ship is urged again by motor power against the ladder, the first coupling element of the ladder and second coupling element of the ship are connected to each other again, etcetera. Thus, for the transfer of each person, the ship has to be urged against the ladder, the first and second coupling elements have to be connected and subsequently disconnected, and the ship has to move away from the ladder. Hence, when transferring more than one person, the procedure takes a long time, whereas safety regulations prescribe that a person on board an offshore wind turbine must always be accompanied by a second person.

[0005] In a second embodiment according to this document, the ship comprises a frame and a cage which can be vertically moved relative to the frame. The cage is held in position by a spring and a friction brake. The cage is provided with a ladder and a first coupling element. The tower of the offshore wind turbine comprises a fixed ladder which is provided with a second coupling element. In operation, a person enters the cage which is stationary relative to the ship and which moves relative to the offshore wind turbine. The ship is urged against the fixed ladder of the tower and the first and second coupling elements are connected to each other. As a result, the cage becomes stationary relative to the fixed ladder of the tower and the cage moves relative to the frame of the ship against the forces of the spring and the friction brake. However, the connection between the first and second coupling elements causes a significant shock to the cage when a person is present therein. This is not safe and may lead to injuries. After the first and second coupling elements have been disconnected, the person may climb up the ladder in the cage and transfer to the fixed ladder of the tower of the offshore wind turbine.

[0006] An object of the invention to provide an improved method for transfer of at least one person from an object floating in the sea to a stationary object.

[0007] This object is achieved by a method for transfer of at least one person from an object floating in a sea to a stationary object, in which the stationary object comprises a support structure for supporting the person, which support structure can be moved between a first level and a second level, the support structure being biased in a bias direction towards its second level, the method comprising:

- connecting the object floating in the sea to the support structure by means of a connecting member when the support structure is situated at its second level, the connecting member having a length which can be adjusted by operating a driving unit,
- adjusting the length of the connecting member (6) by operating the driving unit for moving the support structure from its second level to its first level, opposite to the bias direction,
- fixing the length of the connecting member after the support structure has moved to its first level for fixing the support structure relative to the object floating in the sea so that the support structure is moved up and down in unison with the object floating in the sea,
- transferring the person from the object floating in the sea to the support structure after the support structure (8) has been fixed relative to the object floating in the sea and the support structure is moving up and down in unison with the object floating in the sea,
- with the support structure carrying the person, adjusting the length of the connecting member by operating the driving unit for moving the support structure back from its first level to its second level.

[0008] With the transfer method known from W02010/034429, the bow of a ship engages with the lad-

der of an offshore wind turbine so as to establish a connection between the ship and the ladder. The connection is instantly released when the ship disengages the ladder. As a result, the person on the ladder may experience a significant shock. According to the invention, the object floating in the sea, such as a ship, may engage with the stationary object, such as an offshore wind turbine. Alternatively, the object floating in the sea may be positioned at a distance from the stationary object. The object floating in the sea is connected to the stationary object by means of the connecting member having an adjustable length, for example a cable or a telescopic arm. The stationary object is provided with the support structure, such as a ladder, which can be moved between a first level and a second level. The first level and/or the second level may be a range which is defined by the motion of the waves. The support structure is biased in a bias direction towards its second level.

[0009] According to the invention, the connecting member first provides a connection between the object floating in the sea and the support structure of the stationary object when the support structure is situated at its biased second level. Then, the support structure is moved from its second level to its first level, opposite to the bias direction, by adjusting the length of the connecting member by operating the driving unit. After the support structure has reached its first level, the length of the connecting member is fixed, for example by locking the driving unit. As a result, the support structure is fixed relative to the object floating in the sea at its first level so that the support structure is moved up and down in unison with the object floating in the sea. The motion of the support structure is synchronised with the motion of the object floating in the sea.

[0010] Subsequently, it is possible for the person to safely step from the object floating in the sea to the support structure. Then, with the support structure carrying the person, the length of the connecting member is adjusted in a controlled manner by operating the driving unit so as to move the support structure back, i.e. in the bias direction, from its first level to its second level. Using the driving unit, the length of the connecting member may be adjusted in a smooth or otherwise safe manner and the support structure is moved accordingly. Thus, the motion of the support structure can be uncoupled from the motion of the object floating in the sea in a gradual manner until the motion of the support structure is fully independent of the motion of the object floating in the sea. Therefore, significant shocks during the transfer of personnel can be prevented which improves safety.

[0011] US2874855 describes a method for transferring personnel from a platform that is supported from the floor of a body of water to a boat. A utility crane or hoist is carried on the platform. First, the personnel steps onto a platform of a personnel vehicle. Then, the vehicle will be hoisted by a hoist cable of the crane and swung out over the side of the platform, and held suspended there while a guide line is lowered down to the deck of the boat. The free end of the guide line is fastened onto a fixture on the deck of the boat. After that, the guide line will be reeled in until taut; thereafter sufficient tension will be applied to the guide line to keep the guide line taut until the personnel vehicle has been lowered to within the vicinity of the boat. The suspended personnel vehicle will be stopped to avoid any contact with the boat as it moves about on the waves. Subsequently, the suspension of the personnel vehicle is shifted from the hoist cable to the guide line. A brake carried by the personnel vehicle will be applied which will cause transfer of the suspending force from the hoist cable to the friction braking action by reason of the wedging action of a dog. After this transfer has been carried out, the personnel vehicle will be moving up and down in unison with the deck of the boat, while it is suspended above the deck by friction gripping action on the guide line. Finally, the remaining distance to the deck of the boat may be traversed by merely releasing the gripping action caused by the dog, sufficiently to allow personnel vehicle to slide smoothly down into gentle contact with the deck of the boat.

[0012] It is stated in this document that, although the transfer from the stationary platform to the boat is described, the reverse procedure of transferring from the boat to the stationary platform may be carried out by reversing the procedure. However, this statement seems to be not entirely correct, as the brake can only provide friction gripping action while the personnel vehicle is moving down the guide line. The brake is inoperative when the personnel vehicle is hoisted up by the hoist cable. In addition, it should be noted that this document does not disclose that the personnel vehicle is moved against a bias before the personnel steps onto the personnel vehicle - the first step of the procedure described in this document is the personnel stepping onto the platform of the personnel vehicle. In contrast thereto, the support structure with the method according to the invention is first moved against a bias, and after this the support structure is brought into synchronization with the wave motion of the object floating in the sea, and only thereafter the person steps onto the support structure.

[0013] W02004/099606 describes a device for accessing an offshore wind turbine which is installed on a foundation plane at a defined height above the water level. The foundation plane is erected on pillars that are anchored in the sea bed. The wind turbine comprises a channel which is displaceably fitted to the tower of the wind turbine. The channel can be moved away from the tower, in a vertical direction, towards the sea. A lateral access opening in the channel is positioned at a minimum distance from a ship which is located below the foundation plane. A lift is installed inside the channel, which lift can move between the wind turbine and the lateral access opening. The lower end of the channel is provided with sensors for continuously sensing the distance between the channel and the ship. The sensors are connected to a control unit which is also connected to a drive device. If the sensed distance between the channel and

the ship differs from a predefined range, for example 0.30 to 0.50 m, the channel is displaced by the drive device.

