MARINE LIFT WITH PANTOGRAPH MOVEMENT

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ABSTRACT

Marine lift apparatus for raising and lowering vessels, platforms, and cargo are disclosed. A lift apparatus comprises a base and at least one assembly. The assembly further comprises a shuttle configured for movement between first and second positions, a link arm connected to the shuttle, and a control link attached to the link arm, all configured to move the link arm between first and second positions. In some aspects, marine lift apparatus exhibit pantograph-like movement, facilitating the level raising, lowering, and storing vessels, platforms, and cargo. Lift apparatus mounted on to multi-hull vessel, such as catamarans, configured for lifting a combination swim and dinghy platform are also disclosed.
For Example:

FIG. 18
MARINE LIFT WITH PANTOGRAPH MOVEMENT

CROSS-REFERENCE TO RELATED APPLICATIONS


FIELD OF THE DISCLOSURE

[0002] The present disclosure relates to marine lifts and more particularly to launch and recovery of marine vessels.

BACKGROUND

[0003] Marine lifts have long been available. Lifts have been mounted on large luxury watercraft where the lift is configured to raise and lower smaller boats, dinghies, or personal watercraft. Marine lifts may also be mounted to a permanent or semi-permanent marine structure such as a dock, a floating platform, a semi-submersible platform, or fixed platform. Marine lifts may be used to raise, lower, and transport marine vessels, cargo, and people.

[0004] Many presently-available marine lifts utilize large and complex lift mechanisms. The size and complexity of many marine lifts limits their use to larger watercraft because smaller vessels cannot support the weight of the lift mechanism.

[0005] In the case of vessel-mounted marine lifts, lift mechanisms are often mounted on the transom of monohulled vessels. This mounting location exposes the lift mechanism to the surrounding environment where waves, water, harsh sunlight, and artificial conditions such as floating debris or a collision may damage the lift mechanism. Outboard mounting of the lift mechanism also hinders diagnostic and repair efforts when a vessel is underway. In order to protect the lift mechanism from the surrounding environment, a cover or other shielding element must be installed which adds additional weight to the marine lift.

[0006] Transom-mounted lift mechanisms configured for monohulled vessels are difficult to adapt to multi-hull vessels (e.g., catamarans, trimarans, pros, and the like). Monohulled vessels provide a large, near-vertical surface for mounting the lift mechanism. In contrast, the decks which interconnect the hulls of a multi-hull vessel such as a catamaran provide only a narrow, elevated mounting surface for the lift mechanism. Transom-mounted lift mechanisms often cannot be adapted to mount to such a narrow, elevated mounting surface.

[0007] The length of the marine vessel being carried by a lift mechanism mounted on a multi-hull vessel is constrained by the dimensions of the multi-hull vessel. For example, where a lift mechanism is mounted between the twin hulls of a catamaran, the lift mechanism cannot raise or lower a dinghy longer than the distance between the hulls of the catamaran.

[0008] While many marine lifts are capable of raising and lowering significant loads, these lifts often tilt or flex out of level as the load is lowered or raised. Other marine lifts provide a level surface in only one position, such as the raised position. This tilting makes raising and lowering many loads such as smaller boats, dry cargo, and people an unstable and dangerous undertaking. Loads may slide off the marine lift as it ascends, descends, or is in a deployed position. Lack of a level surface also makes many marine lifts dangerous for a person to stand on. Furthermore, this tilting condition may cause a portion of a marine lift to drag in the water and may require an additional locking mechanism to maintain a marine lift platform’s position when not in operation.

[0009] Marine lifts which include a platform may also be used as a swim platform, other recreational area or a boarding platform. Use of the marine lift as a swim platform or boarding platform is impeded where the marine lift is also used to transport smaller vessels, because many marine lifts include a cradle or other support device for transporting the smaller vessel. These cradles are sometimes fixedly attached to the platform, making it difficult to use the platform for other purposes.

[0010] Given the foregoing, there is a need for simpler lift apparatus which may be adapted for use on multi-hull vessels, lift apparatus wherein the apparatus is at least partially protected from environmental hazards, lift apparatus capable of carrying larger vessels, and lift apparatus configured to provide a level surface as the lift is operated. Additionally, there is a need for platform-based dinghy lift mechanisms which may easily be adapted for use as a swim platform or other recreational area.

SUMMARY

[0011] This Summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This Summary is not intended to identify key features or essential features of the subject matter to be claimed, nor is it intended to be used to limit the scope of the subject matter to be claimed.

[0012] This disclosure addresses the above-described needs by providing marine lift apparatus exhibiting pantograph-like movement and methods for utilizing such marine lift apparatus.

[0013] In one aspect, a lift apparatus for lifting a combination swim and dinghy platform is mounted on a multi-hull vessel. The lift apparatus comprises two assemblies and a platform. In some aspects, the platform stays level as it ascends and descends.

[0014] The platform is a flat surface, suitable for swimming and recreation comprising one or more channels and one or more chock assemblies which lay flush with the top surface of the platform when stowed. When deployed, the chock assemblies are configured to support a watercraft, such as a dinghy. In some aspects, chock assemblies are moveable fore and aft in order to accommodate larger watercraft on the lift apparatus and to redistribute the weight of the watercraft when the lift apparatus is being utilized.

[0015] In some aspects, the platform moves aft as it descends, facilitating easy docking with a watercraft, such as a dinghy. The lift apparatus may be mounted on a multi-hull vessel and configured to facilitate raising and lowering a dinghy with a length greater than the platform length and greater than the distance between the hulls of a multi-hull vessel, such as a catamaran.

[0016] In an aspect, the lift apparatus comprises an actuator housed in the bridge deck of the vessel, protecting the actuator from the environment.

[0017] Further features and advantages of the apparatus and methods disclosed herein, as well as the structure and
operation of various aspects of the present disclosure, are described in detail below with reference to the accompanying figures.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] The features and advantages of the present disclosure will become more apparent from the detailed description set forth below when taken in conjunction with the drawings in which like reference numbers indicate identical or functionally similar elements.

[0019] FIG. 1 is a perspective view of a lift apparatus between a raised and a lowered position, in accordance with an aspect of the present disclosure.

[0020] FIG. 2 is a perspective view of another aspect of a lift apparatus between a raised and a lowered position, in accordance with an aspect of the present disclosure.

[0021] FIG. 3 is a side view of a lift apparatus in a lowered position, in accordance with an aspect of the present disclosure.

