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(54) **BOW FENDER**

BUGFENDER

DÉFENSE DE PROUE

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Description

Field of the invention

[0001] The present invention relates to a bow fender for service vessels for the offshore wind industry and oil and gas market, comprising an elongated fender equipped with two in longitudinal and opposite directions movable support blocks, wherein said support blocks are longitudinally skidable on a front side of the rubber fender under the influence of a pressure actuator.

Background of the invention

[0002] Offshore wind turbines are normally gathered in wind farms placed on the continental shelf with reduced water dept. Higher wind speeds are available offshore compared to land, and supplies more energy.

[0003] Oil and gas platforms, special in Far East, Mexico, Brazil etc. where service personnel need to embark and disembark the platforms from service vessels, the inventive bow fender with sideways forces, will improve the vessels stability, and safety and ability for the service personnel.

[0004] Offshore wind power refers to the construction of wind farms in bodies of water to generate electricity from wind. Offshore wind power utilizes traditional fixed-bottom wind turbine technologies, as well as deep-water areas utilizing floating wind turbines.

[0005] The service crews are normally brought from ports or accommodation vessels with service vessels, and the service personnel embark and disembark between the service vessel and the turbines or platforms.

[0006] Each turbine has two vertical poles/fender bars to protect the turbine while the service vessel approach the turbine and allows the service personnel to use the turbines ladder between the two poles for embarking and disembarking. With the vessels engines/propellers the vessel's transverse bow-fender is pushed against the poles.

[0007] The challenge is to keep the bow of the vessel steady when the service personnel embark and disembark in rougher sea conditions.

[0008] Different solutions have been used. For instance has stabilized walkways been tried, cranes with claws, etc. One solution is use of a hydraulic clamping system that is mounted on the deck of the crew transfer vessel. Its main elements are two hydraulic arms which can rotate around a vertical axis. At their front-end a hydraulic clamp is mounted which can be swung around the vertical fender bars of the wind turbine, and by activating two hydraulic rams they pull the vessel's fender against the fender bars with a preset force. The resulting friction stabilizes the position of the vessel.

[0009] GB 2476858 A discloses an apparatus for stabilizing a floating craft against a stationary structure. The apparatus comprises means of attaching the apparatus to a floating craft, an elongate fender comprising a structure contacting face, and at least two jaws, each comprising a front face and a structure contacting surface. At least one jaw is movable from a first position to a second position and vice versa, in order that said jaws may be positioned in a first open position where the structure contacting surfaces of the jaws are relatively far apart and a second closed position wherein the structure contacting surfaces of the jaws are relatively close together. During use the apparatus is positioned such that a suitably sized part of the stationary structure is placed between the jaws, the said jaws can then be brought into the closed position, thereby creating craft stabilizing contact between the structure contacting surfaces of the jaws and the structure.

[0010] EP 2520485 A1 discloses a system for mooring a vessel against a stationary object, for example the mast of a wind turbine erected in water. The stationary object comprises at least one substantially vertical bumper bar which is attached to the stationary object by means of an extension. The vessel comprises a hull, an engine for propelling the vessel, and a buffer body which protrudes in relation to the hull. The bumper bar comprises a substantially vertical, inside guide track which substantially faces the stationary object and a substantially vertical, outside guide track which substantially faces away from the stationary object. The vessel comprises at least one engagement arm which at one end is provided with an engagement member. The engagement arm can be moved in relation to the hull between a mooring state, in which the engagement member engages on the inside guide track of the bumper bar and is vertically displaceable along this, and a release state, in which the engagement member is out of engagement with the inside guide track. The buffer body in the mooring state engages on the outside guide track of the bumper bar and is vertically displaceable along this. The inside guide track protrudes sideways in relation to an adjacent part of the extension of the bumper bar such that the engagement member of the engagement arm in the mooring state can be moved past the extension on vertical displacement along the inside guide track of the bumper bar.

Objects of the present invention

[0011] An object of the present invention is to provide an improved alternative and simplified solution with an integrated solution in the bow fender, making the vessel's bow fender to stay quiet while the service crew embark and disembark in rough sea conditions.

[0012] The present invention also provides a solution which makes it easy to center the bow of the vessel to the correct positioned, which save time and increase the safety.

[0013] With the present invention it is not necessary with heavy equipment in the bow of the vessel, which can make the vessel unstable, at least at the bow end. Such heavy equipment may also be an obstacle for the service crew to pass.

Summary of the invention

[0014] Said object are achieved with a bow fender on a crew transfer vessel, comprising an elongated fender equipped with two in longitudinal and opposite directions movable support blocks, wherein said support blocks are longitudinally skidable on a front side of the fender under the influence of a pressure actuator, wherein each of said support blocks comprises a U-shaped base plate, which at least partially envelopes the fender, and with an interior width between respective side faces of the U-shaped base plate corresponding to the height of the fender.

[0015] Said base plate can comprise at least one internal connection arm extending though a longitudinal slit in the front side of the fender, and which is connected to the pressure actuator, such as a hydraulic cylinder.

[0016] The pressure actuator can be resting in an open box placed in a back side of the fender, and the pressure actuator and the connection arm of the support block can be connected to a skid plate, said skid plate being skidable in respective side slots in the box.

[0017] Each of said support blocks can comprise a rubber covering, said rubber covering may be placed on an outer side of the base plate.

