

Description

The invention relates to a work platform for carrying out offshore operations, such as for transfer of men and equipment to offshore platforms, handling of anchor buoys, and deployment of men and equipment subsea.

Many thousands of vessels form a fleet of marine transportation boats serving companies working in offshore waters throughout the world. The vast majority of these work vessels support offshore oil and gas exploration and production activities. Most of these vessels are classed as tugboats, supply boats, or crew boats, and have displacement type hulls. A common problem with such conventional work vessels is that it is difficult for men to perform useful work from the decks thereof due to waves which wet the decks and which cause excessive roll and pitch motions of the vessels.

A potential solution to this problem is to build a fleet of small to medium sized, column-stabilized, semi-submersible work vessels like the larger semi-submersible vessels used for drilling operations. These vessels are stable work platforms having long natural periods of response in the order of 20 to 40 seconds. By contrast, a 60 m supply boat has natural periods of from 6 to 9 seconds, which is quite close to the period range of highest wave energy. While such semi-submersible work vessels would significantly reduce wave-induced motions and deck wetness, it would be at an excessive cost of retiring the conventional fleet and building a new and more expensive fleet.

Another possible solution, which is in conformity with the prior art portion of claim 1, is disclosed in U.S. patent specification 3,323,478. The patent discloses two parallel conventional work vessels that are pivotally interconnected by a truss work carrying a work platform, thus forming a work platform supported by a hinged catamaran-type floating substructure. The complicated but fragile truss work between the vessels make that this known assembly is generally not an economically and technically feasible approach.

An object of the present invention is to provide a cheap but safe and stable work platform which is attachable to a conventional work vessel or other support.

In accordance with the invention this object is accomplished by a work platform which is mounted on semi-submersible flotation means that are interconnected by a substantially rigid connecting structure, which structure is provided with pivot means for pivotally attracting the structure to a separate support.

In an attractive embodiment of the invention the semi-submersible flotation means are provided with ballast means providing an adjustable ballast weight, so that when the platform is not in use, or in transit, the flotation means may be de-ballasted to ride high in the water and permit entrance to shallow harbours. Thus the flotation means can be raised from a lowered, partly

submerged, working mode to a raised transit mode.

The invention will now be described in more detail by way of example with reference to the drawings, in which:

Figure 1 discloses a side view of a work platform embodying the invention.

Figure 2 provides a plan view of the embodiment of Figure 1.

Figure 3 provides a view from astern, of the embodiment of Figure 1.

Figure 4 discloses a modification of the embodiment of Figure 3.

In Figure 1 there is shown a semi-submersible, gooseneck style trailer/work platform 10 which is towable by a conventional work vessel 21 such as a supply boat, or by other means. The trailer/work platform 10 is pivotable from a raised or hoisted transit mode (indicated in phantom lines) to a lowered or partially submerged working mode. With the floating semi-submersible trailer/work platform 10, workmen can safely climb aboard from a supply boat, rig or other vessel and do useful work on a stable, dry deck. Further, using the present invention, men and equipment can be easily and safely transferred subsea or upward to an offshore platform or larger floating vessel.

As shown in the drawings the semi-submersible trailer/work platform 10 includes pontoons 11 and 12 which may be in a lowered position for work use or in a partially raised position (as shown in phantom) for transit. Alternatively, the pontoons 11 and 12 may be hoisted over a vessel 21 or other floating support means. Pontoons 11 and 12 are at the ends of two vertical columns 13 and 14 which in turn are connected by slanted cross beams 15 and 16 which abut pivoting framework 17. A vertical beam 18 extends downwardly from the opposite end of framework 17 to a ball swivel joint 19, or the like, which in turn can be mounted on a track or slot 20 on the vessel 21, so that it can be moved forward or aft, or even released aft in an emergency. If the trailer/work platform 10 is released, buoyancy of the beam 18 provides sufficient flotation to prevent the trailer/work platform 10 from overturning. The buoyancy may be obtained by means of a water-tight compartment 9 tankage, foam, or any other suitable means.