[0022] FIG. 4 is a side view of a lift apparatus in a raised position, in accordance with an aspect of the present disclosure.

[0023] FIG. 5 is a perspective view of a lift apparatus comprising a platform mounted on a vessel in a lowered position, in accordance with an aspect of the present disclosure.

[0024] FIG. 6 is a perspective view of a lift apparatus comprising a platform mounted on a vessel in a raised position, in accordance with an aspect of the present disclosure.

[0025] FIG. 7 is a cross section of a lift apparatus comprising a platform mounted on a vessel in a raised position, in accordance with an aspect of the present disclosure.

[0026] FIG. 8 is a cross section of a lift apparatus comprising a platform mounted on a vessel in a lowered position, in accordance with an aspect of the present disclosure.

[0027] FIG. 9 is a cross section of a vessel-mounted lift apparatus in a lowered position and carrying a watercraft, in accordance with an aspect of the present disclosure.

[0028] FIG. 10 is a detail cross section of a vessel-mounted lift apparatus in a lowered position and carrying a watercraft, in accordance with an aspect of the present disclosure.

[0029] FIG. 11 is a perspective view of a vessel-mounted lift apparatus in a lowered position and carrying a watercraft, in accordance with an aspect of the present disclosure.

[0030] FIG. 12 is a top view of a vessel-mounted lift apparatus in a raised position and carrying a watercraft, in accordance with an aspect of the present disclosure.

[0031] FIGS. 13A and 13B are perspective views of a chock assembly in a stowed and deployed position, in accordance with an aspect of the present disclosure.

[0032] FIG. 14 is a side view of a vessel-mounted lift apparatus in a lowered position and carrying a watercraft, in accordance with an aspect of the present disclosure.

[0033] FIG. 15 is a side view of a vessel-mounted lift apparatus in a raised position and carrying a watercraft, in accordance with an aspect of the present disclosure.

[0034] FIG. 16 is a side view of a vessel-mounted lift apparatus in a raised position and carrying a watercraft wherein deployed chock assemblies supporting the watercraft have been retracted, in accordance with an aspect of the present disclosure.

[0035] FIG. 17 is a top view of a vessel-mounted lift apparatus in a raised position and carrying a watercraft wherein the watercraft has a length greater than the distance between the two hulls of the vessel, in accordance with an aspect of the present disclosure.

[0036] FIG. 18 is a block diagram illustrating an exemplary computer system useful for implementing the present disclosure.

DETAILED DESCRIPTION

[0037] The present disclosure is directed to marine lift apparatus exhibiting pantograph-like movement for raising, lowering, and storing vessels, platforms, and cargo.

[0038] Referring now to FIG. 1, a perspective view of a lift apparatus 102 between a raised and a lowered position, in accordance with an aspect of the present disclosure, is shown.

[0039] Lift apparatus 102 comprises shuttle 104, at least one link arm 106 (shown, for clarity, as link arms 106a-b in FIG. 1), and control link 110. Shuttle 104 is configured to move in one or more dimensions relative to at least one surface. In an aspect, lift apparatus 102 is integrated into deck of a vessel.

[0040] Lift apparatus 102 may be at least partially constructed of rigid, corrosion resistant materials such as fiber-glass, plastic, carbon fiber, Kevlar® para-aramid synthetic fiber, aluminum, steel, titanium, or other corrosion-resistant materials and the like.

[0041] Shuttle 104 is configured to move fore and aft along shuttle guide 116. Shuttle guide 116 may be a rigid sliding rail comprising at least one rail and at least one slider. Shuttle 104 is configured to connect to the slider of shuttle guide 116, enabling shuttle 104 to move fore and aft parallel to the centerline of a vessel. In an alternative aspect, shuttle 104 is configured to slideably connect with shuttle guide 116 rails. In this aspect, shuttle 104 is the slider. Shuttle guide 116 may be a rigid T- or I-beam. Shuttle 104 may be configured to slideably connect to shuttle guide 116.

[0042] Shuttle 104 may move freely along shuttle guide 116. In another aspect, shuttle guide 116 positions shuttle 104. Shuttle guide 116 may comprise a worm gear or a rack and pinion gear configured to move shuttle 104 fore and aft.

[0043] Shuttle 104 comprises one or more connection points 118 (shown, for clarity, as connection points 118a-b in FIG. 1) configured to moveably connect shuttle 104 to one or more link arms 106. Link arm 106 is configured to support the weight of cargo carried by lift apparatus 102. Link arm 106 is configured to move between a lowered position and a raised position. A proximal portion of link arm 106 is rotatably connected to shuttle 104 at connection point 118 and is configured for generally vertical movement of a distal portion of link arm 106 relative to shuttle 104.

[0044] Link arm 106 may be a hollow member, solid member, or partially solid member. A first link arm 106a may be configured differently from a second link arm 106b. In some environments, a more robust first link arm 106a is desired, in order, for example to support heavier cargo.

[0045] Shuttle 104 is configured such that shuttle 104 may be moved. Movement of shuttle 104 causes link arm 106 to move between a lowered position and a raised position. Movement of shuttle 104 may be accomplished by manually sliding shuttle 104 along shuttle guide 116 or mechanically moving shuttle 104 along shuttle guide 116 via an actuator (not shown in FIG. 1) such as a worm gear, rack and pinion, piston, hydraulic ram, pneumatic ram, electric motor, and the like attached for movement to shuttle 104 or link arm 106.
In an alternative aspect, link arm 106 moves between a lowered position and a raised position via attachment of an actuator (not shown) along link arm body. The actuator may be attached on one end portion to a surface and rotatably attached on another end portion to link arm body. The actuator may be a hydraulic piston, electric motor, pneumatic ram, and the like.

Control link 110 is a rigid member connected for movement on a distal portion to link arm 106 at connection point 120. Control link 110 is connected for movement on a proximal portion to a surface and is configured such that movement of control link 110 causes link arm 106 to move between a lowered position and a raised position. Lift apparatus 102 may further comprise lift bracket 108. Lift bracket 108 is a vertically-oriented rigid member comprising a bore portion and an aft portion. Foreportion of lift bracket 108 further comprises connection point 128a. Connection point 128a is located near the bottom portion of lift bracket 108. Aft portion of lift bracket 108 further comprises connection point 128b. Connection point 128b has a location higher than connection point 128a. Lift bracket 108 is movably connected to lift apparatus 102 and configured for movement between a first position (e.g., a lowered position, as shown for example, in FIG. 3) and a second position (e.g., a raised position, as shown, for example, in FIG. 4).