[0018] Two boxes with a hydraulic cylinder can be placed on opposite sides to a center line of the fender, and connected to each of said support blocks.

[0019] The support blocks can be skidable to an extracted position and a retracted position on the front side of the elongated fender.

[0020] When said support blocks are in the retracted position on the front side of the fender, the support blocks are preferable clamping against an object, in order to prevent movement of the bow fender in relation to said object. The object can be two vertical fender bars on an offshore wind turbine foundation.

[0021] Said support blocks can comprise respective connection arms, which extends through longitudinal slits in the front side of the fender, and the connection arms of each support block can be connected to a respective hydraulic actuator extending through a cavity in the fender.

[0022] Preferable, the bow fender is connected to a control system on the vessel's bridge, in order to activate the bow fender to retract or extract the support blocks.

[0023] The fender can in the middle of the front side comprise a protruding, ticker part, and the two in longitudinal and opposite directions movable support blocks are skidable on each side of the ticker middle part.

[0024] The elongated fender can be made of rubber, or the elongated fender can be made of plastic.

Description of the diagrams

[0025] Embodiments of the present invention will now be described, by way of example only, with reference to the following diagrams, wherein:

Figure 1 shows a perspective view of a bow fender according to the invention.

Figure 2 shows side view of the bow fender according to the invention, with support blocks in an extracted position.

Figure 3 shows side view of the bow fender according to the invention, with support blocks in a retracted position.

Figure 4 shows a partially exploded view of the bow fender according to the invention.

Figure 5 shows a support blocks used in the bow fender according to the invention.

Figure 6 shows an open box with a hydraulic cylinder used in the bow fender according to the invention.

Figure 7 shows a back view of the bow fender according to the invention.

Figure 8 shows a cross-sectional view through the line A-A in figure 7.

Figures 9-11 show an alternative embodiment of the bow fender according to the invention.

Figure 12 shows a crew transfer vessel equipped with a bow fender.

Figure 13 shows an offshore wind turbine foundation.

Description of preferred embodiments of the invention

[0026] As shown in the figures the bow fender 10 according to the invention comprises an elongated rubber fender 12. In the middle of the rubber fender 12 there is a ticker part 36 on the front side 12a, which is pressed against a ladder 54 of a wind turbine foundation 52. The bow fender 10 is mounted on the bow of a vessel 60, such as a crew transfer vessel, with the ticker part 36 facing forward.

[0027] The elongated fender 12 is disclosed as made of rubber, but the elongated fender 12 can be made of plastic or other suitable material. The bow fender 10 according to the invention is disclosed in relation to a wind turbine foundation, but may of course be used with any similar offshore construction.

[0028] Such a bow fender 10 can for instance be approximately 10m long, and with a thickness of 45cm and a height of 65cm. Support poles 50, or fender bars, on a typical wind turbine foundation 52 have a diameter of 33cm, and a center distance of for instance 1,8m. The ticker part 36 of the bow fender is accommodated between the support poles 50 when the vessel 60 is pushing forward. The thrust by the vessel may for instance be between 8 to 10 tons.

[0029] To keep the bow of the vessel 60 steady with respect to the support poles 50, the bow fender 10 according to the invention is equipped with two support blocks 14, or fender clamps/shoes, which can be pushed against the outside of each support pole 50. The support blocks 14 can each be pushed against the poles 50 with a force of for instance 5 tons, which together with the forward trust from the vessel makes the bow of the vessel

steady with respect to the ladder 54, and allowing the service crew to enter the construction safely. Due to the high forces, the bow fender can for instance be compressed approximately 10cm in the area where the bow fender meets the poles. If the fender 12 is made of thick rubber, such a compression is unproblematic.

[0030] The support blocks 14 or fender clamps/shoes are made of a baseplate 20, which at least partly envelopes the rubber fender 12. Such a rubber fender 12 normally has a square or rectangular cross-section, and the baseplate 20 is thus formed in a corresponding U-shape. However, in case the rubber fender 12 has an oval or rounded front face, i.e. the side facing the support poles, the baseplate may have a similar shape. An interior width between respective side faces 20a,20b of the baseplate 20 corresponds preferable to the height of the rubber fender 12. The support blocks 14 are thus skidable in longitudinal directions back and forth on the front side 12a of the rubber fender 12. The side faces 20a,20b will normally not completely cover the rubber fender 12 to allow for compression of the rubber fender 12.

[0031] The support blocks 14 comprises a rubber covering 30, which is placed externally on an outer side 20c of the base plate 20.

[0032] The baseplate 20 can have a height of 65cm, similar to the height of the rubber fender 12, and a length of 80cm. The base part of the rubber covering 30 can have similar length of 80cm and a thickness of 20cm. However, the rubber covering 30 may extend quite a bit passed the baseplate 20, in the direction towards the middle of the rubber fender 12. The rubber covering 30 may extend passed the baseplate 20 with 20cm. The front face 30a of the rubber covering 30, i.e. the part that is pressed against the support poles 50 on the wind turbine foundation 54, can have an arched surface similar to the radius of the poles. The front part can also be thicker than the rear part.

[0033] For the support blocks 14 to be secured and skidable on the rubber fender 12, the base plate 20 comprise on the inside one or two downward directed internal connections arm 22, which extend through longitudinal slits 16 in the front side 12a of the rubber fender 12.