For best motion response with platform 10 in a working mode, ball swivel joint 19 is located at the centre of pitch of the vessel 21 or other floating support means to which it is attached. For storm survival, ball swivel joint 19 can be moved aft to minimize the risk of the underside of framework 17 contacting the stern of vessel 21 while the vessel is pitching in severe waves. Alternatively, or in addition, the trailer/work platform 10 can be deballasted to a light condition as shown in phantom in figure 1 for storm survival. Low tension tieback ropes, chains or cables 22 and 23 are used to ensure that the trailer/work platform 10 does not jackknife into contact with the vessel 21 or other floating support means.

The trailer/work platform 10 can take many

forms, depending on the specific application. Thus, it can have an aft deck 24 to support workmen or it can be used for off-loading to platforms. Crane 25 may be used for off-loading to platforms, etc. not having cranes, but it generally is preferred to use other cranes when available. The trailer/work platform 10 can have various other lifting means such as gantry hoist 28 for lifting loads from supply vessel deck 26 to work platform 24 or to move equipment and/or personnel subsea. Also, the trailer/work platform 10 can be used for submarine operations by having special launch/recovery equipment 29. Although submarines can be launched from the platform in various ways, it is preferred to launch from a duct 32 between pontoons 11 and 12. This facilitates getting the submarine through the wave/air interface, hence the cylindrical duct 32 to guide the submarine in and out of the water. Alternatively, an elevator may be used to lift and lower the submarine. Although it is prudent to keep the trailer/work platform 10 simple, thrusters 30 can be placed in pontoons 11 and 12 and extended downward for operation to aid in off-loading operations, then retracted when not in use.

Just like other semi-submersibles, the trailer/work platform 10 can be towed out in a shallow draft, low ballast condition and then be ballasted down at the work site to perform required work. By towing the trailer/work platform 10 in a lightened condition, the reduction in tow vessel speed due to the trailer is normally small, and shallow harbours can be used. In the lightened mode, the trailer/work platform 10 has the performance of a displacement type catamaran. Once the trailer/work platform is ballasted down with equipment weight and/or by water 31 in the pontoons 11 and 12, the favourable long period semi-submersible characteristics above mentioned appear.

A floodable chamber 33 may be attached to pontoons 11 and 12 by beams 34 and 35 and hinges 36 in order to provide added stability to the semi-submersible. The amount of ballast in chamber 33 is adjustable by changing water level 37. This chamber provides more righting moment in roll of the semi-submersible. Alternatively, a dead weight 50 may be suspended by cables 51 and 52 from pontoons 11 and 12 as shown in Figure 4.

A work platform according to the present invention was tested at 1/50th scale in a wave tank, using a simulated 2000-ton prototype supply vessel and a simulated 350-ton trailer-work platform, the trailer/work platform was calm and stable in 12 and 25 feet (3.7 and 7.7 m) waves with wave lengths 20 times the wave height while the bow moored vessel was excessively pitching and rolling. Natural periods for prototype roll and heave for the trailer/work platform were in the 15 to 35 second range. For this combination of trailer/work platform and vessel, useful work could be done in wave heights to about 20 feet (6.2 m). The vessel/trailer/work platform combination tracked well under tow in both light and heavy ballast condi-

tions. Based on estimations, light ballast condition would only reduce the normal vessel transit speed by no more than one knot.

Claims

1. An offshore work platform being mounted on a plurality of interconnected flotation means, characterized in that the flotation means are of the semi-submersible type and that the flotation means are interconnected by a substantially rigid connecting structure, said structure being provided with pivot means for pivotally attaching the structure to a separate support.

2. The platform of claim 1, wherein the pivot means comprises a swivel joint.

3. The platform of claim 1, wherein the flotation means comprise pontoons.

4. The platform of claim 1, wherein the connecting structure comprises at least one truss.

5. The platform of claim 1, wherein the pivot means is attached to a floating support.

6. The platform of claim 5, wherein the floating support is a vessel.

7. The platform of claim 1, wherein the pivot means is attached to a non-floating support.

8. The platform of claim 7, wherein the support is a dock.

9. The platform of claim 2, wherein each flotation means is provided with a tie line for connecting the flotation means to the support.