Now referring to FIG. 2, a perspective view of another embodiment of lift apparatus 102 between a raised and a lowered position, in accordance with an aspect of the present disclosure, is shown. Lift apparatus 102 comprises two assemblies 210 (shown, for clarity, as assembly 210a in FIG. 2) and one or more stabilizers 202. Assembly 210 comprises shuttle 104, shuttle guide 116 (shown, for clarity, as shuttle guide 116/ in FIG. 2), two link arms 106 (shown, for clarity, as link arms 106c–d in FIG. 2), control link 110, and lift bracket 108.

Assembly 210 may additionally comprise a mounting bracket 204 (shown, for clarity, as mounting bracket 204/ in FIG. 2) and an actuator 206 (shown, for clarity, as actuator 206/ in FIG. 2).

Shuttle 104 is vertically-oriented and comprises a fore portion and an aft portion, and is connected for sliding movement in a horizontal direction relative to shuttle guide 116. Shuttle guide 116 is a horizontally-oriented slide rail comprising a fore portion and an aft portion. Aft portion of shuttle 104 further comprises connection point 118c. Connection point 118c is located near the bottom portion of shuttle 104. The fore portion of shuttle 104 further comprises connection point 118d, which has a location higher than connection point 118c.

Lift bracket 108 is vertically-oriented and comprises a fore portion and an aft portion. Foreportion of lift bracket 108 further comprises connection point 128a. Connection point 128a is located near the bottom portion of lift bracket 108. Aft portion of lift bracket 108 further comprises connection point 128d. Connection point 128d has a location higher than connection point 128c.

A first link arm 106c is horizontally-oriented and connected for rotation in a vertical plane on a proximal portion to shuttle 104 at connection point 118c. First link arm 106c is connected at a distal portion for rotation in a vertical plane to lift bracket 108 at connection point 128c. A second link arm 106d is horizontally-oriented and connected at a proximal portion for rotation in a vertical plane to shuttle 104 at connection point 118d. Second link arm 106d is connected at a distal portion for rotation in a vertical plane to lift bracket 108 at connection point 128d. First link arm 106c and second link arm 106d are substantially the same and are connected at substantially the same respective locations. First link arm 106c further comprises connection point 120 located between proximal connection point 118c and distal connection point 128c.

Control link 110 is vertically-oriented and connected at a distal portion for rotation in a vertical plane to first link arm 106c at connection point 120. Control link 110 is connected at a proximal portion for rotation in a vertical plane to mounting bracket 204 at a connection point. Control link 110 may cause link arm 106 to move between a lowered position and a raised position. Control link 110 may be rotatably connected at a middle portion for pivotal movement to an actuator 206. Actuator 206 may be a hydraulic ram, pneumatic ram, electric motor, or other suitable device. At a proximal portion, control link 110 is rotatably connected to a surface at a connection point.

In an aspect in accordance with FIG. 2, actuator 206 is rotatably connected to a mounting bracket 204 at a connection point 208 (shown, for clarity, as mounting point 208/ in FIG. 2).

In FIG. 2, actuator 206 is a vertically-oriented hydraulic ram and connected for rotation in a vertical plane on a proximal portion to mounting bracket 204 at connection point 208. Mounting bracket 204 is configured to provide a static connection to a surface, enabling actuator 206 to move control link 110 which in turn causes link arm 106 to move from one position to another. Actuator 206 may cause link arm 106 to move from a raised position (as shown, for example, in FIG. 4) to a lowered position (as shown, for example, in FIG. 3) by hydraulic, pneumatic, or electric extension, or by extending via some other means that will become apparent to those having skill in the relevant art(s) after reading the description herein.

Actuator 206 is connected at a distal portion for rotation in a vertical plane to control link 110 at connection point 136. Actuator 206 may be extended, causing control link 110 to rotate downward in a counterclockwise direction. Downward movement of control link 110 causes shuttle 104 to slide aft toward the aft portion of shuttle guide 116. Downward movement of control link 110 and aft movement of shuttle 104 causes first link arm 106c and second link arm 106d to move aft and rotate clockwise, causing the distal portions of first and second control arms 106 to move from a first position (e.g., a raised position, as shown in FIG. 4) and a second position (e.g., a lowered position, as shown in FIG. 3). Lift bracket 108 moves from a first position to a second position while maintaining its initial vertical orientation, in a manner similar to the operation of a pantograph. In an aspect, second position is lower and more aft than first position.

Stabilizer 202 is a rigid member permanently or removably connected to portions of separate assemblies 210 and configured to stabilize lift apparatus 102. Stabilizer 202 may be connected on a port portion to connector link 110b and is connected on a starboard portion to connector link 110a. In another aspect, stabilizer 202 is connected on a port portion to first shuttle 104a and is connected on a starboard portion to second shuttle 104b. In another aspect, stabilizer 202 is connected on a port portion to first lift bracket 108a and is connected on a starboard portion to second lift bracket 108b. In another aspect, stabilizer 202 is connected on a port portion to first or second link arm 106 of first assembly 210.
Referring now to FIGS. 3 and 4, side views of lift apparatus 102 in a lowered position and a raised position, in accordance with an aspect of the present disclosure, are shown, respectively.

Lift apparatus 102 may be mounted to or integrated into at least one surface. In FIG. 3, lift apparatus 102 is integrated into deck 302 of vessel 304. In another aspect, lifting apparatus 102 is mounted on the transom of vessel 304. Lifting apparatus 102 may be configured to mount or integrate into deck 302, a beam, the chassis, the hull, or some other portion or portions of the structure of vessel 304 or other marine structure. Lift apparatus 102 may be permanently or removably mounted to the selected surface or surfaces via fasteners (e.g., bolts, rivets, screws, straps, and the like). Portions of lift apparatus 102 may be mounted to the selected surface or surfaces via welding, application of adhesives, and the like. Lift apparatus 102 may be integrated in the selected surface or surfaces by forming connectors (e.g., brackets, rails, treads, weld points, mounting points, and the like) into one or more surfaces, thereby enabling portions of lift apparatus 102 to permanently or removably attach.

Now referring to FIG. 5, a perspective view of lift apparatus 102 comprising platform 502 mounted on vessel 304 in a lowered position, in accordance with an aspect of the present disclosure, is shown.