[0014] According to the invention, the support structure may be biased towards its second level against a stop which defines the second level of the support structure. The stop defines a height position of the support structure. In this case, the second level of the support structure corresponds to the height position defined by the stop. The stop may be provided with a buffer member which is configured to damp the movement against the stop. The buffer prevents significant shocks upon contact between the support structure and the stop. Thus, the support structure is first moved counter to the bias from the second level to the first level, and then the length of the connecting member is fixed so as to maintain the support structure stationary relative to the object floating in the sea.

[0015] It is possible that, after the length of the connecting member has been adjusted by operating the driving unit for moving the support structure carrying the person back from its first level to its second level, the support structure remains connected to the object floating in the sea by means of the connecting member, and in which the length of the connecting member is then adjusted by operating the driving unit for moving the support structure from its second level to its first level again, opposite to the bias direction, and in which the length of the connecting member is fixed after the support structure has moved to its first level again for fixing the support structure relative to the object floating in the sea again so that the support structure is moved up and down in unison with the object floating in the sea again, and in which a second person is transferred from the object floating in the sea to the support structure after the support structure has been fixed relative to the object floating in the sea again, and in which, with the support structure carrying the second person, the length of the connecting member is adjusted by operating the driving unit for moving the support structure back from its first level to its second level again. According to the invention, it is not necessary for the object floating in the sea to disengage the stationary object every time a person is transferred. The object floating in the sea, such as a vessel, may remain engaged with the stationary object, for example the tower of an offshore wind turbine, while two or more people are being transferred. Thus, the object floating in the sea has to establish a connection to the stationary object only once, which results in a relatively fast procedure for transferring two or more people.

[0016] Preferably, the length of the connecting member is gradually adjusted by operating the driving unit. As a result, the support structure carrying the person is moved from its first level to its second level substantially without shocks. In other words, during the movement of the support structure carrying the person from its first level to its second level, the support structure is subjected only to vertical accelerations which do not exceed 0.1g in which g is the gravitational acceleration which is substantially 9.8 m/s^2.

[0017] It is possible that the first level corresponds to a lower level and in which the second level corresponds to an upper level. In this application, the terms "lower level" and "upper level" are used relative to each other, i.e. the upper level is situated above the lower level. With the support structure displaceably connected to the stationary object, the support structure may be biased towards its upper level, for example by a counterweight member. The support structure is then lowered to its lower level by shortening the connecting member by means of the driving unit. When the length of the connecting member is fixed with the support structure at its lower level, the support structure is stationary relative to the object floating in the sea. The support structure together with the object floating in the sea are subjected to the motion of the waves at the lower level of the support structure. Therefore, they are not stationary relative to the stationary object. After a person has climbed onto the ladder, the driving unit is operated to extend the connecting member. The driving unit can be controlled in such as manner that the ladder is gradually risen from its lower level due to the bias towards the upper level.

[0018] The counterweight members may have a weight which is larger than the total weight of the support structure and the person together. The counterweight member may have a minimal weight of 250 kg.

[0019] In addition, it is possible that the first level corresponds to an upper level and in which the second level corresponds to a lower level. With the support structure displaceably connected to the stationary object, the support structure may be biased towards its lower level, for example under the influence of its own weight.

[0020] It should be noted that the support structure may be biased under the influence of gravity, for example using one or more counterweights or the own weight of the support structure. However, the bias may be achieved in various other ways, for example using a spring member.

[0021] The driving unit and the connecting member can also be constructed in various ways. For example, the driving unit comprises a winch, in which the connecting member comprises a cable which is winded up on the winch. The length of the cable can be fixed by locking the winch. With the support structure displaceably connected to the stationary object, if the first level is the lower level, the support structure can be maintained at the lower level stationary with respect to the object floating in the sea when it is subjected to the motion of the waves. If the object floating in the sea descends under the influence of waves, the cable will pull down the support structure. With wave motions raising the vessel, the support structure will be lifted due to the bias of the support structure towards its upper level.

[0022] In an embodiment, the winch is arranged on the object floating in the sea. As a result, the operation and the power supply for the winch can be located on the object floating in the sea, which is advantageous for safe-

ty and constructional reasons. The object floating in the sea may visit a number of stationary object installed in the sea.

[0023] It is possible that the stationary object comprises a fixed carrying structure, and in which, after the support structure carrying the person has been moved from its first level to its second level, the person transfers from the support structure to the fixed carrying structure of the stationary object. The fixed carrying structure may be, for example, a fixed ladder or a platform.

[0024] It is possible that the stroke between the first level and the second level is 1 to 4 meters. A range of 1 to 4 meters is sufficient to eliminate the influence of the motion of the waves under most weather conditions. After moving the support structure from the first level to the second level over a stroke of 1 to 4 meters, the support structure is kept stationary with respect to the stationary object without being influenced by the motion of the waves.

[0025] The transfer method according to the invention can be used in various applications. For example, the stationary object is an offshore wind turbine comprising a tower which is installed in the sea. The object floating in the sea may be a vessel having a motor for propelling it. The vessel may deliver service personnel to the offshore wind turbine. However, the stationary object may also be an object floating in the sea such as a boat or an object installed in the sea such as an offshore platform. Also in these applications and other applications, the method according to the invention allows safe transfer of personnel from the vessel to the stationary object.

[0026] The invention also relates to an assembly of an object floating in a sea and a stationary object, in which the stationary object comprises a support structure for supporting at least one person, which support structure can be moved between a first level and a second level, the support structure being biased in a bias direction towards its second level, in which one of the objects comprises a driving unit and a connecting member having a length which can be adjusted by operating a driving unit, in which the object floating in the sea can be connected to the support structure by means of the connecting member when the support structure is situated at its second level, and in which the length of the connecting member can be adjusted by operating the driving unit for moving the support structure from its second level to its first level, opposite to the bias direction, and in which the length of the connecting member can be fixed after the support structure has moved to its first level for fixing the support structure relative to the object floating in the sea so that the support structure is moved up and down in unison with the object floating in the sea, and in which the person can be transferred from the object floating in the sea to the support structure after the support structure has been fixed relative to the object floating in the sea and the support structure is moving up and down in unison with the object floating in the sea, and, with the support structure carrying the person, the length of the connecting member can be adjusted by operating the driving unit for moving the support structure back from its first level to its second level.

[0027] It should be noted that in an alternative embodiment according to the invention the support structure is connected to the object floating in the sea instead of to the stationary object. In this case, the method according to the invention can be described as follows:

A method for transfer of at least one person from an object floating in a sea to a stationary object, in which the object floating in the sea comprises a support structure for supporting the person, which support structure can be moved between a first level and a second level, the support structure being biased in a bias direction towards its second level, the method comprising:

- stepping of the person onto the support structure when the support structure is at its second level so that the support structure is moving up and down in unison with the object floating in the sea,
- connecting the object floating in the sea to the support structure carrying the person by means of a connecting member when the support structure carrying the person is situated at its second level, the connecting member having a length which can be adjusted by operating a driving unit,
- adjusting the length of the connecting member by operating the driving unit for moving the support structure carrying the person from its second level to its first level, opposite to the bias direction,
- fixing the length of the connecting member after the support structure carrying the person has moved to its first level for fixing the support structure carrying the person relative to the stationary object so that the support structure carrying the person is moved up and down relative to the object floating in the sea,
- transferring the person from the support structure of the object floating in the sea to the stationary object after the support structure carrying the person has been fixed relative to the stationary object and the support structure carrying the person is moving up and down relative the object floating in the sea.