10. The platform of claim 1, including means for ballasting the flotation means in an adjustable manner.

11. The platform of claim 2, wherein the swivel joint is attached to a floating vessel at least near the centre of pitch on the deck of the vessel.

12. The platform of claim 1, wherein the connecting structure is provided with supply means for moving supplies between the pivot means and the area about the flotation means.

13. The platform of claim 1, wherein thrusters are positioned within and beneath the pontoons.

14. The platform of claim 2, wherein the swivel joint is releasably attached to guide means, the guide means being mounted on the support.

15. The platform of claim 14, wherein the guide means is a track extending in a substantially horizontal direction on the support.

16. The platform of claim 14, wherein the guide means is a slot extending in a substantially horizontal direction on the support.

17. The platform of claim 1, including ballast means deployable from the flotation means.

18. The platform of claim 17, wherein the ballast means is a floodable chamber.

19. The platform of claim 1, including a deck.

20. The platform of claim 1, including a crane.

21. The platform of claim 1, including launch/recovery means for a submarine.

Revendications

1. Une plate-forme de travail en mer montée sur plusieurs moyens de flottaison reliés entre eux

forms, depending on the specific application. Thus, it can have an aft deck 24 to support workmen or it can be used for off-loading to platforms. Crane 25 may be used for off-loading to platforms, etc. not having cranes, but it generally is preferred to use other cranes when available. The trailer/work platform 10 can have various other lifting means such as gantry hoist 28 for lifting loads from supply vessel deck 26 to work platform 24 or to move equipment and/or personnel subsea. Also, the trailer/work platform 10 can be used for submarine operations by having special launch/recovery equipment 29. Although submarines can be launched from the platform in various ways, it is preferred to launch from a duct 32 between pontoons 11 and 12. This facilitates getting the submarine through the wave/air interface, hence the cylindrical duct 32 to guide the submarine in and out of the water. Alternatively, an elevator may be used to lift and lower the submarine. Although it is prudent to keep the trailer/work platform 10 simple, thrusters 30 can be placed in pontoons 11 and 12 and extended downward for operation to aid in off-loading operations, then retracted when not in use.

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A floodable chamber 33 may be attached to pontoons 11 and 12 by beams 34 and 35 and hinges 36 in order to provide added stability to the semi-submersible. The amount of ballast in chamber 33 is adjustable by changing water level 37. This chamber provides more righting moment in roll of the semi-submersible. Alternatively, a dead weight 50 may be suspended by cables 51 and 52 from pontoons 11 and 12 as shown in Figure 4.

A work platform according to the present invention was tested at 1/50th scale in a wave tank; using a simulated 2000-ton prototype supply vessel and a simulated 350-ton trailer-work platform, the trailer/work platform was calm and stable in 12 and 25 feet (3.7 and 7.7 m) waves with wave lengths 20 times the wave height while the bow moored vessel was excessively pitching and rolling. Natural periods for prototype roll and heave for the trailer/work platform were in the 15 to 35 second range. For this combination of trailer/work platform and vessel, useful work could be done in wave heights to about 20 feet (6.2 m). The vessel/trailer/work platform combination tracked well under tow in both light and heavy ballast condi-

tions. Based on estimations, light ballast condition would only reduce the normal vessel transit speed by no more than one knot.

Claims

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2. The platform of claim 1, wherein the pivot means comprises a swivel joint.

3. The platform of claim 1, wherein the flotation means comprise pontoons.

4. The platform of claim 1, wherein the connecting structure comprises at least one truss.

5. The platform of claim 1, wherein the pivot means is attached to a floating support.

6. The platform of claim 5, wherein the floating support is a vessel.

7. The platform of claim 1, wherein the pivot means is attached to a non-floating support.

8. The platform of claim 7, wherein the support is a dock.

9. The platform of claim 2, wherein each flotation means is provided with a tie line for connecting the flotation means to the support.