In an aspect, lift apparatus 102 is attached to the rear of vessel 304 and further comprises platform 502. Platform 502 is a substantially flat, rigid structure constructed of fiberglass, plastic, carbon fiber, Kevlar® para-aramid synthetic fiber, aluminum, steel, titanium, or any other strong, corrosion-resistant materials and the like. Platform 502 may be horizontally-oriented and configured to support cargo such as marine vessels, dry goods, other cargo, and people. Platform 502 permanently or removably attaches to one or more lift brackets 108 (shown, for clarity, as lift bracket 108a in FIG. 5) on the top portion of lift bracket 108.

Now referring to FIG. 6, a perspective view of lift apparatus 102 comprising platform 502 mounted on vessel 304 in a raised position, in accordance with an aspect of the present disclosure, is shown.

Lift apparatus 102 is configured to provide a flat, level platform 502 flush with a first deck 302 when platform 502 is in a raised position. One or more mounting brackets 204 are mounted to a portion of vessel 304. One or more shuttle guides 116 are mounted to an underside portion of second deck 112 (not shown in FIG. 6. See, for example, FIG. 7) of vessel 304. Lift apparatus 102 is configured move platform 502 between a raised position and a lowered position via extension and retraction of actuator 206.

As shown in FIGS. 5 and 6, vessel 304 may be a catamaran comprising two hulls separated by a distance and connected by one or more decks.

Now referring to FIGS. 7 and 8, cross sections of lift apparatus 102 comprising platform 502 mounted on vessel 304, in accordance with an aspect of the present disclosure, are shown, respectively in a raised position and in a lowered position.

In an aspect, platform 502 is configured to arrest the downward motion of lift apparatus 102 when it physically contacts brace 702. Brace 702 is a rigid member comprising an angled aft portion and a locking eye. In an aspect, rigid brace 702 further comprises a shock absorber connected to an angled aft portion configured to dampen impact forces when brace 702 physically contacts platform 502. Brace 702 further comprises a top portion and a bottom portion. Brace 702 is permanently or removably mounted to link arm 106.

Mounting bracket 204 may further comprise a locking pin. When lift apparatus 102 is in a raised position, brace 702 is positioned inside mounting bracket 204 and brace 702 locking eye is horizontally aligned with mounting bracket 204 locking pin. Locking pin may be inserted into brace 702 locking eye, thereby preventing lift apparatus 102 movement. In an aspect, this reduces or eliminates forces on actuator 206 for lif apparatus 102.

Yet another aspect, stabilizer 202 is connected on a port portion to first brace 702 and is connected on a starboard portion to second brace 702.

Referring now to FIG. 9, a cross section of a vessel-mounted lift apparatus 102 in a lowered position and carrying a watercraft 902, in accordance with an aspect of the present disclosure, is shown.

Platform 502 is a flat rigid surface mounted on one or more assemblies 210 comprising one or more channels 904, one or more chock assemblies 402, and one or more rail guides 404. Platform 502 is configured to support watercraft 902 and raise and lower watercraft 902.

Channel 904 may be a cavity in platform 502 accessible from the top of platform 502 and configured to support chock assembly 906. Chock assembly 204 is configured to support watercraft 902 via contacting watercraft 902 about watercraft centerline 910 (shown as a dashed line in FIG. 9). Chock assembly 906 may fold into channel 904 when chock assembly 906 is not in use. Chock assembly 906 and channel 904 are configured such that the top surface of chock assembly 906 is flush with the top surface of platform 502 when chock assembly is stowed.

Referring now to FIG. 10, a detail cross section of a vessel-mounted lift apparatus 102 in a lowered position and carrying watercraft 902, in accordance an aspect of with the present disclosure, is shown.

Channel 904 is a cavity in platform 502 accessible from the top of platform 502 and configured to support chock assembly 906. In an aspect, channel 904 further comprises one or more rail guides 1002 mounted to side portions of channel 904.

Chock assembly 906 is configured to support watercraft 902 via contacting watercraft 902 about watercraft centerline 910 (shown as a dashed line in FIG. 10). Chock assembly 906 is foldable into channel 904. Chock assembly 906 and channel 904 are configured such that the top surface of channel 904 and chock assembly 906 is flush with the top surface of platform 502 when chock assembly 906 is stowed. Chock assembly 906 folds upward into a deployed position, forming a V shape substantially similar to the hull shape of watercraft 902. Chock assembly 906 is configured to support.

Rail guide 1002 is configured to facilitate fore and aft movement of chock assembly 906. Rail guide 1002 may be a rigid sliding rail comprising at least one rail and at least one slider. Chock assembly 906 is configured to connect to the slider of rail guide 1002, enabling chock assembly 906 to move fore and aft. Chock assembly 402 may be configured to slideably connect with rail guide 1002 rails. Chock assembly 906 may comprise the slider. Alternatively, rail guide 1002 may be a rigid T- or I-beam. Chock assembly 906 may be configured to slideably connect to rail guide 1002. In another
Movement of chock assembly 906 may facilitate positioning watercraft 902 or chock assembly 906. For example, in rough seas it may be necessary to move both the chock assembly 906 and the watercraft 902 in order to establish a contact suitable for raising and lowering watercraft 902 with lift apparatus 102.

Alternatively, watercraft 902 may possess a sufficiently large beam such that chock assembly 402 must be moved aft in order to properly make contact with watercraft 902 without contacting another portion of lift apparatus 102 or vessel 304. In some aspects, platform 502 moves astern as it descends, facilitating easy docking with watercraft 902 and making contact with watercraft 902 at a location relative to vessel 304 where watercraft 902 will not make contact with another portion of lift apparatus 102 or vessel 304 when watercraft 902 is in contact with lift apparatus or being moved between a raised and a lowered position.

Alternative aspects suitable for extension and retraction of chock assemblies 906 are further described with reference to FIGS. 14 through 16.

Platform 502 may be a flat rigid surface mounted on one or more assemblies 210. Platform 502 comprises one or more channels 904, one or more chock assemblies 906, and one or more rail guides 1002. Platform 502 is configured to support watercraft 902 and raise and lower watercraft 902.