[0034] An open box with a hydraulic actuator 18, such as a hydraulic cylinder, is placed in a cavity 40 in the back side 12b of the rubber fender 12. The box is secured to the rubber fender 12, and can also be secured to the vessel's bow. The connection arms 22 extending down through the slits 16 are connected to the hydraulic actuator 18 via a skid plate 26 placed in the bottom of the box. The skid plate 26 has a connection 34 for connection of a rod part of the actuator 18, and a connection 32 for connection of each of the connection arms 22. To secure movement of the skid plate 26 in the box, the box 24 may comprise respective side slots 28. The sides of the skid plate 26 may comprise a glider 38 to ease movement in the side slots 28. Said glider 38 can be made of brass, and the side slots 28 can be covered by a nonstick material, such as Teflon.

[0035] Figures 9-11 show an alternative and simplified embodiment of the bow fender 10 according to the invention. The main difference is that the hydraulic actuator 18 is placed biased in a somewhat larger slit or cavity 45 in a back side 12b of the rubber fender, and is directly connected to the connection arms 22 to push and pull on the support blocks 14. Figure 9 shows the support blocks 14 in a retracted position. Figure 10 shows the support blocks 14 in an extracted position. Figure 11 shows the support blocks 14 in both retracted and extracted positions.

[0036] The rubber covering 12 may be equipped with other slits (not shown) than the slits for the connection arms 22, and the interior of the base plate 20 can have corresponding protrusions to further restrict unwanted tilting or other movement of the base plate.

[0037] To facilitate operation during docking at the wind turbine, the bow fender 10 is preferable connected to a control system on the vessel's bridge, in order to activate the bow fender to retract or extract the support blocks 14.

Claims

1. Bow fender (10) for a crew transfer vessel, comprising an elongated fender (12) equipped with two in longitudinal and opposite directions movable support blocks (14), wherein said support blocks (14) are longitudinally skidable on a front side (12a) of the fender (12) under the influence of a pressure actuator (18),
   characterized in that each of said support blocks (14) comprises a U-shaped base plate (20), which at least partially envelopes the fender (12), and with an interior width between respective side faces (20a,20b) of the U-shaped base plate (20) corresponding to the height of the fender (12).

2. Bow fender (10) according to claim 1, wherein said base plate (20) comprises at least one internal connection arm (22) extending though a longitudinal slit (16) in the front side (12a) of the fender (12), and which is connected to the pressure actuator (18), such as a hydraulic cylinder.

3. Bow fender (10) according to claim 1-2, wherein the pressure actuator (18) is resting in an open box (24) placed in a back side (12b) of the fender (12), and the pressure actuator (18) and the connection arm (22) of the support block (14) are connected to a skid plate (26), said skid plate (26) being skidable in respective side slots (28) in the box (24).

4. Bow fender (10) according to claim 1, wherein each of said support blocks (14) comprises a rubber covering (30), said rubber covering (30) is being placed on an outer side (20c) of the base plate (20).

5. Bow fender (10) according to claim 1-4, wherein two boxes (24) with a hydraulic cylinder (18) are placed on opposite sides to a center line of the fender (12), and connected to each of said support blocks (14).

6. Bow fender (10) according to claim 1, wherein said support blocks (14) are skidable to an extracted position and a retracted position on the front side (12a) of the elongated fender (12).

7. Bow fender (10) according to claim 6, wherein, when said support blocks (14) are in the retracted position on the front side (12a) of the fender (12), the support blocks (14) are clamping against an object, in order to prevent movement of the bow fender (10) in relation to said object.

8. Bow fender (10) according to claim 7, wherein said object is two vertical fender bars (50) on an offshore wind turbine foundation (52).

9. Bow fender (10) according to claim 1, wherein said support blocks (14) comprises respective connection arms (22), which extends through longitudinal slits (16) in the front side (12a) of the fender (12), and the connection arms (22) of each support block (14) are connected to a respective hydraulic actuator (18) extending through a cavity (45) in the fender (12).

10. Bow fender (10) according to claims 1-9, wherein the bow fender (10) is connected to a control system on the vessel's bridge, in order to activate the bow fender (10) to retract or extract the support blocks (14).

11. Bow fender (10) according to claims 1-10, wherein the fender (12) in the middle of the front side (12a) comprises a protruding, ticker part (36), and the two in longitudinal and opposite directions movable support blocks (14) are skidable on each side of the ticker middle part (36).

12. Bow fender (10) according to claims 1-11, wherein the elongated fender (12) is made of rubber, or the elongated fender (12) is made of plastic.

Patentansprüche

1. Bugfender (10) für ein Mannschaftstransportschiff, der einen länglichen, mit zwei in Längs- und entgegengesetzte Richtungen beweglichen Stützblöcken (14) ausgestatteten Fender (12) aufweist, wobei die Stützblöcke (14) unter dem Einfluss eines Druckaktuators (18) auf einer Vorderseite (12a) des Fenders (12) in Längsrichtung gleitfähig sind,
dadurch gekennzeichnet, dass jeder der Stützblöcke (14) eine U-förmige Grundplatte (20) aufweist, die den Fender (12) mindestens teilweise umgibt und deren innere Breite zwischen jeweiligen Seitenflächen (20a, 20b) der U-förmigen Grundplatte (20) der Höhe des Fenders (12) entspricht.