[0028] In this case, the support structure may be biased towards its second level against a stop which defines a height position corresponding to the second level of the support structure. While at the second level due to the bias, the support structure is stationary relative to the object floating in the sea and a person can safely step onto the support structure. Then, the support structure is connected to the stationary object by means of the connecting member, after which the length of the con-

necting member is adjusted so as to move the support structure from the second level to the first level. The adjustment of the length of the connecting member can be made in a smooth manner so as to prevent significant shocks. At the first level, the support structure is made stationary relative to the stationary object by fixing the length of the connecting member. Then, the support structure can still move relative to the object floating in the sea due to the motion of the waves while the support structure is held at a fixed position relative to the stationary object. Thus, the person can safely transfer from the support structure of the object floating in the sea to the stationary object.

[0029] With this alternative embodiment in which the support structure is displaceably connected to the object floating in the sea, the support structure may also be biased towards its upper level, for example by a counterweight member, or towards its lower level, for example by its own weight.

[0030] One or more of the features described in the description above and/or one or more of the features of the claims can be applied, each individually or in any combination of features, to this alternative embodiment.

[0031] The invention will now be described by way of example with reference to the accompanying drawings.

Figure 1 shows a first embodiment of an assembly comprising an object floating in the sea and a stationary object according to the invention.

Figure 2a-2e show the transfer of a person from an object floating in a sea to a stationary object according to the invention.

Figure 3 shows a second embodiment of an assembly comprising an object floating in the sea and a stationary object according to the invention.

[0032] Figure 1 shows an assembly comprising a floating object 1 and a stationary object 3 which is installed in the sea 4. In this exemplary embodiment the stationary object is an offshore wind turbine having a tower 3. However, the stationary object may also be another offshore structure installed in the sea 4 or another floating object such as a ship. The tower 3 comprises two fender bars 12 which extend substantially in a vertical direction.

[0033] The assembly comprises a transfer system for the transfer of personnel from the floating object 1 to the tower 3 and vice versa. The transfer system comprises a support structure 8, such as a ladder, which is connected to the tower 3 between the fender bars 12. The ladder 8 can be displaced in a substantially vertical direction between a first, lower level and a second, upper level. The displacement of the ladder 8 is guided by guide members 11.

[0034] The ladder 8 is connected to a counterweight member 15 by means of a cable which is led over a pulley 14. The counterweight member 15 has a weight which is larger than the total weight of the ladder 8 and a person 10 which is to climb up the ladder 8. For example, the counterweight member 15 has a weight of 200 kg or more. As a result, the ladder 8 is biased towards the second, upper level. The tower 3 comprises a stop 9 for limiting the upward movement of the ladder 8. The stop 9 is configured to control the speed and acceleration of the ladder 8 according to a preset, adjustable value. For example, the stop 9 comprises a buffer member. The stop 9 defines a specific height (position) relative to the tower 3 for the second, upper level of the ladder 8.

[0035] The floating object 1 such as a crew transport vessel is used to transfer personnel to the offshore wind turbine. The vessel 1 comprises a motor for propelling the vessel (not shown). The bow of the vessel 1 is provided with a fender body comprising a resilient material. The vessel 1 also comprises a driving unit 5 and a connecting member 6 having a length which can be adjusted by operating the driving unit 5. The connecting member 6 comprises an engaging member 7 for engaging with the ladder 8 of the stationary object 3. In this exemplary embodiment, the driving unit is formed by a winch 5, whereas the connecting member and the engaging member comprise a cable 6 and a hook 7 attached at the end of the cable 6.

[0036] The method for transfer of personnel from the vessel 1 to the tower 3 of the offshore wind turbine will now be explained with reference to figures 2a-2e.

[0037] In figure 2a the vessel 1 is positioned adjacent to the fender bars 12 of the tower 3. The vessel 1 may be positioned adjacent to or against the stationary object. In this exemplary embodiment, the vessel 1 is urged by the motor against the fender bars 12 of the tower 3 to engage the resilient material of the fender body at the bow of the vessel 1 therewith (see figure 2b). Alternatively, the vessel 1 remains at a distance from the fender bars 12 (not shown). The ladder 8 is preloaded in its second, upper level by the counterweight member 15. The person 10 then engages the hook 7 of the cable 6 with the ladder 8.

[0038] Subsequently, as shown in figure 2c, the winch 5 is driven so as to draw in the cable 6. The cable 6 is pulled taut and the ladder 8 is pulled down from its second, upper level to its first, lower level by the hook 7 at the end of the cable 6. Next, the winch 15 is locked so as to fasten the cable 6, i.e. the length of the cable 6 is set to a fixed length. As a result, the ladder 8 is fixed or held stationary relative to the vessel 1, i.e. the vertical movement of the ladder 8 follows the vertical movement of the vessel 1 caused by the motion of the waves. If the vessel 1 ascends, the ladder 8 is lifted accordingly by means of the counterweight member 15. With descending movement of the vessel 1, the ladder 8 is pulled down by the cable 6.

[0039] As there is no relative movement between the vessel 1 and the ladder 8, it is now safe for the person 10 to step onto the ladder 8 (see figure 2d). Once the person 10 has stepped onto the ladder 8, the winch 5 is operated to pay out the cable 6 in a gradual and controlled manner. Due to the counterweight member 11 and the

operation of the winch 5, the ladder 8 carrying the person 10 is lifted without any shocks. The ladder 8 continues to rise vertically in a controlled manner until the ladder 8 is stopped by the stop 9 in a controlled manner. The buffer member of the stop 9 controls the forces being exerted upon contact between the ladder 8 and the stop 9 such that significant shocks are prevented. Then, the person 10 on the ladder 8 may climb up the ladder 8 from which the person 10 may transfer to a fixed carrying structure such as a fixed ladder or a platform attached to the tower 3 (not shown).

[0040] Subsequently, a second person can be transferred to the tower 3. While the hook 7 remains connected to the ladder 8, the winch 5 is driven so as to draw in the cable 6. The cable 6 is pulled taut and the ladder 8 is pulled down again from its second, upper level to its first, lower level by the hook 7 at the end of the cable 6. Again, the winch 15 is locked so as to fasten the cable 6, i.e. the length of the cable 6 is set to a fixed length. As a result, the ladder 8 is fixed or held stationary relative to the vessel 1 and it is now safe for the second person to step onto the ladder 8. Once the second person 10 has stepped onto the ladder 8, the winch 5 is operated again to pay out the cable 6 in a gradual and controlled manner. Due to the counterweight member 11 and the operation of the winch 5, the ladder 8 carrying the second person 10 moves upwards without any shocks. The ladder 8 continues to rise vertically in a controlled manner until the ladder 8 is stopped by the stop 9 in a controlled manner. Then, the second person on the ladder 8 may climb up the ladder 8 from which the second person may transfer to the fixed carrying structure such as a fixed ladder or a platform attached to the tower 3. Further people may be transferred to the tower 3 in a corresponding manner. After the last person has been transferred, the hook 7 can be disengaged from the ladder 8 without causing any shocks. With the hook 7 disengaged, the cable 6 can be retracted by driving the winch 5 and the vessel 1 may move away from the tower 3.