Chock assembly 906 is configured to support watercraft 902 via contacting watercraft 902 about watercraft centerline 910 (shown as a dashed line in FIG. 10). Chock assembly 906 comprises a chock base 1004, a first chock 1006a, a second chock 1006b, support arms 1008 (shown, for clarity, as support arm 1008a in FIG. 10), and locking channels 1010 (shown, for clarity, as locking channel 1010a in FIG. 5).

Chock base 1004 slideably connects to rail guide 1002 on at least one side portion. Chock base 502 is configured to slide fore and aft along base portion of channel 904. Chock base 502 may further comprise wheels on chock base 502 end portions configured for rolling movement fore and aft, facilitating movement of chock assembly 1004 within channel 904.

Chock base 1004 may further comprise two chock connection points and locking channels 1010. Chock connection points may be located near the center top portion of channel 1004.

Locking channel 1010 is a downward facing, L-shaped void in chock base 1004, configured to prevent movement of support arm 1006 from the aft portion of locking channel 1010 to fore portion of locking channel 1010 without first vertically lifting support arm 1006. First locking channel 1010a is located on the aft top portion of chock base 1004. Second locking channel 1010b is located on the fore top portion of chock base 1004.

Chock 1008 is a rigid member configured to contact watercraft 902 and support watercraft 902 when lift apparatus 102 is being utilized to raise, lower, support, or transport watercraft 902. Chock 504 may have a width substantially equal to the width of channel 904 and a length substantially equal to half the width of channel 904. Chock 1008 may be configured such that when chock assembly 1004 is in a stowed position, chock 1008 top surface is flush with platform 502 top surface and chocks 1008 seal off channel 904. Chock 1008 comprises a distal portion and a proximal portion. Distal portion is approximately chock 908 length from center portion of chock base 1004. Proximal portion is located near center portion of chock base 1004. Chock 1008 is connected for rotation in a vertical plane on a proximal portion to chock base 1004 at a chock connection point. A middle portion of chock 1004 further comprises a support arm connection point.

Chock 1008 is supported and held in place at proximal portion by chock connection point. Chock 1008 is supported and held in place at a middle portion by support arm 1006. Support arm 1006 comprises a top portion and a bottom portion. Top portion of support arm 1006 is connected for rotation in a vertical plane to a middle portion of chock at support arm connection point. Bottom portion of support arm 1006 is slideably connected to locking channel 1010. In another aspect, chocks 1008 are supported and held in place via alternative configurations which will become apparent to those having skill in the relevant art(s) upon reading the description herein.

Referring now to FIG. 11, a perspective view of a vessel-mounted lift apparatus 102 in a lowered position and carrying watercraft 902, in accordance with an aspect of the present disclosure, is shown.

Platform further comprises one or more channels 904 (shown, for clarity, as channels 904a-b in FIG. 11) and one or more chock assemblies 906 (shown, for clarity, as chock assembly 906a in FIG. 11) configured to support watercraft 902.

In an aspect, lift apparatus 102 is mounted on vessel 304. Lift apparatus comprises two assemblies 102 connected to platform 502. Platform 502 is configured as a recreation platform and comprises two stowable chock assemblies 906 configured such that the top surface of chocks 1008 (shown, for clarity, as chock 1008a in FIG. 11) is flush with top surface of platform 502 when chock assembly 906 is stowed. Chock assemblies 906 are stowed in channels 904. Chock assemblies 906 may be moved fore and aft such that the position of watercraft 902 supported by chock assemblies 906 is moved fore and aft. This allows larger watercraft 902 to be lifted without contacting vessel 304 or assemblies 210. It also allows redistribution of the weight of watercraft 902 when lift apparatus 102 is in the raised position, reducing moment arms and torques associated with watercraft 902 weight.

Referring now to FIG. 12, a top view of a vessel-mounted lift apparatus 102 in a raised position and carrying watercraft 902, in accordance with an aspect of the present disclosure, is shown.

In an aspect in accordance with FIG. 11, a large watercraft 902 is lifted by lift apparatus 102. Chock assemblies 906 lifting watercraft 902 along watercraft centerline 910 are extended to aft portion of platform 502. Once watercraft 902 is raised, chock assemblies 906 may be moved to a fore position on platform 502 wherein watercraft 902 extends over vessel 304.

Referring now to FIGS. 13A and 13B, perspective views of chock assembly 906 in a stowed and deployed position, in accordance with an aspect of the present disclosure, are shown.

Chock assembly 906 may be configured to extend beyond aft portion of platform 502 and support watercraft 902 via contacting watercraft 902 about watercraft centerline 910. Chock assembly 906 comprises chock base 1004, first chock 1006a, second chock 1006b, support arms 1008 (shown, for clarity, as support arm 1008a) illustrated in FIGS. 13A and B), and
locking channels 1010 (shown, for clarity, as locking channel 1010a in FIGS. 13A and B), wheels 1302 (shown, for clarity, as wheels 1302a-c in FIGS. 13A and B), and retaining pin 1304.

[0095] Referring now to FIG. 14, a side view of a vessel-mounted lift apparatus 102 in a lowered position and carrying watercraft 902, in accordance with an aspect of the present disclosure, is shown.

[0096] In an aspect, lift apparatus 102 is mounted to vessel 304. Lift apparatus 102 comprises chock assemblies 906, two assemblies 210, and platform 502. Lift apparatus 102 may further comprise stabilizer 202.

[0097] Platform 502 comprises at least one channel 904 and at least one chock assembly 906.

[0098] Channel 904 may be a cavity in platform 502 accessible from the top of platform 502 and configured to support chock assembly 906. In another aspect, channel 904 is a cavity in platform 502 accessible from top portion of platform 502 and the aft portion of platform 502 and configured to support chock assembly 906. In yet another aspect, channel 904 is a cavity in platform 502 accessible from aft portion of platform 502 and configured to support chock assembly 906. Channel 904 may further comprise one or more rail guides 1002 mounted to side portions of channel 904.

[0099] As shown in FIGS. 14-16, channel 904 is a cavity in platform 502 accessible from aft portion of platform 502 and configured to support chock assembly 906. Chock assembly 906 is moveable fore and aft in channel 904 and extendable beyond aft portion of platform 502. Platform 502 is configured to prevent overextension of chock assembly 906. Platform 502 further comprises a physical stop (not shown) which is positioned in the path of retaining pin 1304. Retaining pin 1304 and physical stop are configured for arresting the aft movement of chock assembly 906 when retaining pin 1304 and physical stop come in contact.