2. Bugfender (10) nach Anspruch 1, wobei die Grundplatte (20) mindestens einen inneren Verbindungsarm (22) aufweist, der sich durch einen Längsschlitz (16) in der Vorderseite (12a) des Fenders (12) erstreckt und der mit dem Druckaktuator (18), wie zum Beispiel einem Hydraulikzylinder, verbunden ist.

3. Bugfender (10) nach Anspruch 1 bis 2, wobei sich der Druckaktuator (18) in einem auf einer Hinterseite (12b) des Fenders (12) platzierten offenen Behälter (24) befindet und der Druckaktuator (18) und der Verbindungsarm (22) des Stützblocks (14) mit einer Gleitplatte (26) verbunden sind, wobei die Gleitplatte (26) in entsprechenden Seitenschlitzen (28) in dem Behälter (24) gleitfähig ist.

4. Bugfender (10) nach Anspruch 1, wobei jeder der Stützblöcke (14) einen Gummibelag (30) aufweist, wobei der Gummibelag (30) auf einer Außenseite (20c) der Grundplatte (20) platziert ist.

5. Bugfender (10) nach Anspruch 1 bis 4, wobei zwei Behälter (24) mit einem Hydraulikzylinder (18) auf entgegengesetzten Seiten einer Mittellinie des Fenders (12) platziert und jeweils mit den Stützblöcken (14) verbunden sind.

6. Bugfender (10) nach Anspruch 1, wobei die Stützblöcke (14) zu einer Ausfahrposition und einer Einfahrposition auf der Vorderseite (12a) des länglichen Fenders (12) gleitfähig sind.

7. Bugfender (10) nach Anspruch 6, wobei die Stützblöcke (14), wenn sich die Stützblöcke (14) an der Einfahrposition auf der Vorderseite (12a) des Fenders (12) befinden, gegen ein Objekt geklemmt sind, um eine Verschiebung des Bugfenders (10) im Verhältnis zu dem Objekt zu verhindern.

8. Bugfender (10) nach Anspruch 7, wobei es sich bei dem Objekt um zwei vertikale Fenderstangen (50) an einem Unterbau (52) einer Offshore-Windkraftanlage handelt.

9. Bugfender (10) nach Anspruch 1, wobei die Stützblöcke (14) entsprechende Verbindungsarme (22) aufweisen, die sich durch Längsschlitze (16) in der Vorderseite (12a) des Fenders (12) erstrecken und die Verbindungsarme (22) jedes Stützblocks (14) mit einem entsprechenden Hydraulikaktuator (18) verbunden sind, der sich durch einen Hohlraum (45) in dem Fender (12) erstreckt.

10. Bugfender (10) nach den Ansprüchen 1 bis 9, wobei der Bugfender (10) mit einem Steuersystem auf der Schiffsbrücke verbunden ist, um den Bugfender (10) so zu aktivieren, dass er die Stützblöcke (14) einfährt oder ausfährt.

11. Bugfender (10) nach den Ansprüchen 1 bis 10, wobei der Fender (12) in der Mitte der Vorderseite (12a) einen vorspringenden, dickeren Teil (36) aufweist und die beiden in Längs- und entgegengesetzte Richtungen beweglichen Stützblöcke (14) auf jeder Seite des dickeren Mittelteils (36) gleitfähig sind.

12. Bugfender (10) nach den Ansprüchen 1 bis 11, wobei der längliche Fender (12) aus Gummi hergestellt ist oder der längliche Fender (12) aus Kunststoff hergestellt ist.

Revendications

1. Défense de proue (10) pour un navire de transfert d'équipage, comprenant une défense allongée (12) équipée de deux blocs de support (14) mobiles dans une direction longitudinale et dans une direction opposée, dans laquelle lesdits blocs de support (14) peuvent glisser de manière longitudinale sur un côté avant (12a) de la défense (12) sous l'influence d'un actionneur de pression (18),
caractérisé en ce que chacun desdits blocs de support (14) comprend une plaque de base en forme de U (20), qui enveloppe au moins partiellement la défense (12), et avec une largeur intérieure entre des faces latérales respectives (20a, 20b) de la plaque de base en forme de U (20) correspondant à la hauteur de la défense (12).

2. Défense de proue (10) selon la revendication 1, dans laquelle ladite plaque de base (20) comprend au moins un bras de raccordement interne (22) s'étendant à travers une fente longitudinale (16) sur le côté avant (12a) de la défense (12), et qui est raccordé à l'actionneur de pression (18), comme un cylindre hydraulique.

3. Défense de proue (10) selon la revendication 1 à 2, dans laquelle l'actionneur de pression (18) s'appuie sur un boîtier ouvert (24) placé sur le côté arrière (12b) de la défense (12), et l'actionneur de pression (18) et le bras de connexion (22) du bloc de support (14) sont raccordés à une plaque de protection (26), ladite plaque de protection (26) pouvant glisser dans des fentes latérales respectives (28) dans le boîtier (24).

4. Défense de proue (10) selon la revendication 1, dans laquelle chacun desdits blocs de support (14) comprend une couverture en caoutchouc (30), ladite couverture en caoutchouc (30) est située sur un côté extérieur (20c) de la plaque de base (20).

5. Défense de proue (10) selon la revendication 1 à 4, dans laquelle deux boîtiers (24) avec un cylindre hydraulique (18) sont placés sur des côtés opposés à une ligne centrale de la défense (12), et raccordés à chacun desdits blocs de support (14).