[0041] The transfer of one or more people from the tower 3 to the vessel 1 is carried out in reverse order.

[0042] Figure 3 shows a second embodiment of an assembly comprising an object floating in the sea and a stationary object. The same or similar features have been designated using the same reference numerals. In this second embodiment, the ladder 8 is connected to the vessel 1. The ladder 8 can be displaced in a substantially vertical direction between a first, lower level and a second, upper level. The ladder 8 is preloaded towards its second, upper level defined by a removable stop 18 by means of the counterweight member 15. Thus, the ladder 8 is held stationary relative to the vessel 1. The tower 3 is provided with the winch 5, the cable 6 and the hook 7. Figure 3 also shows that the tower 3 comprises a fixed ladder 17.

[0043] After the vessel 1 has been urged against the fender bars 12 of the tower 3 or positioned adjacent to the tower 3 with a clearance (not shown), the person may step up the ladder 8 while the ladder 8 follows the movements of the vessel 1. After that, the hook 7 may be connected to the ladder 8. Subsequently, the winch 5 may be driven to draw in the cable 6 in a gradual and controlled manner and the stop 18 is removed. As a result, the ladder 8 carrying the person 10 will be pulled down in a gradual and controlled manner from its second, upper level to its first, lower level. During this procedure, the vessel 1 is subjected to the motion of the waves and the ladder 8 is able to move up and down relative to the vessel 1. Next, the length of the cable 6 is fixed, for example by locking the winch 5, and the ladder 8 becomes stationary relative to the tower 3. In this state, the ladder 8 may still move up and down relative to the vessel 1. The person 10 is then able to transfer safely from the ladder 8 to the fixed ladder 17 of the tower 3. The fixed ladder 17 may lead to a platform (not shown).

[0044] The invention is not limited to the exemplary embodiment shown in the figures. The skilled person may apply various modifications which are within the scope of the invention. For example, figures 1 and 2a-2e show that the winch 5 is mounted on the vessel 1, while figure 3 shows that the winch 5 is mounted on the tower 3. However, the winch 5 may also be installed on the tower 3 in figures 1 and 2a-2e or on the vessel 1 in figure 3. In addition, the ladder 8 may also be biased towards its lower position under the influence of its weight. The ladder 8 may then be stopped by a stop at the lower level and the counterweight members 11 can be omitted. Also, the support structure may be a ladder, a cage, a platform or any other support structure for carrying one or more people. Furthermore, the connecting member can be constructed in various ways. For example, the connecting member may be flexible, such as a cable or rope, or the connecting member may be rigid, such as a telescopic arm.

[0045] The invention also relates to a method for the transfer of at least one person from an object floating in a sea to a stationary object,

the stationary object being provided with:

- a support structure which is connected to the stationary object, which support structure can be moved between a first level and a second level, in which the support structure is biased towards its second level,

the object floating in the sea being provided with:

- a driving unit,
- a connecting member for connecting to the support structure of the stationary object, the connecting member having a length which can be adjusted by operating the driving unit,

the method comprising:

- connecting the connecting member between the object floating in the sea and the support structure being biased towards its second level,
- adjusting the length of the connecting member by operating the driving unit for moving the support structure from its second level to its first level,

- fixing the length of the connecting member after the support structure has moved to its first level so as to maintain the support structure stationary relative to the object floating in the sea,
- transferring the person from the object floating in the sea to the support structure,
- adjusting the length of the connecting member by operating the driving unit for moving the support structure carrying the person from its first level to its second level. This method can be combined with one or more of the features of the claims and/or one or more of the features described above. One or more of the features described in the description above and/or one or more of the features of the claims can also be applied, each individually or in any combination of features, to one or more of the features of the claims.

[0046] The invention can also be described by the following clauses:

1. A method for transfer of at least one person (10) from an object (1) floating in a sea (4) to a stationary object (3), in which one of the objects (1, 3) comprises a support structure (8) for supporting the person (10), which support structure (8) can be moved between a first level and a second level, the method comprising:

- fixing the support structure (8) relative to the object (1) floating in the sea (4),
- transferring the person (10) to the support structure (8) being fixed relative to the object (1) floating in the sea (4),

characterised in that
the support structure (8) is connected to the other object (1, 3) by means of a connecting member (6) having a length which can be adjusted by operating a driving unit (5), and **in that,** with the support structure (8) carrying the person (10), the length of the connecting member (6) is adjusted by operating the driving unit (5) for moving the support structure (8) from its first level to its second level.

2. A method as described in clause 1, in which the support structure (8) is connected to the stationary object (3), which support structure (8) is biased towards the second level, and in which fixing the support structure (8) relative to the object (1) floating in the sea (4) comprises connecting the support structure (8) to the object (1) floating in the sea (4) by means of the connecting member (6) with the support structure (8) being biased towards the second level, adjusting the length of the connecting member (6) by operating the driving unit (5) for moving the support structure (8) from its second level to its first level, and fixing the length of the connecting member (6) after the support structure (8) has moved to its first level.

3. A method as described in one of clause 2, in which the support structure (8) is biased towards its second level against a stop which defines the second level of the support structure (8).

4. A method as described in clause 1, in which the support structure (8) is connected to the object (1) floating in the sea (4), which support structure (8) is biased towards the first level for fixing the support structure (8) relative to the object (1) floating in the sea (4).

5. A method as described in clause 4, in which the support structure (8) is biased towards its first level against a stop which defines the first level of the support structure (8).

6. A method as described in one of the preceding clauses, in which the length of the connecting member (6) is gradually adjusted by operating the driving unit (5).

7. A method as described in one of the preceding clauses, in which the first level corresponds to a lower level and in which the second level corresponds to an upper level.

8. A method as described in one of the clauses 1-6, in which the first level corresponds to an upper level and in which the second level corresponds to a lower level.

9. A method as described in one of the preceding clauses, in which the support structure (8) is biased by a counterweight member (15).

10. A method as described in one of clauses 1-8, in which the support structure (8) is biased by its weight.

11. A method as described in one of the preceding clauses, in which the driving unit comprises a winch (5), and in which the connecting member comprises a cable (6) which is winded up on the winch (5).

12. A method as described in one of the preceding clauses, in which the winch (5) is arranged on the object (1) floating in the sea (4).

13. A method as described in one of the preceding clauses, in which the stationary object (3) comprises a fixed carrying structure, and in which, after the support structure (8) carrying the person (10) has been moved from its first level to its second level, the person (10) transfers from the support structure (8) to the fixed carrying structure of the stationary object

(3).

14. A method as described in one of the preceding clauses, in which the stroke between the first level and the second level is 1 to 4 meters.

15. A method as described in one of the preceding clauses, in which the stationary object is an offshore wind turbine comprising a tower (3) which is installed in the sea (4).

