

SYSTEMS AND PROCESSES FOR COVERING OPENINGS OF MARINE VESSEL HULLS

TECHNICAL FIELD

5 This disclosure relates generally to systems and processes useful for facilitating repair and maintenance of sea valves and other components on marine vessels, particularly large vessels, including vessels used for floating storage (FSO's) and production (FPSO's), while in the water. Specifically, the systems and processes described herein relate to facilitating repairs and maintenance of sea valves, and other components, on marine vessels
10 by closing openings in the hulls of marine vessels to permit dry access to the sea valves and other components which are normally in direct communication with the openings.

BACKGROUND ART

 Repair and maintenance operations of marine vessels, particularly FSO's and FPSO's, in dry dock are usually very time consuming and expensive processes. Moreover,
15 the vessel is out of service during the time required to transit from its service location to dry dock facility, the time it takes to conduct the repair or maintenance work, and the time required to transit back to its service location. For FSO's and FPSO's the vessels may require towing by tugboats from location to the shipyard, further complicating transfer to a dry dock. Waiting for dry dock space in busy port may lengthen the service interruption. Of
20 course, the longer the service interruption, the greater the adverse financial impact of the out of service time.

 Marine vessels such as floating oil and gas production vessels and petroleum product storage vessels are designed to stay on station in an anchored or moored position for 10 to 30 years. For these types of vessels, dry dock repair and maintenance is completely
25 inconsistent with the intended service lives and economic return for the vessels.

 Many large marine vessels, such as sea going ships, FSO's and FPSO's and the like, have openings in the hull below the waterline to allow inflow and outflow of water into cavities often referred to as sea chests. A sea chest is simply a cavity or chamber behind the hull of a marine vessel below the waterline that communicates externally with the water. The
30 sea chest is often connected by plumbing such as piping and valves to convey water for various purposes within the ship. Such openings to the water are used for many purposes including drawing of water from the ocean for cooling and the like and for expelling water and other waste material into the ocean. The openings are typically connected by conduits

and the like to pumps, valves, and other equipment within the engine room and other compartments of the vessel.

It is necessary to inspect piping and valves, and on occasion to replace or repair some of the plumbing or valves in and around the openings and leading to the openings. These repairs and reconstructions can be readily accomplished in dry dock. However, dry docks are frequently unavailable or are available only after a long wait. Moreover, putting a marine vessel in dry dock to perform such repairs and maintenance takes the vessel out of service, which usually results in substantial adverse financial affects.

Some sea chests require an affixed cover that may be opened and closed as needed while the vessel is in service. For example, many ships utilize maneuvering thrusters within sea chests from which water is ejected through hinged covers that act as a cover that opens to permit water to exit and closes to prevent water from entering the sea chest. Other sea chests do not have fixed covers and temporary covers are used to close the opening in the marine vessel hull to the sea chest when it becomes necessary to have dry access to the sea chest compartment while the vessel is in the water. Vessels with temporary covers require divers to properly place the covers over openings. This can be a hazardous operation, particularly in areas where there is restricted visibility.

U.S. Patent 5,692,451 discloses sea chest covers fabricated from one or more viscoelastic materials such as polyethylene or polyurethane. The patent discloses that the viscoelastic materials reduce corrosion and erosion as well as minimize marine organism growth and ice build-up on the covers. The covers disclosed in this patent are designed to be permanently affixed to a vessel.

U.S. Patent application 2004/0011265 A1 discloses sea chest covers made from viscoelastic materials that have been exposed to gamma radiation for enhanced strength. The application also discloses that the viscoelastic materials may also contain an anti-bacterial or anti algae growth additive. The covers disclosed in this patent are designed to be permanently affixed to a vessel.

U.S. Patent 4,175,510 discloses a cofferdam for closing openings in hulls of vessels below the waterline. The cofferdam is a wooden structure that is lowered by a crane and guided in place by divers. The cofferdam may be secured to the hull of the vessel through attachment to a grating in the opening in the hull with a series of J-bolts.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 depicts an embodiment of the systems and processes for closing the opening in the hull of a marine vessel in use on the hull of a marine vessel.