[0100] Lift apparatus 102 may be moved to a lowered position wherein platform 502 has moved aft and down relative to vessel 304. Chock assembly 906 may be moved aft as shown in FIG. 14, such that watercraft 902 having a beam wider than platform 502 may be engaged by lift apparatus 102 without contacting other portions of vessel 304. Lift apparatus 102 may also be placed in this position such that vessel with a length greater than the length of platform 502 and greater than the distance between the hulls of a multi-hull vessel (e.g., a catamaran, as shown in FIG. 14) may be engaged by lift apparatus 102 without contacting other portions of vessel 304.

[0101] Referring briefly to FIG. 15, a side view of a vessel-mounted lift apparatus 102 in a raised position and carrying watercraft 906, in accordance with an aspect of the present disclosure, is shown.

[0102] Lifting of large watercraft 902 is facilitated by extending chock assemblies 906 aft such that the centerline 910 of watercraft 902 is near aft portion of platform 502 or beyond aft portion of platform 502. Lift apparatus 102 may be configured to support, raise, and lower watercraft 902 when chock assemblies 906 are fully extended aft. Watercraft 902 may be raised and lowered with chock assemblies 906 extended fully aft in order to avoid contact between watercraft 902 and other portions of vessel 304. This may be desirable where watercraft 902 has a length greater than platform 502 or a width greater than platform 502.

[0103] Referring briefly to FIG. 16, a side view of a vessel-mounted lift apparatus 102 in a raised position and carrying watercraft 902 wherein deployed chock assemblies 906 supporting watercraft 902 have been retracted, in accordance with an aspect of the present disclosure, is shown.

[0104] In an aspect in accordance with FIG. 16, large watercraft 902 is lifted by lift apparatus 102. Upon being secured in the raised position, chock assemblies 906 may be retracted such that watercraft 902 is positioned over platform 502 and vessel 304.

[0105] Referring now to FIG. 17, a top view of a vessel-mounted lift apparatus 102 in a raised position and carrying watercraft 902 wherein watercraft 902 has a length greater than the distance between the two hulls of vessel 304 in accordance with an aspect of the present disclosure, is shown.

[0106] Lift apparatus 102 may be configured in accordance with lift apparatus depicted in FIGS. 11 and 12. In another aspect, lift apparatus 102 is configured in accordance with lift apparatus 102 depicted in FIGS. 14-16. Lift apparatus 102 is mounted on catamaran 304. Catamaran comprises two hulls 1702. Watercraft 902 has a length greater than the distance between hull 1702a and hull 1702b. When watercraft is 902 in a raised position, portions of watercraft 902 over hang vessel. Chock assembly 902 (not shown in FIG. 17) may extend watercraft 902 aft when lift apparatus 102 lowers or raises watercraft 902 in order to avoid contacting other portions of vessel 304 with watercraft 902. Platform 502 may also move aft as lift apparatus 102 moves from a raised position to a lowered position, avoiding contacting other portions of vessel 304 with watercraft 902.

[0107] Referring now to FIG. 18, a block diagram illustrating an exemplary system useful for implementing the present disclosure is shown.

[0108] FIG. 18 sets forth illustrative computing functionality 1800 that may be used to implement any aspect of the functions described herein. For example, computing functionality 1800 may be used to implement any aspect of the present disclosure. In all cases, computing functionality 1800 represents one or more physical and tangible processing mechanisms.

[0109] As will be appreciated by those skilled in the relevant art(s) after reading the description herein, movement of one or more portions of the present disclosure may be controlled by electronic means. For example, computing functionality 1800 may be used to facilitate the positioning of platform 502 or assembly 210.

[0110] Computing functionality 1800 may include volatile and non-volatile memory, such as RAM 1802 and ROM 1804, as well as one or more processing devices 1806 (e.g., one or more central processing units (CPUs), one or more graphical processing units (GPUs), and the like). Computing functionality 1800 also optionally includes various media devices 1808, such as a hard disk module, an optical disk module, and so forth. Computing functionality 1800 can perform various operations identified above when the processing device(s) 1806 executes instructions that are maintained by memory (e.g., RAM 1802, ROM 1804).

[0111] More generally, instructions and other information may be stored on any computer readable medium 1810, including, but not limited to, static memory storage devices, magnetic storage devices, and optical storage devices. The term “computer readable medium” also encompasses plural storage devices. In all cases, computer readable medium 1810 represents some form of physical and tangible entity. By way of example, and not limitation, computer readable medium 1810 may comprise “computer storage media” and “communications media.”
“Computer storage media” include volatile and non-volatile, removable and non-removable media implemented in any method or technology for storage of information, such as computer readable instructions, data structures, program modules or other data. Computer storage media include, but are not limited to, RAM 1802, ROM 1804, EEPROM, Flash memory or other memory technology, CD-ROM, digital versatile disks (DVD) or other optical storage, magnetic cassettes, magnetic tape, magnetic disk storage or other magnetic storage devices, or any other medium which can be used to store the desired information and which can be accessed by a computer.

“Communication media” typically embody computer readable instructions, data structures, program modules, or other data in a modulated data signal, such as carrier wave or other transport mechanism. Communication media also include any information delivery media. The term “modulated data signal” means a signal that has one or more of its characteristics set or changed in such a manner as to encode information in the signal. By way of example, and not limitation, communication media include wired media such as a wired network or direct-wired connection, and wireless media such as acoustic, RF, infrared, and other wireless media. Combinations of any of the above are also included within the scope of computer readable medium.

Computing functionality 1800 also includes an input/output module 1812 for receiving various inputs (via input modules 1814), and for providing various outputs (via one or more output modules). One particular output mechanism may include a presentation module 1816 and an associated GUI 1818. Computing functionality 1800 may also include one or more network interfaces 1820 for exchanging data with other devices via one or more communication conduits 1822. One or more communication buses 1824 communicatively couple the above-described components together.

Communication conduit(s) 1822 may be implemented in any manner (e.g., by a local area network, a wide area network (e.g., the Internet), etc., or any combination thereof). Communication conduit(s) 1822 can include any combination of wired hardlinks, wireless links, routers, gateway functionalities, name servers, etc., governed by any protocol or combination of protocols.

Alternatively, or in addition, any of the functions described herein can be performed, at least in part, by one or more hardware logic components. For example, without limitation, illustrative types of hardware logic components that can be used include Field-Programmable Gate Arrays (FP-GAs), Application-specific Integrated Circuits (ASICs), Application-specific Standard Products (ASSPs), System-on-a-chip systems (SOCs), Complex Programmable Logic Devices (CPLDs), etc.