16. A method as described in one of the preceding clauses, in which the support structure comprises a ladder (8).

17. A method as described in one of the clauses 2-16, in which, after the length of the connecting member (6) has been adjusted by operating the driving unit (5) for moving the support structure (8) from its first level to its second level, the support structure (8) remains connected to the object (1) floating in the sea (4) by means of the connecting member (6), and in which the length of the connecting member (6) is then adjusted by operating the driving unit (5) for moving the support structure (8) from its second level to its first level again, and in which the length of the connecting member (6) is fixed after the support structure (8) has moved to its first level again for fixing the support structure (8) relative to the object (1) floating in the sea (4) again, and in which a second person is transferred to the support structure (8) being fixed relative to the object (1) floating in the sea (4) again, and in which, with the support structure (8) carrying the second person, the length of the connecting member (6) is adjusted by operating the driving unit (5) for moving the support structure (8) from its first level to its second level again.

18. An assembly comprising an object (1) floating in a sea (4) and a stationary object (3), in which one of the objects (1, 3) comprises a support structure (8) for supporting at least one person (10), which support structure (8) can be moved between a first level and a second level, in which the support structure (8) can be fixed relative to the object (1) floating in the sea (4), characterised in that the support structure (8) can be connected to the other object (1, 3) by means of a connecting member (6) having a length which can be adjusted by operating a driving unit (5), and in that the length of the connecting member (6) can be adjusted by operating the driving unit (5) for moving the support structure (8) from its first level to its second level.

19. An assembly as described in clause 18, in which the support structure (8) is connected to the stationary object (3), and in which the support structure (8) is biased towards the second level.

20. An assembly as described in clause 18, in which the support structure (8) is connected to the object (1) floating in the sea (4), and in which the support structure (8) is biased towards the first level.

Claims

1. A method for transfer of at least one person (10) from an object (1) floating in a sea (4) to a stationary object (3), in which the stationary object (3) comprises a support structure (8) for supporting the person (10), which support structure (8) can be moved between a first level and a second level, the support structure (8) being biased in a bias direction towards its second level, the method comprising:

- connecting the object (1) floating in the sea (4) to the support structure (8) by means of a connecting member (6) when the support structure (8) is situated at its second level, the connecting member (6) having a length which can be adjusted by operating a driving unit (5),
- adjusting the length of the connecting member (6) by operating the driving unit (5) for moving the support structure (8) from its second level to its first level, opposite to the bias direction,
- fixing the length of the connecting member (6) after the support structure (8) has moved to its first level for fixing the support structure (8) relative to the object (1) floating in the sea (4) so that the support structure (8) is moved up and down in unison with the object (1) floating in the sea (4),
- transferring the person (10) from the object (1) floating in the sea (4) to the support structure (8) after the support structure (8) has been fixed relative to the object (1) floating in the sea (4) and the support structure (8) is moving up and down in unison with the object (1) floating in the sea (4),
- with the support structure (8) carrying the person (10), adjusting the length of the connecting member (6) by operating the driving unit (5) for moving the support structure (8) back from its first level to its second level.

2. A method as claimed in claim 1, in which the support structure (8) is biased towards its second level against a stop which defines the second level of the support structure (8).

3. A method as claimed in claim 1 or 2, in which the length of the connecting member (6) is gradually adjusted by operating the driving unit (5).

4. A method as claimed in one of the preceding claims, in which the first level corresponds to a lower level

and in which the second level corresponds to an upper level.

5. A method as claimed in one of the claims 1-3, in which the first level corresponds to an upper level and in which the second level corresponds to a lower level.

6. A method as claimed in one of the preceding claims, in which the support structure (8) is biased towards its second level by a counterweight member (15).

7. A method as claimed in one of claims 1-5, in which the support structure (8) is biased towards its second level by its own weight.

8. A method as claimed in one of the preceding claims, in which the driving unit comprises a winch (5), and in which the connecting member comprises a cable (6) which is winded up on the winch (5).

9. A method as claimed in one of the preceding claims, in which the winch (5) is arranged on the object (1) floating in the sea (4).

10. A method as claimed in one of the preceding claims, in which the stationary object (3) comprises a fixed carrying structure, and in which, after the support structure (8) carrying the person (10) has been moved from its first level to its second level, the person (10) transfers from the support structure (8) to the fixed carrying structure of the stationary object (3).

11. A method as claimed in one of the preceding claims, in which the stroke between the first level and the second level is 1 to 4 meters.

12. A method as claimed in one of the preceding claims, in which the stationary object is an offshore wind turbine comprising a tower (3) which is installed in the sea (4)
and/or
in which the support structure comprises a ladder (8).

13. A method as claimed in one of the preceding claims, in which, after the length of the connecting member (6) has been adjusted by operating the driving unit (5) for moving the support structure (8) carrying the person (10) back from its first level to its second level, the support structure (8) remains connected to the object (1) floating in the sea (4) by means of the connecting member (6), and in which the length of the connecting member (6) is then adjusted by operating the driving unit (5) for moving the support structure (8) from its second level to its first level again, opposite to the bias direction, and in which the length of the connecting member (6) is fixed after the support structure (8) has moved to its first level again for fixing the support structure (8) relative to the object (1) floating in the sea (4) again so that the support structure (8) is moved up and down in unison with the object (1) floating in the sea (4) again, and in which a second person is transferred from the object (1) floating in the sea (4) to the support structure (8) after the support structure (8) has been fixed relative to the object (1) floating in the sea (4) again and the support structure (8) is moving up and down in unison with the object (1) floating in the sea (4) again, and in which, with the support structure (8) carrying the second person, the length of the connecting member (6) is adjusted by operating the driving unit (5) for moving the support structure (8) back from its first level to its second level again.

14. An assembly comprising an object (1) floating in a sea (4) and a stationary object (3), in which the stationary object (3) comprises a support structure (8) for supporting at least one person (10), which support structure (8) can be moved between a first level and a second level, the support structure (8) being biased in a bias direction towards its second level, in which one of the objects (1, 3) comprises a driving unit (5) and a connecting member (6) having a length which can be adjusted by operating a driving unit (5), in which the object (1) floating in the sea (4) can be connected to the support structure (8) by means of the connecting member (6) when the support structure (8) is situated at its second level, and in which the length of the connecting member (6) can be adjusted by operating the driving unit (5) for moving the support structure (8) from its second level to its first level, opposite to the bias direction, and in which the length of the connecting member (6) can be fixed after the support structure (8) has moved to its first level for fixing the support structure (8) relative to the object (1) floating in the sea (4) so that the support structure (8) is moved up and down in unison with the object (1) floating in the sea (4), and in which the person (10) can be transferred from the object (1) floating in the sea (4) to the support structure (8) after the support structure (8) has been fixed relative to the object (1) floating in the sea (4) and the support structure (8) is moving up and down in unison with the object (1) floating in the sea (4), and, with the support structure (8) carrying the person (10), the length of the connecting member (6) can be adjusted by operating the driving unit (5) for moving the support structure (8) back from its first level to its second level.