FIG. 2 depicts an embodiment of a track assembly useful in the systems and processes described herein.

FIG. 3 is side a view of the embodiment of the systems for closing the opening in the hull of a marine vessel depicted in FIG 1.

FIG. 4 depicts the second surface of a cover of the systems and processes for closing the opening in the hull of a marine vessel in accordance with one embodiment.

FIG. 5 is a side view of the cover depicted in FIG. 3.

FIG. 6 depicts the first surface of an embodiment of a cover of the systems and processes for closing the opening in the hull of a marine vessel.

FIG. 7 depicts a sea chest cover and a track assembly in accordance with an embodiment of the systems and processes described herein.

FIG. 8 provides a detailed depiction of the interaction of a track assembly and a sea chest cover in accordance with an embodiment of the systems and processes described herein.

FIG. 9A provides a depiction of an embodiment of a portable track assembly and means for securing a track assembly to a vessel hull.

FIG. 9B provides a detailed depiction of an embodiment of a means for securing a track assembly to a vessel hull.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

The disclosure relates to systems and processes for closing openings in the hull of a marine vessel. The process and systems are useful for facilitating repair and maintenance of marine vessels, particularly large ocean going and other vessels, while in the water. Specifically, the systems and processes described herein relate to facilitating repairs and maintenance of such marine vessels by closing openings in the hulls of marine vessels to permit dry access to compartments in communication with the openings.

The processes and systems incorporate a cover constructed from a relatively lightweight material such as fiberglass, or from one or more viscoelastic materials such as polyethylene or polyurethane. The cover is configured to the size and shape necessary to cover the opening in the marine vessel hull to be closed. The cover is guided in place to effectuate closure of the opening by a track assembly that receives at least two of the

peripheral edges of the cover and directs the cover to the proper position to completely cover and close the hull opening.

The cover may be lowered into place by use of a hoisting device such as a davit on a dock, the deck of the vessel undergoing repair or maintenance, or on the deck of another vessel alongside the vessel undergoing repair or maintenance.

The cover may incorporate a number of features to facilitate its proper placement and sealing function. For example, the cover may be provided with a buoyancy control compartment to regulate buoyancy or ballast plates that may be changed to control the weight of the cover and to help maintain the proper orientation of the cover during installation under a variety of sea conditions. The cover may also be provided with a seal layer or annular seal on its surface to enhance the seal between the cover and the hull.

The disclosure relates to systems and processes for closing the opening in the hull of a marine vessel. The process and systems are useful for facilitating repair and maintenance of marine vessels, particularly floating oil and gas production vessels and petroleum product storage vessels. Specifically, the systems and processes described herein facilitate repairs and maintenance of marine vessels by closing openings in the hulls of marine vessels to permit dry access to compartments in communication with the openings without the need to put the vessel in dry dock. By eliminating the need for dry dock to accomplish certain repairs and maintenance, the systems and processes described herein are capable of providing vessel owners and operators significant financial advantages.

The processes and systems described herein incorporate a cover that may be in the form of a panel or plate-like structure constructed from a relatively lightweight material such as fiberglass, or from one or more viscoelastic materials such as polyethylene or polyurethane. The cover is configured in a size and shape as necessary to completely cover the opening in the marine vessel hull opening to be closed. The cover is guided in place to effectuate closure of the opening by a track assembly having at least two tracks that receive at least two peripheral edges of the cover to direct the cover to the proper position to completely cover the hull opening. The cover may be lowered into place by use of a hoisting device such as a davit on a dock, the deck of the vessel undergoing repair or maintenance, or on the deck of another vessel alongside the vessel undergoing repair or maintenance.

Because of the track assembly used to guide the cover into position to close the opening of the marine vessel hull, the need for divers to position or place the cover into operation is eliminated or at least minimized. Diver placed covers are very functional in

locations where the water is clear and warm and currents are minimal. However, in the many locations around the world where the water is murky, cold, or where strong currents exist, positioning a sea chest cover on a marine vessel is often associated with risk of the health and safety of the divers involved.