The terms “module” and “component” as used herein generally represent software, firmware, hardware, or combinations thereof. In the case of a software implementation, the module or component represents program code that performs specified tasks when executed on a processor. The program code can be stored in one or more computer readable memory devices, as described with reference to FIG. 18. The features of the present disclosure described herein are platform-independent, meaning that the techniques can be implemented on a variety of commercial computing platforms having a variety of processors (e.g., desktop, laptop, notebook, tablet computer, personal digital assistant (PDA), mobile telephone, smart telephone, gaming console, and the like).

While various aspects of the present disclosure have been described above, it should be understood that they have been presented by way of example and not limitation. It will be apparent to persons skilled in the relevant art(s) that various changes in form and detail can be made therein without departing from the spirit and scope of the present disclosure. Thus, the present disclosure should not be limited by any of the above described exemplary aspects.

In addition, it should be understood that the figures in the attachments, which highlight the structure, methodology, functionality and advantages of the present disclosure, are presented for example purposes only. The present disclosure is sufficiently flexible and configurable, such that it may be implemented in ways other than those shown in the accompanying figures.

What is claimed is:
1. A lift apparatus for raising, lowering, and transporting marine vessels, watercraft, cargo, and people, the lift apparatus comprising:
   a base; and
   an assembly, the assembly comprising:
   a shuttle movable between a first shuttle position and a second shuttle position;
   a link arm comprising:
   a first link arm portion;
   a link arm body; and
   a second link arm portion;
   wherein the first portion is attached to the shuttle and configured for movement relative to the shuttle and the link arm is movable between a first link arm position and a second link arm position; and
   a control link comprising:
   a first control link portion;
   a control link body; and
   a second control link portion;
   wherein the control link is attached for movement to the link arm at second control link portion and attached for movement to the base at first control link portion, wherein the control link guides the link arm between the first link arm position and the second link arm position.
2. The lift apparatus of claim 1, wherein the base is connected to at least one surface.
3. The lift apparatus of claim 2, wherein the surface is one of: a deck, a transom of a vessel, a beam, a chaisson, and a portion of a vessel.
4. The lift apparatus of claim 3, wherein the vessel is one of: a multi-hull vessel, a catamaran, and a trimaran.
5. The lift apparatus of claim 2, wherein the lift apparatus is mounted on a vessel and generally parallel to the centerline of the vessel.
6. The lift apparatus of claim 1, wherein link arm is rotatably connected to the shuttle such that the link arm rotates and slides as it moves from the first link arm position to the second link arm position.
7. The lift apparatus of claim 1, further comprising:
   A shuttle guide comprising:
   a first shuttle guide portion;
   a shuttle guide body; and
   a second shuttle guide portion;
   wherein the shuttle guide is configured to allow linear movement of the shuttle along the shuttle guide body between the first shuttle position and the second shuttle position.
8. The lift apparatus of claim 7, wherein the shuttle guide further comprises a rail and a slider.

9. The lift apparatus of claim 8, wherein the slider is located on a top portion of the shuttle, the slider being configured to slide along the shuttle guide rail between the first shuttle position and the second shuttle position.

10. The lift apparatus of claim 1, further comprising:
   - an actuator comprising:
     - a first actuator portion; and
     - a second actuator portion;
   - wherein the actuator is connected at the first actuator portion to the shuttle guide and connected at the second actuator portion to the shuttle and configured to move the shuttle between the first shuttle position and the second shuttle position.

11. The lift apparatus of claim 1, wherein the link arm moves from the first link arm position to the second link arm position via generally vertical movement.

12. The lift apparatus of claim 1, wherein the second control link portion is pivotally attached to the link arm body and the first control link portion is pivotally attached to the base.

13. The lift apparatus of claim 1 further comprising:
   - an actuator comprising:
     - a first actuator portion; and
     - a second actuator portion;
   - wherein the first actuator portion is rotatably connected to an actuator connection point, the second actuator portion is rotatably connected to the assembly, and the actuator and the assembly are configured to guide link arm between the first link arm position and the second link arm position.

14. The lift apparatus of claim 13, wherein the second actuator portion is rotatably connected to the assembly at the control link.

15. The lift apparatus of claim 13, wherein the second actuator portion is rotatably connected to the assembly at the link arm.

16. The lift apparatus of claim 13, further comprising:
   - a vertically-oriented lift bracket comprising:
     - a top lift bracket portion; and
     - a bottom lift bracket portion;
   - wherein the bottom lift bracket portion is rotatably connected to the first link arm at the first second link arm portion and the second actuator portion is rotatably connected to the assembly at the lift bracket.

17. The lift apparatus of claim 13, wherein the actuator is one of: a hydraulic ram, a pneumatic ram, and an electric motor.

18. The lift apparatus of claim 13, wherein the base further comprises:
   - the actuator connection point configured to rotatably connect the actuator to the base.

19. The lift apparatus of claim 13, further comprising:
   - a mounting bracket rigidly connected to the base and having the actuator connection point configured to rotatably connect to the actuator.

20. The lift apparatus of claim 1, further comprising:
   - a second link arm comprising:
     - a first link arm portion;
     - a link arm body portion; and
     - a second link arm portion;
   - wherein the first link arm portion of the second link arm is attached to the shuttle and configured for movement relative to the shuttle, wherein the second link arm is moveable between a first link arm position and a second link arm position.

21. The lift apparatus of claim 20, wherein the length of the second link arm is substantially equal to the length of the first link arm.

22. The lift apparatus of claim 1, further comprising:
   - a vertically-oriented lift bracket comprising:
     - a top lift bracket portion;
     - a bottom lift bracket portion; and
     - a lift bracket first link arm connection point;
   - wherein the bottom lift bracket is rotatably connected to the second link arm portion of the first link arm at the lift bracket first link arm connection point.

23. The lift apparatus of claim 22, wherein the lift bracket further comprises:
   - a fore lift bracket portion;
   - an aft lift bracket portion; and
   - a lift bracket second link arm connection point;
   - wherein the fore lift bracket portion is proximately located relative to the shuttle and the aft lift bracket portion is distally located relative to the shuttle, the lift bracket first link arm connection point is located at the bottom fore lift bracket portion, the lift bracket second link arm connection point is located at the distal bottom portion of the lift bracket at a location height higher than the lift bracket first link arm connection point, and the second link arm portion of the second link arm is rotatably connected to the lift bracket at the lift bracket second link arm connection point.