15. A method for transfer of at least one person (10) from an object (1) floating in a sea (4) to a stationary object (3), in which the object (1) floating in the sea (4) comprises a support structure (8) for supporting the person (10), which support structure (8) can be moved

between a first level and a second level, the support structure (8) being biased in a bias direction towards its second level, the method comprising:

- stepping of the person (10) onto the support structure (8) when the support structure (8) is at its second level so that the support structure (8) is moving up and down in unison with the object (1) floating in the sea (4),
- connecting the object (1) floating in the sea (4) to the support structure (8) carrying the person (10) by means of a connecting member (6) when the support structure (8) carrying the person (10) is situated at its second level, the connecting member (6) having a length which can be adjusted by operating a driving unit (5),
- adjusting the length of the connecting member (6) by operating the driving unit (5) for moving the support structure (8) carrying the person (10) from its second level to its first level, opposite to the bias direction,
- fixing the length of the connecting member (6) after the support structure (8) carrying the person (10) has moved to its first level for fixing the support structure (8) carrying the person (10) relative to the stationary object (3) so that the support structure (8) carrying the person (10) is moved up and down relative to the object (1) floating in the sea (4),
- transferring the person (10) from the support structure (8) of the object (1) floating in the sea (4) to the stationary object (3) after the support structure (8) carrying the person (10) has been fixed relative to the stationary object (3) and the support structure (8) carrying the person (10) is moving up and down relative the object (1) floating in the sea (4).