6. Défense de proue (10) selon la revendication 1, dans laquelle lesdits blocs de support (14) peuvent glisser vers une position extraite et une position rétractée sur le côté avant (12a) de la défense allongée (12).

7. Défense de proue (10) selon la revendication 6, dans laquelle, lorsque lesdits blocs de support (14) sont dans la position rétractée sur le côté avant (12a) de la défense (12), les blocs de support (14) sont serrés contre un objet, afin d'empêcher le mouvement de la défense de proue (10) relativement audit objet.

8. Défense de proue (10) selon la revendication 7, dans laquelle ledit objet est constitué de deux barres de défense verticales (50) sur une fondation d'éolienne offshore (52).

9. Défense de proue (10) selon la revendication 1, dans laquelle lesdits blocs de support (14) comprennent des bras de raccordement respectifs (22), qui s'étendent à travers des fentes longitudinales (16) sur le côté avant (12a) de la défense (12), et les bras de raccordement (22) de chaque bloc de support (14) sont raccordés à un actionneur hydraulique respectif (18) s'étendant à travers une cavité (45) dans la défense (12).

10. Défense de proue (10) selon les revendications 1 à 9, dans laquelle la défense de proue (10) est raccordée à un système de commande sur le pont du vaisseau, afin d'activer la défense de proue (10) afin de rétracter ou d'extraire les blocs de support (14).

11. Défense de proue (10) selon les revendications 1 à 10, dans laquelle la défense (12) au centre du côté avant (12a) comprend une partie de bandeau saillante (36), et les deux blocs de support (14) mobiles dans la direction longitudinale et la direction opposée peuvent glisser de chaque côté de la partie centrale de bandeau (36).

12. Défense de proue (10) selon les revendications 1 à 11, dans laquelle la défense allongée (12) est réalisée en caoutchouc, ou la défense allongée (12) est réalisée en plastique.