5 FIG. 1 depicts an embodiment of the systems and processes for closing the opening in the hull of a marine vessel in use on the hull of a marine vessel. In this embodiment, two hull opening covers 2 are depicted. Each of the covers 2 can be lowered to or raised from their functional positions by one or more marine davits 6 and cables 8 releasably attached to the covers 2. The covers 2 are guided into place through the use of a track assembly 3, which in this
10 embodiment is comprised of three standards 4. In other embodiments, only two such standards 4 may be used; however this embodiment is described to elucidate certain features that may be present when more than two standards 4 are employed. Standards 4 are attached to the hull 1 of the vessel and each standard 4 incorporates for forms at least one track 5 configured to receive a peripheral edge of at least one of the covers 2. In the embodiment depicted, standard 4 includes
15 a track 5 on each of its opposite sides. A first track 5 is configured to receive and guide a peripheral edge of cover 2 and a second track 5 is configured to receive and guide a peripheral edge of cover 2. In the depicted embodiment, each standard 4 incorporate a single track 5 respectively configured to receive and guide a peripheral edge of covers 2.

 The placement of one or more of the standards 4 in accordance with embodiments
20 of the inventions described herein is determined by the location of the opening to be closed by positioning of the covers 2 guided by at least two tracks 5. In one embodiment, the track assembly 3 includes two tracks 5, wherein one track 5 is positioned on each side of the hull opening 26 to be closed. It is understood that more than two tracks 5 may be employed in the track assembly 3 for interaction with a given cover 2. For example, with reference to
25 FIG. 1, one or more tracks 5 that are not shown may be positioned perpendicular to standards 4 at a lower terminus of the standard 4. In some embodiments, such tracks 5 act as cover stop mechanisms configured to receive the lower peripheral edges 12 of one or more covers such as covers 2. In other embodiments, the tracks 5 forming the cover stop mechanism may not necessarily be perpendicular to any of the standards 4. Any angle sufficient to allow the
30 cover 2 to be positioned over the hull opening is envisioned. Any other means of stopping the cover 2 at the proper position is also contemplated.

 Placement of the upper terminus of the track assembly 3 may vary. In one embodiment, the upper ends of the tracks 5 of the standards 4 are positioned at about 50

centimeters below the normal operational waterline 9 of the marine vessel. Placement this close to the surface of the water facilitates guiding the peripheral edges 12 of the covers 2 into the tracks 5 of the track assembly 3 without the assistance of divers. However, it is understood that in many instances some diver assistance may be necessary to position the cover 2 into place to initiate guidance by the track assembly 3. However, it is likely that the assistance would be required only at or near the surface of the water, thereby minimizing diver risk.

In one embodiment, an extension to the track 5 could be added to raise the upper start point of the track assembly 3 above the waterline 9 at the time when the cover 2 is to be put in place over a hull opening. Removable tracks 5 may be attached to the vessel hull 1 with studs 30. Details of an embodiment of such an attachment means will be described hereinafter with reference to portable track assemblies 3. If placement of the upper terminus of the track assembly 3 is below the surface of the water, this also helps protect the tracks 5 from other vessels and debris floating in the water.

The standards 4 and tracks 5 forming the track assembly 3 described herein may be made from a variety of materials, including metals, plastics, fiberglass, viscoelastic materials and other synthetic materials. A variety of lightweight materials are found to be suitable for facilitating construction, installation, and operation. An exemplary material is fiberglass in that it is strong and is impact and corrosion resistant. The track assembly materials may also include additives designed to retard or minimize growth of marine organisms on the tracks 5. The thickness of the materials used for construction of the track assembly 3 may vary with the specific installation requirements and the specific materials used. In one embodiment, the thickness of fiberglass track assembly 3 ranges from about 0.3 cm to about 1.5 cm. In another embodiment, the thickness of the fiberglass is from about 0.6 cm to about 1.2 cm. In a third embodiment, the fiberglass thickness is from about 0.9 cm to about 1.5 cm. In a fourth embodiment, the fiberglass thickness is from about 0.3 cm to about 0.6 cm. One skilled in the art will readily recognize that the thickness should be chosen according to the material selected and the forces the track assembly 3 should withstand for proper operation.