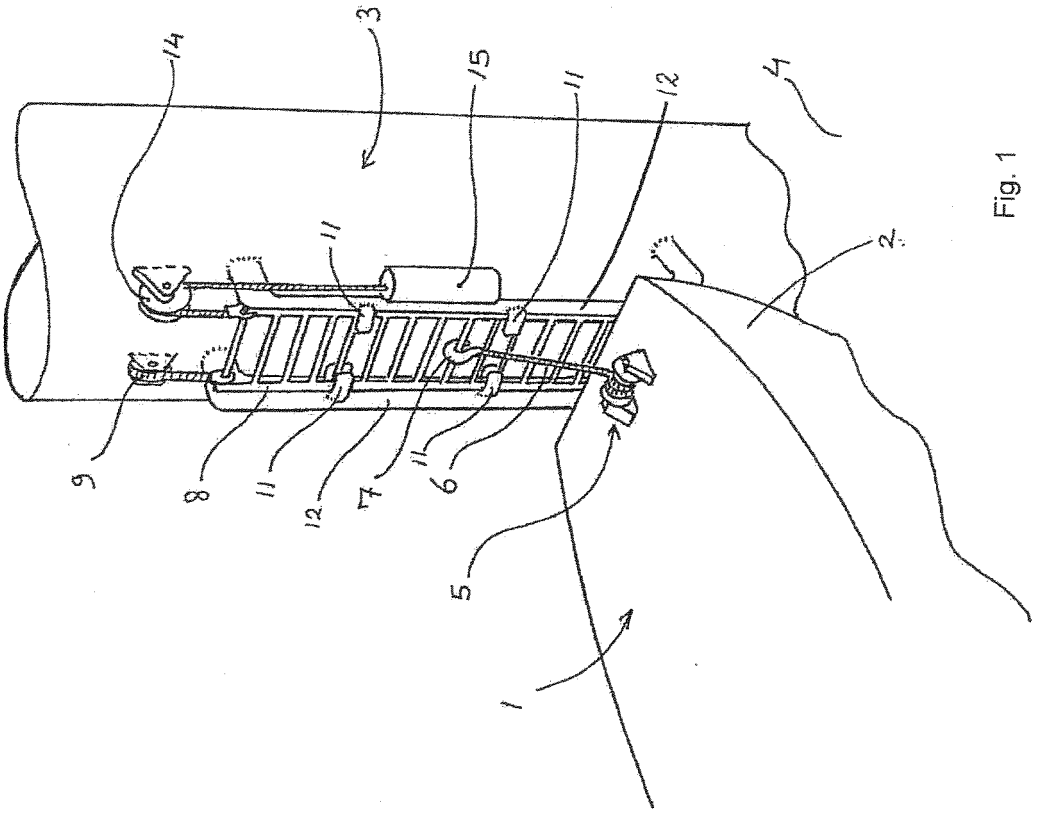

Fig. 1

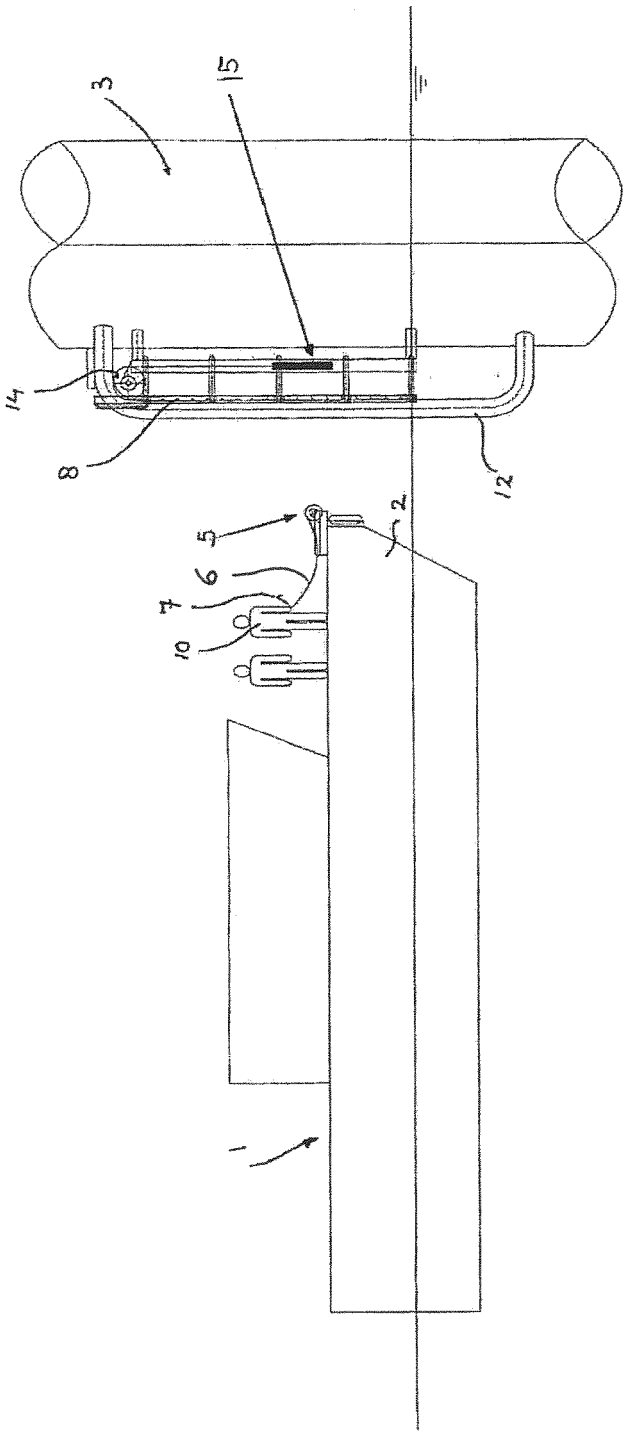

Fig. 2a

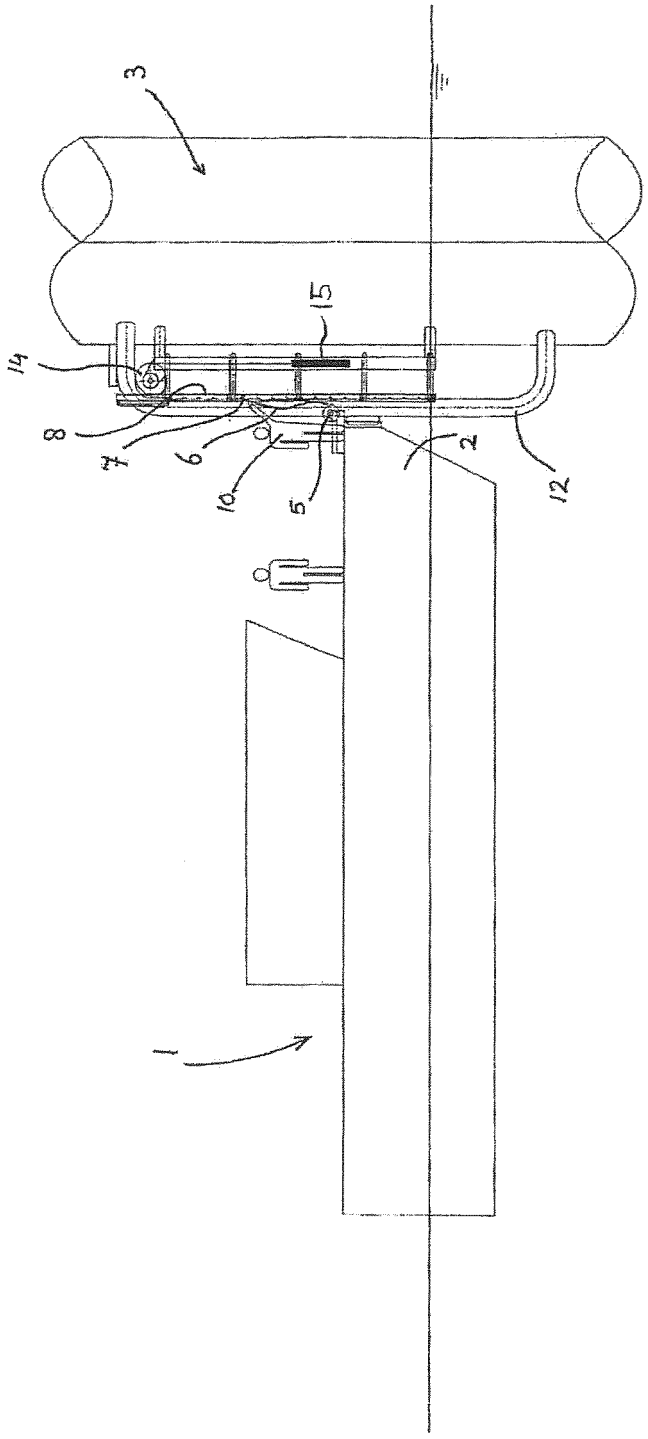

Fig. 2b

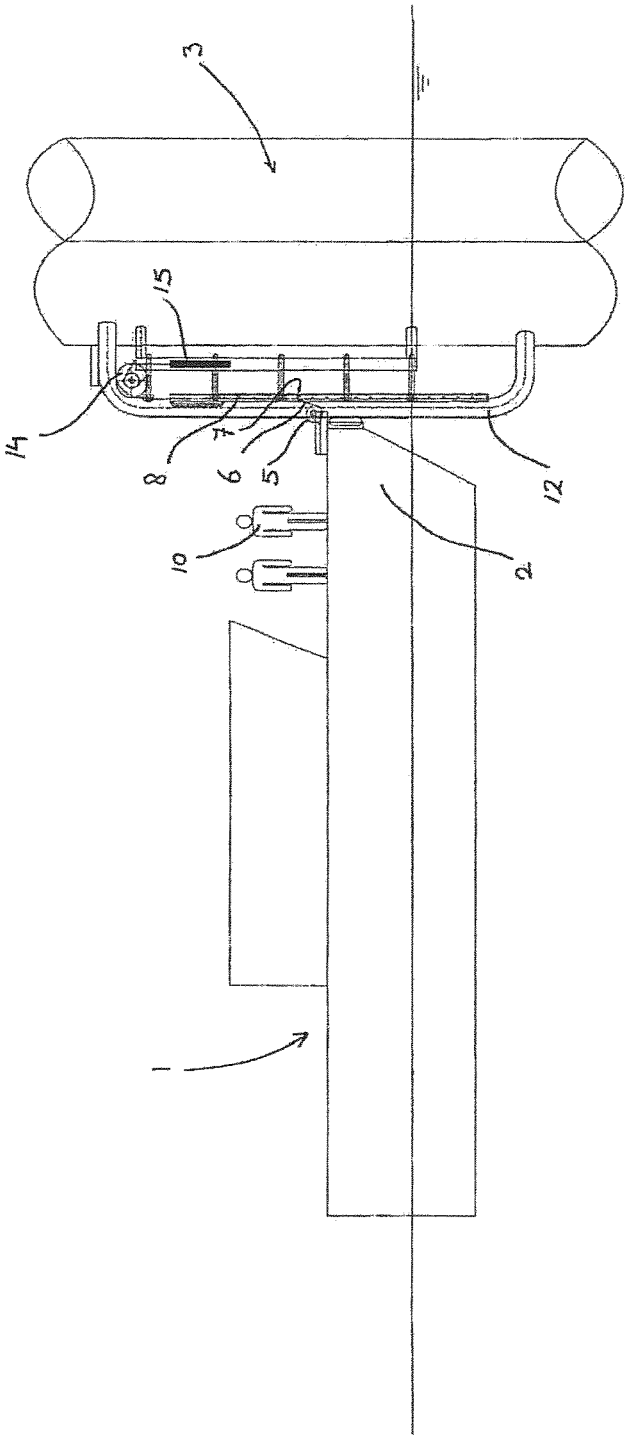

Fig. 2c

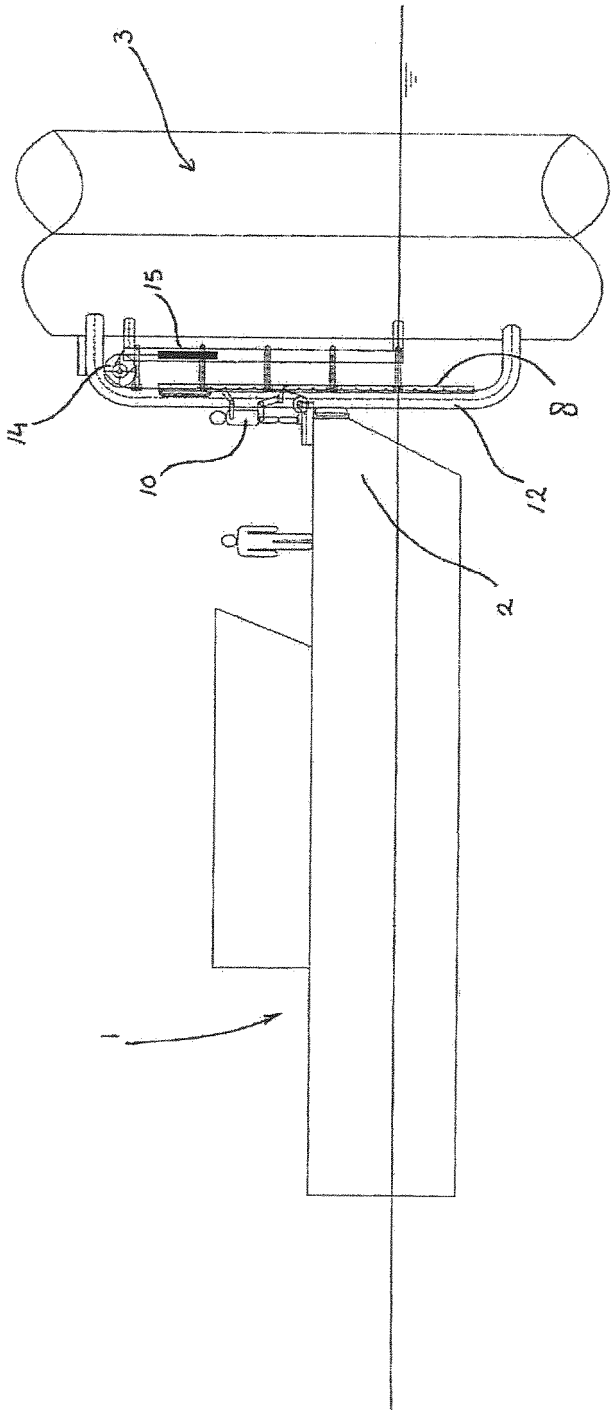

Fig. 2d

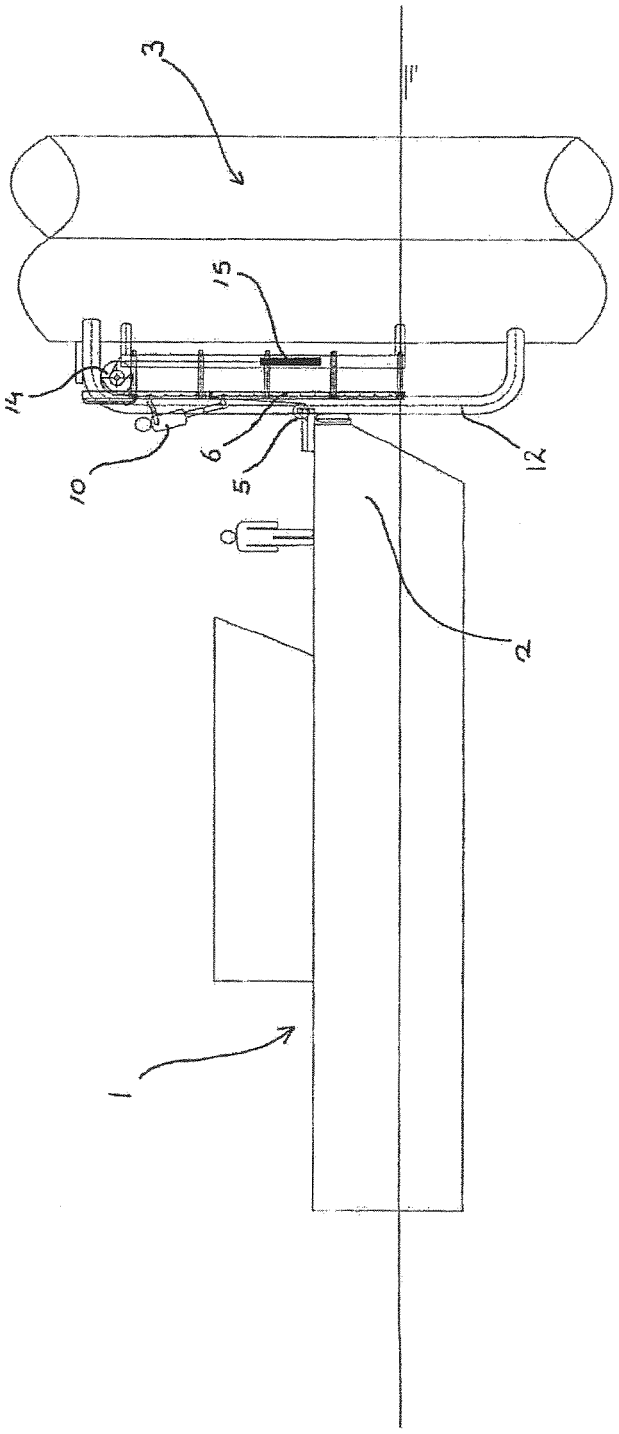

Fig. 2e