10. The platform of claim 1, including means for ballasting the flotation means in an adjustable manner.

11. The platform of claim 2, wherein the swivel joint is attached to a floating vessel at least near the centre of pitch on the deck of the vessel.

12. The platform of claim 1, wherein the connecting structure is provided with supply means for moving supplies between the pivot means and the area about the flotation means.

13. The platform of claim 1, wherein thrusters are positioned within and beneath the pontoons.

14. The platform of claim 2, wherein the swivel joint is releasably attached to guide means, the guide means being mounted on the support.

15. The platform of claim 14, wherein the guide means is a track extending in a substantially horizontal direction on the support.

16. The platform of claim 14, wherein the guide means is a slot extending in a substantially horizontal direction on the support.

17. The platform of claim 1, including ballast means deployable from the flotation means.

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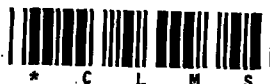
19. The platform of claim 1, including a deck.

20. The platform of claim 1, including a crane.

21. The platform of claim 1, including launch/recovery means for a submarine.

Revendications

1. Une plate-forme de travail en mer montée sur plusieurs moyens de flottaison reliés entre eux



caractérisée en ce que les moyens de flottaison sont du type semi-submersible et en ce que les moyens de flottaison sont reliés entre eux par une structure de liaison sensiblement rigide, ladite structure étant munie de moyens formant pivot pour monter la structure de manière pivotante dans un support séparé.

2. La plate-forme de la revendication 1, dans laquelle les moyens formant pivot comprennent un joint articulé.

3. La plate-forme de la revendication 1, dans laquelle les moyens de flottaison comprennent des pontons.

4. La plate-forme de la revendication 1, dans laquelle la structure de liaison comprend au moins une poutre.

5. La plate-forme de la revendication 1, dans laquelle les moyens formant pivot sont assemblés à un support flottant.

6. La plate-forme de la revendication 5, dans laquelle le support flottant est un navire.

7. La plate-forme de la revendication 1, dans laquelle les moyens formant pivot sont assemblés à un support non flottant.

8. La plate-forme de la revendication 7, dans laquelle le support est un dock.

9. La plate-forme de la revendication 2, dans laquelle chaque moyen de flottaison est muni d'un câble d'amarre qui relie le moyen de flottaison au support.

10. La plate-forme de la revendication 1, comportant des moyens pour lester les moyens de flottaison d'une manière réglable.

11. La plate-forme de la revendication 1, dans laquelle le joint articulé est assemblé à un navire à flot au moins au voisinage du centre de tangage du pont du navire.

12. La plate-forme de la revendication 1, dans laquelle la structure de liaison est munie de moyens de manutention de marchandises pour déplacer les marchandises entre les moyens formant pivot et la région qui entoure les moyens de flottaison.

13. La plate-forme de la revendication 1, dans laquelle des moyens de poussée sont positionnés dans les pontons et au-dessous d'eux.

14. La plate-forme de la revendication 2, dans laquelle le joint articulé est assemblé de manière séparable à des moyens de guidage, les moyens de guidage étant montés sur le support.

15. La plate-forme de la revendication 14, dans laquelle les moyens de guidage sont constitués par une voie de guidage qui s'étend dans une direction sensiblement horizontalement sur le support.

16. La plate-forme de la revendication 14, dans laquelle les moyens de guidage sont constitués par une fente de guidage qui s'étend dans une direction sensiblement horizontalement sur le support.

17. La plate-forme de la revendication 1, comportant des moyens de lestage qui peuvent être mis en place à partir des moyens de flottaison.

18. La plate-forme de la revendication 17, dans laquelle les moyens de lestage sont constitués

par une chambre noyable.