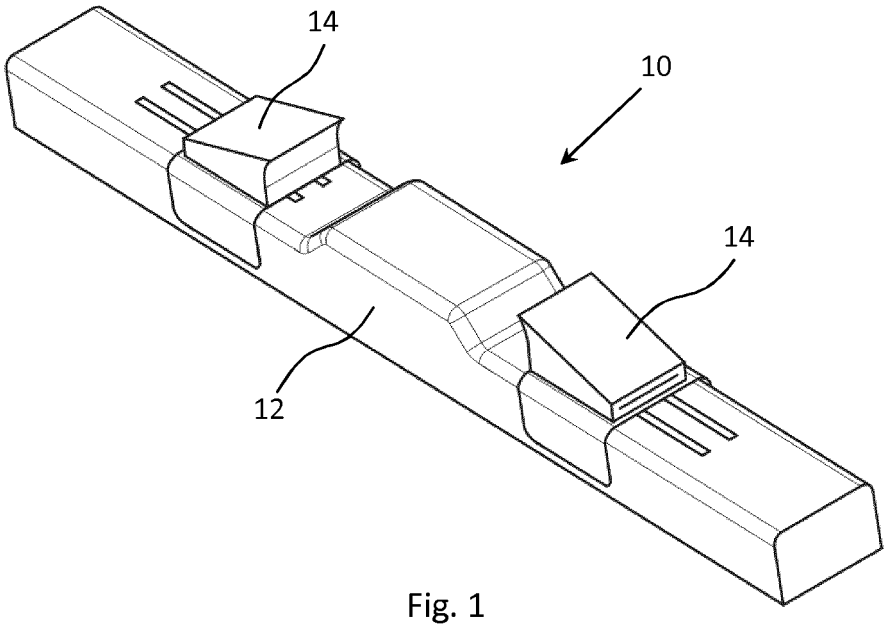

Fig. 1

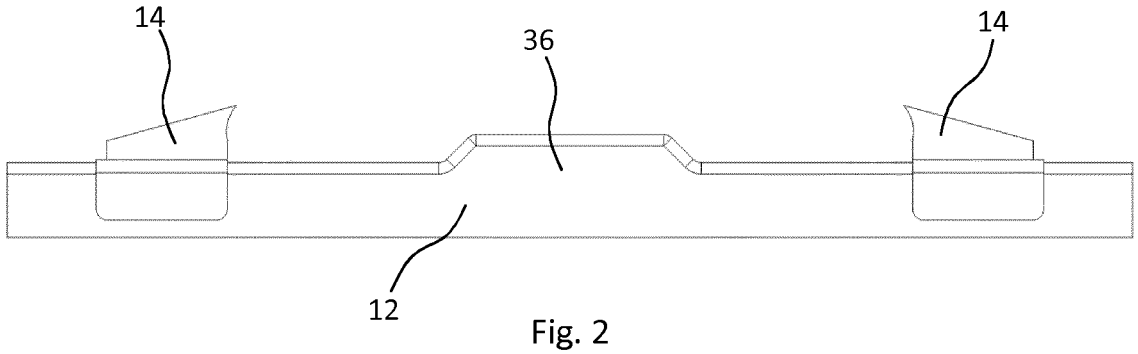

Fig. 2

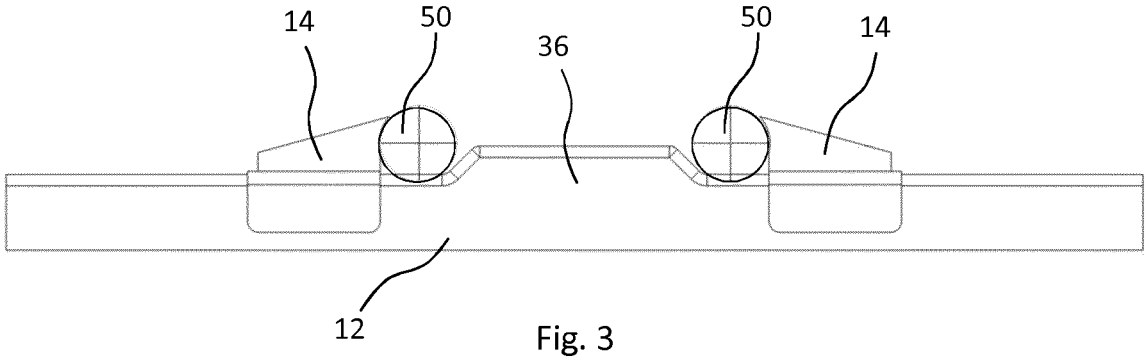

Fig. 3

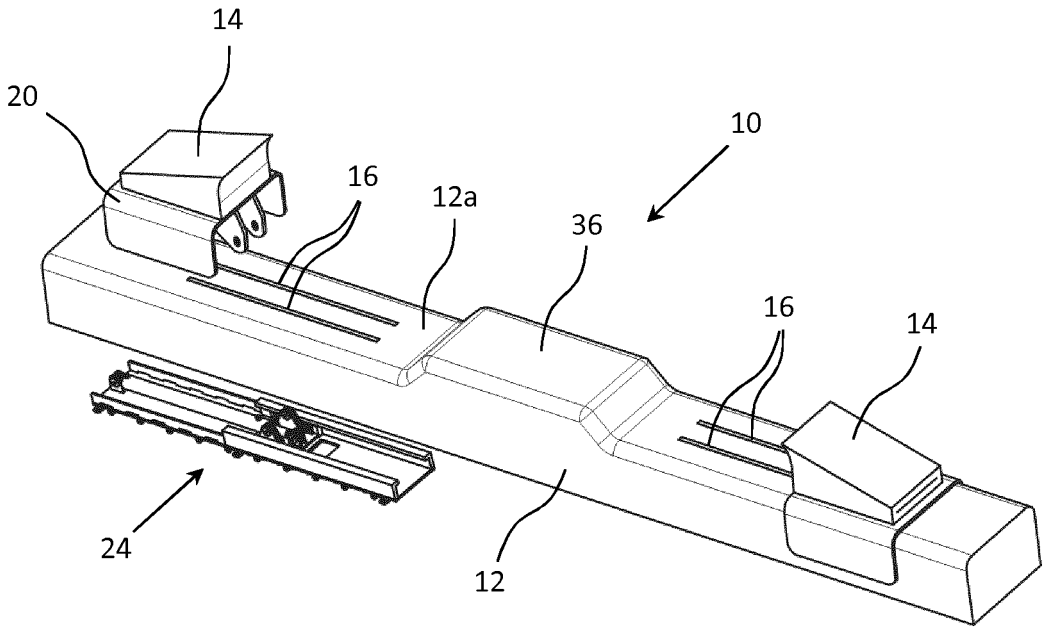

Fig. 4

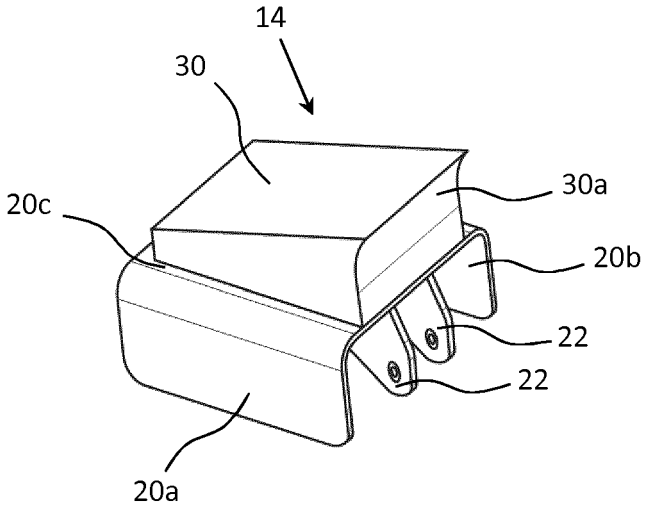

Fig. 5