24. The lift apparatus of claim 23, wherein the distance between first link arm portion of the first link arm and second link arm portion of the first link arm is substantially equal to the distance between first link arm portion of the second link arm and second link arm portion of the second link arm.

25. The lift apparatus of claim 24, further comprising:
   - a platform rigidly connected to the top lift bracket portion;
   - wherein the lift apparatus is configured to move the platform between a first raised position and a second lowered position.

26. The lift apparatus of claim 25, wherein the platform is horizontally-oriented and remains substantially level as it moves between the first raised position and the second lowered position.

27. The lift apparatus of claim 25, wherein the surface is a portion of a vessel, the vessel further comprises a deck, and the platform is configured to provide a flat surface level with the deck.

28. The lift apparatus of claim 25, further comprising:
   - a brace comprising:
     - a bottom brace portion;
     - a top brace portion; and
     - an aft brace portion;
   - wherein the bottom brace portion is rigidly attached to the link arm body, the top brace portion is configured to removably connect to the base and restrain the movement of the lift apparatus when the platform is in the first raised position, and the aft portion is configured to restrain the movement of the lift apparatus when the platform is in the second lowered position via physical contact with the platform.

29. The lift apparatus of claim 25, wherein the platform is configured to support a watercraft.
30. The lift apparatus of claim 25, the platform further comprising:
   at least one deployable chock assembly configured to contact the watercraft and support the watercraft when deployed.
31. The lift apparatus of claim 25, wherein the platform is configured as a swim platform.
32. The lift apparatus of claim 25, wherein the platform is configured to support cargo.
33. The lift apparatus of claim 1, further comprising:
   a first assembly wherein the first assembly shuttle is configured for linear movement and the second assembly link arm moves between a first link arm position and a second position in a vertical plane,
   a second assembly, wherein the second assembly shuttle is configured for linear movement and the second assembly link arm moves between a first link arm position and a second link arm position in a vertical plane;
   wherein the second assembly is substantially similar to the first assembly and positioned in parallel to the first assembly a distance apart from the first assembly such that the first link arm position of second assembly link arm and the first link arm position of the first assembly link arm have substantially similar vertical positions and the second link arm position of the second assembly link arm and the second link arm position of the first assembly link arm have substantially similar vertical positions.
34. The lift apparatus of claim 33, further comprising:
   a stabilizer comprising:
   a port stabilizer portion; and
   a starboard stabilizer portion;
   wherein the port stabilizer portion is connected to first assembly and the starboard stabilizer portion is connected to the second assembly and the stabilizer is configured to rigidly connect the first assembly to the second assembly.
35. The lift apparatus of claim 34, wherein the port stabilizer portion is connected to the first assembly at the first assembly control link and the starboard stabilizer portion is connected to the second assembly at the second assembly control link.
36. The lift apparatus of claim 34, wherein the port stabilizer portion is connected to the first assembly at the first assembly link arm and the starboard stabilizer portion is connected to the second assembly at the second assembly link arm.
37. The lift apparatus of claim 34, wherein the port stabilizer portion is connected to the first assembly at the first assembly shuttle and the starboard stabilizer portion is connected to the second assembly at the second assembly shuttle.
38. The lift apparatus of claim 34, further comprising:
   a first assembly lift bracket, the first assembly lift bracket being vertically-oriented and comprising:
   a top lift bracket portion; and
   a bottom lift bracket portion;
   wherein the bottom lift bracket portion is rotatably connected to the second assembly link arm at the second link arm portion;
   wherein the port stabilizer portion is connected to the first assembly at the first assembly lift bracket and the starboard stabilizer portion is connected to the second assembly at the second assembly lift bracket.
39. The lift apparatus of claim 34, further comprising:
   a first assembly second link arm;
   a second assembly second link arm;
   wherein the port stabilizer portion is connected to the first assembly at the first assembly second link arm and the starboard stabilizer portion is connected to the second assembly at the second assembly second link arm.
40. A stowable, vessel-mounted chock assembly for supporting marine vessels or watercraft comprising:
   a base comprising:
   a first locking channel;
   a first chock connection point; and
   a second locking channel;
   a first chock comprising:
   a proximal first chock portion; and
   a first chock body;
   wherein the first chock is connected at the proximal first chock portion for rotation between a stowed position and a deployed position to the base at the chock connection point and a top first chock portion of the first chock body is configured to contact the watercraft when the first chock is in the deployed position;
   a first support arm comprising:
   a proximal first support arm portion; and
   a distal first support arm portion;
   wherein the proximal first support arm portion is connected for rotation to a bottom portion of the first chock body and the distal portion is slidably connected to the first locking channel and configured to move the first chock between the deployed and the stowed positions and to support the first chock when the first chock is in the deployed position;
   a second chock comprising:
   a proximal second chock portion; and
   a second chock body;
   wherein the second chock is connected at the proximal second chock portion for rotation between a stowed position and a deployed position to the base at the second chock connection point and a top second chock portion of the second chock body is configured to contact the watercraft when the second chock is in the deployed position; and
   a second support arm comprising:
   a proximal second support arm portion; and
   a distal second support arm portion;
   wherein the proximal second support arm portion is connected for rotation to a bottom portion of the second chock body and the distal portion slidably connected to the second locking channel and configured to move the second chock between the deployed and the stowed positions and to support the second chock when the second chock is in the deployed position.
41. The chock assembly of claim 40 further comprising:
   a platform comprising:
   a top platform surface; and
   a platform channel;
wherein the chock assembly is disposed within the platform channel and the top first chock portion and the top second chock portion are configured to be flush with the top platform surface when in the stowed position.

42. The chock assembly of claim 40, wherein the chock assembly is moveable within the platform channel.

43. The chock assembly of claim 40, further comprising: a channel having a fore portion and an aft portion; at least one wheel located on a portion of the chock base, configured to facilitate movement of the chock assembly; a physical stop configured to limit the movement of chock assembly; and at least one retaining pin attached to a portion of the chock base and configured to limit movement of the chock assembly when the retaining pin comes into contact with a physical stop.

44. The chock assembly of claim 43, wherein the chock assembly is configured to allow at least a portion of the first chock or at least a portion of the second chock to extend beyond the channel.