19. La plate-forme de la revendication 1, comportant un pont.

20. La plate-forme de la revendication 1, comportant une grue.

21. La plate-forme de la revendication 1, comportant des moyens de lancement/récupération d'un sous-marin.

Patentansprüche

1. Plattform für Arbeiten von der Küste, die auf mehreren miteinander verbundenen Schwimmkörpern montiert ist, dadurch gekennzeichnet, daß die Schwimmkörper teilweise eintauchen und daß die Schwimmkörper miteinander verbunden sind durch ein im wesentlichen starres Gerüst, wobei dieses Gerüst mit einem Gelenk versehen ist, um das Gerüst schwenkbar an einer getrennten Trageinrichtung zu befestigen.

2. Plattform nach Anspruch 1, dadurch gekennzeichnet, daß das Gelenk ein Drehgelenk umfaßt.

3. Plattform nach Anspruch 1, dadurch gekennzeichnet, daß die Schwimmkörper Pontons umfassen.

4. Plattform nach Anspruch 1, dadurch gekennzeichnet, daß das Gerüst zumindest einen Träger bzw. eine Strebe umfaßt.

5. Plattform nach Anspruch 1, dadurch gekennzeichnet, daß das Gelenk an einer schwimmenden Trageinrichtung befestigt ist.

6. Plattform nach Anspruch 5, dadurch gekennzeichnet, daß die schwimmende Trageinrichtung ein Schiffskörper ist.

7. Plattform nach Anspruch 1, dadurch gekennzeichnet, daß das Gelenk an einer nicht schwimmenden Trageinrichtung befestigt ist.

8. Plattform nach Anspruch 7, dadurch gekennzeichnet, daß die Trageinrichtung ein Dock ist.

9. Plattform nach Anspruch 2, dadurch gekennzeichnet, daß jeder Schwimmkörper mit einer Trosse versehen ist, um den Schwimmkörper mit der Trageinrichtung zu verbinden.

10. Plattform nach Anspruch 1, dadurch gekennzeichnet, daß sie Vorrichtungen enthält, um die Schwimmkörper in einstellbarer Weise mit Ballast zu versehen.

11. Plattform nach Anspruch 2, dadurch gekennzeichnet, daß das Drehgelenk an einem Schiffskörper zumindest nahe dem Zentrum der Stampfbewegung auf dem Deck des Schiffskörpers befestigt ist.

12. Plattform nach Anspruch 1, dadurch gekennzeichnet, daß das Gerüst mit Fördereinrichtungen versehen ist zum Transport von Ausrüstungsgegenständen zwischen dem Gelenk und dem Bereich um die Schwimmkörper.

13. Plattform nach Anspruch 1, dadurch gekennzeichnet, daß Druckgeber innerhalb und unterhalb der Pontons angeordnet sind.

14. Plattform nach Anspruch 2, dadurch gekennzeichnet, daß das Drehgelenk abnehmbar an Führungsvorrichtungen befestigt ist, die auf der Trageinrichtung festgemacht sind.

15. Plattform nach Anspruch 14, dadurch



gekennzeichnet, daß die Führungsvorrichtung ein Gleis ist, das sich im wesentlichen horizontal auf der Trageinrichtung erstreckt.

16. Plattform nach Anspruch 14, dadurch gekennzeichnet, daß die Führungsvorrichtung eine Rille ist, die sich im wesentlichen horizontal auf dem Träger erstreckt.

17. Plattform nach Anspruch 1, dadurch gekennzeichnet, daß sie einen Ballastkörper umfaßt, der von den Schwimmkörpern entfernt werden kann.

18. Plattform nach Anspruch 17, dadurch gekennzeichnet, daß der Ballastkörper eine flutbare Kammer ist.

19. Plattform nach Anspruch 1, dadurch gekennzeichnet, daß sie eine Tragfläche umfaßt.

20. Plattform nach Anspruch 1, dadurch gekennzeichnet, daß sie einen Kran umfaßt.

21. Plattform nach Anspruch 1, dadurch gekennzeichnet, daß sie Vorrichtungen zum Ablassen und Aufnehmen eines U-Boots umfaßt.

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