The standards 4 of the track assembly 3 may be attached to the hull 1 by any suitable means such as waterproof adhesives, stainless steel weld studs, and drilled and tapped doublers.

In other embodiments, the track assembly 3 may include at least one portable standard 4 including the track 5 that may be attached to the marine vessel on location when it

is needed at that particular point in time. Details of such an embodiment are described hereinafter. Of course, it is understood that the use of a portable standard 4 may lead to problems associated with holding the standard 4 securely in place while in use.

Track assemblies 3 with tracks 5 for receiving the peripheral edges 12 of the covers 2 in accordance with embodiments of this disclosure may be of any suitable dimensions and configurations for cooperating with at least two of the peripheral edges 12 of a cover 2. In one embodiment the tracks 5 may be configured in the shape of grooves for receiving and guiding the peripheral edges 12 of the cover 2. In other embodiments, the groove of the track 5 may have a tapered configuration to ensure proper positioning of the cover 2 and to retard or minimize growth of marine organisms on the track 5. For example, the cover 2 may be tapered on the bottom side, along with narrowing the track 5 near the bottom end. The bottom end of the track 5 could then be left "open" so marine growth would not accumulate in the bottom stop.

Alternatively, the track assembly 3 may have standards 4 and/or tracks 5 configured as depicted in FIG. 2 wherein the lower portion 10 of the standards 4 are flared at an angle relative to the main body of the standard 4, which is linear or substantially linear. As is understood by reference to FIG. 2, the flared lower portion 10 of the standard 4 includes a track 5 is configured to receive the lower peripheral edge of the cover 2 to hold the lower surface of the cover 2 in contact with the hull 1 of the vessel while at the same time providing a stop to hold the cover 2 at the proper vertical position along the vessel hull 1 to ensure closure of the opening.

With continuing reference to FIG. 1, FIG. 3 is a side view of the embodiment of the systems for closing the opening in the hull 1 of a marine vessel depicted in FIG 1. The lower peripheral edge of the cover 2 while in use may be at any location along the vessel hull 1 as required by placement of the opening 26 to be closed. However, as may be appreciated, the curvature of the hull 1 is a factor in maintaining contact between the surface of the cover 2 and the hull 1. In this depiction, the lower peripheral edge of the cover 2 as indicated by the lower terminus of the track 5 is located approximately 200 mm above the bilge radius tangent as indicated by the dimension labeled A. This dimension should be selected so that the cover 2 and seal (shown in FIG. 5) are in contact with a flat portion of the hull 1 to assure a proper seal. Positioning the lower peripheral edge of the cover 2 at a position at least 200 mm above the bilge radius tangent ensures maximum functional contact between the cover 2 and the hull 1. For this reason, in one embodiment, the systems and processes described herein

function best when the sea chests bottoms are located above the bilge radius tangent. In other words, the systems and process described herein function best when the hull openings 26 are within the "flat" of the vessel's side. In such arrangements, the cover 2 raises and lowers in the tracks 5 and seals more easily. However, if the cover 2 and track assembly 3 are sufficiently flexible, the systems and processes described herein are suitable for covering hull opening 26 along the curvature of a vessel hull 1.

The covers 2 used in the systems and process described herein may be of any suitable configuration designed to cover the hull opening 26 to be closed. The covers 2 will have at least three peripheral edges 12 of which at least two are configured for placement into and guidance by at least the tracks 5 into the operative position. However, generally square or rectangular shaped cover configurations are useful for covering most hull openings 26. In one embodiment, the cover 2 has a panel or plate-like configuration with first and second surfaces. The first surface is configured for contact with the hull 1 and the second surface is opposite the first surface.