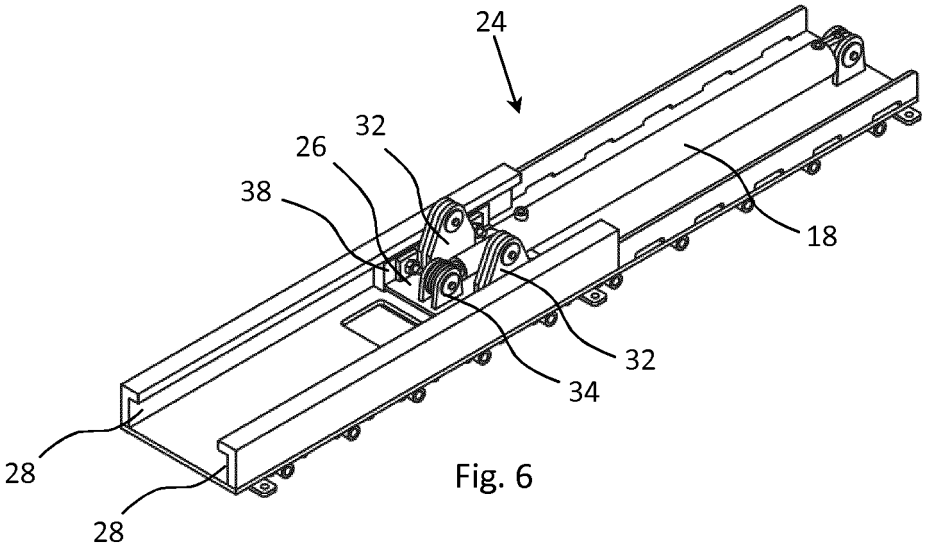

Fig. 6

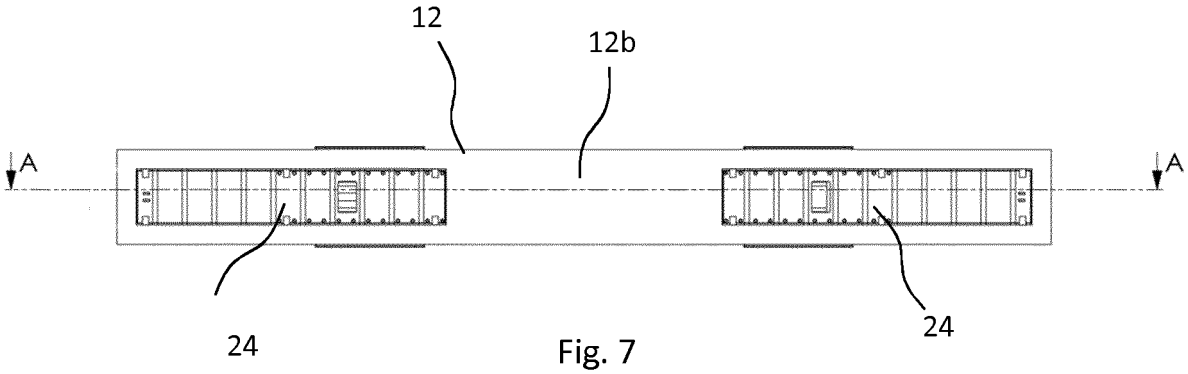

Fig. 7

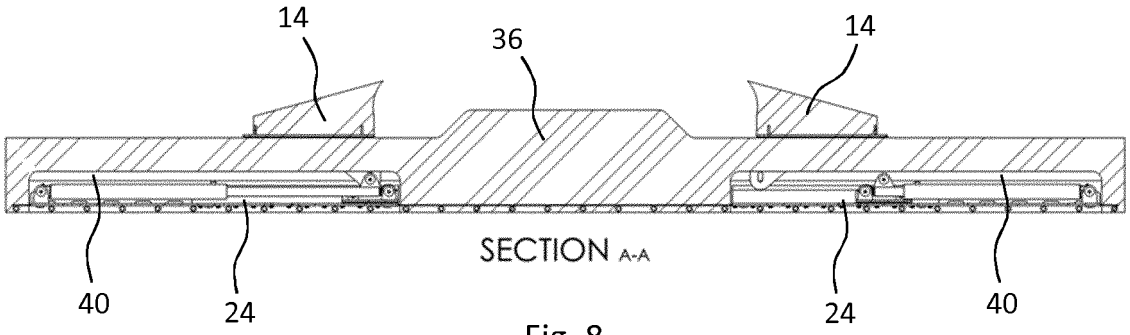

Fig. 8

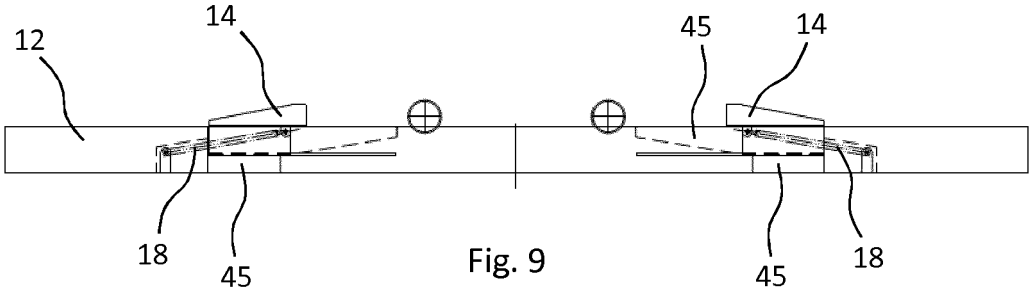

Fig. 9

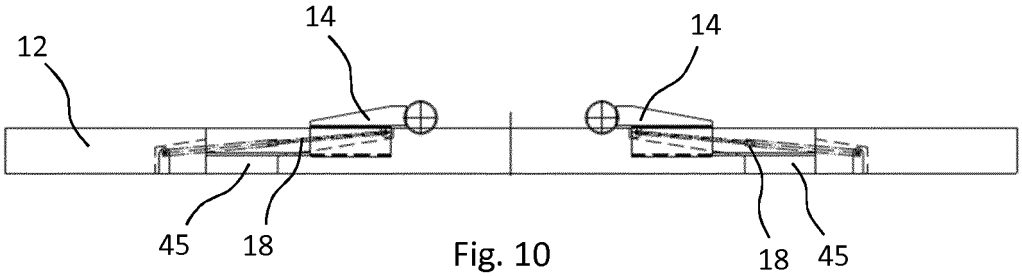

Fig. 10

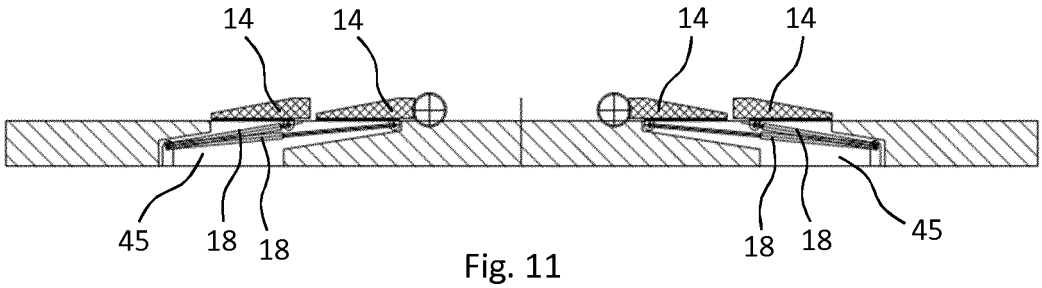