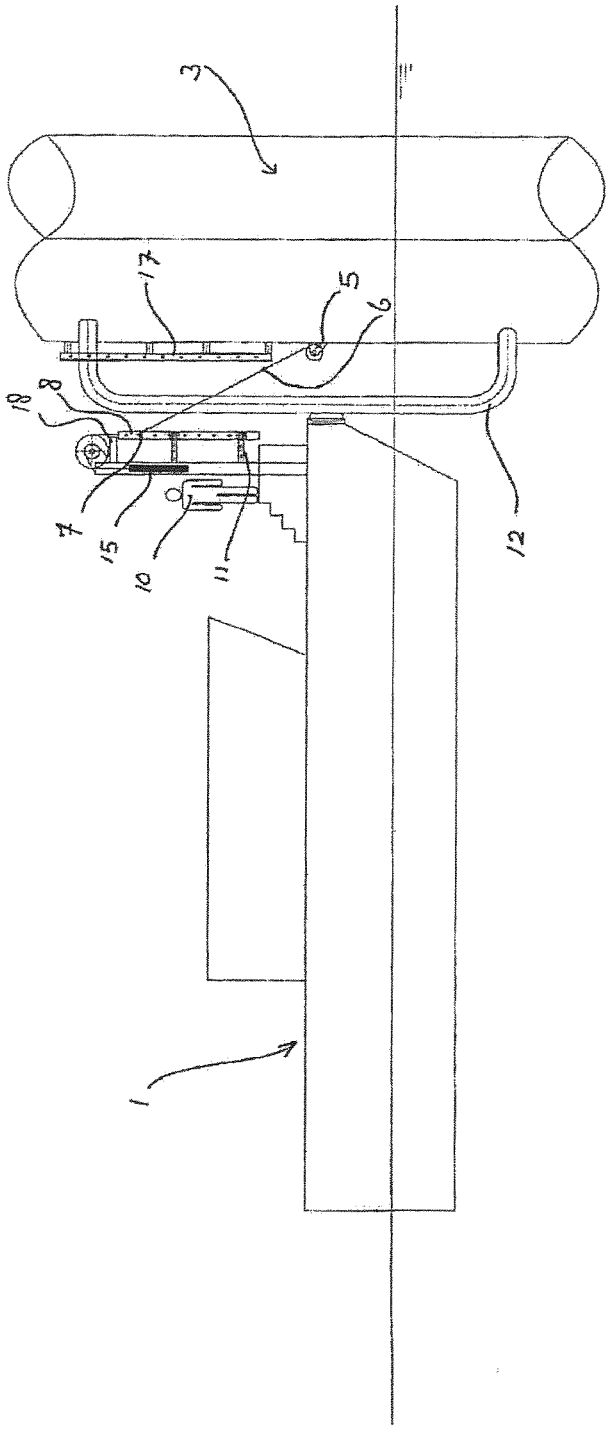

Fig. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 11 18 0643

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	10 January 2012	Blazquez Lainez, R

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1

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