The covers 2 described herein may be constructed from any suitable material. In one embodiment, the covers 2 are made from durable lightweight materials to facilitate handling and long service life. Exemplary suitable cover 2 construction materials are fiberglass, viscoelastic materials such as polyethylene or polyurethane, and blends thereof. The materials used in the covers 2 may also incorporate additives to retard or minimize growth of marine organisms. The construction materials and the covers 2 manufactured from these materials may be a variety of thicknesses, depending on the desired weight and durability as well as the sea conditions and depths at which the covers 2 will be used. Of course, the covers 2 must be of appropriate thicknesses to allow proper interaction between the cover 2 and the track assembly 3 receiving the peripheral edges 12 of the cover 2. In one embodiment, the covers 2 have a thickness of about 5.0 cm to about 20.0 cm. In one embodiment, the covers 2 are in the form of a fiberglass sheet having a thickness of about 5.0 cm to about 20.0 cm. In a second embodiment, the covers 2 are a fiberglass sheet having a thickness of about 10.0 cm to about 15.0 cm. In still another embodiment, the covers 2 are a fiberglass sheet having a thickness of about 15.0 cm to about 20.0 cm. In a fourth embodiment, the covers 2 are a fiberglass sheet having a thickness of about 5.0 cm to about 10.0 cm.

The covers 2 may incorporate a number of features to facilitate their proper placement and sealing function. For example, the covers 2 may be provided with a buoyancy

compartment to regulate buoyancy or ballast plates that may be changed to control the weight of the covers 2 and to help maintain proper orientation of the covers 2 during installation under a variety of sea conditions. The covers 2 may also be provided with annular seals or sealant layers to enhance the seal between the covers 2 and vessel hulls 1.

5 FIG. 4 depicts exemplary features that may be incorporated into an embodiment of the covers 2 in accordance with this disclosure. Each of the covers 2 should be configured to provide a surface area at least as large as the opening in the hull 1. In some embodiments, the covers 2 are configured to have at least three peripheral edges 12. When constructed from most of the lightweight durable materials mentioned above, the covers 2 will have
10 slightly negative buoyancy allowing them to be lowered into position using a davit 6 as described above or other similar device. However, as depicted in FIG. 4, the buoyancy of cover 2 may be adjusted through the use of a buoyancy chamber 14 by adding or withdrawing ballast such as water. Additionally, the cover 2 may incorporate an adjustable ballast system 16, including for example solid ballast plates that may be added or removed as
15 necessary for properly controlling buoyancy under certain water conditions. As depicted in FIG. 4, these features are incorporated on the second surface of cover 2 but may be incorporated at other locations on the cover 2.

 FIG. 5 is a side view of cover 2 depicted in FIG. 4. As seen in this view, the buoyancy chamber 14 may incorporate a drain 18 and vent 20 to facilitate entry and exit of
20 water or other ballast from the chamber 14 to regulate buoyancy. Additionally, FIG. 5 depicts a seal 22 that may be provided on the first surface of the cover 2 for contact with the hull 1 to facilitate closure of the marine vessel hull opening 26. The seal 22 may be made from any suitable material including, but not limited to, natural and synthetic rubber, other synthetic sealing materials, and blends thereof. In one embodiment, the seal 22 is made from
25 synthetic rubber, such as neoprene.

 The seal 22 may be configured as a sheet or annulus of seal material to be positioned around the perimeter of the marine vessel hull opening 26 as depicted in FIG. 6. The seal 22 may have a variety of thickness as may be suitable for a particular use application. In one embodiment, the seal material has a thickness of about 0.3 cm to about
30 1.8 cm. In another embodiment, the thickness is from about 0.6 cm to about 1.2 cm. In a third embodiment, the thickness is from about 1.2 cm to about 1.8 cm. In a fourth embodiment, the thickness is from about 0.3 cm to about 0.6 cm. The seal 22 may be of flat materials forming a layer, or may be of a round or donut shaped cross section to facilitate a

tight seal. Depending on seal availability, custom seals with a “squared 8” configuration may be used. Density of the seal material should be sufficient to assure durability, while remaining flexible enough to allow the seal 22 to deform to the imperfections in the hull 1 and to form a tight gasket. In some embodiments, the seal 22 relies on the seawater head pressure to press the cover 2 against the hull 1. Consequently, the seal 22 itself is not required to adhere directly to the hull 1.