Fig. 11

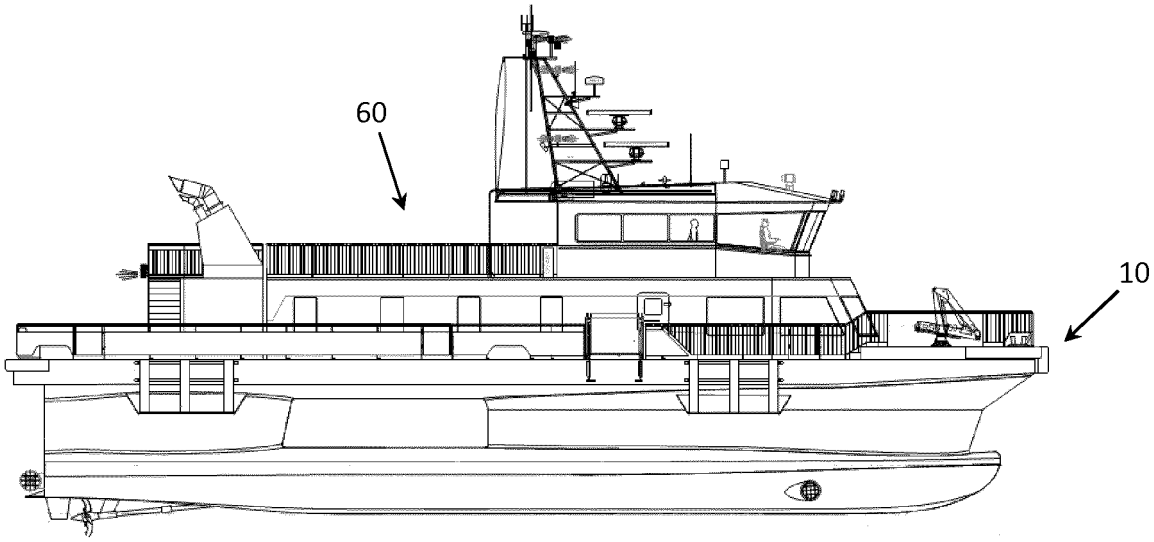

Fig. 12

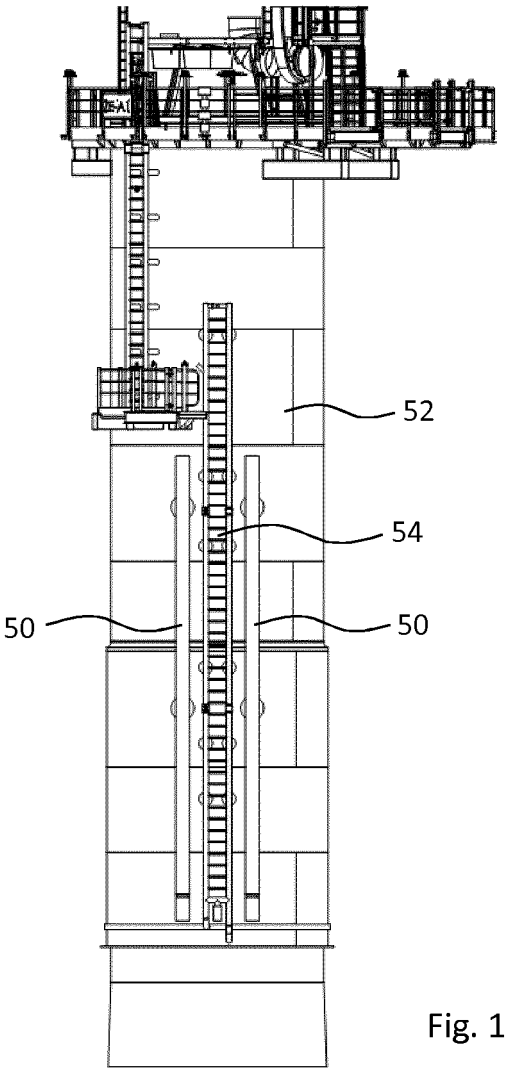

Fig. 13

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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- EP 2520485 A1 **[0010]**