FIG. 6 also depicts another feature that may be incorporated into the design of the cover 2. A lifting eye 24 may be incorporated onto the top peripheral edge 12 of the cover 2. The lifting eye 24 may be used as a means of attaching the cover 2 to the device used to lower the cover 2 to its operational position or to raise the cover 2 once its function is no longer necessary.

FIG. 7 provides a detailed depiction of the cooperative relationship of a sea chest cover 2 and a track assembly 3 in accordance with one of the embodiments described herein. Specifically, FIG. 7 depicts a cover 2 being lowered into a cooperative relationship with standards 4 of a track assembly 3. In such an embodiment, the tracks 5 are formed by the spaces between a portion of the standards 4 and the hull (not shown) of the ship to which the standards 4 are mounted. In other embodiments, the standards 4 may be configured as I-beams wherein the tracks 5 are formed by the base and top portions of the I-beam. Similarly, where convenient, a U-shaped beam may be used as a standard 4 to provide one or more of the tracks 5.

FIG. 8 provides additional detail describing an embodiment where a standard 4 in the form of an I-shaped beam is employed and depicts the cooperative relationship of a cover 2 and a track assembly 3 of such embodiments in accordance with the systems and processes described herein. FIG. 8 also depicts a cooperative relationship of a seal 22 for a cover 2 and a vessel hull 1 in accordance with an embodiment of the systems and processes described herein. A peripheral edge 12 of a cover 2 fits within and is guided into place and held in place by an I-shaped standard 4 that provides one of the tracks 5 of the track assembly 3. The cover 2 is provided with a seal 22 that, when the cover 2 is held in its functional position by track 5, is in contact with the vessel hull 1. The contact between the seal 22 and the vessel hull 1 facilitates a water-tight closure of the hull opening 26 using sea chest cover 2.

FIG. 9A and FIG. 9B depict embodiments of a portable track assembly 3 and means for securing track assemblies 3 to a vessel hull 1. The embodiments depicted are useful for securing portable track assemblies 3 and portions of portable track assemblies 3, such as

track 5 extensions as previously described. With reference to FIG. 9A, a standard 4 in the shape of an I-beam, one side of which provides track 5, is secured to vessel hull 1 by a securing means 28. It is understood that any number of securing means 28 may be used as may be desirable depending on the size and configuration of the standard 4.

5 FIG. 9B provides a detailed depiction of the securing means 28 depicted in FIG. 9A. Standard 4 is secured to hull 1 by a securing means 28 including a stud 30 in communication with a doubler pad 32 adjacent to hull 1. A dog or bracket 34 holds the standard 4 in position against the hull 1 through the application of force by tightening wing nut 36.

10 Once a cover 2 is guided into place by a track assembly 3 as described herein, the sea chest associated with the vessel hull opening 26 being closed may be pumped out or drained. Once water is removed from the sea chest, the water pressure against the second surface of the cover 2 will exceed the atmospheric pressure within the sea chest. This pressure differential will force the cover 2, and a seal 22, if used, into engagement with the
15 hull 1 thereby sealing the sea chest and permitting it to be pumped or drained completely and forming a dry work area within the sea chest.

 The systems and processes describe herein permit the ready and rapid repair of marine vessels without the necessity of interrupting their surface as required for dry dock repair and maintenance.

20 While the invention has been described with respect to a limited number of embodiments, the specific features of one embodiment should not be attributed to other embodiments of the invention. No single embodiment is representative of all aspects of the inventions. Moreover, variations and modifications therefrom exist. For example, the track assemblies described herein may lack any feature not specifically enumerated. Some
25 embodiments of the track assemblies described herein consist of or consist essentially of the enumerated components. In addition, some embodiments of the systems and processes described herein consist of or consist essentially of the enumerated steps. The appended claims intend to cover all such variations and modifications as falling within the scope of the invention.

What is claimed is:

1. A system for covering an underwater opening (26) in a marine vessel hull (1) comprising:
 - (i) a cover (2) having a first and second surface and at least three peripheral edges (12) wherein the cover (2) is configured such that the surface area of the first surface of the cover (2) is at least as great as the area of the underwater opening (26) in the marine vessel hull (1); and
 - (ii) at least one track assembly (3) configured to receive at least two peripheral edges (12) of the cover (2) to position the cover (2) so that the first surface of the cover (2) covers the underwater opening (26) of the marine vessel hull (1).
2. The system of claim 1 wherein the track assembly (3) comprises at least two standards (4) positioned on the marine vessel hull (1) on opposite sides of the opening (26) of the marine vessel hull (1) and wherein the standards (4) form at least a portion of at least two tracks (5) configured to receive at least two peripheral edges (12) of the cover (2).
3. The system of claim 2 wherein the tracks (5) are configured in the shape of a groove capable of receiving a peripheral edge (12) of the cover (2).
4. The system of claim 3 wherein the standards (4) comprise a material selected from the group consisting of metal, plastic, fiberglass, viscoelastic material and blends thereof.
5. The system of any preceding claim wherein the first surface of the cover (2) is provided with a seal (22) configured for contact with the marine vessel hull (1).
6. The system of any preceding claim wherein the cover (2) comprises a material selected from the group consisting of fiberglass, viscoelastic material, polyethylene, polyurethane, and blends thereof.
7. The system of claim 5 or 6 wherein the seal (22) comprises a material selected from the group consisting of natural rubber, synthetic rubber, synthetic sealing material and blends thereof.
8. The system of any preceding claim wherein the cover (2) is provided with a buoyancy chamber (11) capable of controlling the buoyancy of the cover (2) underwater.

9. The system of any preceding claim wherein the cover (2) comprises an adjustable ballast system (12) capable of varying the weight of the cover (2).

5 10. The system of any of claims 2-9 comprising a device (6) for vertically lowering and raising the cover (2) to effect movement of the at least two peripheral edges (12) of the cover (2) along the at least two tracks (5) to cover and uncover the underwater opening (26) of the marine vessel hull (1).

10 11. The system of claim 10 wherein the device (6) for vertically lowering and raising the cover (2) is a davit equipped with a cable (8).

12. The system of any of claims 2-11 wherein a portion of the tracks (5) are tapered.

15 13. The system of any of claims 2-12 wherein the standards (5) comprise an flared portion (10).

14. The system of any preceding claim wherein the first surface of the cover (2) is in contact with the marine vessel hull (1) and the at least one track assembly (3) is configured to engage at least two peripheral edges (12) of the cover (2) to position the cover (2) so that the first surface
20 of the cover (2) covers the underwater opening (26) of the marine vessel hull (1).

15. A process for covering an underwater opening (26) in a marine vessel hull (1) comprising:

vertically lowering a cover (2) having a first and second surface and at least three peripheral
25 edges (12) so that at least two peripheral edges (12) are received by and guided along a track assembly (3) to a position at which the first surface of the cover (2) covers the underwater opening (26) of the marine vessel hull (1).

16. The process of claim 15 wherein the track assembly (3) comprises at least standards (4)
30 wherein at least two peripheral edges (12) of the cover (2) are received and guided by at least two tracks (5) individually formed at least in part by one of the standards (4) positioned on the marine vessel hull (1) on opposite sides of the opening (26) of the marine vessel hull (1).

17. The process of claim 16 wherein the tracks (5) are configured in the shape of a groove capable of receiving a peripheral edge of the cover (2).

18. The process of any of claims 15-16 wherein the standards (4) comprise a material selected
5 from the group consisting of metal, plastic, fiberglass, viscoelastic material, and blends thereof.

19. The process of claim 18 wherein a seal (22) comprising a material selected from the group consisting of natural rubber, synthetic rubber, synthetic sealing materials, and blends thereof is positioned on the first surface of the cover (2) engages the hull of the marine vessel (1) when the
10 first surface of the cover (2) covers the underwater opening (26) of the marine vessel hull (1) and wherein the cover (2) comprises a material selected from the group consisting of fiberglass, polyethylene, polyurethane, and blends thereof.

20. The process of any of claims 16-19 wherein a portion of the tracks (5) are tapered.